THE WCM GROUP, INC.
110 S. Bender Ave.
Humble, TX 77338

March 30, 2020

Executive Director
Applications Review and Processing Team, MC-148
Texas Commission on Environmental Quality
12100 Park 35 Circle
Austin, Texas 78753

HAND DELIVERED

REFERENCE: Industrial Wastewater Permit Renewal With Changes Application
TPDES Permit No. WQ0001244000; NPDES Permit No. TX0003581
Nueces Bay, LLC; Nueces Bay Power Station
Corpus Christi, Nueces County, Texas
CN605698612; RN100552181

Dear Sir or Madam,

On behalf of Nueces Bay, LLC, Nueces Bay Power Station, The WCM Group Inc. is submitting this application for the renewal of Texas Commission on Environmental Equality (TCEQ) TPDES Permit No. WQ0001244000.

A check in the amount of $2,015.00 (copy attached) has been forwarded to the TCEQ Financial Administration Division under separate letter for the application fee.

Should you have any questions, or require additional information regarding this matter, please feel free to contact me at (281) 446-7070.

Sincerely,

Alison K. Davis
Director, Technical Services
adavis@wcmgroup.com

AKD/tnk
ENCLOSURE

cc: C. Garcia-Rios

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
PERMIT RENEWAL WITH CHANGES TO DISCHARGE, DEPOSIT OR DISPOSE OF WASTE(S) INTO OR ADJACENT TO WATER IN THE STATE
PERMIT NO. WQ0001244000

Prepared for
NUECES BAY, LLC
NUECES BAY POWER STATION
Corpus Christi, Texas

March 2020

THE WCM GROUP, INC.
110 S. Bender Ave.
Humble, TX 77338
phone 281.446.7070 | fax 281.446.3348
wcmgroup.com

TABLE OF CONTENTS

FIGURES

ATTACHMENTS

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY
WASTEWATER PERMIT RENEWAL WITH CHANGES APPLICATION
NUECES BAY POWER STATION
CORPUS CHRISTI, TEXAS

BACKGROUND

Nueces Bay, LLC (Nueces Bay) owns and operates the Nueces Bay Power Station (NBPS), located at 2002 East Navigation Boulevard in Corpus Christi, Nueces County, Texas, which is a 633-megawatt natural gas-fired electric power generation facility. The facility is located on approximately 63 acres of land and improvements that include: a cooling water intake structure; two (2) natural gas fired combustion turbines (NB8 and NB9), two (2) Heat Recovery Steam Generators (HRSGs), one (1) steam turbine (STG7), a Power Distribution Center, Firewater Pump House, Continuous Emission Monitoring (CEM) Buildings, and a warehouse. The facility was first constructed in the mid-1930s to provide electrical power to the power grid and has been in operation as currently configured since repowering in June 2010.

NBPS withdraws water from the Corpus Christi Inner Harbor, Segment 2484 of the Bays and Estuaries, for once-through cooling. This water is then discharged via Outfall 001 directly to Nueces Bay in Segment 2482 of the Bays and Estuaries under TPDES Permit No. WQ0001244000. Wastewater generated on site includes once through cooling water, low volume wastes, metal cleaning waste, and stormwater run-off discharged via Outfall 001.

CHANGES REQUESTED WITH PERMIT RENEWAL WITH CHANGES

On August 31, 2018 NBPS sought clarification from Texas Commission on Environmental Quality (TCEQ) regarding the biomonitoring language in the NBPS permit as it pertains to invalid tests/failures. The biomonitoring language currently states:

> "An invalid test must be repeated during the same reporting period. An invalid test is herein defined as any test failing to satisfy the test acceptability criteria, and quality assurance requirements specified in the test methods and permit. All test results, valid or invalid, must be submitted as described below."

Nueces Bay's sister facility, Barney Davis, LLC (Barney Davis) (TPDES Permit No. WQ0001490000), historically included the above language. In 2009, a request was submitted by Huther and Associates (Huther) to obtain concurrence that since pre-existing toxicity was present in the intake water prior to any use or treatment by the facility, the test is considered invalid rather than a failed test. In response to this letter, Barney Davis' biomonitoring language was revised to the following:

> "The permittee should perform and report a valid test for each test species during the prescribed reporting period. An invalid test must be repeated during the same reporting period, unless the test was invalid due to the intake water (i.e., the control) being toxic (i.e., failing to meet acceptability criteria). In such case, the requirement to perform a valid test is waived for that reporting period only. An invalid test is defined as any test failing to satisfy the test acceptability criteria, procedures, and quality assurance requirements specified in the test methods and permit."

The letter submitted by Huther in 2009 and the 2018 e-mail concurrence/response received from Mr. Michael Pfeil of TCEQ are included as part of this Executive Summary for your reference. Based on this information NBPS is requesting that the above language be incorporated into the permit's biomonitoring section to clarify retesting requirements for tests that are invalid due to toxicity in the intake water.

June 18, 2009

Michael Pfeil
TCEQ (MC 150)
P.O. Box 13087
Austin, TX 78711 - 3087

Dear Mr. Pfeil,

Huther and Associates recently conducted chronic tests on effluent from the Topaz Power Group L.L.C., Barney M. Davis Power Station. The TPDES permit number is 01490.

The facility uses Laguna Madre water for once-through cooling and discharges to Oso Creek. Upstream Oso Creek water is used for the control and diluent. An additional control of 100% intake water was also conducted. Both the critical 100% effluent and the 100% intake water control had statistically detectable lethality to both species. The laboratory water control and the Oso Creek water control met all test acceptability criteria. These results demonstrated that toxicity was present in the intake water prior to use as cooling water.

Historically, Laguna Madre has had periods of elevated salinity in the range of 40 - 70 ppt. The current salinity in the three samples were 42 - 43 ppt. Organisms for testing are cultured at the recommended salinity of 24 - 26 ppt. Sample holding times did not allow us time for acclimation to a higher salinity. The facility will test again the week of June 22 using duel controls. Huther has begun to acclimate both organisms to a higher test salinity.

Since the pre-existing toxicity was present in the intake water prior to any use or treatment by the facility, I believe this test will be considered as invalid rather then a failed test. Please let me know if this is correct and whether any additional testing is required.

Thank you for your consideration in this matter.

Sincerely,

Bruce Huther

The permittee is exempted from performing and reporting a valid test for each test species during the prescribed reporting period if the invalid test is due to failure to meet acceptability criteria in the control when the control is intake water. This provision applies solely to once-through cooling-water facilities that use intake water as the control. This provision precludes permittees from running additional tests when the lake itself is already toxic to one or both test organisms due to total dissolved solids (TDS), pathogenic bacteria (PB) or toxic algae blooms. An invalid test is herein defined as any test failing to satisfy the test acceptability criteria, procedures, and quality assurance requirements specified in the test methods and permit. All test results, valid or invalid, must be submitted as described below.

Jim Michael Pfeil
7/13/2009

Hailey V. Cofty

From: Garcia-Rios, Cecilia <Cecilia.Garcia-Rios@talenenergy.com>
Sent: Friday, September 7, 2018 12:31 PM
To: Alison Davis; Hailey Cofty
Subject: Fwd: Nueces Bay Power Station (WQ0001244000) Biomonitoring clarification

Cecilia Garcia Rios
Environmental Director
(956) 763-3510

Begin forwarded message:

> **From:** Michael Pfeil <michael.pfeil@tceq.texas.gov>
> **Date:** September 7, 2018 at 12:28:38 PM CDT
> **To:** "Garcia-Rios, Cecilia" <Cecilia.Garcia-Rios@talenenergy.com>
> **Subject: RE: Nueces Bay Power Station (WQ0001244000) Biomonitoring clarification**
>
> Cecilia-
>
> An invalid test is not a failure.
>
> If there is pre-existing toxicity in the intake water for a OTCW facility, than a valid test is not required for that reporting period. We do not want OTCW facilities using SDW in order to produce a valid test. You should also be measuring TDS at both ends while testing for WET.
>
> Mike
>
> ---
>
> **From:** Garcia-Rios, Cecilia <Cecilia.Garcia-Rios@talenenergy.com>
> **Sent:** Friday, August 31, 2018 7:10 AM
> **To:** Michael Pfeil <Michael.Pfeil@tceq.texas.gov>
> **Cc:** Garcia-Rios, Cecilia <Cecilia.Garcia-Rios@talenenergy.com>
> **Subject:** Nueces Bay Power Station (WQ0001244000) Biomonitoring clarification
>
> Mr. Pfeil,
>
> I am seeking clarification regarding the biomonitoring language for Nueces Bay Power Station (TPDES Permit No. WQ0001244000).
>
> The current biomonitoring language states:
>
> > "An invalid test must be repeated during the same reporting period. An invalid test is herein defined as any test failing to satisfy the test acceptability criteria, and quality assurance requirements specified in the test methods and permit. All test results, valid or invalid, must be submitted as described below."
>
> Nueces Bay's sister facility, Barney M. Davis (TPDES Permit No. WQ0001490000) historically had the same language as above. However, in 2009 a request was submitted by Huther and

Associates to obtain concurrence that since pre-existing toxicity was present in the intake water prior to any use or treatment by the facility, the test is considered invalid rather than a failed test. The letter submitted by Huther and your response are attached for your reference. Barney Davis' biomonitoring language was subsequently changed to the following:

> "The permittee should perform and report a valid test for each test species during the prescribed reporting period. An invalid test must be repeated during the same reporting period, unless the test was invalid due to the intake water (i.e., the control) being toxic (i.e., failing to meet acceptability criteria). In such case, the requirement to perform a valid test is waived for that reporting period only. An invalid test is defined as any test failing to satisfy the test acceptability criteria, procedures, and quality assurance requirements specified in the test methods and permit."

Operations at Nueces Bay and Barney Davis are similar in nature; therefore Talen would like to obtain concurrence for Nueces Bay that if pre-existing toxicity is present in the intake water prior to any use or treatment by the facility, the test is considered invalid rather than a failed test.

If you have any questions, please do not hesitate to contact me.

Thank you, Cecilia

Cecilia Garcia-Rios
Regional Environmental Director | Talen Energy -ERCOT
www.TalenEnergy.com | Cell: 956.763.3510
Barney M. Davis & Nueces Bay | Corpus Christi, TX
Laredo Energy Center | Laredo, TX

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ADMINISTRATIVE REPORT 1.0

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

TCEQ INDUSTRIAL WASTEWATER PERMIT APPLICATION

INDUSTRIAL ADMINISTRATIVE REPORT

Complete and submit this checklist with the application.

APPLICANT NAME: NUECES BAY, LLC

PERMIT NUMBER: WQ0001244000

Check Y for each of the following items included in this application. If an item was not included, check N.

	Y	N		Y	N
Administrative Report 1.0	☒	☐	Worksheet 8.0	☐	☒
Administrative Report 1.1	☐	☒	Worksheet 9.0	☐	☒
SPIF	☒	☐	Worksheet 10.0	☐	☒
Core Data Form	☒	☐	Worksheet 11.0	☒	☐
Technical Report 1.0	☒	☐	Worksheet 11.1	☒	☐
Worksheet 1.0	☒	☐	Worksheet 11.2	☒	☐
Worksheet 2.0	☒	☐	Worksheet 11.3	☒	☐
Worksheet 3.0	☐	☒	Original USGS Map	☒	☐
Worksheet 3.1	☐	☒	Affected Landowners Map	☐	☒
Worksheet 3.2	☐	☒	Landowner Disk or Labels	☐	☒
Worksheet 3.3	☐	☒	Flow Diagram	☒	☐
Worksheet 4.0	☒	☐	Site Drawing	☒	☐
Worksheet 4.1	☐	☒	Original Photographs	☐	☒
Worksheet 5.0	☐	☒	Solids Management Program	☐	☒
Worksheet 6.0	☐	☒	Water Balance	☐	☒
Worksheet 7.0	☐	☒			

For Commission Use Only:
Segment Number: _____ County: _____ Expiration Date: _____
Proposed/Current Permit Number: _____ Region: _____

INDUSTRIAL ADMINISTRATIVE REPORT 1.0

The following information **is required** for **all** applications for TPDES permits and TLAPs.

1. TYPE OF APPLICATION AND FEES (Instructions, Page 21)

a. Permit No.: WQ0001244000 Expiration Date: April 1, 2020

EPA ID No.: TX0003581

b. Check the box next to the appropriate application type.

☐	New TPDES permit	☐	New TLAP permit
☐	Major amendment with renewal	☐	Major amendment without renewal
☒	Renewal with changes	☐	Renewal without changes
☐	Minor amendment without renewal	☐	Minor modification without renewal
☐	Stormwater only discharge		

c. If applying for an **amendment** or **modification** of a permit, describe the request in detail: Click to enter text.

d. Application Fee

Check the box next to the amount submitted for the application fee:

EPA Classification	New	Major Amendment (With or Without Renewal)	Renewal (With or Without Changes)	Minor Amendment/ Minor Modification (Without Renewal)
Minor facility not subject to EPA categorical effluent guidelines (*40 CFR Parts 400-471*)	☐ $350	☐ $350	☐ $315	☐ $150
Minor facility subject to EPA categorical effluent guidelines (*40 CFR Parts 400-471*)	☐ $1,250	☐ $1,250	☐ $1,215	☐ $150
Major facility	N/A *	☐ $2,050	☒ $2,015	☐ $450

* All facilities are designated as minors until formally classified as a major by EPA.

e. Payment Information:

Mailed Check or money order number: 39965

Check or money order amount: $2,015.00

Named printed on check or money order: The WCM Group, Inc.

ePAY Voucher number: Click to enter text.

Copy of voucher attached? ☐ Yes

Attachment: A

2. APPLICANT INFORMATION (Instructions, Pages 21-22)

a. Facility Owner (Owner of the facility must apply for the permit.)

- Provide the legal name of the entity (applicant) applying for this permit: Nueces Bay, LLC

  (The legal name must be spelled exactly as filed with the TX SOS, Texas Comptroller of Public Accounts, County, or in the legal documents forming the entity.)

- If the applicant is currently a customer with the TCEQ, provide the Customer Number, which can be located using the TCEQ's Central Registry Customer Search[1]: **CN**605698612

- Provide the name and title of the person signing the application. The person must be an executive official meeting signatory requirements in *30 TAC § 305.44*.

  Mr. ☒ Ms. ☐ First/Last Name: Dale Lebsack

  Title: President Credential: Click to enter text.

b. Co-applicant Information

- Provide the legal name of the co-applicant applying for this permit, if applicable: N/A

  (The legal name must be spelled exactly as filed with the TX SOS, Texas Comptroller of Public Accounts, County, or in the legal documents forming the entity.)

- If the co-applicant is currently a customer with the TCEQ, provide the Customer Number, which can be located using the TCEQ's Central Registry Customer Search: **CN** Click to enter text.

- Provide the name and title of the person signing the application. The person must be an executive official meeting signatory requirements in *30 TAC § 305.44*.

  Mr. ☐ Ms. ☐ First/Last Name: Click to enter text.

  Title: Click to enter text. Credential: Click to enter text.

- Provide a brief description of the need for a co-permittee: Click to enter text.

c. Core Data Form

Complete the Core Data Form for each customer and include as an attachment. If the customer type selected on the Core Data Form is **Individual**, complete **Attachment 1** of the Administrative Report.

Attachment: B

3. APPLICATION CONTACT INFORMATION (Instructions, Page 22)

If the TCEQ needs additional information regarding this application, who should be contacted?

a. Mr. ☐ Ms. ☒ First/Last Name: Cecilia Garcia-Rios Credential: Click to enter text.

Organization Name: Talen Energy Title: Texas Compliance Manager

Mailing Address: 7300 CPL Road City/State/ZIP Code: Laredo, TX 78041

Phone No.: 956-763-3510 Fax No.: E-mail: Cecilia.Garcia-Rios@talenenergy.com

Check one or both: ☒ Administrative Contact ☒ Technical Contact

[1] http://www15.tceq.texas.gov/crpub/index.cfm?fuseaction=cust.CustSearch

b. Mr. ☐ Ms. ☒ First/Last Name: Alison Davis Credential: Click to enter text.

Organization Name: The WCM Group, Inc. Title: Senior Director, Technical Services

Mailing Address: P.O. Box 3247 City/State/ZIP Code: Humble, TX 77338-3247

Phone No.: 281-446-7070 Fax No.: 281-446-3348 E-mail: adavis@wcmgroup.com

Check one or both: ☐ Administrative Contact ☒ Technical Contact

Attachment: Click to enter text.

4. PERMIT CONTACT INFORMATION (Instructions, Page 22)

Provide two names of individuals that can be contacted throughout the permit term.

a. Mr. ☐ Ms. ☒ First/Last Name: Cecilia Garcia-Rios Credential: Click to enter text.

Organization Name: Talen Energy Title: Texas Compliance Manager

Mailing Address: 7300 CPL Road City/State/ZIP Code: Laredo, TX 78041

Phone No.: 956-763-3510 Fax No.: E-mail: Cecilia.Garcia-Rios@talenenergy.com

b. Mr. ☐ Ms. ☒ First/Last Name: Alison Davis Credential: Click to enter text.

Organization Name: The WCM Group, Inc. Title: Senior Director, Technical Services

Mailing Address: P.O. Box 3247 City/State/ZIP Code: Humble, TX 77338-3247

Phone No.: 281-446-7070 Fax No.: 281-446-3348 E-mail: Click to enter text.

Attachment: Click to enter text.

5. BILLING CONTACT INFORMATION (Instructions, Page 22)

The permittee is responsible for paying the annual fee. The annual fee will be assessed to permits **in effect on September 1 of each year**. *The TCEQ will send a bill to the address provided in this section. The permittee is responsible for terminating the permit when it is no longer needed (form TCEQ-20029).*

Provide the complete mailing address where the annual fee invoice should be mailed and the name and phone number of the permittee's representative responsible for payment of the invoice.

Mr. ☐ Ms. ☒ First/Last Name: Cecilia Garcia-Rios Credential: Click to enter text.

Organization Name: Talen Energy Title: Texas Compliance Manager

Mailing Address: 7300 CPL Road City/State/ZIP Code: Laredo, TX 78041

Phone No.: 956-763-3510 Fax No.: E-mail: Cecilia.Garcia-Rios@talenenergy.com

6. DMR/MER CONTACT INFORMATION (Instructions, Page 22)

Provide the name and mailing address of the person delegated to receive and submit DMRs or MERs.

Mr. ☒ Ms. ☐ First/Last Name: Norm Duperron Credential: Click to enter text.

Organization Name: CAMS Title: Plant Manager

Mailing Address: 2002 E. Navigation Blvd City/State/ZIP Code: Corpus Christi, TX 78402

Phone No.: 361-561-2226 Fax No.: E-mail: nduperron@camsops.com

DMR data must be submitted through the NetDMR[2] system. An electronic reporting account can be established once the facility has obtained the permit number.

7. NOTICE INFORMATION (Instructions, Pages 23-24)

a. Individual Publishing the Notices

Mr. ☐ Ms. ☒ First/Last Name: Cecilia Garcia-Rios Credential: Click to enter text.

Organization Name: Talen Energy Title: Texas Compliance Manager

Mailing Address: 7300 CPL Road City/State/ZIP Code: Laredo, TX 78041

Phone No.: 956-763-3510 Fax No.: E-mail: Cecilia.Garcia-Rios@talenenergy.com

b. Method for Receiving Notice of Receipt and Intent to Obtain a Water Quality Permit Package (only for NORI, NAPD will be sent via regular mail)

☒ E-mail: Cecilia.Garcia-Rios@talenenergy.com / adavis@wcmgroup.com

☐ Fax: Click to enter text.

☐ Regular Mail (USPS)

Mailing Address: Click to enter text. City/State/ZIP Code: Click to enter text.

c. Contact in the Notice

Mr. ☐ Ms. ☒ First/Last Name: Cecilia Garcia-Rios Credential: Click to enter text.

Organization Name: Talen Energy Title: Texas Compliance Manager

Phone No.: 956-763-3510 Fax No.: E-mail: Cecilia.Garcia-Rios@talenenergy.com

d. Public Place Information

If the facility or outfall is located in more than one county, provide a public viewing place for each county.

Public building name: Janet F. Harte Public Library Location within the building: Reference Section

Physical Address of Building: 2629 Waldron Road

City: Corpus Christi County: Nueces

e. Bilingual Notice Requirements:

This information **is required** for **new, major amendment, and renewal applications**. It is not required for minor amendment or minor modification applications.

This section of the application is only used to determine if alternative language notices will be needed. Complete instructions on publishing the alternative language notices will be in your public notice package.

Please call the bilingual/ESL coordinator at the nearest elementary and middle schools and obtain the following information to determine whether an alternative language notices are required.

1. Is a bilingual education program required by the Texas Education Code at the elementary or middle school nearest to the facility or proposed facility?

   ☒ Yes ☐ No

[2] https://www.tceq.texas.gov/permitting/netdmr

If **no**, publication of an alternative language notice is not required; **skip to** Item 8 (REGULATED ENTITY AND PERMITTED SITE INFORMATION.)

2. Are the students who attend either the elementary school or the middle school enrolled in a bilingual education program at that school?

   ☒ Yes ☐ No

3. Do the students at these schools attend a bilingual education program at another location?

   ☐ Yes ☒ No

4. Would the school be required to provide a bilingual education program but the school has waived out of this requirement under 19 TAC §89.1205(g)?

   ☐ Yes ☒ No

5. If the answer is yes to question 1, 2, 3, or 4, public notices in an alternative language are required. Which language is required by the bilingual program? Spanish

8. REGULATED ENTITY AND PERMITTED SITE INFORMATION (Instructions Pages 24-25)

If the site of your business is part of a larger business site, a Regulated Entity Number (RN) may already be assigned for the larger site. Use the RN assigned for the larger site. Search the TCEQ's Central Registry[3] to determine the RN or to see if the larger site may already be registered as a regulated site:

If the site is found, provide the assigned RN and the information for the site to be authorized through this application below. The site information for this authorization may vary from the larger site information.

a. TCEQ issued Regulated Entity Number (RN): **RN**100552181

b. Name of project or site (the name known by the community where located): Nueces Bay Power Station

c. Is the location address of the facility in the existing permit the same?

   ☒ Yes ☐ No

d. If the facility is located in Bexar, Comal, Hays, Kinney, Medina, Travis, Uvalde, or Williamson County, additional information concerning protection of the Edwards Aquifer may be required.

e. Owner of treatment facility: Nueces Bay, LLC

   Ownership of Facility: ☐ Public ☒ Private ☐ Both ☐ Federal

f. Owner of land where treatment facility is or will be:

   Mr. ☐ Ms. ☐ First/Last or Organization Name: Nueces Ba, LLC

   Mailing Address: 2002 E. Navigation Blvd City/State/ZIP Code: Corpus Christi, TX 78402

   Phone No.: 956-763-3510 Fax No.: Click to enter text E-mail: Cecilia.Garcia-Rios@talenenergy.com

   If not the same as the facility owner, there must be a long-term lease agreement in effect for at least six years. In some cases, a lease may not suffice - see instructions.

   Attachment: N/A

g. Owner of effluent TLAP disposal site (if applicable):

[3] http://www15.tceq.texas.gov/crpub/index.cfm?fuseaction=regent.RNSearch

Mr. ☐ Ms. ☐ First/Last or Organization Name: N/A

Mailing Address: Click to enter text. City/State/ZIP Code: Click to enter text.

Phone No.: Click to enter text. Fax No.: Click to enter text. E-mail: Click to enter text.

If not the same as the facility owner, there must be a long-term lease agreement in effect for at least six years. **Attachment**: Click to enter text.

h. Owner of sewage sludge disposal site (if applicable):

Mr. ☐ Ms. ☐ First/Last or Organization Name: N/A

Mailing Address: Click to enter text. City/State/ZIP Code: Click to enter text.

Phone No.: Click to enter text. Fax No.: Click to enter text. E-mail: Click to enter text.

If not the same as the facility owner, there must be a long-term lease agreement in effect for at least six years. **Attachment**: Click to enter text.

(This information is required only if authorization is sought in the permit for sludge disposal on property owned or controlled by the applicant.)

9. TDPES DISCHARGE/TLAP DISPOSAL INFORMATION (Instructions, Pages 25-28)

a. Is the facility located on or does the treated effluent cross American Indian Land?

☐ Yes ☒ No

b. Attach an **original** full size USGS Topographic Map (or an 8.5"×11" **reproduced** portion for renewal or amendment applications) with all required information. Check the box next to each item below to confirm it has been included on the map.

- ☒ One-mile radius and three-miles downstream information
- ☒ Applicant's property boundaries
- ☐ Treatment facility boundaries
- ☒ Labeled point(s) of discharge and highlighted discharge route(s)
- ☐ Effluent disposal site boundaries
- ☒ All wastewater ponds
- ☐ Sewage sludge disposal site
- ☐ New and future construction
- ☒ Attachment: Figure 1

c. Is the location of the sewage sludge disposal site in the existing permit accurate?

☐ Yes ☐ No ☒ N/A

If **no**, or a **new** application, please give an accurate description: N/A

d. Are the point(s) of discharge and the discharge route(s) in the existing permit correct?

☒ Yes ☐ No ☐ N/A

If **no**, or a **new or amendment** applications, provide an accurate description: Click to enter text.

e. City nearest the outfall(s): Corpus Christi

f. County in which the outfalls(s) is/are located: Nueces

g. Is or will the treated wastewater discharge to a city, county, or state highway right-of-way, or a flood control district drainage ditch?

☐ Yes ☒ No

If **yes**, indicate by a check mark if: ☐ Authorization granted ☐ Authorization pending

For **new and amendment** applications, provide copies of letters that show proof of contact and the approval letter upon receipt.

Attachment: N/A

h. For all applications involving an average daily discharge of 5 MGD or more, provide the names of all counties located within 100 statute miles downstream of the point(s) of discharge. Nueces, Kleberg, Kennedy, Willacy, Victoria, Jackson, San Patricio, Aransas, Refugio, Calhoun, Matagorda.

i. For **TLAPs**, is the location of the effluent disposal site in the existing permit accurate?

☐ Yes ☐ No ☒ N/A

If **no**, or if this a **new or amendment** application, provide an accurate description: N/A

j. City nearest the disposal site: N/A

k. County in which the disposal site is located: N/A

l. Disposal Site Latitude: N/A Longitude: N/A

m. For **TLAPs**, describe how effluent is/will be routed from the treatment facility to the disposal site: N/A

n. For **TLAPs**, identify the nearest watercourse to the disposal site to which rainfall runoff might flow if not contained: N/A

10. MISCELLANEOUS INFORMATION (Instructions, Page 28)

a. Did any person formerly employed by the TCEQ represent your company and get paid for service regarding this application?

☒ Yes ☐ No

If **yes**, list each person: Hailey J. Cofty

b. Do you owe any fees to the TCEQ?

☐ Yes ☒ No

If **yes**, provide the following:

- Acct. No.: Click to enter text.
- Amt. due: Click to enter text.

c. Do you owe any penalties to the TCEQ?

☐ Yes ☒ No

If **yes**, provide the following:

- Enforcement Order No.: Click to enter text.
- Amt. due: Click to enter text.

11. SIGNATURE PAGE (Instructions, Page 29)

Permit No: WQ0001244000

Applicant Name: Nueces Bay, LLC

Certification:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

I further certify that I am authorized under 30 Texas Administrative Code §305.44 to sign and submit this document, and can provide documentation in proof of such authorization upon request.

Signatory name (typed or printed): Dale Lebsack

Signatory title: President

Signature: Dale Lebsack Date: 3/30/2020

(Use blue ink)

Subscribed and Sworn to before me by the said Dale Lebsack

on this 30th day of March, 20 20.

My commission expires on the 9th day of August, 20 20.

Kristina Cooper

Notary Public

KRISTINA KENNE COOPER
NOTARY PUBLIC - STATE OF TEXAS
ID# 12908672-7
COMM. EXP. 08-09-2020

[SEAL]

Harris

County, Texas

If co-applicants are necessary, each entity must submit an original, separate signature page.

SUPPLEMENTAL PERMIT INFORMATION FORM (SPIF)

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

SUPPLEMENTAL PERMIT INFORMATION FORM (SPIF)

FOR AGENCIES REVIEWING INDUSTRIAL TPDES WASTEWATER PERMIT APPLICATIONS

TCEQ USE ONLY:

Application type: ____Renewal _____Major Amendment ____Minor Amendment _____New

County: _____ Segment Number: _____

Admin Complete Date: _____

Agency Receiving SPIF:

_____ Texas Historical Commission _____ U.S. Fish and Wildlife

_____ Texas Parks and Wildlife Department _____ U.S. Army Corps of Engineers

This form applies to TPDES permit applications only. (Instructions, Page 33)

The SPIF must be completed as a separate document. The TCEQ will mail a copy of the SPIF to each agency as required by the TCEQ agreement with EPA. If any of the items are not completely addressed or further information is needed, you will be contacted to provide the information before the permit is issued. Each item must be completely addressed.

Do not refer to a response of any item in the permit application form. Each attachment must be provided with this form separately from the administrative report of the application. The application will not be declared administratively complete without this form being completed in its entirety including all attachments.

The following applies to all applications:

1. Permittee Name: Nueces Bay, LLC

2. Permit No.: WQ0001244000 EPA ID No.: TX0003581

3. Address of the project (location description that includes street/highway, city/vicinity, and county): 2002 East Navigation Blvd., Corpus Christi, Nueces County, Texas

4. Provide the name, address, phone and fax number, and email address of an individual that can be contacted to answer specific questions about the property.

   First/Last Name: Cecilia Garcia-Rios Title: Texas Compliance Manager Credential:

   Organization Name: Talen Energy

   Mailing Address: 7300 CPL Road City/State/ZIP Code: Laredo, TX 78041

   Phone No.: 956-763-3510 Fax No.: E-mail: Cecilia.Garcia-Rios@talenenergy.com

5. List the county in which the facility is located: Nueces

6. If the property is publicly owned and the owner is different than the permittee/applicant, please list the owner of the property: N/A

7. Provide a description of the effluent discharge route. The discharge route must follow the flow of effluent from the point of discharge to the nearest major watercourse (from the point of discharge to a classified segment as defined in *30 TAC Chapter 307*). If known, please identify the classified segment number: Directly to Nueces Bay in Segment No.2482 of the Bays and Estuaries

8. Please provide a separate 7.5-minute USGS quadrangle map with the project boundaries plotted and a general location map showing the project area. Please highlight the discharge route from the point of discharge for a distance of one mile downstream. (This map is required in addition to the map in the administrative report.)

   Attachment: SPIF

9. Provide original photographs of any structures 50 years or older on the property.

   Attachment: SPIF

10. Does your project involve any of the following? Check all that apply.

    ☐ Proposed access roads, utility lines, construction easements

    ☐ Visual effects that could damage or detract from a historic property's integrity

    ☐ Vibration effects during construction or as a result of project design

    ☐ Additional phases of development that are planned for the future

    ☐ Sealing caves, fractures, sinkholes, other karst features

    ☐ Disturbance of vegetation or wetlands

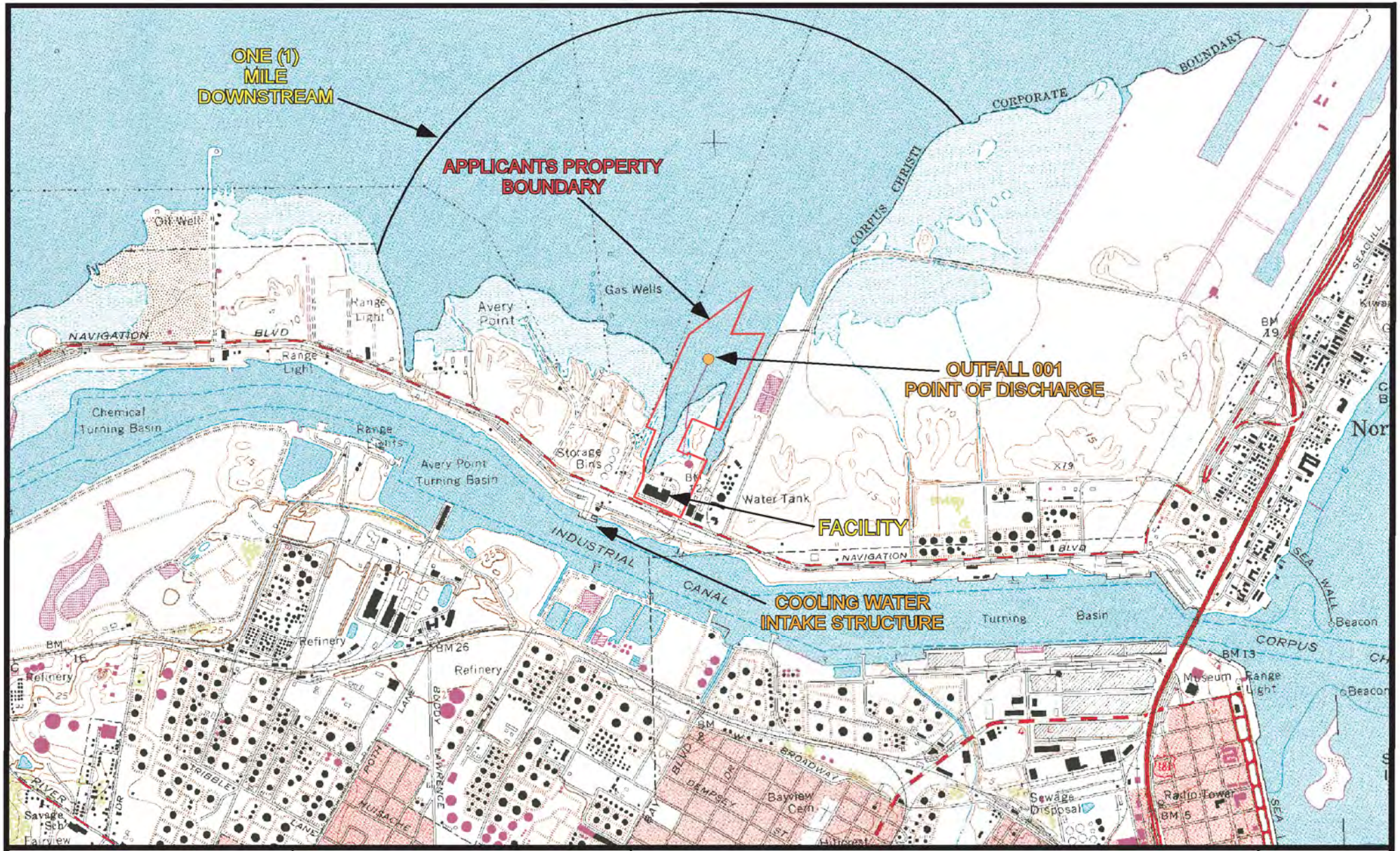
11. List proposed construction impact (surface acres to be impacted, depth of excavation, sealing of caves, or other karst features): N/A

12. Describe existing disturbances, vegetation, and land use: Electric generating facility, ancillary buildings, fuel oil storage tanks, roads, vegetation-lawn immediately surrounding the plant.

THE FOLLOWING ITEMS APPLY ONLY TO APPLICATIONS FOR NEW TPDES PERMITS AND MAJOR AMENDMENTS TO TPDES PERMITS

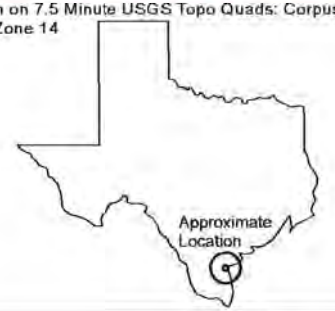
13. List construction dates of all buildings and structures on the property: N/A

14. Provide a brief history of the property, and name of the architect/builder, if known: N/A



ENVIRONMENTAL PROFESSIONALS
WCM
P. O. Box 3247
Humble, TX 77347-3247
(281) 446-7070 Fax (281) 446-3348

Location on 7.5 Minute USGS Topo Quads: Corpus Christi, Texas; Zone 14



SITE LOCATION USGS MAP

Nueces Bay, LLC

Corpus Christi, Nueces County, Texas

ATTACHMENT

SPIF

DRAWN BY:	AKD/BLS/lb/HJC
DATE:	10/08/2019
DRAWING ID:	Y:\NUE\CC\WWRNW19_22078\1565090349/Figure 1.cvx

ONE (1) INCH = 2,000 FEET

N

SUPPLEMENTAL PERMIT INFORMATION FORM
(ITEM 9 - ORIGINAL PHOTOGRAPHS OF STRUCTURES 50 YEARS OR OLDER)

1. Cribhouse adjacent to CWIS.

2. Cribhouse near administrative building.

TECHNICAL REPORT 1.0

TECHNICAL REPORT 1.0
INDUSTRIAL

The following information **is required** for all applications for a TLAP or an individual TPDES discharge permit.

For additional information or clarification on the requested information, refer to the Instructions for Completing the Industrial Wastewater Permit Application[1] available on the TCEQ website.

If more than one outfall is included in the application, provide applicable information for each individual outfall. **If an item does not apply to the facility, enter N/A** to indicate that the item has been considered. Include separate reports or additional sheets as **clearly cross-referenced attachments** and provide the attachment number in the space provided for the item the attachment addresses.

NOTE: This application is for an industrial wastewater permit only. Additional authorizations from the TCEQ Waste Permits Division or the TCEQ Air Permits Division may be needed.

1. FACILITY/SITE INFORMATION (Instructions, Pages 34-35)

a. Describe the general nature of the business and type(s) of industrial and commercial activities. Include all applicable SIC codes (up to 4).

Nueces Bay Power Station (NBPS) is a 633-megawatt (MW) natural gas-fired electric power generation facility. (SIC Code 4911)

b. Describe all wastewater-generating processes at the facility.

NBPS withdraws water from the Corpus Christi Inner Harbor (CCIH) for once-through cooling. This water is then discharged to Nueces Bay via Outfall 001. All other wastewaters are generated from water purchased from the City of Corpus Christi. These low volume waste sources, metal cleaning waste water, and stormwater are discharged through Internal Outfalls 101 and 201 prior to commingling with other waters and discharging via Outfall 001.

c. Provide a list of raw materials, major intermediates, and final products handled at the facility.

Materials List

Raw Materials	Intermediate Products	Final Products
See Attachment C		

Attachment: C

[1] https://www.tceq.texas.gov/permitting/wastewater/industrial/TPDES_industrial_wastewater_steps.html

d. Attach a facility map (drawn to scale) with the following information:

- Production areas, maintenance areas, materials-handling areas, waste-disposal areas, and water intake structures.
- The location of each unit of the WWTP including the location of wastewater collection sumps, impoundments, outfalls, and sampling points, if significantly different from outfall locations.

Attachment: Figure 2

e. Is this a new permit application for an existing facility?

☐ Yes ☒ No

If **yes**, provide background discussion: Click to enter text.

f. Is/will the treatment facility/disposal site be located above the 100-year frequency flood level.

☐ Yes ☒ No

List source(s) used to determine 100-year frequency flood plain: FIRM Flood Insurance Rate Map, Panel 308 of 705. Community Panel Number 485494 0308 C, Map Revised: March 18, 1985

If **no**, provide the elevation of the 100-year frequency flood plain and describe what protective measures are used/proposed to prevent flooding (including tail water and rainfall run-on controls) of the treatment facility and disposal area: The administrative building and a portion of the units are above the 100-year frequency flood level. The portion below the 100-year frequency flood level has a base flood elevation of 12 ft and flood hazard factors have been determined. The current layout and existing construction has proven effective and the facility is not susceptible to flooding during 100-year flood events.

Attachment: N/A

g. For **new** or **major amendment** permit applications, will any construction operations result in a discharge of fill material into a water in the state?

☐ Yes ☐ No ☒ N/A (renewal only)

h. If **yes** to Item 1.g, has the applicant applied for a USACE CWA Chapter 404 Dredge and Fill permit?

☐ Yes ☐ No

If **yes**, provide the permit number: N/A

If **no**, provide an approximate date of application submittal to the USACE: Click to enter text.

2. TREATMENT SYSTEM (Instructions, Page 35)

a. List any physical, chemical, or biological treatment process(es) used/proposed to treat wastewater at this facility. Include a description of each treatment process, starting with initial treatment and finishing with the outfall/point of disposal.

A process flow diagram is included as Figure 3.

b. Attach a flow schematic **with a water balance** showing all sources of water and wastewater flow into the facility, wastewater flow into and from each treatment unit, and wastewater flow to each outfall/point of disposal.

Attachment: Figure 3

3. IMPOUNDMENTS (Instructions, Pages 35-37)

Does the facility use or plan to use any wastewater impoundments (e.g., lagoons or ponds?)

☐ Yes ☒ No

If **no**, proceed to Item 4. If **yes**, complete **Item 3.a** for **existing** impoundments and **Items 3.a - 3.e** for **new or proposed** impoundments. **NOTE:** See instructions, Pages 35-37, for additional information on the attachments required by Items 3.a – 3.e.

a. Complete the table with the following information for each existing, new, or proposed impoundment:

Use Designation: Indicate the use designation for each impoundment as Treatment (**T**), Disposal (**D**), Containment (**C**), or Evaporation (**E**).

Associated Outfall Number: Provide an outfall number if a discharge occurs or will occur.

Liner Type: Indicate the liner type as Compacted clay liner (**C**), In-situ clay liner (**I**), Synthetic/plastic/rubber liner (**S**), or Alternate liner (**A**). **NOTE:** See instructions for further detail on liner specifications. If an alternate liner (A) is selected, include an attachment that provides a description of the alternate liner and any additional technical information necessary for an evaluation.

Leak Detection System: If any leak detection systems are in place/planned, enter **Y** for yes. Otherwise, enter **N** for no.

Groundwater Monitoring Wells and Data: If groundwater monitoring wells are in place/planned, enter **Y** for yes. Otherwise, enter **N** for no. Attach any existing groundwater monitoring data.

Dimensions: Provide the dimensions, freeboard, surface area, storage capacity of the impoundments, and the maximum depth (not including freeboard). For impoundments with irregular shapes, submit surface area instead of length and width.

Compliance with 40 CFR Part 257, Subpart D: If the impoundment is required to be in compliance with 40 CFR Part 257, Subpart D, enter **Y** for yes. Otherwise, enter **N** for no.

Date of Construction: Enter the date construction of the impoundment commenced (mm/dd/yy).

Impoundment Information

Parameter	Pond #	Pond #	Pond #	Pond #
Use Designation: (T) (D) (C) or (E)	N/A			
Associated Outfall Number				
Liner Type (C) (I) (S) or (A)				
Alt. Liner Attachment Reference				
Leak Detection System, Y/N				
Groundwater Monitoring Wells, Y/N				
Groundwater Monitoring Data Attachment				
Pond Bottom Located Above The Seasonal High-Water Table, Y/N				
Length (ft)				
Width (ft)				

Parameter	Pond #	Pond #	Pond #	Pond #
Max Depth From Water Surface (ft), Not Including Freeboard				
Freeboard (ft)				
Surface Area (acres)				
Storage Capacity (gallons)				
40 CFR Part 257, Subpart D, Y/N				
Date of Construction				

Impoundment Information

Parameter	Pond #	Pond #	Pond #	Pond #
Use Designation: (T) (D) (C) or (E)	N/A			
Associated Outfall Number				
Liner Type (C) (I) (S) or (A)				
Alt. Liner Attachment Reference				
Leak Detection System, Y/N				
Groundwater Monitoring Wells, Y/N				
Groundwater Monitoring Data Attachment				
Pond Bottom Located Above The Seasonal High-Water Table, Y/N				
Length (ft)				
Width (ft)				
Max Depth From Water Surface (ft), not including freeboard				
Freeboard (ft)				
Surface Area (acres)				
Storage Capacity (gallons)				
40 CFR Part 257, Subpart D, Y/N				
Date of Construction				

Attachment: N/A

The following information (**Items 3.b – 3.e**) is required only for **new or proposed** impoundments.

b. For new or proposed impoundments, attach any available information on the following items. If attached, check **yes** in the appropriate box. Otherwise, check **no** or **not yet designed**.

i. Liner data

☐ Yes ☐ No ☐ Not yet designed

ii. Leak detection system or groundwater monitoring data

☐ Yes ☐ No ☐ Not yet designed

iii. Groundwater impacts

☐ Yes ☐ No ☐ Not yet designed

NOTE: Item b.iii is required if the bottom of the pond is not above the seasonal high-water table in the shallowest water-bearing zone.

Attachment: N/A

For TLAP applications: Items 3.c – 3.e are **not required**, continue to Item 4.

c. Attach a USGS map or a color copy of original quality and scale which accurately locates and identifies all known water supply wells and monitor wells within ½-mile of the impoundments.

Attachment: N/A

d. Attach copies of State Water Well Reports (e.g., driller's logs, completion data, etc.), and data on depths to groundwater for all known water supply wells including a description of how the depths to groundwater were obtained.

Attachment: N/A

e. Attach information pertaining to the groundwater, soils, geology, pond liner, etc. used to assess the potential for migration of wastes from the impoundments or the potential for contamination of groundwater or surface water.

Attachment: N/A

4. OUTFALL/DISPOSAL METHOD INFORMATION (Instructions, Pages 38-39)

Complete the following tables to describe the location and wastewater discharge or disposal operations for each outfall for discharge operations and for each point of disposal for TLAP operations.

If there are more outfalls/points of disposal at the facility than the spaces provided, copies of pages 6 and/0r numbered accordingly (i.e., page 6a, 6b, etc.) may be used to provide information on the additional outfalls.

For TLAP applications: Indicate the disposal method and each individual irrigation area **I**, evaporation pond **E**, or subsurface drainage system **S** by providing the appropriate letter designation for the disposal method followed by a numerical designation for each disposal area in the space provided for **Outfall** number (e.g. **E1** for evaporation pond 1, **I2** for irrigation area No. 2, etc.).

Outfall Latitude and Longitude

Outfall Number	Latitude-decimal degrees	Longitude-decimal degrees
001	27.824625	97.4177899
101	27.820086	97.420112
201	Discharge of metal cleaning waste occurs from process/frac tanks located throughout the building.	

Outfall Location Description

Outfall Number	Location Description
001	Outfall 001 is located at the end of the discharge canal (end of pier) where commingled effluents are discharged.
101	Outfall 101 is located where low volume waste sources and stormwater are discharged prior to commingling with other wastewaters.
201	Outfall 201 is located where metal cleaning wastes are discharged, prior to commingling with other wastewaters.

Description of Sampling Points (if different from Outfall location)

Outfall Number	Description of Sampling Point
001	Samples are taken at the outfall location.
101	Samples are taken at the outfall location.
201	Samples are taken at the outfall location.

Outfall Flow Information – Permitted and Proposed

Outfall Number	Permitted Daily Avg Flow (MGD)	Permitted Daily Max Flow (MGD)	Proposed Daily Avg Flow (MGD)	Proposed Daily Max Flow (MGD)	Anticipated Discharge Date (mm/dd/yy)
001	500	605	500	605	N/A
101	Variable	Variable	Variable	Variable	N/A
201	Variable	Variable	Variable	Variable	N/A

Outfall Discharge – Method and Measurement

Outfall Number	Pumped Discharge? Y/N	Gravity Discharge? Y/N	Type of Flow Measurement Device Used
001	Y	N	Pump Curve Calculation
101	Y	N	Estimate
201	Y	N	Estimate

Outfall Discharge – Flow Characteristics

Outfall Number	Intermittent Discharge? Y/N	Continuous Discharge? Y/N	Seasonal Discharge? Y/N	Discharge Duration (hrs/day)	Discharge Duration (days/mo)	Discharge Duration (mo/yr)
001	N	Y	N	24	31	12
101	Y	N	N	Variable	Variable	Variable
201	Y	N	N	Variable	Variable	Variable

Wastestream Contributions

Outfall No.: 001

Contributing Wastestreams	Volume (MGD)	% of Total Flow
Once-through cooling water	605	99%
Previously monitored effluent from Internal Outfalls 101 and 201	Variable	1%

Outfall No.: 101

Contributing Wastestreams	Volume (MGD)	% of Total Flow
Low volume waste sources	Variable	<1% of Outfall 001 total flow
Stormwater	Variable	<1% of Outfall 001 total flow
Metal cleaning waste	Variable	<1% of Outfall 001 total flow

Outfall No.: 201

Contributing Wastestreams	Volume (MGD)	% of Total Flow
Metal cleansing waste	Variable	<1% of Outfall 001 total flow

Attachment: N/A

5. BLOWDOWN AND ONCE-THROUGH COOLING WATER DISCHARGES (Instructions, Page 39)

a. Does the facility use/propose to use any cooling towers which discharge blowdown or other wastestreams to the outfall(s)?

☐ Yes ☒ No

NOTE: If the facility uses or plans to use cooling towers, Item 12 **is required**.

b. Does the facility use or plan to use any boilers that discharge blowdown or other wastestreams to the outfall(s)?

☒ Yes ☐ No

c. Does or will the facility discharge once-through cooling water to the outfall(s)?

☒ Yes ☐ No

NOTE: If the facility uses or plans to use once-through cooling water, Item 12 **is required**.

d. If **yes** to Items 5.a, 5.b, **or** 5.c, attach the SDS with the following information for each chemical additive.

- Manufacturers Product Identification Number
- Product use (e.g., biocide, fungicide, corrosion inhibitor, etc.)
- Chemical composition including CASRN for each ingredient
- Classify product as non-persistent, persistent, or bioaccumulative
- Product or active ingredient half-life
- Frequency of product use (e.g., 2 hours/day once every two weeks)
- Product toxicity data specific to fish and aquatic invertebrate organisms
- Concentration of whole product or active ingredient, as appropriate, in wastestream.

Attach a summary of this information in addition to the submittal of the SDS for each specific wastestream and the associated chemical additives and specify which outfalls are affected.

Attachment: C

e. Cooling Towers and Boilers

If **yes** to either Item 5.a **or** 5.b, complete the following table.

Cooling Towers and Boilers

Type of Unit	Number of Units	Dly Avg Blowdown (gallons/day)	Dly Max Blowdown (gallons/day)
Cooling Towers	N/A	N/A	N/A
Boilers	2	28,800	28,800

6. STORMWATER MANAGEMENT (Instructions, Pages 39-40)

Are there any existing/proposed outfalls which discharge stormwater associated with industrial activities, as defined at *40 CFR § 122.26(b)(14)*, commingled with any other wastestream?

☒ Yes ☐ No

If **yes**, briefly describe the industrial processes and activities that occur outdoors or in some manner which may result in exposure of the activities or materials to stormwater: Storm drains, yard drains, and floor

drains that are in the plant production area convey stormwater and any potential insignificant leaks/drips to an oil/water separator prior to discharge via Outfall 101. Stormwater from non-process areas flows to the discharge canal.

7. DOMESTIC SEWAGE, SEWAGE SLUDGE, AND SEPTAGE MANAGEMENT AND DISPOSAL (Instructions, Page 40)

a. Check the box next to the appropriate method of domestic sewage and domestic sewage sludge treatment or disposal. Complete Worksheet 5.0 or Item 7.b if directed to do so.

☐ Domestic sewage is routed (i.e., connected to or transported to) to a WWTP permitted to receive domestic sewage for treatment, disposal, or both. **Complete Item 7.b**.

☒ Domestic sewage is disposed of by an on-site septic tank and drainfield system. **Complete Item 7.b**.

☐ Domestic and industrial treatment sludge **ARE commingled** prior to use or disposal.

☐ Industrial wastewater and domestic sewage are treated separately, and the respective sludge **IS NOT commingled** prior to sludge use or disposal. **Complete Worksheet 5.0**.

☐ Facility is a POTW. **Complete Worksheet 5.0**.

☐ Domestic sewage is not generated on-site.

☐ Other (e.g., portable toilets), specify and **Complete Item 7.b**: Click to enter text.

b. Provide the name and TCEQ, NPDES, or TPDES Permit No. of the waste-disposal facility which receives the domestic sewage/septage. If hauled by motorized vehicle, provide the name and TCEQ Registration No. of the hauler.

Domestic Sewage Plant/Hauler Name

Plant/Hauler Name	Permit/Registration No.
A & R Septic Service LLC	Permit No. 839610

8. IMPROVEMENTS OR COMPLIANCE/ENFORCEMENT REQUIREMENTS (Instructions, Page 40)

a. Is the permittee currently required to meet any implementation schedule for compliance or enforcement?

☐ Yes ☒ No

b. Has the permittee completed or planned for any improvements or construction projects?

☐ Yes ☒ No

c. If **yes** to either 8.a **or** 8.b, provide a brief summary of the requirements and a status update: N/A

9. TOXICITY TESTING (Instructions, Page 41)

Have any biological tests for acute or chronic toxicity been made on any of the discharges or on a receiving water in relation to the discharge within the last three years?

☒ Yes ☐ No

If **yes**, identify the tests and describe their purposes: N/A, all results have previously been submitted to TCEQ.

Additionally, attach a copy of all tests performed which **have not** been submitted to the TCEQ or EPA.

Attachment: N/A

10. OFF-SITE/THIRD PARTY WASTES (Instructions, Page 41)

a. Does or will the facility receive wastes from off-site sources for treatment at the facility, disposal on-site via land application, or discharge via a permitted outfall?

☐ Yes ☒ No

If **no**, proceed to Item 11. If **yes**, provide responses to Items 10.b through 10.d below.

b. Attach the following information to the application:

- List of wastes received (including volumes, characterization, and capability with on-site wastes).
- Identify the sources of wastes received (including the legal name and addresses of the generators).
- Description of the relationship of waste source(s) with the facility's activities.

Attachment: Click to enter text.

c. Is or will wastewater from another TCEQ, NPDES, or TPDES permitted facility commingled with this facility's wastewater after final treatment and prior to discharge via the final outfall/point of disposal?

☐ Yes ☐ No

If **yes**, provide the name, address, and TCEQ, NPDES, or TPDES permit number of the contributing facility and a copy of any agreements or contracts relating to this activity.

Attachment: Click to enter text.

d. Is this facility a POTW that accepts/will accept process wastewater from any SIU and has/is required to have an approved pretreatment program under the NPDES/TPDES program?

☐ Yes ☐ No

If **yes**, **Worksheet 6.0** of this application **is required**.

11. RADIOACTIVE MATERIALS (Instructions, Pages 41-42)

a. Are/will radioactive materials be mined, used, stored, or processed at this facility?

☐ Yes ☒ No

If **yes**, use the following table to provide the results of one analysis of the effluent for all radioactive materials that may be present. Provide results in pCi/L.

Radioactive Materials Mined, Used, Stored, or Processed

Radioactive Material	Concentration (pCi/L)

Radioactive Material	Concentration (pCi/L)

b. Does the applicant or anyone at the facility have any knowledge or reason to believe that radioactive materials may be present in the discharge, including naturally occurring radioactive materials in the source waters or on the facility property?

☐ Yes ☒ No

If **yes**, use the following table to provide the results of one analysis of the effluent for all radioactive materials that may be present. Provide results in pCi/L. Do not include information provided in response to Item 11.a.

Radioactive Materials Present in the Discharge

Radioactive Material	Concentration (pCi/L)

12. COOLING WATER (Instructions, Pages 42-43)

a. Does the facility use or propose to use water for cooling purposes?

☒ Yes ☐ No

If **no**, stop here. If **yes**, complete Items 12.b thru 12.f.

b. Cooling water is/will be obtained from a groundwater source (e.g., on-site well).

☐ Yes ☒ No

If **yes**, stop here. If **no**, continue.

c. Cooling Water Supplier

i. Provide the name of the owner(s) and operator(s) for the CWIS that supplies or will supply water for cooling purposes to the facility.

Cooling Water Intake Structure(s) Owner(s) and Operator(s)

CWIS ID	CWIS 001			
Owner	Nueces Bay, LLC			
Operator	Nueces Bay, LLC			

ii. Cooling water is/will be obtained from a Public Water Supplier (PWS)

☐ Yes ☒ No

If **no**, continue. If **yes**, provide the PWS Registration No. and stop here: Click to enter text

iii. Cooling water is/will be obtained from an Independent Supplier

☐ Yes ☒ No

If **no**, proceed to Item 12.d. If **yes,** contact the Industrial Permits Team to determine what application materials are required. Attach copies of the correspondence with the TCEQ and any required application materials, as stipulated in the correspondence with the TCEQ.

Attachment:

d. 316(b) General Criteria

i. The CWIS(s) have or will have a cumulative design intake flow of 2 MGD or greater

☒ Yes ☐ No

ii. At least 25% of the total water withdrawn by the CWIS is/will be used exclusively for cooling purposes on an annual average basis

☒ Yes ☐ No

iii. The facility withdraws/proposes to withdraw water for cooling purposes from surface waters that meet the definition of Waters of the United States in *40 CFR § 122.2*.

☒ Yes ☐ No

If **no**, provide an explanation of how the waterbody does not meet the definition of Waters of the United States in *40 CFR § 122.2*: Click to enter text.

If **yes** to all three questions in Item 12.d, the facility is subject to 316(b). Proceed to Item 12.f.

If **no** to any of the questions in Item 12.d, the facility does not meet the minimum criteria to be subject to the full requirements of 316(b). Proceed to Item 12.e.

e. The facility is **not subject** to 316(b) **and uses/proposes to use cooling towers**.

☐ Yes ☐ No

If **yes**, stop here. If **no**, complete Worksheet 11.0, Items 1(a), 1(b)(i-iii) and (vi), 2(b)(i), and 3(a) to allow for a determination based upon BPJ.

f. Phase I vs Phase II Facilities

i. Existing facility (Phase II)

☒ Yes ☐ No

If **yes**, complete Worksheets 11.0 through 11.3, as applicable. Otherwise, continue.

ii. New Facility – (Phase I)

☐ Yes ☒ No

If **yes**, check the box next to the facility's compliance track selection, attach the requested information, and complete Worksheet 11.0, Items 2 and 3, and Worksheet 11.2:

☐ Track I - AIF greater than 2 MGD, but less than 10 MGD
- Attach information required by *40 CFR §§ 125.86(b)(2)-(4)*.

☐ Track I - AIF greater than 10 MGD
- Attach information required by *40 CFR § 125.86(b)*.

☐ Track II
- Attach information required by *40 CFR § 125.86(c)*.

Attachment:

NOTE: Item 13 is required only for existing permitted facilities.

13. PERMIT CHANGE REQUESTS (Instructions, Pages 43-44)

a. Is the facility requesting a **major amendment** of an existing permit?

☐ Yes ☒ No

If **yes**, list each request individually and provide the following information: 1) detailed information regarding the scope of each request and 2) a justification for each request. Attach any supplemental information or additional data to support each request.

Click to enter text.

b. Is the facility requesting any **minor amendments** to the permit?

☐ Yes ☒ No

If **yes**, list and discuss the requested changes.

Click to enter text.

c. Is the facility requesting any **minor modifications** to the permit?

☒ Yes ☐ No

If **yes**, list and discuss the requested changes.

NBPS is requesting a revision to the biomonitoring language to clarify the requirements for invalid tests / failures based on pre-existing toxicity in the intake water prior to any use or treatment by the facility. Please see the Executive Summary for further information.

WORKSHEET 1.0
EPA EFFLUENT CATEGORICAL GUIDELINES

WORKSHEET 1.0
EPA CATEGORICAL EFFLUENT GUIDELINES

This worksheet **is required** for all applications for TPDES permits for discharges of wastewaters subject to EPA categorical effluent limitation guidelines (ELGs).

1. CATEGORICAL INDUSTRIES (Instructions, Pages 47-48)

Is this facility subject to any of the 40 CFR categorical ELGs outlined on page 52 of the instructions?

☒ Yes ☐ No

If **no**, this worksheet is not required. If **yes**, provide the appropriate information in the table below.

40 CFR Effluent Guidelines

Industry	40 CFR Part
Steam Electric Power Plants	423

2. PRODUCTION/PROCESS DATA (Instructions, Page 48)

a. Production Data

Provide the appropriate data for effluent guidelines with production-based effluent limitations.

Production Data

Subcategory	Actual Quantity/Day	Design Quantity/Day	Units
N/A			

b. Organic Chemicals, Plastics, and Synthetic Fibers Manufacturing Data (40 CFR Part 414)

Provide each applicable subpart and the percent of total production. Provide data for metal-bearing and cyanide-bearing wastestreams, as required by *40 CFR Part 414, Appendices A and B*.

Percentages of Total Production

Subcategory	Percent of Total Production	Appendix A and B - Metal	Appendix A – Cyanide
N/A			

c. Refineries (40 CFR Part 419)

Provide the applicable subcategory and a brief justification.

N/A

3. PROCESS/NON-PROCESS WASTEWATER FLOWS (Instructions, Page 48)

Provide a breakdown of wastewater flow(s) generated by the facility, including both process and non-process wastewater flow(s). Specify which wastewater flows are to be authorized for discharge under this permit and the disposal practices for wastewater flows, excluding domestic, which are not to be authorized for discharge under this permit.

NBPS withdraws water from the Corpus Christi Inner Harbor (CCIH) for once-through cooling. This water is then discharged to Nueces Bay via Outfall 001. All other wastewaters are generated from water purchased from the City of Corpus Christi. The low volume waste sources, metal cleaning waste water, and stormwater are discharged through Internal Outfalls 101 and 201 prior to commingling with other waters and discharging via Outfall 001. See Figure 3.

4. NEW SOURCE DETERMINATION (Instructions, Page 48)

Provide a list of all wastewater-generating processes subject to EPA categorical ELGs, identify the appropriate guideline Part and Subpart, and provide the date the process/construction commenced.

Wastewater-generating Processes Subject to Effluent Guidelines

Process	EPA Guideline: Part	EPA Guideline: Subpart	Date Process/ Construction Commenced
Steam Electric Power Generating	423		Mid-1930s

WORKSHEET 2.0
POLLUTANT ANALYSES REQUIREMENT

WORKSHEET 2.0
POLLUTANT ANALYSES REQUIREMENTS

Worksheet 2.0 **is required** for all applications submitted for a TPDES permit. Worksheet 2.0 is not required for applications for a permit to dispose of all wastewater by land disposal or for discharges solely of stormwater associated with industrial activities.

1. LABORATORY ACCREDITATION (Instructions, Page 49)

Effective July 1, 2008, all laboratory tests performed must meet the requirements of *30 TAC Chapter 25, Environmental Testing Laboratory Accreditation and Certification* with the following general exemptions:

a. The laboratory is an in-house laboratory and is:
   i. periodically inspected by the TCEQ; or
   ii. located in another state and is accredited or inspected by that state; or
   iii. performing work for another company with a unit located in the same site; or
   iv. performing pro bono work for a governmental agency or charitable organization.

b. The laboratory is accredited under federal law.

c. The data are needed for emergency-response activities, and a laboratory accredited under the Texas Laboratory Accreditation Program is not available.

d. The laboratory supplies data for which the TCEQ does not offer accreditation.

Review *30 TAC Chapter 25* for specific requirements. The following certification statement shall be signed and submitted with every application. See Instructions, Page 32, for a list of approved signatories.

I, Dale Lebsack, certify that all laboratory tests submitted with this application meet the requirements of *30 TAC Chapter 25, Environmental Testing Laboratory Accreditation and Certification.*

Dale Lebsack

(Signature)

2. GENERAL TESTING REQUIREMENTS (Instructions, Pages 49-51)

a. Provide the date range of all sampling events conducted to obtain the analytical data submitted with this application (e.g., 05/01/2018-05/30/2018): 7/29/2019 –1/14/2020

b. ☒ Check the box to confirm all samples were collected no more than 12 months prior to the date of application submittal.

c. Read the general testing requirements in the instructions for important information about sampling, test methods, and MALs. If a contact laboratory was used, attach a list which includes the name, contact information, and pollutants analyzed for each laboratory/firm. **Attachment:** D

3. SPECIFIC TESTING REQUIREMENTS (Instructions, Pages 51-62)

Attach correspondence from TCEQ approving submittal of less than the required number of samples, if applicable. **Attachment:** N/A

TABLE 1 and TABLE 2 (Instructions, Page 50)

Completion of Tables 1 and 2 **is required** for **all external outfalls** for all TPDES permit applications.

Table 1 for Outfall No.: 001

Samples are (check one): ☒ **Composite** ☒ **Grab**

Pollutant	Sample 1 (mg/L)	Sample 2 (mg/L)	Sample 3 (mg/L)	Sample 4 (mg/L)
BOD (5-day)	<2	<2	<2	<2
CBOD (5-day)	<2	<2	<2	<2
Chemical oxygen demand	362	196	182	186
Total organic carbon	3.5	3.3	3.4	3.4
Dissolved oxygen	6.61	7.44	7.19	8.06
Ammonia nitrogen	<0.04	0.0419	<0.04	0.1164
Total suspended solids	61.7	104	192.8	78
Nitrate nitrogen	<10	<0.01	<0.5	<0.5
Total organic nitrogen	<0.5	<0.5	<0.5	<0.5
Total phosphorus	<0.01	<0.01	<0.01	<0.01
Oil and grease	<1.27	<1.12	<1.12	<1.16
Total residual chlorine	<0.02	<0.02	<0.02	<0.02
Total dissolved solids	33,500	33,050	33,200	36,700
Sulfate	2,026.48	2,917.8897	2,838.6846	2,881.3912
Chloride	1,7458.36	1,8912.821	1,9200.419	1,8725.497
Fluoride	<0.01	<0.01	<0.5	<0.5
Total alkalinity (mg/L as CaCO3)	130	140	140	128
Temperature (°F)	33.62	34.16	32.36	36.14
pH (standard units)			7.56	

Table 2 for Outfall No.: 001

Samples are (check one): ☒ **Composites** ☒ **Grabs**

Pollutant	Sample 1 (µg/L)	Sample 2 (µg/L)	Sample 3 (µg/L)	Sample 4 (µg/L)	MAL (µg/L)
Aluminum, total	489.88	735.54	848.38	445.69	2.5
Antimony, total	1.22	1.14	<1	1.14	5
Arsenic, total	4.5	4.41	4.99	4.99	0.5
Barium, total	73.27	62.21	71.9	69.45	3
Beryllium, total	<0.5	<0.5	<0.5	<0.5	0.5
Cadmium, total	<0.5	<0.5	<0.5	<0.5	1
Chromium, total	1.02	1.04	1.17	1.09	3
Chromium, hexavalent	<0.5	<0.5	<0.5	<0.5	3
Chromium, trivalent	<1	<1	<1	<1	N/A
Copper, total	4.71	3.72	3.46	4.21	2
Cyanide, available	<1	<1	<1	2.1	2/10
Lead, total	1.02	0.713	0.832	0.718	0.5
Mercury, total	0.00278	0.00333	0.00467	0.00293	0.005/0.0005
Nickel, total	1.38	1.26	1.34	1.59	2
Selenium, total	11.84	9.87	10.48	13.55	5

Pollutant	Sample 1 (µg/L)	Sample 2 (µg/L)	Sample 3 (µg/L)	Sample 4 (µg/L)	MAL (µg/L)
Silver, total	0.223	<0.88	<0.44	<0.44	0.5
Thallium, total	<0.5	<0.5	<0.5	<0.5	0.5
Zinc, total	23.2	14.36	18.47	17.55	5.0

TABLE 3 (Instructions, Page 50)

Completion of Table 3 **is required** for all **external outfalls** which discharge process wastewater.

Partial completion of Table 3 **is required** for all **external outfalls** which discharge non-process wastewater and stormwater associated with industrial activities commingled with other wastestreams (see instructions for additional guidance).

Table 3 for Outfall No.: 001

Samples are (check one): ☒ **Composites** ☐ **Grabs**

Pollutant	Sample 1 (µg/L)*	Sample 2 (µg/L)*	Sample 3 (µg/L)*	Sample 4 (µg/L)*	MAL (µg/L)*
Acrylonitrile	<3	<3	<3	<3	50
Anthracene	<0.35	<0.35	<0.35	<0.35	10
Benzene	<1	<1	<1	<1	10
Benzidine	<0.66	<0.66	<0.66	<0.66	50
Benzo(a)anthracene	<0.38	<0.38	<0.38	<0.38	5
Benzo(a)pyrene	<0.85	<0.85	<0.85	<0.85	5
Bis(2-chloroethyl)ether	<0.72	<0.72	<0.72	<0.72	10
Bis(2-ethylhexyl)phthalate	<2.20	<2.2	<2.2	<2.2	10
Bromodichloromethane [Dichlorobromomethane]	<1	<1	<1	<1	10
Bromoform	<1	<1	<1	<1	10
Carbon tetrachloride	<1	<1	<1	<1	2
Chlorobenzene	<1	<1	<1	<1	10
Chlorodibromomethane [Dibromochloromethane]	<1	<1	<1	<1	10
Chloroform	<1	<1	<1	<1	10
Chrysene	<0.57	<0.57	<0.57	<0.57	5
m-Cresol [3-Methylphenol]	<1.32	<1.32	<1.32	<1.32	10
o-Cresol [2-Methylphenol]	<1	<1	<1	<1	10
p-Cresol [4-Methylphenol]	<1.32	<1.32	<1.32	<1.32	10
1,2-Dibromoethane	<1	<1	<1	<1	10
m-Dichlorobenzene [1,3-Dichlorobenzene]	<1	<1	<1	<1	10
o-Dichlorobenzene [1,2-Dichlorobenzene]	<1	<1	<1	<1	10
p-Dichlorobenzene [1,4-Dichlorobenzene]	<1	<1	<1	<1	10
3,3'-Dichlorobenzidine	<0.88	<0.88	<0.88	<0.88	5
1,2-Dichloroethane	<1	<1	<1	<1	10

Pollutant	Sample 1 (µg/L)*	Sample 2 (µg/L)*	Sample 3 (µg/L)*	Sample 4 (µg/L)*	MAL (µg/L)*
1,1-Dichloroethene [1,1-Dichloroethylene]	<1	<1	<1	<1	10
Dichloromethane [Methylene chloride]	<1	<1	<1	<1	20
1,2-Dichloropropane	<1	<1	<1	<1	10
1,3-Dichloropropene [1,3-Dichloropropylene]	<1	<1	<1	<1	10
2,4-Dimethylphenol	<0.53	<0.53	<0.53	<0.53	10
Di-n-Butyl phthalate	1.7	1.52	1.55	<1.22	10
Ethylbenzene	<1	<1	<1	<1	10
Fluoride	<10	<10	<500	<500	500
Hexachlorobenzene	<0.69	<0.69	<0.69	<0.69	5
Hexachlorobutadiene	<0.41	<0.41	<0.41	<0.41	10
Hexachlorocyclopentadiene	<1.38	<1.38	<1.38	<1.38	10
Hexachloroethane	<0.47	<0.47	<0.47	<0.47	20
Methyl ethyl ketone	<1	<1	<1	<1	50
Nitrobenzene	<0.91	<0.91	<0.91	<0.91	10
N-Nitrosodiethylamine	<2.5	<2.5	<2.5	<2.5	20
N-Nitroso-di-n-butylamine	<2.5	<2.5	<2.5	<2.5	20
Nonylphenol	<5	<5	4.35	<5	333
Pentachlorobenzene	<3	<3	<3	<3	20
Pentachlorophenol	<0.5	<0.5	<0.5	<0.5	5
Phenanthrene	<0.44	<0.44	<0.44	<0.44	10
Polychlorinated biphenyls (PCBs) (**)	<0.0129	<0.0129	<0.0129	<0.0129	0.2
Pyridine	<0.35	<0.35	<0.35	<0.35	20
1,2,4,5-Tetrachlorobenzene	<2.5	<2.5	<2.5	<2.5	20
1,1,2,2-Tetrachloroethane	<1	<1	<1	<1	10
Tetrachloroethene [Tetrachloroethylene]	<1	<1	<1	<1	10
Toluene	<1	<1	<1	<1	10
1,1,1-Trichloroethane	<1	<1	<1	<1	10
1,1,2-Trichloroethane	<1	<1	<1	<1	10
Trichloroethene [Trichloroethylene]	<1	<1	<1	<1	10
2,4,5-Trichlorophenol	<0.85	<0.85	<0.85	<0.85	50
TTHM (Total trihalomethanes)	<2	<2	<2	<2	10
Vinyl chloride	<1	<1	<1	<1	10

(*) Indicate units if different from µg/L.
(**) Total of detects for PCB-1242, PCB-1254, PCB-1221, PCB-1232, PCB-1248, PCB-1260, and PCB-1016. If all non-detects, enter the highest non-detect preceded by a "<".

TABLE 4 (Instructions, Pages 50-51)

Partial completion of Table 4 **is required** for each **external outfall** based on the conditions below.

a. Tributyltin

Is this facility an industrial/commercial facility which currently or proposes to directly dispose of wastewater from the types of operations listed below or a domestic facility which currently or proposes to receive wastewater from the types of industrial/commercial operations listed below?

☐ Yes ☒ No

If **yes**, check the box next to each of the following criteria which apply and provide the appropriate testing results in Table 4 below (check all that apply).

☐ Manufacturers and formulators of tributyltin or related compounds.

☐ Painting of ships, boats and marine structures.

☐ Ship and boat building and repairing.

☐ Ship and boat cleaning, salvage, wrecking and scaling.

☐ Operation and maintenance of marine cargo handling facilities and marinas.

☐ Facilities engaged in wood preserving.

☐ Any other industrial/commercial facility for which tributyltin is known to be present, or for which there is any reason to believe that tributyltin may be present in the effluent.

b. Enterococci (discharge to saltwater)

i. This facility discharges/proposes to discharge directly into saltwater receiving waters **and** Enterococci bacteria are expected to be present in the discharge based on facility processes.

☐ Yes ☒ No

ii. Domestic wastewater is/will be discharged.

☐ Yes ☒ No

If **yes to either** question, provide the appropriate testing results in Table 4 below.

c. E. coli (discharge to freshwater)

i. This facility discharges/proposes to discharge directly into freshwater receiving waters **and** *E. coli* bacteria are expected to be present in the discharge based on facility processes.

☐ Yes ☒ No

ii. Domestic wastewater is/will be discharged.

☐ Yes ☒ No

If **yes to either** question, provide the appropriate testing results in Table 4 below.

Table 4 for Outfall No.: N/A

Samples are (check one): ☐ **Composites** ☐ **Grabs**

Pollutant	Sample 1	Sample 2	Sample 3	Sample 4	MAL
Tributyltin (µg/L)					0.010
Enterococci (cfu or MPN/100 mL)					N/A
E. coli (cfu or MPN/100 mL)					N/A

TABLE 5 (Instructions, Page 51)

Completion of Table 5 **is required** for all **external outfalls** which discharge process wastewater from a facility which manufactures or formulates pesticides or herbicides or other wastewaters which may contain pesticides or herbicides.

If this facility does not/will not manufacture or formulate pesticides or herbicides and does not/will not discharge other wastewaters which may contain pesticides or herbicides, check N/A.

☒ N/A

Table 5 for Outfall No.: Click to enter text.

Samples are (check one): ☐ **Composites** ☐ **Grabs**

Pollutant	Sample 1 (µg/L)*	Sample 2 (µg/L)*	Sample 3 (µg/L)*	Sample 4 (µg/L)*	MAL (µg/L)*
Aldrin					0.01
Carbaryl					5
Chlordane					0.2
Chlorpyrifos					0.05
4,4'-DDD					0.1
4,4'-DDE					0.1
4,4'-DDT					0.02
2,4-D					0.7
Danitol [Fenpropathrin]					—
Demeton					0.20
Diazinon					0.5/0.1
Dicofol [Kelthane]					1
Dieldrin					0.02
Diuron					0.090
Endosulfan I (*alpha*)					0.01
Endosulfan II (*beta*)					0.02
Endosulfan sulfate					0.1
Endrin					0.02
Guthion [Azinphos methyl]					0.1
Heptachlor					0.01
Heptachlor epoxide					0.01
Hexachlorocyclohexane (*alpha*)					0.05
Hexachlorocyclohexane (*beta*)					0.05
Hexachlorocyclohexane (*gamma*) [Lindane]					0.05
Hexachlorophene					10
Malathion					0.1
Methoxychlor					2.0
Mirex					0.02
Parathion (ethyl)					0.1
Toxaphene					0.3
2,4,5-TP [Silvex]					0.3

* Indicate units if different from µg/L.

TABLE 6 (Instructions, Page 52)

Completion of Table 6 **is required** for all **external outfalls**.

Table 6 for Outfall No.: 001

Samples are (check one): ☒ **Composites** ☐ **Grabs**

Pollutants	Believed Present	Believed Absent	Sample 1 (mg/L)	Sample 2 (mg/L)	Sample 3 (mg/L)	Sample 4 (mg/L)	MAL (µg/L)*
Bromide	☒	☐	55.1				400
Color (PCU)	☐	☒	<2				—
Nitrate-Nitrite (as N)	☐	☒	<0.01				—
Sulfide (as S)	☐	☒	<0.03				—
Sulfite (as SO3)	☐	☒	<2.0				—
Surfactants	☒	☐	0.21				—
Boron, total	☒	☐	4.554				20
Cobalt, total	☐	☒	<0.0005				0.3
Iron, total	☒	☐	0.409				7
Magnesium, total	☒	☐	1128.601				20
Manganese, total	☐	☒	<0.004				0.5
Molybdenum, total	☒	☐	0.016				1
Tin, total	☐	☒	<0.001				5
Titanium, total	☐	☒	<0.004				30

* Indicate units if different from µg/L.

TABLE 7 (Instructions, Page 52)

Check the box next to any of the industrial categories applicable to this facility. If no categories are applicable, check N/A. If GC/MS testing is required, check the box provided to confirm the testing results for the appropriate parameters are provided with the application.

☐ N/A

Table 7 for Applicable Industrial Categories

Industrial Category	40 CFR Part	Volatiles Table 8	Acids Table 9	Bases/Neutrals Table 10	Pesticides Table 11
☐ Adhesives and Sealants		☐ Yes	☐ Yes	☐ Yes	No
☐ Aluminum Forming	467	☐ Yes	☐ Yes	☐ Yes	No
☐ Auto and Other Laundries		☐ Yes	☐ Yes	☐ Yes	☐ Yes
☐ Battery Manufacturing	461	☐ Yes	No	☐ Yes	No
☐ Coal Mining	434	No	No	No	No
☐ Coil Coating	465	☐ Yes	☐ Yes	☐ Yes	No
☐ Copper Forming	468	☐ Yes	☐ Yes	☐ Yes	No
☐ Electric and Electronic Components	469	☐ Yes	☐ Yes	☐ Yes	☐ Yes
☐ Electroplating	413	☐ Yes	☐ Yes	☐ Yes	No
☐ Explosives Manufacturing	457	No	☐ Yes	☐ Yes	No
☐ Foundries		☐ Yes	☐ Yes	☐ Yes	No
☐ Gum and Wood Chemicals - Subparts A,B,C,E	454	☐ Yes	☐ Yes	No	No
☐ Gum and Wood Chemicals - Subparts D,F	454	☐ Yes	☐ Yes	☐ Yes	No
☐ Inorganic Chemicals Manufacturing	415	☐ Yes	☐ Yes	☐ Yes	No
☐ Iron and Steel Manufacturing	420	☐ Yes	☐ Yes	☐ Yes	No
☐ Leather Tanning and Finishing	425	☐ Yes	☐ Yes	☐ Yes	No
☐ Mechanical Products Manufacturing		☐ Yes	☐ Yes	☐ Yes	No
☐ Nonferrous Metals Manufacturing	421,471	☐ Yes	☐ Yes	☐ Yes	☐ Yes
☐ Ore Mining - Subpart B	440	No	☐ Yes	No	No
☐ Organic Chemicals Manufacturing	414	☐ Yes	☐ Yes	☐ Yes	☐ Yes
☐ Paint and Ink Formulation	446,447	☐ Yes	☐ Yes	☐ Yes	No
☐ Pesticides	455	☐ Yes	☐ Yes	☐ Yes	☐ Yes
☐ Petroleum Refining	419	☐ Yes	No	No	No
☐ Pharmaceutical Preparations	439	☐ Yes	☐ Yes	☐ Yes	No
☐ Photographic Equipment and Supplies	459	☐ Yes	☐ Yes	☐ Yes	No
☐ Plastic and Synthetic Materials Manufacturing	414	☐ Yes	☐ Yes	☐ Yes	☐ Yes
☐ Plastic Processing	463	☐ Yes	No	No	No
☐ Porcelain Enameling	466	No	No	No	No
☐ Printing and Publishing		☐ Yes	☐ Yes	☐ Yes	☐ Yes
☐ Pulp and Paperboard Mills - Subpart C	430	☐ *	☐ Yes	☐ *	☐ Yes
☐ Pulp and Paperboard Mills - Subparts F, K	430	☐ *	☐ Yes	☐ *	☐ *
☐ Pulp and Paperboard Mills - Subparts A, B, D, G, H	430	☐ Yes	☐ Yes	☐ *	☐ *
☐ Pulp and Paperboard Mills - Subparts I, J, L	430	☐ Yes	☐ Yes	☐ *	☐ Yes
☐ Pulp and Paperboard Mills - Subpart E	430	☐ Yes	☐ Yes	☐ Yes	☐ *
☐ Rubber Processing	428	☐ Yes	☐ Yes	☐ Yes	No
☐ Soap and Detergent Manufacturing	417	☐ Yes	☐ Yes	☐ Yes	No
☒ Steam Electric Power Plants	423	☒ Yes	☒ Yes	No	No
☐ Textile Mills (Not Subpart C)	410	☐ Yes	☐ Yes	☐ Yes	No
☐ Timber Products Processing	429	☐ Yes	☐ Yes	☐ Yes	☐ Yes

* Test if believed present.

TABLES 8, 9, 10, and 11 (Instructions, Page 52)

Completion of Tables 8, 9, 10, and 11 **is required** as specified in Table 7 for all **external outfalls** that contain process wastewater.

Completion of Tables 8, 9, 10, and 11 **may be required** for types of industry not specified in Table 7 for specific parameters that are believed to be present in the wastewater.

Table 8 for Outfall No.: 001 : Volatile Compounds

Samples are (check one): ☒ **Composites** ☐ **Grabs**

Pollutant	Sample 1 (µg/L)*	Sample 2 (µg/L)*	Sample 3 (µg/L)*	Sample 4 (µg/L)*	MAL (µg/L)
Acrolein	<6				50
Acrylonitrile	<3	<3	<3	<3	50
Benzene	<1	<1	<1	<1	10
Bromoform	<1	<1	<1	<1	10
Carbon tetrachloride	<1	<1	<1	<1	2
Chlorobenzene	<1	<1	<1	<1	10
Chlorodibromomethane	<1	<1	<1	<1	10
Chloroethane	<1				50
2-Chloroethylvinyl ether	<6				10
Chloroform	<1	<1	<1	<1	10
Dichlorobromomethane [Bromodichloromethane]	<1	<1	<1	<1	10
1,1-Dichloroethane	<1				10
1,2-Dichloroethane	<1	<1	<1	<1	10
1,1-Dichloroethylene [1,1-Dichloroethene]	<1	<1	<1	<1	10
1,2-Dichloropropane	<1	<1	<1	<1	10
1,3-Dichloropropylene [1,3-Dichloropropene]	<1	<1	<1	<1	10
Ethylbenzene	<1	<1	<1	<1	10
Methyl bromide [Bromomethane]	<2				50
Methyl chloride [Chloromethane]	<1				50
Methylene chloride [Dichloromethane]	<1	<1	<1	<1	20
1,1,2,2-Tetrachloroethane	<1	<1	<1	<1	10
Tetrachloroethylene [Tetrachloroethene]	<1	<1	<1	<1	10
Toluene	<1	<1	<1	<1	10
1,2-Trans-dichloroethylene [1,2-Trans-dichloroethene]	<1	<1	<1	<1	10
1,1,1-Trichloroethane	<1	<1	<1	<1	10
1,1,2-Trichloroethane	<1	<1	<1	<1	10
Trichloroethylene [Trichloroethene]	<1	<1	<1	<1	10
Vinyl chloride	<1	<1	<1	<1	10

* Indicate units if different from µg/L.

Table 9 for Outfall No.: 001 : Acid Compounds

Samples are (check one): ☒ Composites ☒ Grabs

Pollutant	Sample 1 (µg/L)*	Sample 2 (µg/L)*	Sample 3 (µg/L)*	Sample 4 (µg/L)*	MAL (µg/L)
2-Chlorophenol	<0.5				10
2,4-Dichlorophenol	<0.69				10
2,4-Dimethylphenol	<0.53	<0.53	<0.53	<0.53	10
4,6-Dinitro-o-cresol	<0.66				50
2,4-Dinitrophenol	<1.41				50
2-Nitrophenol	<0.88				20
4-Nitrophenol	<1.13				50
p-Chloro-m-cresol	<0.53				10
Pentachlorophenol	<0.5	<0.5	<0.5	<0.5	5
Phenol	<0.44				10
2,4,6-Trichlorophenol	<0.79				10

* Indicate units if different from µg/L.

Table 10 for Outfall No.: N/A : Base/Neutral Compounds

Samples are (check one): ☐ Composites ☐ Grabs

Pollutant	Sample 1 (µg/L)*	Sample 2 (µg/L)*	Sample 3 (µg/L)*	Sample 4 (µg/L)*	MAL (µg/L)
Acenaphthene					10
Acenaphthylene					10
Anthracene					10
Benzidine					50
Benzo(a)anthracene					5
Benzo(a)pyrene					5
3,4-Benzofluoranthene [Benzo(b)fluoranthene]					10
Benzo(ghi)perylene					20
Benzo(k)fluoranthene					5
Bis(2-chloroethoxy)methane					10
Bis(2-chloroethyl)ether					10
Bis(2-chloroisopropyl)ether					10
Bis(2-ethylhexyl)phthalate					10
4-Bromophenyl phenyl ether					10
Butylbenzyl phthalate					10
2-Chloronaphthalene					10
4-Chlorophenyl phenyl ether					10
Chrysene					5
Dibenzo(a,h)anthracene					5
1,2-Dichlorobenzene [o-Dichlorobenzene]					10
1,3-Dichlorobenzene [m-Dichlorobenzene]					10
1,4-Dichlorobenzene [p-Dichlorobenzene]					10
3,3'-Dichlorobenzidine					5

Pollutant	Sample 1 (µg/L)*	Sample 2 (µg/L)*	Sample 3 (µg/L)*	Sample 4 (µg/L)*	MAL (µg/L)
Diethyl phthalate					10
Dimethyl phthalate					10
Di-n-butyl phthalate					10
2,4-Dinitrotoluene					10
2,6-Dinitrotoluene					10
Di-n-octyl phthalate					10
1,2-Diphenylhydrazine (as Azobenzene)					20
Fluoranthene					10
Fluorene					10
Hexachlorobenzene					5
Hexachlorobutadiene					10
Hexachlorocyclopentadiene					10
Hexachloroethane					20
Indeno(1,2,3-cd)pyrene					5
Isophorone					10
Naphthalene					10
Nitrobenzene					10
N-Nitrosodimethylamine					50
N-Nitrosodi-n-propylamine					20
N-Nitrosodiphenylamine					20
Phenanthrene					10
Pyrene					10
1,2,4-Trichlorobenzene					10

* Indicate units if different from µg/L.

Table 11 for Outfall No.: N/A : Pesticides

Samples are (check one): ☐ Composites ☐ Grabs

Pollutant	Sample 1 (µg/L)*	Sample 2 (µg/L)*	Sample 3 (µg/L)*	Sample 4 (µg/L)*	MAL (µg/L)
Aldrin					0.01
alpha-BHC [alpha-Hexachlorocyclohexane]					0.05
beta-BHC [beta-Hexachlorocyclohexane]					0.05
gamma-BHC [gamma-Hexachlorocyclohexane]					0.05
delta-BHC [delta-Hexachlorocyclohexane]					0.05
Chlordane					0.2
4,4'-DDT					0.02
4,4'-DDE					0.1
4,4'-DDD					0.1
Dieldrin					0.02
Endosulfan I (alpha)					0.01
Endosulfan II (beta)					0.02

Pollutant	Sample 1 (µg/L)*	Sample 2 (µg/L)*	Sample 3 (µg/L)*	Sample 4 (µg/L)*	MAL (µg/L)
Endosulfan sulfate					0.1
Endrin					0.02
Endrin aldehyde					0.1
Heptachlor					0.01
Heptachlor epoxide					0.01
PCB 1242					0.2
PCB 1254					0.2
PCB 1221					0.2
PCB 1232					0.2
PCB 1248					0.2
PCB 1260					0.2
PCB 1016					0.2
Toxaphene					0.3

* Indicate units if different from µg/L.

Attachment: Click to enter text

TABLE 12 (DIOXINS/FURAN COMPOUNDS)

Complete of Table 12 **is required** for **external outfalls**, as directed below. (Instructions, Pages 53-54)

a. Indicate which compound(s) are manufactured or used at the facility and provide a brief description of the conditions of its/their presence at the facility (check all that apply).

- ☐ 2,4,5-trichlorophenoxy acetic acid (2,4,5-T) CASRN 93-76-5
- ☐ 2-(2,4,5-trichlorophenoxy) propanoic acid (Silvex, 2,4,5-TP) CASRN 93-72-1
- ☐ 2-(2,4,5-trichlorophenoxy) ethyl 2,2-dichloropropionate (Erbon) CASRN 136-25-4
- ☐ 0,0-dimethyl 0-(2,4,5-trichlorophenyl) phosphorothioate (Ronnel) CASRN 299-84-3
- ☐ 2,4,5-trichlorophenol (TCP) CASRN 95-95-4
- ☐ hexachlorophene (HCP) CASRN 70-30-4
- ☒ None of the above

Description: N/A

b. Does the applicant or anyone at the facility know or have any reason to believe that 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) or any congeners of TCDD may be present in the effluent proposed for discharge?

☐ Yes ☒ No

Description: N/A

If **yes** to either Items a **or** b, complete Table 12 as instructed.

Table 12 for Outfall No.: N/A

Samples are (check one): ☐ **Composites** ☐ **Grabs**

Compound	Toxicity Equivalent Factors	Wastewater Concentration (ppq)	Wastewater Toxicity Equivalents (ppq)	Sludge Concentration (ppt)	Sludge Toxicity Equivalents (ppt)	MAL (ppq)
2,3,7,8-TCDD	1					10
1,2,3,7,8-PeCDD	1.0					50
2,3,7,8-HxCDDs	0.1					50
1,2,3,4,6,7,8-HpCDD	0.01					50
2,3,7,8-TCDF	0.1					10
1,2,3,7,8-PeCDF	0.03					50
2,3,4,7,8-PeCDF	0.3					50
2,3,7,8-HxCDFs	0.1					50
2,3,4,7,8-HpCDFs	0.01					50
OCDD	0.0003					100
OCDF	0.0003					100
PCB 77	0.0001					500
PCB 81	0.0003					500
PCB 126	0.1					500
PCB 169	0.03					500
Total						

TABLE 13 (HAZARDOUS SUBSTANCES)

Complete Table 13 **is required** for all **external outfalls** as directed below. (Instructions, Page 54)

a. Are there any pollutants listed in the instructions (pages 55-62) believed present in the discharge?

☐ Yes ☒ No

b. Are there pollutants listed in Item 1.c. of Technical Report 1.0 which are believed present in the discharge and have not been analytically quantified elsewhere in this application?

☐ Yes ☒ No

If **yes** to either Items a **or** b, complete Table 13 as instructed.

Table 13 for Outfall No.: Click to enter text.

Samples are (check one): ☐ **Composites** ☐ **Grabs**

Pollutant	CASRN	Sample 1 (µg/L)	Sample 2 (µg/L)	Sample 3 (µg/L)	Sample 4 (µg/L)	Analytical Method

WORKSHEET 4.0
RECEIVING WATERS

WORKSHEET 4.0
RECEIVING WATERS

This worksheet **is required** for all TPDES permit applications.

1. DOMESTIC DRINKING WATER SUPPLY (Instructions, Page 74)

a. There is a surface water intake for domestic drinking water supply located within 5 (five) miles downstream from the point/proposed point of discharge.

☐ Yes ☒ No

If **no**, stop here and proceed to Item 2. If **yes**, provide the following information:

i. The legal name of the owner of the drinking water supply intake: Click to enter text.

v. The distance and direction from the outfall to the drinking water supply intake: Click to enter text.

b. Locate and identify the intake on the USGS 7.5-minute topographic map provided for Administrative Report 1.0.

☐ Check this box to confirm the above requested information is provided.

2. DISCHARGE INTO TIDALLY INFLUENCED WATERS (Instructions, Page 74)

If the discharge is to tidally influenced waters, complete this section. Otherwise, proceed to Item 3.

a. Width of the receiving water at the outfall: 1,716 feet

b. Are there oyster reefs in the vicinity of the discharge?

☒ Yes ☐ No

If **yes**, provide the distance and direction from the outfall(s) to the oyster reefs: Approximately 0.9 mile north of the point of discharge.

c. Are there sea grasses within the vicinity of the point of discharge?

☒ Yes ☐ No

If **yes**, provide the distance and direction from the outfall(s) to the grasses: Approximately 0.3 mile north of the point of discharge and 0.25 mile west of the point of discharge.

3. CLASSIFIED SEGMENT (Instructions, Page 74)

The discharge is/will be directly into (or within 300 feet of) a classified segment.

☒ Yes ☐ No

If **yes**, stop here. It is not necessary to complete Items 4 and 5 of this worksheet or Worksheet 4.1.

If **no**, complete Items 4 and 5 and Worksheet 4.1 may be required.

4. DESCRIPTION OF IMMEDIATE RECEIVING WATERS (Instructions, Page 75)

a. Name of the immediate receiving waters: Click to enter text.

b. Check the appropriate description of the immediate receiving waters:

☐ Lake or Pond
- Surface area (acres): Click to enter text.
- Average depth of the entire water body (feet): Click to enter text.
- Average depth of water body within a 500-foot radius of the discharge point (feet): Click to enter text.

☐ Man-Made Channel or Ditch
☐ Stream or Creek
☐ Freshwater Swamp or Marsh
☐ Tidal Stream, Bayou, or Marsh
☐ Open Bay
☐ Other, specify: Click to enter text.

If **Man-Made Channel or Ditch** or **Stream or Creek** were selected above, provide responses to Items 4.c – 4.g below:

c. For **existing discharges**, check the description below that best characterizes the area **upstream** of the discharge.

For **new discharges**, check the description below that best characterizes the area **downstream** of the discharge.

☐ Intermittent (dry for at least one week during most years)
☐ Intermittent with Perennial Pools (enduring pools containing habitat to maintain aquatic life uses)
☐ Perennial (normally flowing)

Check the source(s) of the information used to characterize the area upstream (existing discharge) or downstream (new discharge):

☐ USGS flow records
☐ personal observation
☐ historical observation by adjacent landowner(s)
☐ other, specify: Click to enter text.

d. List the names of all perennial streams that join the receiving water within three miles downstream of the discharge point: Click to enter text.

e. The receiving water characteristics change within three miles downstream of the discharge (e.g., natural or man-made dams, ponds, reservoirs, etc.).

☐ Yes ☐ No

If **yes**, describe how: Click to enter text.

f. General observations of the water body during normal dry weather conditions: Click to enter text.

Date and time of observation: Click to enter text.

g. The water body was influenced by stormwater runoff during observations.

☐ Yes ☐ No

If **yes**, describe how: Click to enter text.

5. GENERAL CHARACTERISTICS OF WATER BODY (Instructions, Page 75)

a. Is the receiving water upstream of the existing discharge or proposed discharge site influenced by any of the following (check all that apply):

☐	oil field activities	☐	urban runoff
☐	agricultural runoff	☐	septic tanks
☐	upstream discharges	☐	other, specify: Click to enter text.

b. Uses of water body observed or evidence of such uses (check all that apply):

☐	livestock watering	☐	fishing	☐	picnic/park activities
☐	non-contact recreation	☐	industrial water supply	☐	other, specify: Click to enter text.
☐	domestic water supply	☐	irrigation withdrawal		
☐	contact recreation	☐	navigation		

c. Description which best describes the aesthetics of the receiving water and the surrounding area (check only one):

☐ **Wilderness:** outstanding natural beauty; usually wooded or un-pastured area: water clarity exceptional

☐ **Natural Area:** trees or native vegetation common; some development evident (from fields, pastures, dwellings); water clarity discolored

☐ **Common Setting:** not offensive, developed but uncluttered; water may be colored or turbid

☐ **Offensive:** stream does not enhance aesthetics; cluttered; highly developed; dumping areas; water discolored

WORKSHEET 11.0
COOLING WATER SYSTEM INFORMATION

WORKSHEET 11.0
COOLING WATER SYSTEM INFORMATION

This worksheet **is required** for all TPDES permit applications **that meet the conditions outlined in Technical Report 1.0, Item 12.**

1. COOLING WATER SYSTEM DATA (Instructions, Pages 99-100)

a. Complete the following table with information regarding the cooling water system.

Cooling Water System Data

Total DIF	344 Million Gallons per Day (MGD)
Total AIF	183-326 MGD
Intake Flow Uses (%)	
Contact cooling	0%
Non-contact cooling	100%
Process uses	0%
Other	0%

b. Attach the following information:

i. A narrative description of the design and annual operation of the facility's cooling water system and its relationship to the CWIS(s).

ii. A scaled map depicting the location of each CWIS, impoundment, intake pipe, and canals, pipes, or waterways used to convey cooling water to, or within, the cooling water system. Provide the latitude and longitude for each CWIS and any intake pipe(s) on the map. Indicate the position of the intake pipe within the water column.

iii. A description of water reuse activities, if applicable, reductions in total water withdrawals, if applicable, and the proportion of the source waterbody withdrawn (on a monthly basis).

iv. Design and engineering calculations prepared by a qualified professional and data to support the information provided in above item a.

v. Previous year (a minimum of 12 months) of AIF data.

vi. A narrative description of existing or proposed impingement and entrainment technologies or operation measures and a summary of their performance, including, but not limited to, reductions in impingement mortality and entrainment due to intake location and reductions in total water withdrawals and usage.

Attachment: E

2. COOLING WATER INTAKE STRUCTURE(S) DATA (Instructions, Page 100)

a. Complete the following table with information regarding each cooling water intake structure (this includes primary and make-up CWIS(s)).

Cooling Water Intake Structure(s) Data

CWIS ID	CWIS 001			
DIF	344 MGD			
AIF	183-326 MGD			
Intake Flow Uses (%)				
Contact cooling	0%			
Non-contact cooling	100%			
Process uses	0%			
Other	0%			
Latitude	27°49'01.92"N			
Longitude	97°25'16.22"W			

b. Attach the following information regarding the CWIS(s):

i. A narrative description of the configuration of each CWIS, annual and daily operation, including any seasonal changes, and where it is located in the water body and in the water column.

ii. Engineering calculations for each CWIS.

Attachment: E

3. SOURCE WATER PHYSICAL DATA (Instructions, Pages 100-101)

a. Complete the following table with information regarding the CWIS(s) source waterbody (this includes primary and make-up CWIS(s)).

Source Waterbody Data

CWIS ID	CWIS 001			
Source waterbody	CCIH			
Mean annual flow	N/A – the CCIH is not a flowing waterbody. See Attachment E for complete source water physical data as required by 40 CFR 122.21(r)(2)			
Source				

b. Attach the following information regarding the source waterbody.

i. A narrative description of the source water for each CWIS, including areal dimensions, depths, salinity and temperature regimes, and other documentation that supports this determination of the water body type where each cooling water intake structure is located.

ii. A narrative description of the source waterbody's hydrological and geomorphological features.

iii. Scaled drawings showing the physical configuration of all source water bodies used by the facility, including the source waterbody's hydrological and geomorphological features. **NOTE:** The source waterbody's hydrological and geomorphological features may be included on the map submitted for item 1.b.ii of this worksheet.

iv. A description of the methods used to conduct any physical studies to determine the intake's area of influence within the waterbody and the results of such studies.

Attachment: E

4. OPERATIONAL STATUS (Instructions, Pages 104-105)

a. Is this application for a power production or steam generation facility?

☒ Yes ☐ No

If **no**, proceed to Item 4.b. If **yes**, provide the following information as an attachment:

i. Describe the operating status of each individual unit, including age, capacity utilization rate (or equivalent) for the previous five years (a minimum of 60 months), and any seasonal changes in operation.

ii. Describe any extended or unusual outages or other factors which significantly affect current data for flow, impingement, entrainment.

iii. Identify any operating unit with a capacity utilization rate of less than 8 percent averaged over a contiguous period of two years (a minimum of 24 months).

iv. Describe any major upgrades completed within the last 15 years, including but not limited to boiler replacement, condenser replacement, turbine replacement, or changes of fuel type.

Attachment: E

b. Process Units

i. Is this application for a facility which has process units that use cooling water (other than for power production or steam generation)?

☐ Yes ☒ No

If **no**, proceed to Item 4.c. If **yes**, continue.

ii. Does the facility use or intend to use reductions in flow or changes in operations to meet the requirements of *40 CFR § 125.94(c)*?

☐ Yes ☐ No

If **no**, proceed to Item 4.c. If **yes**, attach descriptions of the following information:

- Individual production processes and product lines
- The operating status, including age of each line and seasonal operation
- Any extended or unusual outages that significantly affect current data for flow, impingement, entrainment, or other factors
- Any major upgrades completed within the last 15 years and plans or schedules for decommissioning or replacement of process units or production processes and product lines.

Attachment:

c. Is this an application for a nuclear power production facility?

☐ Yes ☒ No

If **no**, proceed to Item 4.d. If **yes**, attach a description of completed, approved, or scheduled upgrades and the Nuclear Regulatory Commission relicensing status for each unit at the facility.

Attachment:

d. Is this an application for a manufacturing facility?

☐ Yes ☒ No

If **no**, proceed to Worksheet 11.1. If **yes**, attach descriptions of current and future production schedules and any plans or schedules for any new units planned within the next five years (a minimum of 60 months)

Attachment:

WORKSHEET 11.1
IMPINGEMENT MORTALITY

WORKSHEET 11.1
IMPINGEMENT MORTALITY

This worksheet **is required** for all TPDES permit applications that **meet the conditions outlined in Technical Report 1.0, Item 12**. Complete one copy of this worksheet for **each** individual CWIS the facility uses or proposes to use.

CWIS ID: CWIS 001

1. IMPINGEMENT COMPLIANCE TECHNOLOGY SELECTION (Instructions, Page 102)

Check the box next to the method of compliance for the Impingement Mortality Standard selected by the facility.

☐ Closed-cycle recirculating system(CCRS) [*40 CFR § 125.94(c)(1)*]
☐ 0.5 ft/s Through-Screen Design Velocity [*40 CFR § 125.94(c)(2)*] – Proceed to Worksheet 11.2
☐ 0.5 ft/s Through Screen Actual Velocity [*40 CFR § 125.94(c)(3)*]
☐ Existing offshore velocity cap [*40 CFR § 125.94(c)(4)*] – Proceed to Worksheet 11.2
☐ Modified traveling screens [*40 CFR § 125.94(c)(5)*]
☒ System of technologies [*40 CFR § 125.94(c)(6)*]
☐ Impingement mortality performance standard [*40 CFR § 125.94(c)(7)*]
☒ De minimis rate of impingement [*40 CFR § 125.94(c)(11)*]
☐ Low capacity utilization power-generation facilities [*40 CFR § 125.94(c)(12)*]

If 0.5 ft/s Through-Screen Design Velocity [*40 CFR § 125.94(c)(2)*] or existing offshore velocity cap [*40 CFR § 125.94(c)(4)*] was selected, proceed to Worksheet 11.2. Otherwise, continue to Item 2.

2. IMPINGEMENT COMPLIANCE TECHNOLOGY INFORMATION (Instructions, Pages 102-103)

Complete the following sections based on the selection made for item 1 above.

a. CCRS [*40 CFR § 125.94(c)(1)*]

☐ Check this box to confirm the CWS meets the definition of CCRS located at *40 CFR § 125.91(c)* and provide a response to the following questions.

i. Does the facility use or propose to use a CWIS to replenish water losses to the CWS?

☐ Yes ☐ No

If **no**, proceed to item a.ii. If **yes**, provide the following information as an attachment and continue.

1. CWIS ID
2. 12 months of intake flow data for any CWIS used for make-up intake flows to replenish cooling water losses, excluding intakes for losses due to blowdown, drift, or evaporation.
3. A narrative description of any physical or operational measures taken to minimize make-up withdraws.

Attachment: N/A

NOTE: Do not complete a separate Worksheet 11.1 for a make-up CWIS.

ii. Does the facility use or propose to use cooling towers?

☐ Yes ☐ No

If **no**, proceed to Worksheet 11.2. If **yes**, provide the following information and proceed to Worksheet 11.2.

1. Average number of COCs prior to blowdown:

Average COCs prior to blowdown

Cooling Tower ID				
COCs				

2. Attach COC monitoring data for each cooling tower from the previous year (a minimum of 12 months)

Attachment: N/A

3. Maximum number of COCs each cooling tower can accomplish based on design of the system.

Calculated COCs prior to blowdown

Cooling Tower ID				
COCs				

4. Describe conditions that may limit the number of COCs prior to blowdown, if any, including but not limited to permit conditions: Click to enter text

b. 0.5 ft/s Through Screen Actual Velocity [*40 CFR § 125.94(c)(3)*]

Provide daily intake flow measurement monitoring data from the previous year (a minimum of 12 months) as an attachment and proceed to Worksheet 11.2.

Attachment: N/A

c. Modified traveling screens [*40 CFR § 125.94(c)(5)*]

Provide the following information as an attachment and proceed to Worksheet 11.2.

i. A description of the modified traveling screens and associated equipment.

ii. A site-specific impingement technology performance optimization study that includes a narrative description of the biological data collection methods

iii. Biological sampling data from the previous two years (a minimum of 24 months).

Attachment: N/A

d. System of technologies [*40 CFR § 125.94(c)(6)*] or impingement mortality performance standard [*40 CFR § 125.94(c)(7)]*

Provide the following information as an attachment and proceed to Worksheet 11.2.

i. A description of the system of technologies used or proposed for use by the facility to achieve compliance with the impingement mortality standard.

ii. A site-specific impingement technology performance optimization study that includes a narrative description of the biological data collection methods.

iii. Biological sampling data from the previous two years (a minimum of 24 months).

Attachment: E

e. De minimis rate of impingement [*40 CFR § 125.94(c)(11)*]

Provide the following information and proceed to Worksheet 11.2.

i. Attach monitoring data from the previous year (a minimum of 12 months) of intake flow measured at a frequency of 1/day on days of operation.

Attachment: E

ii. If the rate of impingement caused by the CWIS is extremely low (at an organism or age-one equivalent count), attach supplemental information to Worksheet 11.0, item 1.b.vi. to support this determination.

Attachment: E

f. Low capacity utilization power-generation facilities [*40 CFR § 125.94(c)(12)*]

Attach monthly utilization data from the previous 2 years (a minimum of 24 months) for each operating unit and proceed to Worksheet 11.2.

Attachment: N/A

WORKSHEET 11.2
SOURCE WATER BIOLOGICAL DATA

WORKSHEET 11.2
SOURCE WATER BIOLOGICAL DATA

This worksheet **is required** for all TPDES permit applications that **meet the conditions outlined in Technical Report 1.0, Item 12**. Complete one copy of this worksheet for **each** source waterbody of a CWIS for which a facility has selected an Impingement Mortality Technology Option described at *40 CFR §§ 125.94(c)(1)-(7)*.

Name of source waterbody: Corpus Christi Inner Harbor (CCIH) (Segment 2484)

1. SPECIES MANAGEMENT (Instructions, Page 104)

a. The facility has obtained an incidental take permit for its cooling water intake structure(s) from the USFWS or the NMFS.

☐ Yes ☒ No

If yes, attach any information submitted in order to obtain that permit, which may be used to supplement the permit application information requirements of paragraph *40 CFR § 125.95(f)*.

Attachment: N/A

b. Is the facility requesting a waiver from application requirements at *40 CFR § 122.21(r)(4)* in accordance with *40 CFR § 125.95* for any CWIS(s) that withdraw from a man-made reservoir that is stocked and managed by a state or federal natural resources agency or the equivalent?

☐ Yes ☒ No

If **yes**, attach a copy of the most recent managed fisheries report to TPWD, or equivalent.

Attachment: N/A

c. There are no federally listed threatened or endangered species or critical habitat designations within the source water body.

☒ True ☐ False

2. SOURCE WATER BIOLOGICAL DATA (Instructions, Pages 104-105)

New Facilities (Phase I, Track I and II)

- Provide responses to all items in this section and stop.

Existing Facilities (Phase II)

- If the answer to **1.b.** above was **no**, provide responses to all items in this section and proceed to Worksheet 11.3.
- If the answer to **1.b.** was **yes** and **1.c.** was **true**, do not complete any items in this section and proceed to Worksheet 11.3.
- If the answer to **1.b.** was **yes** and **1.c.** was **false**, attach a response for any item in this section that is not contained within the most recent TPWD, or equivalent and proceed to Worksheet 11.3.

Attachment: E

a. A list of the data requested at *40 CFR § 122.21(r)(4)(ii)* through *(vi)* that are not available, and efforts made to identify sources of the data.

b. Provide a list of species (or relevant taxa) in the vicinity of the CWIS and identify the following information regarding each species listed.

- all life stages and their relative abundance,
- identification of all species and life stages that would be most susceptible to impingement and entrainment,
- forage base,
- significance to commercial fisheries,
- significance to recreational fisheries,
- primary period of reproduction,
- larval recruitment, and
- period of peak abundance for relevant taxa.

c. Data representative of the seasonal and daily activities (e.g., feeding and water column migration) of biological organisms in the vicinity of the CWIS(s).

d. Identify all threatened, endangered, and other protected species that might be susceptible to impingement and entrainment at the CWIS(s).

e. Documentation of any public participation or consultation with federal or state agencies undertaken.

The following is required for existing facilities only. Include the following information with the above listed attachment.

f. Identify any protective measures and stabilization activities that have been implemented and provide a description of how these measures and activities affected the baseline water condition in the vicinity of the intake.

g. A list of fragile species, as defined at *40 CFR § 125.92(m)*, at the facility. The applicant need only identify those species not already identified as fragile at *40 CFR § 125.92(m)*.

NOTE: New units at an existing facility are not required to resubmit this information if the cooling water withdrawals for the operation of the new unit are from an existing intake.

WORKSHEET 11.3

COMPLIANCE WITH ENTRAINMENT MORTALITY STANDARD

WORKSHEET 11.3
ENTRAINMENT

This worksheet **is required** for all TPDES permit applications that **meet the conditions outlined in Technical Report 1.0, Item 12**. Complete one copy of this worksheet for **each** individual CWIS the facility uses or proposes to use.

CWIS ID: 001 CWIS

1. APPLICABILITY (Instructions, Page 106)

Is the AIF of the CWIS identified above greater than, or equal to, 125 MGD?

☒ Yes ☐ No

- If **no** or the facility has selected **CCRS** [*40 CFR § 125.94(c)(1)*] for the impingement mortality compliance method, complete Item 2 and stop here.
- If **yes** and the facility is **seeking a waiver** from application requirements in accordance with *40 CFR § 125.95* for any CWIS(s) that withdraw from a man-made reservoir that is stocked and managed by a state or federal natural resources agency or the equivalent, complete item 2 and stop.
- If **yes** and the facility is **not seeking a waiver** from application requirements in accordance *with 40 CFR § 125.95*, complete item 2 and provide any required and completed studies listed in item 3. For any required studies in item 3 that are not complete, provide a detailed explanation for the delay and an anticipated schedule for completion and submittal.

2. EXISTING ENTRAINMENT PERFORMANCE STUDIES (Instructions, Page 106)

Attach any previously conducted studies or studies obtained from other facilities addressing technology efficacy, through-facility entrainment survival, and other entrainment studies.

Attachment: E

3. FACILITY ENTRAINMENT PERFORMANCE STUDIES (Instructions, Page 106)

a. Attach an entrainment characterization study, as described at *40 CFR § 122.21(r)(9)*.

Attachment: E

b. Attach a comprehensive feasibility study, as described as *40 CFR § 122.21(r)(10)*.

Attachment: E

c. Attach a benefits valuation study, as described as *40 CFR § 122.21(r)(11)*.

Attachment: E

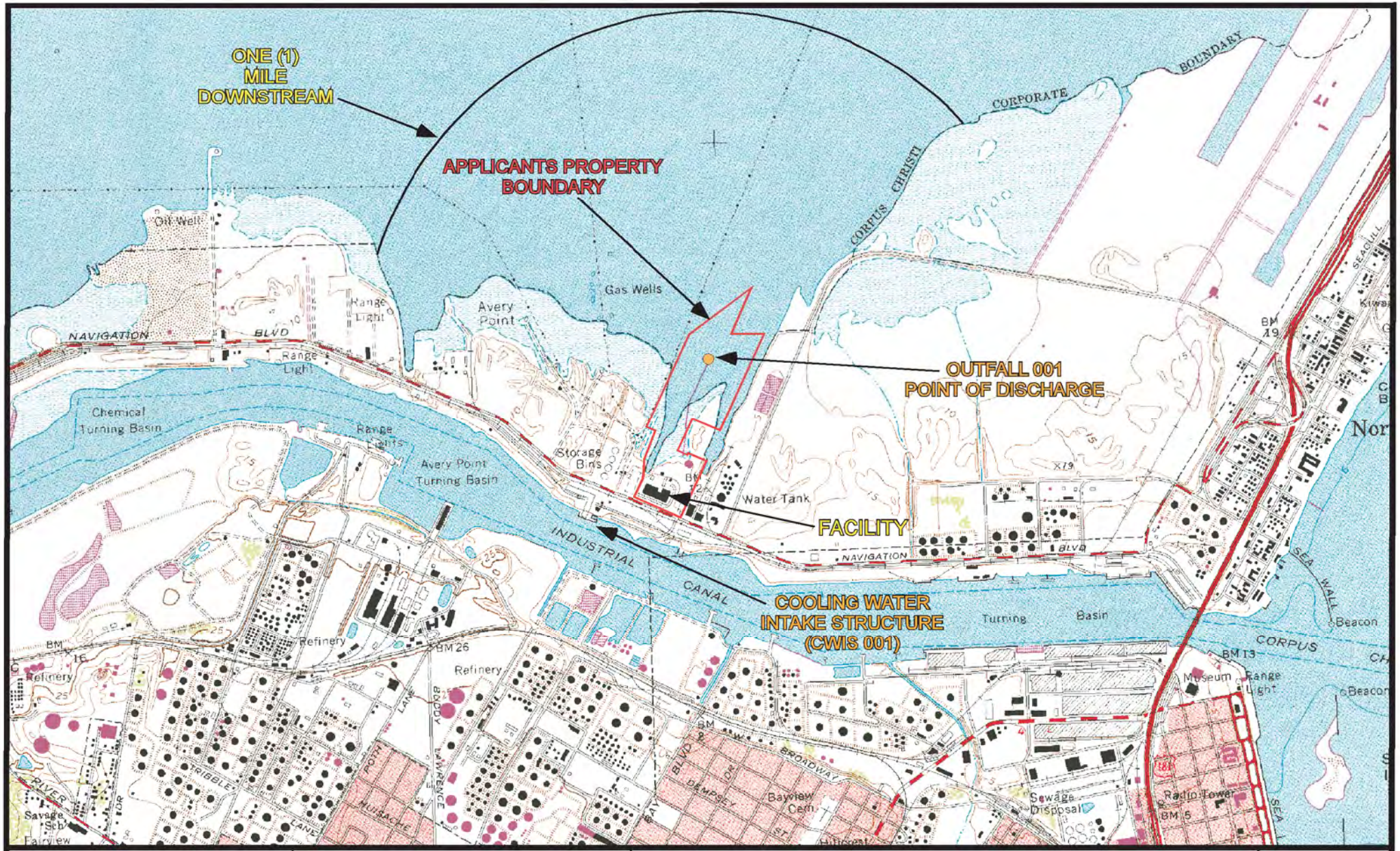
d. Attach a non-water quality environmental and other impacts study, as described as *40 CFR § 122.21(r)(12)*.

Attachment: E

e. Attach a peer review analysis, as described as *40 CFR § 122.21(r)(13)*.

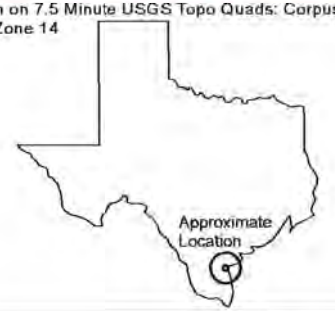
Attachment: E

FIGURE 1
SITE LOCATION USGS MAP
(ADMINISTRATIVE REPORT 1.0, p. 8, ITEM 9.b)



ENVIRONMENTAL PROFESSIONALS
WCM
P. O. Box 3247
Humble, TX 77347-3247
(281) 446-7070 Fax (281) 446-3348

Location on 7.5 Minute USGS Topo Quads: Corpus Christi, Texas; Zone 14



SITE LOCATION USGS MAP

Nueces Bay, LLC

Corpus Christi, Nueces County, Texas

FIGURE 1

DRAWN BY: AKD/BLS/lb/HJC

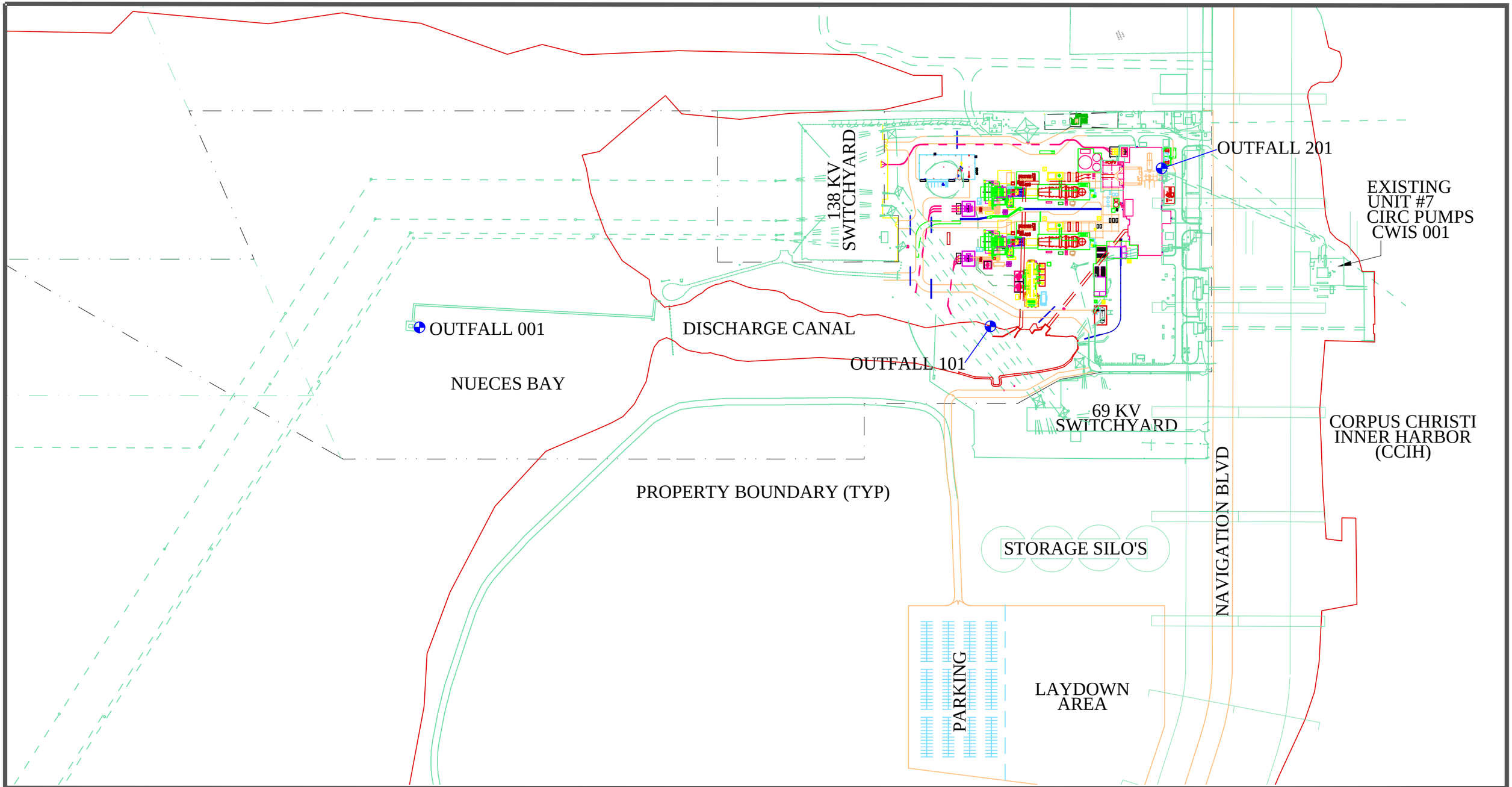
DATE: 10/08/2019

ONE (1) INCH = 2,000 FEET

DRAWING ID: Y:\NUE\CC\WWRNW19_22078\1565090349/Figure 1.cvx

N

FIGURE 2
FACILITY LAYOUT MAP
(TECHNICAL REPORT 1.0, p. 2, ITEM 1.d)



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PROFESSIONALS
WCM GROUP, INC.
P.O. BOX 3247 HUMBLE, TEXAS 77347-3247
PH: (281) 446-7070 FAX: (281) 446-3348

FACILITY LAYOUT MAP

FIGURE 2

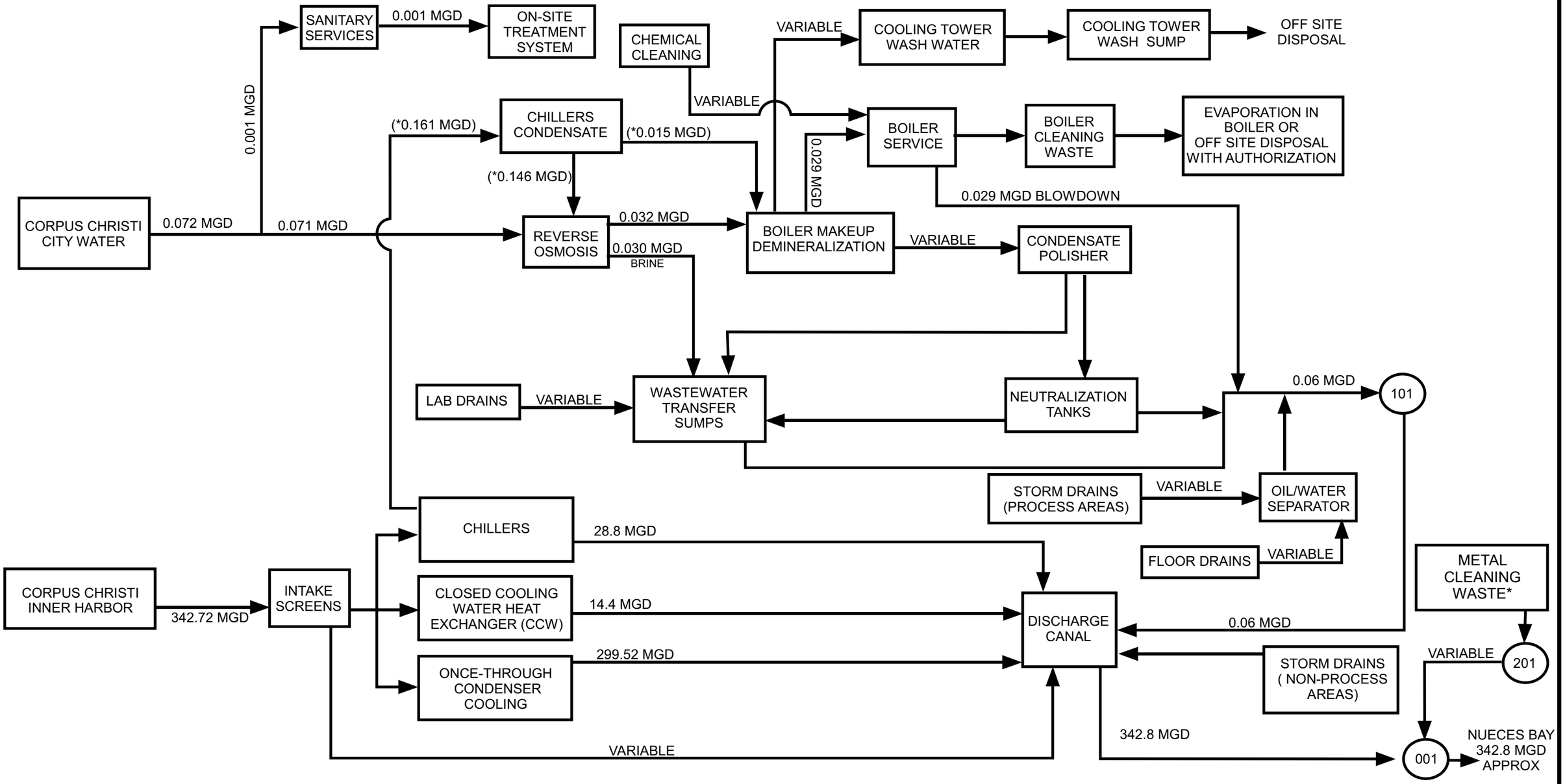
NUECES BAY, LLC
NUECES BAY POWER STATION
Corpus Christi, Nueces County, Texas

N

DRAWN BY:	DATE:	REV. DATE:
KKC	10/22/2019	

FILE NAME: Y:\NUE\CC\Figures\NBP Plot Plan.dwg

FIGURE 3
WASTEWATER PROCESS FLOW DIAGRAM
(TECHNICAL REPORT 1.0, p. 2, ITEM 2.a, p. 3, ITEM 2.B, AND TECHNICAL REPORT WORKSHEET 1.0 p. 15, ITEM 3)



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P. O. Box 3247
Humble, TX 77347-3247
(281) 446-7070 Fax (281) 446-3348

* DISCHARGE OF METAL CLEANING WASTE OCCURS FROM PROCESS/FRAC TANKS LOCATED THROUGHOUT THE BUILDING

PROCESS FLOW DIAGRAM
NUECES BAY, LLC
Nueces Bay Power Station
Corpus Christi, Nueces County, Texas

FIGURE
3

DRAWN BY:	**HJC**
DATE:	**07/15/2017**
REV. DATE:	
DRAWING ID:	

ATTACHMENT A
COPY OF APPLICATION FEE CHECK
(ADMINISTRATIVE REPORT 1.0, p.2, ITEM 1.e)

WATER QUALITY PERMIT

PAYMENT SUBMITTAL FORM

Use this form to submit the Application Fee, if mailing the payment.

- Complete items 1 through 5 below.
- Staple the check or money order in the space provided at the bottom of this document.
- Do not mail this form with the application form.
- Do not mail this form to the same address as the application.
- Do not submit a copy of the application with this form as it could cause duplicate permit entries.

Mail this form and the check or money order to:

BY REGULAR U.S. MAIL

Texas Commission on Environmental Quality
Financial Administration Division
Cashier's Office, MC-214
P.O. Box 13088
Austin, Texas 78711-3088

BY OVERNIGHT/EXPRESS MAIL

Texas Commission on Environmental Quality
Financial Administration Division
Cashier's Office, MC-214
12100 Park 35 Circle
Austin, Texas 78753

Fee Code: WQP **Permit No: WQ000**1244000

1. Check or Money Order Number: 39965
2. Check or Money Order Amount: $2,015.00
3. Date of Check or Money Order: 11/13/2019
4. Name on Check or Money Order: The WCM Group, Inc.
5. APPLICATION INFORMATION

   Name of Project or Site: Nueces Bay, LLC

   Physical Address of Project or Site: 2002 East Navigation Blvd, Corpus Christ, Texas

   If the check is for more than one application, attach a list which includes the name of each Project or Site (RE) and Physical Address, exactly as provided on the application.

Staple Check or Money Order in This Space

THE WCM GROUP, INC.
110 S. Bender Ave.
Humble, TX 77338

March 30, 2020

Texas Commission on Environmental Quality
Financial Administration Division
Cashier's Office, MC-214
12100 Park 35 Circle
Austin, Texas 78753

HAND DELIVERED

REFERENCE: Industrial Wastewater Permit Renewal With Changes Application
TPDES Permit No. WQ0001244000; NPDES Permit No. TX0003581
Nueces Bay, LLC; Nueces Bay Power Station
Corpus Christi, Nueces County, Texas
CN605698612; RN100552181

Dear Sir or Madam,

On behalf of Nueces Bay, LLC, Nueces Bay Power Station, The WCM Group Inc. is submitting this application fee check in the amount of $2,015.00 for the renewal of the above referenced permit.

Should you have any questions, or require additional information regarding this matter, please feel free to contact me at (281) 446-7070.

Sincerely,

Alison K. Davis
Director, Technical Services
adavis@wcmgroup.com

AKD/tnk
ENCLOSURE

cc: C. Garcia-Rios

THE WCM GROUP, INC. • HUMBLE, TX 77347-3247

39965

DATE	INVOICE NO.	COMMENT	AMOUNT	NET AMOUNT
11/13/2019	WQ0001244000	TPDES Permit Renewal - NUE-CC		2,015.00
DATE 11/13/19		**VENDOR** TCEQ	**TOTAL**	2,015.00

ENVIRONMENTAL PROFESSIONALS
WCM
The WCM Group, Inc.

OPERATING ACCOUNT
P.O. BOX 3247
HUMBLE, TX 77347-3247
(281) 446-7070

COMERICA BANK - TEXAS
HOUSTON, TEXAS

32-75
1110

39965

Two Thousand Fifteen and no/100

DATE	CHECK NO.	AMOUNT
11/13/19	39965	$2,015.00

PAY
TO THE
ORDER
OF

TCEQ
12100 PARK 35 CIRCLE
CASHIERS OFC, MC 214
AUSTIN TX 78753

AUTHORIZED SIGNATURE

⑈039965⑈ ⑆111000753⑆ 1880776537⑈

ATTACHMENT B
CORE DATA FORM
(ADMINISTRATIVE REPORT 1.0, p. 3, ITEM 2.c)

TCEQ Core Data Form

TCEQ Use Only

For detailed instructions regarding completion of this form, please read the Core Data Form Instructions or call 512-239-5175.

SECTION I: General Information

1. Reason for Submission *(If other is checked please describe in space provided.)*

☐ New Permit, Registration or Authorization (*Core Data Form should be submitted with the program application.)*

☒ Renewal *(Core Data Form should be submitted with the renewal form)* ☐ Other

2. Customer Reference Number *(if issued)*	Follow this link to search for CN or RN numbers in Central Registry**	3. Regulated Entity Reference Number *(if issued)*
CN **605689612**		RN **100552181**

SECTION II: Customer Information

4. General Customer Information | 5. Effective Date for Customer Information Updates (mm/dd/yyyy)

☐ New Customer ☐ Update to Customer Information ☐ Change in Regulated Entity Ownership
☐ Change in Legal Name (Verifiable with the Texas Secretary of State or Texas Comptroller of Public Accounts)

The Customer Name submitted here may be updated automatically based on what is current and active with the Texas Secretary of State (SOS) or Texas Comptroller of Public Accounts (CPA).

6. Customer Legal Name *(If an individual, print last name first: eg: Doe, John)* | *If new Customer, enter previous Customer below:*

Nueces Bay, LLC

7. TX SOS/CPA Filing Number	8. TX State Tax ID (11 digits)	9. Federal Tax ID (9 digits)	10. DUNS Number *(if applicable)*
0803410579	12010456452	20-1045645	

11. Type of Customer: ☒ Corporation ☐ Individual Partnership: ☐ General ☐ Limited
Government: ☐ City ☐ County ☐ Federal ☐ State ☐ Other ☐ Sole Proprietorship ☐ Other:

12. Number of Employees
☐ 0-20 ☒ 21-100 ☐ 101-250 ☐ 251-500 ☐ 501 and higher

13. Independently Owned and Operated?
☒ Yes ☐ No

14. Customer Role (Proposed or Actual) – *as it relates to the Regulated Entity listed on this form. Please check one of the following:*

☐ Owner ☐ Operator ☒ Owner & Operator
☐ Occupational Licensee ☐ Responsible Party ☐ Voluntary Cleanup Applicant ☐ Other:

15. Mailing Address:

2002 E. Navigation Blvd							
City	Corpus Christi	State	TX	ZIP	78402	ZIP + 4	1913

16. Country Mailing Information *(if outside USA)*	17. E-Mail Address *(if applicable)*
	Cecilia.Garcia-Rios@talenenergy.com

18. Telephone Number	19. Extension or Code	20. Fax Number *(if applicable)*
(956) 763-3510		( ) -

SECTION III: Regulated Entity Information

21. General Regulated Entity Information *(If 'New Regulated Entity" is selected below this form should be accompanied by a permit application)*

☐ New Regulated Entity ☐ Update to Regulated Entity Name ☐ Update to Regulated Entity Information

The Regulated Entity Name submitted may be updated in order to meet TCEQ Agency Data Standards (removal of organizational endings such as Inc, LP, or LLC.)

22. Regulated Entity Name *(Enter name of the site where the regulated action is taking place.)*

Nueces Bay Power Station

23. Street Address of the Regulated Entity: *(No PO Boxes)*	2002 E. Navigation Blvd.							
	City	Corpus Christi	**State**	TX	**ZIP**	78402	**ZIP + 4**	1913
24. County	Nueces							

Enter Physical Location Description if no street address is provided.

25. Description to Physical Location:	N/A - Street address provided

26. Nearest City	**State**	**Nearest ZIP Code**
Corpus Christi	TX	78402

27. Latitude (N) In Decimal:	27.818430	**28. Longitude (W) In Decimal:**	-97.419717

Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
27	49	6.35	97	25	10.98

29. Primary SIC Code (4 digits)	**30. Secondary SIC Code** (4 digits)	**31. Primary NAICS Code** (5 or 6 digits)	**32. Secondary NAICS Code** (5 or 6 digits)
4911		221112	

33. What is the Primary Business of this entity? *(Do not repeat the SIC or NAICS description.)*

Natural-gas fired electric power generation

34. Mailing Address:	**7300 CPL Road**							
	City	**Laredo**	**State**	**TX**	**ZIP**	**78041**	**ZIP + 4**	

35. E-Mail Address:	**Cecilia.Garcia-Rios@talenenergy.com**

36. Telephone Number	**37. Extension or Code**	**38. Fax Number** *(if applicable)*
(953) 763-3510		**( ) -**

39. TCEQ Programs and ID Numbers Check all Programs and write in the permits/registration numbers that will be affected by the updates submitted on this form. See the Core Data Form instructions for additional guidance.

☐ Dam Safety	☐ Districts	☐ Edwards Aquifer	☐ Emissions Inventory Air	☐ Industrial Hazardous Waste
☐ Municipal Solid Waste	☐ New Source Review Air	☐ OSSF	☐ Petroleum Storage Tank	☐ PWS
☐ Sludge	☐ Storm Water	☐ Title V Air	☐ Tires	☐ Used Oil
☐ Voluntary Cleanup	☒ Waste Water	☐ Wastewater Agriculture	☐ Water Rights	☐ Other:
	WQ0001244000			

SECTION IV: Preparer Information

40. Name:	Alison Davis	**41. Title:**	Sr. Director, Technical Services

42. Telephone Number	**43. Ext./Code**	**44. Fax Number**	**45. E-Mail Address**
(281) 446-7070		(281) 446-3348	adavis@wcmgroup.com

SECTION V: Authorized Signature

46. By my signature below, I certify, to the best of my knowledge, that the information provided in this form is true and complete, and that I have signature authority to submit this form on behalf of the entity specified in Section II, Field 6 and/or as required for the updates to the ID numbers identified in field 39.

Company:	Nueces Bay, LLC	**Job Title:**	President		
Name *(In Print)* :	Dale Lebsack			**Phone:**	(281) 203-5327
Signature:	Dale Lebsack			**Date:**	3/30/2020

ATTACHMENT C
SAFETY DATA SHEETS
(TECHNICAL REPORT 1.0, p. 1, ITEM 1.c AND p. 8, ITEM 5.d)

MATERIAL SAFETY DATA SHEET

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

PRODUCT

Product Name: MOBIL DTE OIL HEAVY MEDIUM
Product Description: Base Oil and Additives
Product Code: 201560501590, 600163-00, 970172
Intended Use: Turbine oil

COMPANY IDENTIFICATION

Supplier: EXXON MOBIL CORPORATION
3225 GALLOWS RD.
FAIRFAX, VA. 22037 USA

24 Hour Health Emergency	609-737-4411
Transportation Emergency Phone	800-424-9300
ExxonMobil Transportation No.	281-834-3296
Product Technical Information	800-662-4525, 800-947-9147
MSDS Internet Address	http://www.exxon.com, http://www.mobil.com

SECTION 2 COMPOSITION / INFORMATION ON INGREDIENTS

No Reportable Hazardous Substance(s) or Complex Substance(s).

SECTION 3 HAZARDS IDENTIFICATION

This material is not considered to be hazardous according to regulatory guidelines (see (M)SDS Section 15).

POTENTIAL HEALTH EFFECTS

Low order of toxicity. Excessive exposure may result in eye, skin, or respiratory irritation. High-pressure injection under skin may cause serious damage.

NFPA Hazard ID:	Health:	0	Flammability:	1	Reactivity: 0
HMIS Hazard ID:	Health:	0	Flammability:	1	Reactivity: 0

NOTE: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 4 FIRST AID MEASURES

INHALATION

Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

SKIN CONTACT

Wash contact areas with soap and water. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

EYE CONTACT

Flush thoroughly with water. If irritation occurs, get medical assistance.

INGESTION

First aid is normally not required. Seek medical attention if discomfort occurs.

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Inappropriate Extinguishing Media: Straight Streams of Water

FIRE FIGHTING

Fire Fighting Instructions: Evacuate area. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply. Firefighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Hazardous Combustion Products: Smoke, Fume, Aldehydes, Sulfur oxides, Incomplete combustion products, Oxides of carbon

FLAMMABILITY PROPERTIES

Flash Point [Method]: >223C (433F) [ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0
Autoignition Temperature: N/D

SECTION 6 ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations. US regulations require reporting releases of this material to the environment which exceed the applicable reportable quantity or oil spills which could reach any waterway including intermittent dry creeks. The

National Response Center can be reached at (800)424-8802.

PROTECTIVE MEASURES

Avoid contact with spilled material. See Section 5 for fire fighting information. See the Hazard Identification Section for Significant Hazards. See Section 4 for First Aid Advice. See Section 8 for advice on the minimum requirements for personal protective equipment. Additional protective measures may be necessary, depending on the specific circumstances and/or the expert judgment of the emergency responders. For emergency responders: Respiratory protection: respiratory protection will be necessary only in special cases, e.g., formation of mists. Half-face or full-face respirator with filter(s) for dust/organic vapor or Self Contained Breathing Apparatus (SCBA) can be used depending on the size of spill and potential level of exposure. If the exposure cannot be completely characterized or an oxygen deficient atmosphere is possible or anticipated, SCBA is recommended. Work gloves that are resistant to hydrocarbons are recommended. Gloves made of polyvinyl acetate (PVA) are not water-resistant and are not suitable for emergency use. Chemical goggles are recommended if splashes or contact with eyes is possible. Small spills: normal antistatic work clothes are usually adequate. Large spills: full body suit of chemical resistant, antistatic material is recommended.

SPILL MANAGEMENT

Land Spill: Stop leak if you can do it without risk. Recover by pumping or with suitable absorbent.

Water Spill: Stop leak if you can do it without risk. Confine the spill immediately with booms. Warn other shipping. Remove from the surface by skimming or with suitable absorbents. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Large Spills: Dike far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7 HANDLING AND STORAGE

HANDLING

Prevent small spills and leakage to avoid slip hazard. Material can accumulate static charges which may cause an electrical spark (ignition source). When the material is handled in bulk, an electrical spark could ignite any flammable vapors from liquids or residues that may be present (e.g., during switch-loading operations). Use proper bonding and/or ground procedures. However, bonding and grounds may not eliminate the hazard from static accumulation. Consult local applicable standards for guidance. Additional references include American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practice on Static Electricity) or CENELEC CLC/TR 50404 (Electrostatics - Code of practice for the avoidance of hazards due to static electricity).

Static Accumulator: This material is a static accumulator.

STORAGE

The container choice, for example storage vessel, may effect static accumulation and dissipation. Do not store in open or unlabelled containers. Keep away from incompatible materials.

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits/standards for materials that can be formed when handling this product:
When mists/aerosols can occur the following are recommended: 5 mg/m³ - ACGIH TLV (inhalable fraction), 5 mg/m³ - OSHA PEL.

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:
No special requirements under ordinary conditions of use and with adequate ventilation.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:
No special requirements under ordinary conditions of use and with adequate ventilation.

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapor warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:
No protection is ordinarily required under normal conditions of use.

Eye Protection: If contact is likely, safety glasses with side shields are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:
No skin protection is ordinarily required under normal conditions of use. In accordance with good industrial hygiene practices, precautions should be taken to avoid skin contact.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

ENVIRONMENTAL CONTROLS

See Sections 6, 7, 12, 13.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Note: Physical and chemical properties are provided for safety, health and environmental considerations only and may not fully represent product specifications. Contact the Supplier for additional information.

GENERAL INFORMATION

Physical State: Liquid
Color: Amber
Odor: Characteristic
Odor Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 15 C): 0.87
Flash Point [Method]: >223C (433F) [ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0
Autoignition Temperature: N/D
Boiling Point / Range: > 316C (600F) [Estimated]
Vapor Density (Air = 1): > 2 at 101 kPa [Estimated]
Vapor Pressure: < 0.013 kPa (0.1 mm Hg) at 20 C [Estimated]
Evaporation Rate (n-butyl acetate = 1): N/D
pH: N/A
Log Pow (n-Octanol/Water Partition Coefficient): > 3.5 [Estimated]
Solubility in Water: Negligible
Viscosity: 67.9 cSt (67.9 mm2/sec) at 40 C | 8.7 cSt (8.7 mm2/sec) at 100C
Oxidizing Properties: See Hazards Identification Section.

OTHER INFORMATION

Freezing Point: N/D
Melting Point: N/A
Pour Point: -27°C (-17°F)
DMSO Extract (mineral oil only), IP-346: < 3 %wt
Decomposition Temperature: N/D

SECTION 10 STABILITY AND REACTIVITY

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: Excessive heat. High energy sources of ignition.

MATERIALS TO AVOID: Strong oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

HAZARDOUS POLYMERIZATION: Will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

ACUTE TOXICITY

Route of Exposure	Conclusion / Remarks
Inhalation	
Toxicity (Rat): LC50 > 5000 mg/m3	Minimally Toxic. Based on test data for structurally similar materials.
Irritation: No end point data.	Negligible hazard at ambient/normal handling temperatures. Based on assessment of the components.
Ingestion	
Toxicity (Rat): LD50 > 5000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Skin	
Toxicity (Rabbit): LD50 > 5000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Irritation (Rabbit): Data available.	Negligible irritation to skin at ambient temperatures. Based on test data for structurally similar materials.
Eye	
Irritation (Rabbit): Data available.	May cause mild, short-lasting discomfort to eyes. Based on test data for structurally similar materials.

CHRONIC/OTHER EFFECTS

Contains:

Base oil severely refined: Not carcinogenic in animal studies. Representative material passes IP-346, Modified Ames test, and/or other screening tests. Dermal and inhalation studies showed minimal effects; lung non-specific infiltration of immune cells, oil deposition and minimal granuloma formation. Not sensitizing in test animals.

Additional information is available by request.

The following ingredients are cited on the lists below: None.

--REGULATORY LISTS SEARCHED--

1 = NTP CARC	3 = IARC 1	5 = IARC 2B
2 = NTP SUS	4 = IARC 2A	6 = OSHA CARC

SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY

Material -- Not expected to be harmful to aquatic organisms.

MOBILITY

Base oil component -- Low solubility and floats and is expected to migrate from water to the land. Expected to

partition to sediment and wastewater solids.

PERSISTENCE AND DEGRADABILITY
Biodegradation:
Base oil component -- Expected to be inherently biodegradable

BIOACCUMULATION POTENTIAL
Base oil component -- Has the potential to bioaccumulate, however metabolism or physical properties may reduce the bioconcentration or limit bioavailability.

SECTION 13 DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products. Protect the environment. Dispose of used oil at designated sites. Minimize skin contact. Do not mix used oils with solvents, brake fluids or coolants.

REGULATORY DISPOSAL INFORMATION
RCRA Information: The unused product, in our opinion, is not specifically listed by the EPA as a hazardous waste (40 CFR, Part 261D), nor is it formulated to contain materials which are listed as hazardous wastes. It does not exhibit the hazardous characteristics of ignitability, corrositivity or reactivity and is not formulated with contaminants as determined by the Toxicity Characteristic Leaching Procedure (TCLP). However, used product may be regulated.

Empty Container Warning Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

SECTION 14 TRANSPORT INFORMATION

LAND (DOT): Not Regulated for Land Transport

LAND (TDG): Not Regulated for Land Transport

SEA (IMDG): Not Regulated for Sea Transport according to IMDG-Code

AIR (IATA): Not Regulated for Air Transport

SECTION 15 REGULATORY INFORMATION

OSHA HAZARD COMMUNICATION STANDARD: When used for its intended purposes, this material is not classified as hazardous in accordance with OSHA 29 CFR 1910.1200.

Complies with the following national/regional chemical inventory requirements:: DSL, IECSC, TSCA, EINECS, PICCS, AICS

EPCRA: This material contains no extremely hazardous substances.

SARA (311/312) REPORTABLE HAZARD CATEGORIES: None.

SARA (313) TOXIC RELEASE INVENTORY: This material contains no chemicals subject to the supplier notification requirements of the SARA 313 Toxic Release Program.

The following ingredients are cited on the lists below:

Chemical Name	CAS Number	List Citations
PHOSPHORODITHOIC ACID, O,O-DI C1-14-ALKYL ESTERS, ZINC SALTS (2:1) (ZDDP)	68649-42-3	15

--REGULATORY LISTS SEARCHED--

1 = ACGIH ALL	6 = TSCA 5a2	11 = CA P65 REPRO	16 = MN RTK
2 = ACGIH A1	7 = TSCA 5e	12 = CA RTK	17 = NJ RTK
3 = ACGIH A2	8 = TSCA 6	13 = IL RTK	18 = PA RTK
4 = OSHA Z	9 = TSCA 12b	14 = LA RTK	19 = RI RTK
5 = TSCA 4	10 = CA P65 CARC	15 = MI 293	

Code key: CARC=Carcinogen; REPRO=Reproductive

SECTION 16 OTHER INFORMATION

N/D = Not determined, N/A = Not applicable

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:

Revision Changes:
Section 06: Notification Procedures - Header was modified.
Section 13: Disposal Considerations - Disposal Recommendations was modified.
Section 10 Stability and Reactivity - Header was modified.
Section 13: Disposal Recommendations - Note was modified.
Section 13: Empty Container Warning was modified.
Section 09: Phys/Chem Properties Note was modified.

Section 09: Boiling Point C(F) was modified.
Section 09: Flash Point C(F) was modified.
Section 09: n-Octanol/Water Partition Coefficient was modified.
Section 08: Personal Protection was modified.
Section 08: Hand Protection was modified.
Section 07: Handling and Storage - Handling was modified.
Section 07: Handling and Storage - Storage Phrases was modified.
Section 11: Dermal Lethality Test Data was modified.
Section 11: Oral Lethality Test Data was modified.
Section 05: Hazardous Combustion Products was modified.
Section 06: Accidental Release - Spill Management - Water was modified.
Section 09: Relative Density - Header was modified.
Section 09: Flash Point C(F) was modified.
Section 09: Viscosity was modified.
Section 14: Sea (IMDG) - Header was modified.
Section 14: Air (IATA) - Header was modified.
Section 14: LAND (TDG) - Header was modified.
Section 14: LAND (DOT) - Header was modified.
Section 15: List Citation Table - Header was modified.
Section 14: LAND (DOT) - Default was modified.
Section 14: LAND (TDG) Default was modified.
Section 14: Sea (IMDG) - Default was modified.
Section 14: Air (IATA) - Default was modified.
Section 15: National Chemical Inventory Listing - Header was modified.
Section 15: National Chemical Inventory Listing was modified.
Section 16: Code to MHCs was modified.
Section 08: Exposure limits/standards was modified.
Hazard Identification: OSHA - May be Hazardous Statement was modified.
Section 06: Notification Procedures was modified.
Section 09: Oxidizing Properties was modified.
Section 01: Company Contact Methods Sorted by Priority was modified.
Section 06: Protective Measures was added.
Section 06: Accidental Release - Protective Measures - Header was added.
Section 15: Chemical Name - Header was added.
Section 15: CAS Number - Header was added.
Section 15: List Citations - Header was added.
Section 15: List Citations Table was added.
Section 09: Decomposition Temperature was added.
Section 09: Decomposition Temp - Header was added.
Section 09: Vapor Pressure was added.

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affiliates in which they directly or indirectly hold any interest.

Internal Use Only
MHC: 0B, 0B, 0, 0, 0, 0 PPEC: A

DGN: 2007083XUS (1013293)

DIAMOND CLASS® TURBINE OIL (All Grades)

Material Safety Data Sheet

1. PRODUCT AND COMPANY IDENTIFICATION

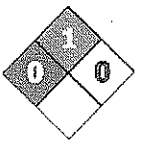
Product Name:	DIAMOND CLASS® TURBINE OIL (All Grades)
MSDS Number:	778980
Synonyms:	DIAMOND CLASS® TURBINE OIL 32 DIAMOND CLASS® TURBINE OIL 46 DIAMOND CLASS® TURBINE OIL 68
Intended Use:	Turbine Oil
Manufacturer/Supplier:	ConocoPhillips Lubricants 600 N. Dairy Ashford Houston, Texas 77079-1175
Emergency Health and Safety Number:	Chemtrec: 800-424-9300 (24 Hours)
Customer Service:	888-766-7676
Technical Information:	800-255-9556
MSDS Information:	Internet: http://w3.conocophillips.com/NetMSDS/

2. HAZARDS IDENTIFICATION

Emergency Overview

This material is not considered hazardous according to OSHA criteria.

NFPA



Appearance: Clear and bright
Physical Form: Liquid
Odor: Petroleum

Potential Health Effects

Eye: Contact may cause mild eye irritation including stinging, watering, and redness.

Skin: Contact may cause mild skin irritation including redness and a burning sensation. Prolonged or repeated contact can defat the skin, causing drying and cracking of the skin, and possibly dermatitis (inflammation). A component of this material may cause an allergic skin reaction. No harmful effects from skin absorption are expected.

Inhalation (Breathing): No information available on acute toxicity.

Ingestion (Swallowing): No harmful effects expected from ingestion.

Signs and Symptoms: Effects of overexposure may include irritation of the digestive tract, nausea and diarrhea. Inhalation of oil mist or vapors at elevated temperatures may cause respiratory irritation.

Pre-Existing Medical Conditions: Conditions aggravated by exposure may include skin disorders.

See Section 11 for additional Toxicity Information.

3. COMPOSITION / INFORMATION ON INGREDIENTS

Component	CASRN	Concentration*
Lubricant Base Oil (Petroleum)	VARIOUS	>98
Additives	PROPRIETARY	<2

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. FIRST AID MEASURES

Eye Contact: If irritation or redness develops from exposure, flush eyes with clean water. If symptoms persist, seek medical attention.

Skin Contact: Remove contaminated shoes and clothing and cleanse affected area(s) thoroughly by washing with mild soap and water or a waterless hand cleaner. If irritation or redness develops and persists, seek medical attention.

Inhalation (Breathing): If respiratory symptoms develop, move victim away from source of exposure and into fresh air in a position comfortable for breathing. If symptoms persist, seek medical attention.

Ingestion (Swallowing): First aid is not normally required; however, if swallowed and symptoms develop, seek medical attention.

Notes to Physician: Acute aspirations of large amounts of oil-laden material may produce a serious aspiration pneumonia. Patients who aspirate these oils should be followed for the development of long-term sequelae. Inhalation exposure to oil mists below current workplace exposure limits is unlikely to cause pulmonary abnormalities.

5. FIRE-FIGHTING MEASURES

NFPA 704 Hazard Class

Health: 0 **Flammability:** 1 **Instability:** 0 (0-Minimal, 1-Slight, 2-Moderate, 3-Serious, 4-Severe)

Unusual Fire & Explosion Hazards: This material may burn, but will not ignite readily. If container is not properly cooled, it can rupture in the heat of a fire.

Extinguishing Media: Dry chemical, carbon dioxide, foam, or water spray is recommended. Water or foam may cause frothing of materials heated above 212°F. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces.

Fire Fighting Instructions: For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear. When the potential chemical hazard is unknown, in enclosed or confined spaces, a self contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8).

Isolate immediate hazard area and keep unauthorized personnel out. Stop spill/release if it can be done safely. Move undamaged containers from immediate hazard area if it can be done safely. Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Cool equipment exposed to fire with water, if it can be done safely. Avoid spreading burning liquid with water used for cooling purposes.

Hazardous Combustion Products: Combustion may yield smoke, carbon monoxide, and other products of incomplete combustion. Oxides of sulfur, nitrogen or phosphorus may also be formed.

See Section 9 for Flammable Properties including Flash Point and Flammable (Explosive) Limits

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions: This material may burn, but will not ignite readily. Keep all sources of ignition away from spill/release. The use of explosion-proof electrical equipment is recommended. Stay upwind and away from spill/release. Notify persons down wind of the spill/release, isolate immediate hazard area and keep unauthorized personnel out. Wear appropriate protective equipment, including respiratory protection, as conditions warrant (see Section 8). See Sections 2 and 7 for additional information on hazards and precautionary measures.

Environmental Precautions: Stop spill/release if it can be done safely. Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems, and natural waterways. Use water sparingly to minimize environmental contamination and reduce disposal requirements. Spills into or upon navigable waters, the contiguous zone, or adjoining shorelines that cause a sheen or discoloration on the surface of the water, may require notification of the National Response Center (phone number 800-424-8802).

Methods for Containment and Clean-Up: Notify relevant authorities in accordance with all applicable regulations. Immediate cleanup of any spill is recommended. Dike far ahead of spill for later recovery or disposal. Absorb spill with inert material such as sand or vermiculite, and place in suitable container for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling: Wash thoroughly after handling. Use good personal hygiene practices and wear appropriate personal protective equipment.

Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29CFR 1910.146. Do not wear contaminated clothing or shoes.

"Empty" containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury or death. "Empty" drums should be completely drained, properly bunged, and promptly shipped to the supplier or a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations. Before working on or in tanks which contain or have contained this material, refer to OSHA regulations, ANSI Z49.1, and other references pertaining to cleaning, repairing, welding, or other contemplated operations.

Conditions for safe storage: Keep container(s) tightly closed. Use and store this material in cool, dry, well-ventilated area away from heat and all sources of ignition. Store only in approved containers. Keep away from any incompatible material (see Section 10). Protect container(s) against physical damage.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Component	US-ACGIH	OSHA	Other
Lubricant Base Oil (Petroleum)	TWA: 5mg/m^3 STEL: 10 mg/m^3 as Oil Mist, if generated	TWA: 5 mg/m^3 as Oil Mist, if generated	---

Note: State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information.

Engineering controls: If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits, additional engineering controls may be required.

Eye/Face Protection: The use of eye protection that meets or exceeds ANSI Z.87.1 is recommended to protect against potential eye contact, irritation, or injury. Depending on conditions of use, a face shield may be necessary.

Skin/Hand Protection: The use of gloves impervious to the specific material handled is advised to prevent skin contact. Users should check with manufacturers to confirm the breakthrough performance of their products. Suggested protective materials: Nitrile

Respiratory Protection: Where there is potential for airborne exposure above the exposure limit a NIOSH certified air purifying respirator equipped with R or P95 filters may be used.

A respiratory protection program that meets or is equivalent to OSHA 29 CFR 1910.134 and ANSI Z88.2 should be followed whenever workplace conditions warrant a respirator's use. Air purifying respirators provide limited protection and cannot be used in atmospheres that exceed the maximum use concentration (as directed by regulation or the manufacturer's instructions), in oxygen deficient (less than 19.5 percent oxygen) situations, or under conditions that are immediately dangerous to life and health (IDLH).

Suggestions provided in this section for exposure control and specific types of protective equipment are based on readily available information. Users should consult with the specific manufacturer to confirm the performance of their protective equipment. Specific situations may require consultation with industrial hygiene, safety, or engineering professionals.

9. PHYSICAL AND CHEMICAL PROPERTIES

Note: Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1 atm). Data represent typical values and are not intended to be specifications.

Appearance:	Clear and bright
Physical Form:	Liquid
Odor:	Petroleum
Odor Threshold:	No data

pH:	Not applicable
Vapor Pressure:	<1 mm Hg
Vapor Density (air=1):	>1
Boiling Point/Range:	No data
Melting/Freezing Point:	<-27.4°F / <-33°C
Pour Point:	<-27.4°F / <-33°C
Solubility in Water:	Negligible
Partition Coefficient (n-octanol/water) (Kow):	No data
Specific Gravity:	0.87 @ 60°F (15.6°C)
Bulk Density:	7.3 lbs/gal
Viscosity:	5.3 - 8.7 cSt @ 100°C; 30 - 72 cSt @ 40°C
Percent Volatile:	Negligible
Evaporation Rate (nBuAc=1):	No data
Flash Point:	>302°F / >150°C
Test Method:	Pensky-Martens Closed Cup (PMCC), ASTM D93, EPA 1010
LEL (vol % in air):	No data
UEL (vol % in air):	No data
Autoignition Temperature:	No data

10. STABILITY AND REACTIVITY

Stability: Stable under normal ambient and anticipated conditions of storage and handling.

Conditions to Avoid: Extended exposure to high temperatures can cause decomposition.

Materials to Avoid (Incompatible Materials): Avoid contact with strong oxidizing agents and strong reducing agents.

Hazardous Decomposition Products: Not anticipated under normal conditions of use.

Hazardous Polymerization: Not known to occur.

11. TOXICOLOGICAL INFORMATION

Chronic Data:

Lubricant Base Oil (Petroleum)

Carcinogenicity: The petroleum base oils contained in this product have been highly refined by a variety of processes including severe hydrocracking/hydroprocessing to reduce aromatics and improve performance characteristics. All of the oils meet the IP-346 criteria of less than 3 percent PAH's and are not considered carcinogens by NTP, IARC, or OSHA.

Acute Data:

Component	Oral LD50	Dermal LD50	Inhalation LC50
Lubricant Base Oil (Petroleum)	>5 g/kg	>2 g/kg	No data

12. ECOLOGICAL INFORMATION

Ecotoxicity: Experimental studies show that acute aquatic toxicity values are greater than 1000 mg/l. These values are consistent with the predicted aquatic toxicity of these substances based on their hydrocarbon compositions.

Mobility: Volatilization to air is not expected to be a significant fate process due to the low vapor pressure of this material. In water, base oils will float and spread over the surface at a rate dependent upon viscosity. There will be significant removal of hydrocarbons from the water by sediment adsorption. In soil and sediment, hydrocarbon components will show low mobility with adsorption to sediments being the predominant physical process. The main fate process is expected to be slow biodegradation of base oil components in soil and sediment.

Persistence and degradability: The hydrocarbons in this material are not readily biodegradable, but since they can be degraded by microorganisms, they are regarded as inherently biodegradable.

Bioaccumulation Potential: Log Kow values measured for the hydrocarbon components of this material range from 4 to over 6, and therefore regarded as having the potential to bioaccumulate. In practice, metabolic processes may reduce bioconcentration.

13. DISPOSAL CONSIDERATIONS

The generator of a waste is always responsible for making proper hazardous waste determinations and needs to consider state and local requirements in addition to federal regulations.

This material, if discarded as produced, would not be a federally regulated RCRA "listed" hazardous waste and is not believed to exhibit characteristics of hazardous waste. See Sections 7 and 8 for information on handling, storage and personal protection and Section 9 for physical/chemical properties. It is possible that the material as produced contains constituents which are not required to be listed in the MSDS but could affect the hazardous waste determination. Additionally, use which results in chemical or physical change of this material could subject it to regulation as a hazardous waste.

This material under most intended uses would become "Used Oil" due to contamination by physical or chemical impurities. Whenever possible, Recycle Used Oil in accordance with applicable federal and state or local regulations. Container contents should be completely used and containers should be emptied prior to discard.

14. TRANSPORTATION INFORMATION

U.S. Department of Transportation (DOT)
Shipping Description: *Not regulated*
Note: *If shipped by land in a packaging having a capacity of 3,500 gallons or more, the provisions of 49 CFR, Part 130 apply. (Contains oil)*

International Maritime Dangerous Goods (IMDG)
Shipping Description: *Not regulated*
Note: *U.S. DOT compliance requirements may apply. See 49 CFR 171.22, 23 & 25.*

International Civil Aviation Org. / International Air Transport Assoc. (ICAO/IATA)
UN/ID #: *Not regulated*

	LTD. QTY	Passenger Aircraft	Cargo Aircraft Only
Packaging Instruction #:	---	---	---
Max. Net Qty. Per Package:	---	---	---

15. REGULATORY INFORMATION

CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs (in pounds):
This material does not contain any chemicals subject to the reporting requirements of SARA 302 and 40 CFR 372.

CERCLA/SARA - Section 311/312 (Title III Hazard Categories)

Acute Health:	No
Chronic Health:	No
Fire Hazard:	No
Pressure Hazard:	No
Reactive Hazard:	No

CERCLA/SARA - Section 313 and 40 CFR 372:
This material does not contain any chemicals subject to the reporting requirements of SARA 313 and 40 CFR 372.

EPA (CERCLA) Reportable Quantity (in pounds):
This material does not contain any chemicals with CERCLA Reportable Quantities.

California Proposition 65:
This material does not contain any chemicals which are known to the State of California to cause cancer, birth defects or other reproductive harm at concentrations that trigger the warning requirements of California Proposition 65.

Canadian Regulations:
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the Regulations.

WHMIS Hazard Class
None

National Chemical Inventories:
All components are either listed on the US TSCA Inventory, or are not regulated under TSCA.
All components are either on the DSL, or are exempt from DSL listing requirements.

U.S. Export Control Classification Number: EAR99

16. OTHER INFORMATION

Issue Date:	06-Aug-2008
Status:	Final
Revised Sections or Basis for Revision:	New MSDS
MSDS Number:	778980

MSDS Legend:
ACGIH = American Conference of Governmental Industrial Hygienists; ADR = Agreement on Dangerous Goods by Road; CASRN = Chemical Abstracts Service Registry Number; CEILING = Ceiling Limit (15 minutes); EINECS - European Inventory of Existing Commercial Chemical Substances; EPA = [US] Environmental Protection Agency; Germany-TRGS = Technical Rules for Dangerous Substances; IARC = International Agency for Research on Cancer; ICAO/IATA = International Civil Aviation Organization / International Air Transport Association; IMDG = International Maritime Dangerous Goods; Ireland-HSA = Ireland's National Health and Safety Authority; LEL = Lower Explosive Limit; N/A = Not Applicable; N/D = Not Determined; NIOSH = National Institute for Occupational Safety and Health; NTP = [US] National Toxicology Program; OSHA = [US] Occupational Safety and Health Administration; PEL = Permissible Exposure Limit; RID = Regulations Concerning the International Transport of Dangerous Goods by Rail; STEL = Short Term Exposure Limit (15 minutes); TLV = Threshold Limit Value; TWA = Time Weighted Average (8 hours); UEL = Upper Explosive Limit; UK-EH40 = United Kingdom EH40/2005 Workplace Exposure Limits

Disclaimer of Expressed and implied Warranties:
The information presented in this Material Safety Data Sheet is based on data believed to be accurate as of the date this Material Safety Data Sheet was prepared. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. No responsibility is assumed for any damage or injury resulting from abnormal use or from any failure to adhere to recommended practices. The information provided above, and the product, are furnished on the condition that the person receiving them shall make their own determination as to the suitability of the product for their particular purpose and on the condition that they assume the risk of their use. In addition, no authorization is given nor implied to practice any patented invention without a license.

SAFETY DATA SHEET

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

PRODUCT

Product Name: **MOBIL DELVAC 1300 SUPER 15W-40**
Product Description: Base Oil and Additives
Product Code: 201520403560, 440693-00, 970529
Intended Use: Engine oil

COMPANY IDENTIFICATION

Supplier: **EXXON MOBIL CORPORATION**
22777 Springwoods Village Parkway
Spring, TX 77389 USA

24 Hour Health Emergency	609-737-4411
Transportation Emergency Phone	800-424-9300 or 703-527-3887 CHEMTREC
Product Technical Information	800-662-4525
MSDS Internet Address	www.exxon.com, www.mobil.com

SECTION 2 HAZARDS IDENTIFICATION

This material is not hazardous according to regulatory guidelines (see (M)SDS Section 15).

Other hazard information:

HAZARD NOT OTHERWISE CLASSIFIED (HNOC): None as defined under 29 CFR 1910.1200.

PHYSICAL / CHEMICAL HAZARDS

No significant hazards.

HEALTH HAZARDS

High-pressure injection under skin may cause serious damage. Excessive exposure may result in eye, skin, or respiratory irritation.

ENVIRONMENTAL HAZARDS

No significant hazards.

NFPA Hazard ID:	Health:	0	Flammability:	1	Reactivity:	0
HMIS Hazard ID:	Health:	0	Flammability:	1	Reactivity:	0

NOTE: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

This material is defined as a mixture.

Hazardous Substance(s) or Complex Substance(s) required for disclosure

Name	CAS#	Concentration*	GHS Hazard Codes
ALKYL PHENOL	125643-61-0	1 - < 5%	H413
C14-16-18 ALKYL PHENOL		0.1 - < 1%	H317, H373
SOLVENT DEWAXED HEAVY PARAFFINIC DISTILLATE	64742-65-0	1 - < 5%	H304
ZINC ALKYL DITHIOPHOSPHATE	113706-15-3	0.1 - < 1%	H303, H315, H318, H401, H411

* All concentrations are percent by weight unless material is a gas. Gas concentrations are in percent by volume.

As per paragraph (i) of 29 CFR 1910.1200, formulation is considered a trade secret and specific chemical identity and exact percentage (concentration) of composition may have been withheld. Specific chemical identity and exact percentage composition will be provided to health professionals, employees, or designated representatives in accordance with applicable provisions of paragraph (i).

SECTION 4 FIRST AID MEASURES

INHALATION

Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

SKIN CONTACT

Wash contact areas with soap and water. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

EYE CONTACT

Flush thoroughly with water. If irritation occurs, get medical assistance.

INGESTION

First aid is normally not required. Seek medical attention if discomfort occurs.

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Inappropriate Extinguishing Media: Straight Streams of Water

FIRE FIGHTING

Fire Fighting Instructions: Evacuate area. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply. Firefighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Hazardous Combustion Products: Aldehydes, Incomplete combustion products, Oxides of carbon, Smoke, Fume, Sulfur oxides

FLAMMABILITY PROPERTIES

Flash Point [Method]: >215°C (419°F) [ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0
Autoignition Temperature: N/D

SECTION 6 ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations. US regulations require reporting releases of this material to the environment which exceed the applicable reportable quantity or oil spills which could reach any waterway including intermittent dry creeks. The National Response Center can be reached at (800)424-8802.

PROTECTIVE MEASURES

Avoid contact with spilled material. See Section 5 for fire fighting information. See the Hazard Identification Section for Significant Hazards. See Section 4 for First Aid Advice. See Section 8 for advice on the minimum requirements for personal protective equipment. Additional protective measures may be necessary, depending on the specific circumstances and/or the expert judgment of the emergency responders.

For emergency responders: Respiratory protection: respiratory protection will be necessary only in special cases, e.g., formation of mists. Half-face or full-face respirator with filter(s) for dust/organic vapor or Self Contained Breathing Apparatus (SCBA) can be used depending on the size of spill and potential level of exposure. If the exposure cannot be completely characterized or an oxygen deficient atmosphere is possible or anticipated, SCBA is recommended. Work gloves that are resistant to hydrocarbons are recommended. Gloves made of polyvinyl acetate (PVA) are not water-resistant and are not suitable for emergency use. Chemical goggles are recommended if splashes or contact with eyes is possible. Small spills: normal antistatic work clothes are usually adequate. Large spills: full body suit of chemical resistant, antistatic material is recommended.

SPILL MANAGEMENT

Land Spill: Stop leak if you can do it without risk. Recover by pumping or with suitable absorbent.

Water Spill: Stop leak if you can do it without risk. Confine the spill immediately with booms. Warn other shipping. Remove from the surface by skimming or with suitable absorbents. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material;

however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Large Spills: Dike far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7 HANDLING AND STORAGE

HANDLING

Avoid contact with used product. Prevent small spills and leakage to avoid slip hazard. Material can accumulate static charges which may cause an electrical spark (ignition source). When the material is handled in bulk, an electrical spark could ignite any flammable vapors from liquids or residues that may be present (e.g., during switch-loading operations). Use proper bonding and/or ground procedures. However, bonding and grounds may not eliminate the hazard from static accumulation. Consult local applicable standards for guidance. Additional references include American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practice on Static Electricity) or CENELEC CLC/TR 50404 (Electrostatics - Code of practice for the avoidance of hazards due to static electricity).

Static Accumulator: This material is a static accumulator.

STORAGE

The type of container used to store the material may affect static accumulation and dissipation. Do not store in open or unlabelled containers.

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE LIMIT VALUES

Exposure limits/standards (Note: Exposure limits are not additive)

Substance Name	Form	Limit / Standard			NOTE	Source
SOLVENT DEWAXED HEAVY PARAFFINIC DISTILLATE	Mist.	TWA	5 mg/m3		N/A	OSHA Z1
SOLVENT DEWAXED HEAVY PARAFFINIC DISTILLATE	Inhalable fraction.	TWA	5 mg/m3		N/A	ACGIH

Exposure limits/standards for materials that can be formed when handling this product: When mists/aerosols can occur the following are recommended: 5 mg/m³ - ACGIH TLV (inhalable fraction), 5 mg/m³ - OSHA PEL.

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

No biological limits allocated.

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions.

Control measures to consider:
No special requirements under ordinary conditions of use and with adequate ventilation.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:
No special requirements under ordinary conditions of use and with adequate ventilation.

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapor warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:
No protection is ordinarily required under normal conditions of use.

Eye Protection: If contact is likely, safety glasses with side shields are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:
No skin protection is ordinarily required under normal conditions of use. In accordance with good industrial hygiene practices, precautions should be taken to avoid skin contact.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

ENVIRONMENTAL CONTROLS

Comply with applicable environmental regulations limiting discharge to air, water and soil. Protect the environment by applying appropriate control measures to prevent or limit emissions.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Note: Physical and chemical properties are provided for safety, health and environmental considerations only and may not fully represent product specifications. Contact the Supplier for additional information.

GENERAL INFORMATION

Physical State: Liquid
Color: Brown

Odor: Characteristic
Odor Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 15 °C): 0.875
Flammability (Solid, Gas): N/A
Flash Point [Method]: >215°C (419°F) [ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0
Autoignition Temperature: N/D
Boiling Point / Range: > 316°C (600°F)
Decomposition Temperature: N/D
Vapor Density (Air = 1): > 2 at 101 kPa
Vapor Pressure: < 0.013 kPa (0.1 mm Hg) at 20 °C
Evaporation Rate (n-butyl acetate = 1): N/D
pH: N/A
Log Pow (n-Octanol/Water Partition Coefficient): > 3.5
Solubility in Water: Negligible
Viscosity: 109 cSt (109 mm2/sec) at 40 °C | 14.1 cSt (14.1 mm2/sec) at 100°C [ASTM D 445]
Oxidizing Properties: See Hazards Identification Section.

OTHER INFORMATION

Freezing Point: N/D
Melting Point: N/A
Pour Point: -27°C (-17°F)
DMSO Extract (mineral oil only), IP-346: < 3 %wt

SECTION 10 STABILITY AND REACTIVITY

REACTIVITY: See sub-sections below.

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: Excessive heat. High energy sources of ignition.

MATERIALS TO AVOID: Strong oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

POSSIBILITY OF HAZARDOUS REACTIONS: Hazardous polymerization will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

INFORMATION ON TOXICOLOGICAL EFFECTS

Hazard Class	Conclusion / Remarks
Inhalation	
Acute Toxicity: No end point data for material.	Minimally Toxic. Based on assessment of the components.
Irritation: No end point data for material.	Negligible hazard at ambient/normal handling temperatures.
Ingestion	
Acute Toxicity: No end point data for	Minimally Toxic. Based on assessment of the components.

material.	
Skin	
Acute Toxicity: No end point data for material.	Minimally Toxic. Based on assessment of the components.
Skin Corrosion/Irritation: No end point data for material.	Negligible irritation to skin at ambient temperatures. Based on assessment of the components.
Eye	
Serious Eye Damage/Irritation: No end point data for material.	May cause mild, short-lasting discomfort to eyes. Based on assessment of the components.
Sensitization	
Respiratory Sensitization: No end point data for material.	Not expected to be a respiratory sensitizer.
Skin Sensitization: No end point data for material.	Not expected to be a skin sensitizer. Based on assessment of the components.
Aspiration: Data available.	Not expected to be an aspiration hazard. Based on physico-chemical properties of the material.
Germ Cell Mutagenicity: No end point data for material.	Not expected to be a germ cell mutagen. Based on assessment of the components.
Carcinogenicity: No end point data for material.	Not expected to cause cancer. Based on assessment of the components.
Reproductive Toxicity: No end point data for material.	Not expected to be a reproductive toxicant. Based on assessment of the components.
Lactation: No end point data for material.	Not expected to cause harm to breast-fed children.
Specific Target Organ Toxicity (STOT)	
Single Exposure: No end point data for material.	Not expected to cause organ damage from a single exposure.
Repeated Exposure: No end point data for material.	Not expected to cause organ damage from prolonged or repeated exposure. Based on assessment of the components.

OTHER INFORMATION

For the product itself:

Component concentrations in this formulation would not be expected to cause skin sensitization, based on tests of the components, this formulation, or similar formulations.
Diesel engine oils: Not carcinogenic in animals tests. Used and unused diesel engine oils did not produce any carcinogenic effects in chronic mouse skin painting studies.
Oils that are used in gasoline engines may become hazardous and display the following properties: Carcinogenic in animal tests. Caused mutations in vitro. Possible allergen and photoallergen. Contains polycyclic aromatic compounds (PAC) from combustion products of gasoline and/or thermal degradation products.

Contains:
Base oil severely refined: Not carcinogenic in animal studies. Representative material passes IP-346, Modified Ames test, and/or other screening tests. Dermal and inhalation studies showed minimal effects; lung non-specific infiltration of immune cells, oil deposition and minimal granuloma formation. Not sensitizing in test animals.

The following ingredients are cited on the lists below: None.

--REGULATORY LISTS SEARCHED--

1 = NTP CARC	3 = IARC 1	5 = IARC 2B
2 = NTP SUS	4 = IARC 2A	6 = OSHA CARC

SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data for the material, components of the material, or for similar materials, through the application of bridging principals.

ECOTOXICITY

Material -- Not expected to be harmful to aquatic organisms.

MOBILITY

Base oil component -- Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

PERSISTENCE AND DEGRADABILITY

Biodegradation:

Base oil component -- Expected to be inherently biodegradable

BIOACCUMULATION POTENTIAL

Base oil component -- Has the potential to bioaccumulate, however metabolism or physical properties may reduce the bioconcentration or limit bioavailability.

SECTION 13 DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products.

REGULATORY DISPOSAL INFORMATION

RCRA Information: The unused product, in our opinion, is not specifically listed by the EPA as a hazardous waste (40 CFR, Part 261D), nor is it formulated to contain materials which are listed as hazardous wastes. It does not exhibit the hazardous characteristics of ignitability, corrositivity or reactivity and is not formulated with contaminants as determined by the Toxicity Characteristic Leaching Procedure (TCLP). However, used product may be regulated.

Empty Container Warning Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE

SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

SECTION 14 TRANSPORT INFORMATION

LAND (DOT): Not Regulated for Land Transport

LAND (TDG): Not Regulated for Land Transport

SEA (IMDG): Not Regulated for Sea Transport according to IMDG-Code

Marine Pollutant: No

AIR (IATA): Not Regulated for Air Transport

SECTION 15 REGULATORY INFORMATION

OSHA HAZARD COMMUNICATION STANDARD: This material is not considered hazardous in accordance with OSHA HazCom 2012, 29 CFR 1910.1200.

Listed or exempt from listing/notification on the following chemical inventories: DSL, ENCS, ISHL, PICCS, TSCA

Special Cases:

Inventory	Status
AICS	Restrictions Apply
IECSC	Restrictions Apply
KECI	Restrictions Apply
TCSI	Restrictions Apply

SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302

SARA (311/312) REPORTABLE GHS HAZARD CLASSES: None.

SARA (313) TOXIC RELEASE INVENTORY: This material contains no chemicals subject to the supplier notification requirements of the SARA 313 Toxic Release Program.

The following ingredients are cited on the lists below:

Chemical Name	CAS Number	List Citations
SEVERELY HYDROTREATED	64742-54-7	17, 18, 19

HEAVY PARAFFINIC DISTILLATE		
ZINC ALKYL DITHIOPHOSPHATE	113706-15-3	15

--REGULATORY LISTS SEARCHED--

1 = ACGIH ALL	6 = TSCA 5a2	11 = CA P65 REPRO	16 = MN RTK
2 = ACGIH A1	7 = TSCA 5e	12 = CA RTK	17 = NJ RTK
3 = ACGIH A2	8 = TSCA 6	13 = IL RTK	18 = PA RTK
4 = OSHA Z	9 = TSCA 12b	14 = LA RTK	19 = RI RTK
5 = TSCA 4	10 = CA P65 CARC	15 = MI 293	

Code key: CARC=Carcinogen; REPRO=Reproductive

SECTION 16 OTHER INFORMATION

N/D = Not determined, N/A = Not applicable

KEY TO THE H-CODES CONTAINED IN SECTION 3 OF THIS DOCUMENT (for information only):
H303: May be harmful if swallowed; Acute Tox Oral, Cat 5
H304: May be fatal if swallowed and enters airways; Aspiration, Cat 1
H315: Causes skin irritation; Skin Corr/Irritation, Cat 2
H317: May cause allergic skin reaction; Skin Sensitization, Cat 1
H318: Causes serious eye damage; Serious Eye Damage/Irr, Cat 1
H373: May cause damage to organs through prolonged or repeated exposure; Target Organ, Repeated, Cat 2
H401: Toxic to aquatic life; Acute Env Tox, Cat 2
H411: Toxic to aquatic life with long lasting effects; Chronic Env Tox, Cat 2
H413: May cause long lasting harmful effects to aquatic life; Chronic Env Tox, Cat 4

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:
Composition: Component Table information was modified.
Section 08: Exposure Limits Table information was modified.
Section 09: Viscosity information was modified.
Section 11 Acute Toxicity data - Header information was deleted.
Section 11 Substance Name - Header information was deleted.
Section 11 Substance Toxicity table - Header information was deleted.
Section 11 Substance Toxicology table information was deleted.
Section 15: List Citations Table information was modified.
Section 15: National Chemical Inventory Listing information was modified.
Section 15: Special Cases Table information was modified.
Section 16: HCode Key information was modified.
Section 16: MSN, MAT ID information was modified.

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included with and/or on the container. Appropriate warnings and safe-handling procedures should be provided to handlers and users. Alteration of this document is strictly prohibited. Except to the extent required by law, re-publication or retransmission of this document, in whole or in part, is not permitted. The term, "ExxonMobil" is used for convenience, and may include any one or more of ExxonMobil Chemical Company, Exxon Mobil Corporation, or any affiliates in which they directly or indirectly hold any interest.

Internal Use Only

MHC: 0B, 0B, 0, 0, 0, 0 PPEC: A

DGN: 2003305XUS (1029203)

SECTION 1. IDENTIFICATION

Product identifier

Trade name : Drew™ 6134
DECHLORINATING AGENT
™ Trademark, Solenis or its subsidiaries or affiliates, registered in various countries

Recommended use of the chemical and restrictions on use

Details of the supplier of the safety data sheet	**Emergency telephone number**
Solenis LLC 500 Hercules Road Wilmington, Delaware 19808 United States of America (USA) RegulatoryRequestsNA@solenis.com	1-844-SOLENIS (844-765-3647) **Product Information** Contact your local Solenis representative

SECTION 2. HAZARDS IDENTIFICATION

GHS classification in accordance with 29 CFR 1910.1200

Corrosive to metals	:	Category 1
Acute toxicity (Oral)	:	Category 4
Skin irritation	:	Category 2
Eye irritation	:	Category 2A
Specific target organ toxicity - single exposure	:	Category 3 (Respiratory system)

GHS label elements

Hazard pictograms :

Signal word : Warning

Hazard statements : H290 May be corrosive to metals.
H302 Harmful if swallowed.
H315 Causes skin irritation.
H319 Causes serious eye irritation.
H335 May cause respiratory irritation.

Precautionary statements :

Prevention:

P234 Keep only in original container.
P261 Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264 Wash skin thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P271 Use only outdoors or in a well-ventilated area.
P280 Wear protective gloves/ eye protection/ face protection.

Response:

P301 + P312 + P330 IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell. Rinse mouth.
P302 + P352 IF ON SKIN: Wash with plenty of soap and water.
P304 + P340 + P312 IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell.
P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P332 + P313 If skin irritation occurs: Get medical advice/ attention.
P337 + P313 If eye irritation persists: Get medical advice/ attention.
P362 Take off contaminated clothing and wash before reuse.
P390 Absorb spillage to prevent material damage.

Storage:

P403 + P233 Store in a well-ventilated place. Keep container tightly closed.
P405 Store locked up.
P406 Store in corrosive resistant container with a resistant inner liner.

Disposal:

P501 Dispose of contents/ container to an approved waste disposal plant.

Other hazards

None known.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Mixture

Hazardous components

Chemical name	CAS-No.	Classification	Concentration (%)
SODIUM BISULFITE	7631-90-5	Acute Tox. 4; H302	>= 30 - < 40

SECTION 4. FIRST AID MEASURES

General advice	:	Move out of dangerous area. Consult a physician. Show this safety data sheet to the doctor in attendance. Do not leave the victim unattended.
If inhaled	:	If breathed in, move person into fresh air. If unconscious, place in recovery position and seek medical advice. If symptoms persist, call a physician.
In case of skin contact	:	Remove contaminated clothing. If irritation develops, get medical attention. If on skin, rinse well with water. Wash contaminated clothing before re-use.
In case of eye contact	:	Flush eyes with water as a precaution. Remove contact lenses. Protect unharmed eye. If eye irritation persists, consult a specialist.
If swallowed	:	Obtain medical attention. Do NOT induce vomiting. Do not give milk or alcoholic beverages. Never give anything by mouth to an unconscious person. If symptoms persist, call a physician.
Most important symptoms and effects, both acute and delayed	:	No symptoms known or expected. Harmful if swallowed. Causes skin irritation. Causes serious eye irritation. May cause respiratory irritation.
Notes to physician	:	No hazards which require special first aid measures.

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media	:	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment. Water spray Foam Carbon dioxide (CO2) Dry chemical
Unsuitable extinguishing media	:	High volume water jet
Specific hazards during firefighting	:	Do not allow run-off from fire fighting to enter drains or water courses.
Hazardous combustion products	:	sodium sulphide residue Sulphur oxides Sodium oxides sulfur oxides

sodium monoxide
sulfur dioxide
toxic fumes

Specific extinguishing methods	:	Product is compatible with standard fire-fighting agents.
Further information	:	Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations.
Special protective equipment for firefighters	:	In the event of fire, wear self-contained breathing apparatus.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	Use personal protective equipment. Persons not wearing protective equipment should be excluded from area of spill until clean-up has been completed. Comply with all applicable federal, state, and local regulations.
Environmental precautions	:	Prevent product from entering drains. Prevent further leakage or spillage if safe to do so. If the product contaminates rivers and lakes or drains inform respective authorities.
Methods and materials for containment and cleaning up	:	Keep in suitable, closed containers for disposal.

SECTION 7. HANDLING AND STORAGE

Advice on protection against fire and explosion	:	Normal measures for preventive fire protection.
Advice on safe handling	:	Do not breathe vapours/dust. Container hazardous when empty. Avoid contact with skin and eyes. Smoking, eating and drinking should be prohibited in the application area. For personal protection see section 8. Dispose of rinse water in accordance with local and national regulations.
Conditions for safe storage	:	Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Electrical installations / working materials must comply with the technological safety standards.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
SODIUM BISULFITE	7631-90-5	TWA	5 mg/m3	ACGIH
		TWA	5 mg/m3	NIOSH REL

Engineering measures : Provide sufficient mechanical (general and/or local exhaust) ventilation to maintain exposure below exposure guidelines (if applicable) or below levels that cause known, suspected or apparent adverse effects.

Personal protective equipment

Hand protection

Remarks : The suitability for a specific workplace should be discussed with the producers of the protective gloves.

Eye protection : Not required under normal conditions of use. Wear splash-proof safety goggles if material could be misted or splashed into eyes.

Skin and body protection : Wear resistant gloves (consult your safety equipment supplier).
Wear as appropriate:
Impervious clothing
Safety shoes
Choose body protection according to the amount and concentration of the dangerous substance at the work place.
Discard gloves that show tears, pinholes, or signs of wear.

Hygiene measures : Wash hands before breaks and at the end of workday.
When using do not eat or drink.
When using do not smoke.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance : liquid

Colour : light yellow

Odour : sulphurous

Odour Threshold : No data available

pH : 4.5

Melting point/freezing point	:	5 °C
Boiling point/boiling range	:	216 °F (1013 hPa)
Flash point	:	Not applicable
Evaporation rate	:	< 1 n-Butyl Acetate
Flammability (solid, gas)	:	No data available
Self-ignition	:	No data available
Upper explosion limit	:	No data available
Lower explosion limit	:	No data available
Vapour pressure	:	14.00 mmHg (77.00 °F)
Relative vapour density	:	0.6 AIR=1
Relative density	:	1.34 (20 °C)
Density	:	1.34 g/cm3 (20 °C)
Solubility(ies)		
Water solubility	:	completely soluble
Solubility in other solvents	:	No data available
Partition coefficient: n-octanol/water	:	No data available
Decomposition temperature	:	No data available
Viscosity		
Viscosity, dynamic	:	No data available
Viscosity, kinematic	:	No data available
Oxidizing properties	:	No data available
Molecular weight	:	105 g/mol
Metal corrosion rate	:	Corrosive to metals

SECTION 10. STABILITY AND REACTIVITY

Reactivity	:	No decomposition if stored and applied as directed.

Chemical stability	:	Stable under recommended storage conditions.
Possibility of hazardous reactions	:	Product will not undergo hazardous polymerization.
Conditions to avoid	:	excessive heat Freezing temperatures. Heat, flames and sparks. Heat Exposure to air. Exposure to moisture
Incompatible materials	:	Acids Alkali metals Alkaline earth metals aluminum magnesium Oxidizing agents Strong bases water
Hazardous decomposition products	:	Sulphur oxides Sodium oxides sodium sulfide residue toxic fumes

SECTION 11. TOXICOLOGICAL INFORMATION

Acute toxicity

Harmful if swallowed.

Product:

Acute oral toxicity	:	LD50 (Rat): 1,420 mg/kg Acute toxicity estimate: 3,550 mg/kg
Acute inhalation toxicity	:	Remarks: Excessive heat or contact with acids, water and/or ice, releases sulfur dioxide gas which may be harmful or deadly if inhaled.
Acute dermal toxicity	:	Acute toxicity estimate: > 5,000 mg/kg Method: Calculation method

Components:

SODIUM BISULFITE:

Acute oral toxicity	:	LD 50 (Rat): 2 g/kg
Acute dermal toxicity	:	LD 50 (Rat): > 2 g/kg

Skin corrosion/irritation

Causes skin irritation.

Product:

Remarks: May cause skin irritation and/or dermatitis.

Components:

SODIUM BISULFITE:

Result: Not irritating to skin

Serious eye damage/eye irritation

Causes serious eye irritation.

Product:

Remarks: Vapours may cause irritation to the eyes, respiratory system and the skin.
Solutions may be severely irritating or cause burns.

Components:

SODIUM BISULFITE:

Result: Mildly irritating to eyes

Respiratory or skin sensitisation

Skin sensitisation

Not classified based on available information.

Respiratory sensitisation

Not classified based on available information.

Product:

Assessment:	May cause allergy or asthma symptoms or breathing difficulties if inhaled. May cause allergic skin reaction.

Components:

SODIUM BISULFITE:

Germ cell mutagenicity

Not classified based on available information.

Carcinogenicity

Not classified based on available information.

IARC	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

OSHA	No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.
NTP	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

Reproductive toxicity

Not classified based on available information.

STOT - single exposure

May cause respiratory irritation.

Product:

Assessment: The substance or mixture is classified as specific target organ toxicant, single exposure, category 3 with respiratory tract irritation.

STOT - repeated exposure

Not classified based on available information.

Aspiration toxicity

Not classified based on available information.

Further information

Product:

Remarks: No data available

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Product:

Toxicity to fish	:	LC 50 (Fish): Expected > 100 mg/l LC50 (Gambusia affinis (Mosquito fish)): 240 mg/l LC50 (Fathead minnow (Pimephales promelas)): 707 mg/l Exposure time: 96 h Test Type: static test Method: OECD Test Guideline 203 GLP: no
Toxicity to daphnia and other aquatic invertebrates	:	EC 50 (Aquatic invertebrates): Expected > 100 mg/l EC 50 (Daphnia magna (Water flea)): 701 mg/l Exposure time: 48 h Test Type: static test Method: OECD Test Guideline 202 GLP: no

Ecotoxicology Assessment

Acute aquatic toxicity : Not classified based on available information.

Chronic aquatic toxicity : Not classified based on available information.

Components:

SODIUM BISULFITE:

Toxicity to fish : LC 50 (Western mosquitofish (Gambusia affinis)): 240 mg/l
Exposure time: 96 h
Method: Static
Remarks: Mortality

Toxicity to daphnia and other aquatic invertebrates : LC 50 (Water flea (Daphnia magna)): 119 mg/l
Exposure time: 48 h
Method: Static
Remarks: Mortality

LC 50 (Water flea (Daphnia magna)): 89 mg/l
Exposure time: 96 h
Method: Static

Persistence and degradability

No data available

Bioaccumulative potential

No data available

Mobility in soil

No data available

Other adverse effects

No data available

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues : Dispose of in accordance with all applicable local, state and federal regulations.

Do not dispose of waste into sewer.
Do not contaminate ponds, waterways or ditches with chemical or used container.
Send to a licensed waste management company.

Contaminated packaging : Empty remaining contents.
Dispose of as unused product.
Empty containers should be taken to an approved waste handling site for recycling or disposal.
Do not re-use empty containers.

SECTION 14. TRANSPORT INFORMATION

International transport regulations

REGULATION

ID NUMBER	PROPER SHIPPING NAME	*HAZARD CLASS	SUBSIDIARY HAZARDS	PACKING GROUP	MARINE POLLUTANT / LTD. QTY.

U.S. DOT - ROAD

UN	2693	Bisulfites, aqueous solutions, n.o.s. (SODIUM BISULFITE)	8	III	

U.S. DOT - RAIL

UN	2693	Bisulfites, aqueous solutions, n.o.s. (SODIUM BISULFITE)	8	III	

U.S. DOT - INLAND WATERWAYS

UN	2693	Bisulfites, aqueous solutions, n.o.s. (SODIUM BISULFITE)	8	III	

TRANSPORT CANADA - ROAD

UN	2693	BISULFITES, AQUEOUS SOLUTION, N.O.S. (SODIUM BISULFITE)	8	III	

TRANSPORT CANADA - RAIL

UN	2693	BISULFITES, AQUEOUS SOLUTION, N.O.S. (SODIUM BISULFITE)	8	III	

INTERNATIONAL MARITIME DANGEROUS GOODS

UN	2693	BISULPHITES, AQUEOUS SOLUTION, N.O.S. (SODIUM BISULFITE)	8	III	

INTERNATIONAL AIR TRANSPORT ASSOCIATION - CARGO

UN	2693	Bisulphites, aqueous solution, n.o.s. (SODIUM BISULFITE)	8	III	

INTERNATIONAL AIR TRANSPORT ASSOCIATION - PASSENGER

UN	2693	Bisulphites, aqueous solution, n.o.s. (SODIUM BISULFITE)	8	III	

MEXICAN REGULATION FOR THE LAND TRANSPORT OF HAZARDOUS MATERIALS AND WASTES

UN	2693	BISULPHITES, AQUEOUS SOLUTION, N.O.S. (SODIUM BISULFITE)	8	III

***ORM = ORM-D, CBL = COMBUSTIBLE LIQUID**

Marine pollutant		no

Dangerous goods descriptions (if indicated above) may not reflect quantity, end-use or region-specific exceptions that can be applied. Consult shipping documents for descriptions that are specific to the shipment.

SECTION 15. REGULATORY INFORMATION

EPCRA - Emergency Planning and Community Right-to-Know Act

CERCLA Reportable Quantity

Components	CAS-No.	Component RQ (lbs)	Calculated product RQ (lbs)
SODIUM BISULFITE	7631-90-5	5000	13513

SARA 304 Extremely Hazardous Substances Reportable Quantity
This material does not contain any components with a section 304 EHS RQ.

SARA 302 Extremely Hazardous Substances Threshold Planning Quantity
This material does not contain any components with a section 302 EHS TPQ.

SARA 311/312 Hazards : Corrosive to metals
Acute toxicity (any route of exposure)
Serious eye damage or eye irritation
Specific target organ toxicity (single or repeated exposure)
Skin corrosion or irritation

SARA 313 : This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

California Prop. 65

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

The components of this product are reported in the following inventories:

DSL : All components of this product are on the Canadian DSL

AICS : On the inventory, or in compliance with the inventory

ENCS : On the inventory, or in compliance with the inventory

KECI	:	On the inventory, or in compliance with the inventory
PICCS	:	On the inventory, or in compliance with the inventory
IECSC	:	On the inventory, or in compliance with the inventory
TCSI	:	On the inventory, or in compliance with the inventory
TSCA	:	On TSCA Inventory

TSCA list

No substances are subject to a Significant New Use Rule.

No substances are subject to TSCA 12(b) export notification requirements.

SECTION 16. OTHER INFORMATION

Further information
Revision Date: 02/18/2019

Full text of H-Statements

H302	:	Harmful if swallowed.

Full text of other abbreviations

Acute Tox.	:	Acute toxicity

Further information

Other information	:	The information accumulated herein is believed to be accurate but is not warranted to be whether originating with the company or not. Recipients are advised to confirm in advance of need that the information is current, applicable, and suitable to their circumstances. This MSDS has been prepared by the Solenis Environmental Health and Safety Department.

Sources of key data used to compile the Safety Data Sheet
Key literature references and sources of data
SOLENIS Internal data
SOLENIS internal data including own and sponsored test reports
The UNECE administers regional agreements implementing harmonised classification for labelling (GHS) and transport.

Full text of other abbreviations

AICS - Australian Inventory of Chemical Substances; ASTM - American Society for the Testing of Materials; bw - Body weight; CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act; CMR - Carcinogen, Mutagen or Reproductive Toxicant; DIN - Standard of the German Institute for Standardisation; DOT - Department of Transportation; DSL - Domestic Substances List (Canada); ECx - Concentration associated with x% response; EHS - Extremely Hazardous Substance; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; ERG - Emergency Response Guide;

GHS - Globally Harmonized System; GLP - Good Laboratory Practice; HMIS - Hazardous Materials Identification System; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IECSC - Inventory of Existing Chemical Substances in China; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organization; ISHL - Industrial Safety and Health Law (Japan); ISO - International Organisation for Standardization; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; MSHA - Mine Safety and Health Administration; n.o.s. - Not Otherwise Specified; NFPA - National Fire Protection Association; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NTP - National Toxicology Program; NZIoC - New Zealand Inventory of Chemicals; OECD - Organization for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; RCRA - Resource Conservation and Recovery Act; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; RQ - Reportable Quantity; SADT - Self-Accelerating Decomposition Temperature; SARA - Superfund Amendments and Reauthorization Act; SDS - Safety Data Sheet; TCSI - Taiwan Chemical Substance Inventory; TSCA - Toxic Substances Control Act (United States); UN - United Nations; UNRTDG - United Nations Recommendations on the Transport of Dangerous Goods; vPvB - Very Persistent and Very Bioaccumulative

US / EN

29 CFR 1910.1200 (OSHA HazCom 2012)

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product identifier

Trade name : Adjunct™ H LIQUID CORROSION INHIBITOR
™ Trademark, Solenis or its subsidiaries or affiliates, registered in various countries

Recommended use of the chemical and restrictions on use

Details of the supplier of the safety data sheet	**Emergency telephone number**
Solenis LLC 500 Hercules Road Wilmington, Delaware 19808 United States of America RegulatoryRequestsNA@solenis.com	1-844-SOLENIS (844-765-3647) / 606-329-5705 **Product Information** 1-844-SOLENIS (844-765-3647)

SECTION 2. HAZARDS IDENTIFICATION

GHS Classification

Corrosive to Metals : Category 1

Skin corrosion : Category 1

Serious eye damage : Category 1

GHS label elements

Hazard pictograms :

Signal Word : Danger

Hazard Statements : May be corrosive to metals.
Causes severe skin burns and eye damage.
Causes serious eye damage.

Precautionary Statements : **Prevention:**
Keep only in original container.
Wash skin thoroughly after handling.
Wear protective gloves/ protective clothing/ eye protection/ face protection.
Response:
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/doctor.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/doctor.
Wash contaminated clothing before reuse.
Absorb spillage to prevent material damage.
Storage:
Store locked up.
Store in corrosive resistant stainless steel container with a resistant inner liner.
Disposal:
Dispose of contents/ container to an approved waste disposal plant.

Other hazards
None known.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Mixture

Hazardous components

Chemical name	CAS-No.	Classification	Concentration (%)
ALKALINE	254504001- 6301	Met. Corr. 1; H290 Skin Corr. 1; H314 Eye Dam. 1; H318	>= 40.00 - < 50.00
INORGANIC BASE	254504001-6415	Acute Tox. 4; H302	>= 5.00 - < 10.00

		Acute Tox. 4; H312 Skin Corr. 1; H314 Eye Dam. 1; H318	

Trade Secret Composition - conceal identity + concentration

SECTION 4. FIRST AID MEASURES

General advice	:	Move out of dangerous area. Consult a physician. Show this safety data sheet to the doctor in attendance. Do not leave the victim unattended.
If inhaled	:	Move to fresh air. If breathed in, move person into fresh air. Keep patient warm and at rest. If unconscious place in recovery position and seek medical advice. If symptoms persist, call a physician.
In case of skin contact	:	If on skin, rinse well with water. Wash contaminated clothing before re-use.
In case of eye contact	:	In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Continue rinsing eyes during transport to hospital. Remove contact lenses. Protect unharmed eye.
If swallowed	:	Get medical attention immediately. Do NOT induce vomiting. Rinse mouth with water. Do not give milk or alcoholic beverages. Never give anything by mouth to an unconscious person. If symptoms persist, call a physician.
Most important symptoms and effects, both acute and delayed	:	Signs and symptoms of exposure to this material through breathing, swallowing, and/or passage of the material through the skin may include: irritation (nose, throat, airways) Cough

lung edema (fluid buildup in the lung tissue)
Difficulty in breathing
Causes serious eye damage.
Causes severe burns.

Notes to physician : No hazards which require special first aid measures.

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media : Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Water spray
Foam
Carbon dioxide (CO2)
Dry chemical

Unsuitable extinguishing media : High volume water jet

Specific hazards during firefighting : Do not allow run-off from fire fighting to enter drains or water courses.

Hazardous combustion products : corrosive vapors
Sodium oxides
toxic fumes
potassium oxide

Specific extinguishing methods : Product is compatible with standard fire-fighting agents.

Further information : Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations.

Special protective equipment for firefighters : In the event of fire, wear self-contained breathing apparatus.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures : Use personal protective equipment.
Persons not wearing protective equipment should be excluded from area of spill until clean-up has been completed.

Environmental precautions : Prevent product from entering drains.

Prevent further leakage or spillage if safe to do so.
If the product contaminates rivers and lakes or drains inform respective authorities.

Methods and materials for containment and cleaning up : Keep in suitable, closed containers for disposal.

Other information : Comply with all applicable federal, state, and local regulations.

SECTION 7. HANDLING AND STORAGE

Advice on safe handling : Do not breathe vapours/dust.
When diluting, always add the product to water. Never add water to the product.
Container hazardous when empty.
Avoid contact with skin and eyes.
Smoking, eating and drinking should be prohibited in the application area.
For personal protection see section 8.
Dispose of rinse water in accordance with local and national regulations.

Conditions for safe storage : Keep container tightly closed in a dry and well-ventilated place.
Containers which are opened must be carefully resealed and kept upright to prevent leakage.
Observe label precautions.
Electrical installations / working materials must comply with the technological safety standards.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
ALKALINE	254504001-6301	Ceiling	2 mg/m3	ACGIH
		Ceil_Time	2 mg/m3	NIOSH/GUIDE
		PEL	2 mg/m3	OSHA_TRANS

		Ceiling	2 mg/m3	TN OEL
INORGANIC BASE	254504001-6415	Ceiling	2 mg/m3	ACGIH
		REL	2 mg/m3	NIOSH/GUIDE
		Ceiling	2 mg/m3	TN OEL

Engineering measures : Provide sufficient mechanical (general and/or local exhaust) ventilation to maintain exposure below exposure guidelines (if applicable) or below levels that cause known, suspected or apparent adverse effects.

Personal protective equipment

Hand protection

Remarks : The suitability for a specific workplace should be discussed with the producers of the protective gloves.

Eye protection : Wear chemical splash goggles and face shield when there is potential for exposure of the eyes or face to liquid, vapor or mist.
Maintain eye wash station in immediate work area.

Skin and body protection : Wear resistant gloves (consult your safety equipment supplier).
Wear as appropriate:
Impervious clothing
Chemical resistant apron
Safety shoes
Choose body protection according to the amount and concentration of the dangerous substance at the work place.
Discard gloves that show tears, pinholes, or signs of wear.

Hygiene measures : Wash hands before breaks and at the end of workday.
When using do not eat or drink.
Ensure that eyewash stations and safety showers are close to the workstation location.
When using do not smoke.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state : liquid

Odour : No data available

Odour Threshold : No data available

pH	:	> 12.5
Melting point/freezing point	:	No data available
Boiling point/boiling range	:	212 °F / 100 °C (1,013.333333 hPa) Calculated Phase Transition Liquid/Gas
Flash point	:	No data available No data available
Evaporation rate	:	No data available
Flammability (solid, gas)	:	No data available
Upper explosion limit	:	No data available
Lower explosion limit	:	No data available
Vapour pressure	:	23.3333333 hPa (20 °C) Calculated Vapor Pressure
Relative vapour density	:	No data available
Relative density	:	No data available
Density	:	1.537 g/cm3 (25 °C)
Solubility(ies)		
Water solubility	:	No data available
Solubility in other solvents	:	No data available
Partition coefficient: n-octanol/water	:	No data available
Thermal decomposition	:	No data available
Viscosity		
Viscosity, dynamic	:	No data available
Viscosity, kinematic	:	No data available
Oxidizing properties	:	No data available

SECTION 10. STABILITY AND REACTIVITY

Reactivity	:	No decomposition if stored and applied as directed.
Chemical stability	:	Stable under recommended storage conditions.
Possibility of hazardous reactions	:	Product will not undergo hazardous polymerization.
Conditions to avoid	:	Exposure to sunlight. Exposure to moisture
Incompatible materials	:	Acids Alcohols aluminum Amines chlorinated solvents halogenated hydrocarbons Metals organic nitro compounds Strong oxidizing agents water Zinc
Hazardous decomposition products		corrosive vapors potassium oxide Sodium oxides toxic fumes

SECTION 11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure	:	Inhalation Skin contact Eye Contact Ingestion

Acute toxicity
Not classified based on available information.
Components:
ALKALINE:
Acute oral toxicity : LD Lo (Rabbit): 500 mg/kg

INORGANIC BASE:

Acute oral toxicity : LD 50 (Rat): 333 mg/kg

Acute dermal toxicity : LD 50 (Rabbit): 1,260 mg/kg

Skin corrosion/irritation
Causes severe burns.
Product:
Remarks: Causes severe skin burns and eye damage., The feeling of irritation or pain may be delayed.

Components:
ALKALINE:
Result: Corrosive to skin

INORGANIC BASE:
Result: Corrosive to skin

Serious eye damage/eye irritation
Causes serious eye damage.
Product:
Remarks: May cause irreversible eye damage.

Components:
ALKALINE:
Result: Corrosive to eyes

INORGANIC BASE:
Result: Corrosive to eyes

Respiratory or skin sensitisation
Skin sensitisation: Not classified based on available information.
Respiratory sensitisation: Not classified based on available information.
Germ cell mutagenicity
Not classified based on available information.
Carcinogenicity
Not classified based on available information.
Reproductive toxicity
Not classified based on available information.
STOT - single exposure
Not classified based on available information.
STOT - repeated exposure
Not classified based on available information.
Aspiration toxicity
Not classified based on available information.
Further information
Product:
Remarks: No data available

Carcinogenicity:

IARC — No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

OSHA — No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

NTP — No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Product:

Toxicity to fish : LC 50 (Oncorhynchus mykiss (rainbow trout)): 141 mg/l
Exposure time: 96 h
Test Type: static test

LC 50 (Pimephales promelas (fathead minnow)): 94.7 mg/l
Exposure time: 96 h
Test Type: static test

Toxicity to daphnia and other aquatic invertebrates : LC 50 (Water flea (Daphnia magna)): 86.2 mg/l
Exposure time: 48 h
Test Type: static test

Components:

ALKALINE:

Toxicity to fish : LC 50 (Western mosquitofish (Gambusia affinis)): 125 mg/l
Exposure time: 96 h
Method: Static
Remarks: Mortality

Toxicity to daphnia and other aquatic invertebrates : EC 50 (Water flea (Daphnia magna)): 34.59 - 47.13 mg/l
Exposure time: 48 h
Remarks: Intoxication

INORGANIC BASE:

Toxicity to fish : LC 50 (Western mosquitofish (Gambusia affinis)): 80 mg/l
Exposure time: 96 h

Method: Static
Remarks: Mortality

Persistence and degradability

Product:

Chemical Oxygen Demand (COD) : 60 mg/l
Method: Chemical oxygen demand

Components:

No data available

Bioaccumulative potential

Components:

No data available

Mobility in soil

Components:

No data available

Other adverse effects

No data available

Product:

Additional ecological information : An environmental hazard cannot be excluded in the event of unprofessional handling or disposal., Harmful to aquatic life.

Components:

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

General advice : The product should not be allowed to enter drains, water courses or the soil.
Do not contaminate ponds, waterways or ditches with chemical or used container.
Send to a licensed waste management company.

Dispose of in accordance with all applicable local, state and federal regulations.

Contaminated packaging : Empty remaining contents.
Dispose of as unused product.
Empty containers should be taken to an approved waste handling site for recycling or disposal.
Do not re-use empty containers.

SECTION 14. TRANSPORT INFORMATION

International transport regulations

REGULATION

ID NUMBER	PROPER SHIPPING NAME	*HAZARD CLASS	SUBSIDIARY HAZARDS	PACKING GROUP	MARINE POLLUTANT / LTD. QTY.

MEXICAN REGULATION FOR THE LAND TRANSPORT OF HAZARDOUS MATERIALS AND WASTES

UN	1719	Caustic alkali liquids, n.o.s. (SODIUM HYDROXIDE, POTASSIUM HYDROXIDE)	8	II

INTERNATIONAL AIR TRANSPORT ASSOCIATION - PASSENGER

UN	1719	Caustic alkali liquids, n.o.s. (SODIUM HYDROXIDE, POTASSIUM HYDROXIDE)	8	II

INTERNATIONAL AIR TRANSPORT ASSOCIATION - CARGO

UN	1719	Caustic alkali liquids, n.o.s. (SODIUM HYDROXIDE, POTASSIUM HYDROXIDE)	8	II

INTERNATIONAL MARITIME DANGEROUS GOODS

UN	1719	CAUSTIC ALKALI LIQUID, N.O.S. (SODIUM HYDROXIDE, POTASSIUM HYDROXIDE)	8	II

TRANSPORT CANADA - INLAND WATERWAYS

UN	1719	CAUSTIC ALKALI LIQUID, N.O.S. (SODIUM HYDROXIDE, POTASSIUM HYDROXIDE)	8	II

TRANSPORT CANADA - RAIL

UN	1719	CAUSTIC ALKALI LIQUID, N.O.S. (SODIUM HYDROXIDE, POTASSIUM HYDROXIDE)	8	II

TRANSPORT CANADA - ROAD

UN	1719	CAUSTIC ALKALI LIQUID, N.O.S. (SODIUM HYDROXIDE, POTASSIUM HYDROXIDE)	8	II

U.S. DOT - INLAND WATERWAYS

UN	1719	Caustic alkali liquid, n.o.s. (SODIUM HYDROXIDE, POTASSIUM HYDROXIDE)	8	II

U.S. DOT - RAIL

UN	1719	Caustic alkali liquid, n.o.s. (SODIUM HYDROXIDE, POTASSIUM HYDROXIDE)	8	II

U.S. DOT - ROAD

UN	1719	LIQUIDOS ALCALINOS CAUSTICOS N.E.P. (SODIUM HYDROXIDE, POTASSIUM HYDROXIDE)	8	II

***ORM = ORM-D, CBL = COMBUSTIBLE LIQUID**

Marine pollutant		no

Dangerous goods descriptions (if indicated above) may not reflect quantity, end-use or region-specific exceptions that can be applied. Consult shipping documents for descriptions that are specific to the shipment.

SECTION 15. REGULATORY INFORMATION

EPCRA - Emergency Planning and Community Right-to-Know Act

CERCLA Reportable Quantity

Components	CAS-No.	Component RQ (lbs)	Calculated product RQ (lbs)
SODIUM HYDROXIDE	1310-73-2	1000	2352.941176

SARA 311/312 Hazards : Acute Health Hazard

SARA 313
Component(s)SARA 313 : This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

California Prop 65 Proposition 65 warnings are not required for this product based on the results of a risk assessment.

The components of this product are reported in the following inventories:

TSCA : On TSCA Inventory

DSL : All components of this product are on the Canadian DSL

AUSTR : On the inventory, or in compliance with the inventory

NZIOC : On the inventory, or in compliance with the inventory

ENCS : On the inventory, or in compliance with the inventory

KECL : On the inventory, or in compliance with the inventory

PHIL : On the inventory, or in compliance with the inventory

IECSC : On the inventory, or in compliance with the inventory

Inventories
AICS (Australia), DSL (Canada), IECSC (China), REACH (European Union), ENCS (Japan), ISHL (Japan), KECI (Korea), NZIoC (New Zealand), PICCS (Philippines), TCSI (Taiwan), TSCA (USA)
Registration: Trade Secret

Chemical name	Identification number
ALKALINE	254504001- 6301
INORGANIC BASE	254504001-6415

SECTION 16. OTHER INFORMATION

Further information
Revision Date: 03/28/2016

Full text of H-Statements referred to under sections 2 and 3.

H290	May be corrosive to metals.
H302	Harmful if swallowed.
H312	Harmful in contact with skin.
H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.
H402	Harmful to aquatic life.

Further information

Sources of key data used to compile the Safety Data Sheet
Key literature references and sources of data
SOLENIS Internal data
SOLENIS internal data including own and sponsored test reports
The UNECE administers regional agreements implementing harmonised classification for labelling (GHS) and transport.

The information accumulated herein is believed to be accurate but is not warranted to be whether originating with the company or not. Recipients are advised to confirm in advance of need that the information is current, applicable, and suitable to their circumstances. This MSDS has been prepared by the Solenis Environmental Health and Safety Department.

List of abbreviations and acronyms that could be, but not necessarily are, used in this safety data sheet :

ACGIH : American Conference of Industrial Hygienists
BEI : Biological Exposure Index
CAS : Chemical Abstracts Service (Division of the American Chemical Society).
CMR : Carcinogenic, Mutagenic or Toxic for Reproduction
FG : Food grade
GHS : Globally Harmonized System of Classification and Labeling of Chemicals.
H-statement : Hazard Statement
IATA : International Air Transport Association.
IATA-DGR : Dangerous Goods Regulation by the "International Air Transport Association" (IATA).
ICAO : International Civil Aviation Organization
ICAO-TI (ICAO) : Technical Instructions by the "International Civil Aviation Organization"
IMDG : International Maritime Code for Dangerous Goods
ISO : International Organization for Standardization
logPow : octanol-water partition coefficient
LCxx : Lethal Concentration, for xx percent of test population
LDxx : Lethal Dose, for xx percent of test population.
ICxx : Inhibitory Concentration for xx of a substance
Ecxx : Effective Concentration of xx
N.O.S.: Not Otherwise Specified
OECD : Organization for Economic Co-operation and Development
OEL : Occupational Exposure Limit
P-Statement : Precautionary Statement
PBT : Persistent , Bioaccumulative and Toxic
PPE : Personal Protective Equipment

STEL : Short-term exposure limit
STOT : Specific Target Organ Toxicity
TLV : Threshold Limit Value
TWA : Time-weighted average
vPvB : Very Persistent and Very Bioaccumulative
WEL : Workplace Exposure Level

CERCLA : Comprehensive Environmental Response, Compensation, and Liability Act
DOT : Department of Transportation
FIFRA : Federal Insecticide, Fungicide, and Rodenticide Act
HMIRC : Hazardous Materials Information Review Commission
HMIS : Hazardous Materials Identification System
NFPA : National Fire Protection Association
NIOSH : National Institute for Occupational Safety and Health
OSHA : Occupational Safety and Health Administration
PMRA : Health Canada Pest Management Regulatory Agency
RTK : Right to Know
WHMIS : Workplace Hazardous Materials Information System

29 CFR 1910.1200 (OSHA HazCom 2012)

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product identifier

Trade name : Ameroyal™ 710
ANTISCALANT
™ Trademark, Solenis or its subsidiaries or affiliates, registered in various countries

Recommended use of the chemical and restrictions on use

Details of the supplier of the safety data sheet	**Emergency telephone number**
Solenis LLC 500 Hercules Road Wilmington, Delaware 19808 United States of America RegulatoryRequestsNA@solenis.com	1-844-SOLENIS (844-765-3647) / 606-329-5705 **Product Information** 1-844-SOLENIS (844-765-3647)

SECTION 2. HAZARDS IDENTIFICATION

GHS Classification

This material is not considered hazardous under the OSHA Hazard Communication Standard (HazCom 2012).

GHS Label element

This material is not considered hazardous under the OSHA Hazard Communication Standard (HazCom 2012).

Other hazards

None known.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Mixture

Hazardous components

No hazardous ingredients

SECTION 4. FIRST AID MEASURES

General advice	:	Move out of dangerous area. Consult a physician. Show this safety data sheet to the doctor in attendance. Do not leave the victim unattended.
If inhaled	:	If breathed in, move person into fresh air. If unconscious place in recovery position and seek medical advice. If symptoms persist, call a physician.
In case of skin contact	:	First aid is not normally required. However, it is recommended that exposed areas be cleaned by washing with soap and water. Wash contaminated clothing before re-use.
In case of eye contact	:	Flush eyes with water as a precaution. Remove contact lenses. Protect unharmed eye. If eye irritation persists, consult a specialist.
If swallowed	:	Get medical attention immediately. Rinse mouth with water. Do not give milk or alcoholic beverages. Never give anything by mouth to an unconscious person. If symptoms persist, call a physician.
Most important symptoms and effects, both acute and delayed	:	Signs and symptoms of exposure to this material through breathing, swallowing, and/or passage of the material through the skin may include: stomach or intestinal upset (nausea, vomiting, diarrhea) irritation (nose, throat, airways)
Notes to physician	:	No hazards which require special first aid measures.

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media	:	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment. Water spray Foam Carbon dioxide (CO2)

Dry chemical

Unsuitable extinguishing media : High volume water jet

Specific hazards during firefighting : Do not allow run-off from fire fighting to enter drains or water courses.

Hazardous combustion products : corrosive vapors
toxic fumes
Oxides of phosphorus
carbon dioxide and carbon monoxide
phosphine
hydrogen chloride
Sodium oxides

Specific extinguishing methods :

Product is compatible with standard fire-fighting agents.

Further information : Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations.

Special protective equipment for firefighters : In the event of fire, wear self-contained breathing apparatus.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures : Persons not wearing protective equipment should be excluded from area of spill until clean-up has been completed.

Environmental precautions : Prevent product from entering drains.
Prevent further leakage or spillage if safe to do so.
If the product contaminates rivers and lakes or drains inform respective authorities.

Methods and materials for containment and cleaning up : Keep in suitable, closed containers for disposal.

Other information : Comply with all applicable federal, state, and local regulations.

SECTION 7. HANDLING AND STORAGE

Advice on safe handling	:	Do not breathe vapours/dust. Do not smoke. Container hazardous when empty. Smoking, eating and drinking should be prohibited in the application area. For personal protection see section 8. Dispose of rinse water in accordance with local and national regulations.
Conditions for safe storage	:	Keep container tightly closed in a dry and well-ventilated place. Observe label precautions. Electrical installations / working materials must comply with the technological safety standards.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Engineering measures	:	Provide sufficient mechanical (general and/or local exhaust) ventilation to maintain exposure below exposure guidelines (if applicable) or below levels that cause known, suspected or apparent adverse effects.

Personal protective equipment

Respiratory protection	:	A NIOSH-approved particulate filter respirator is recommended if excess dust is generated.
Hand protection Remarks	:	The suitability for a specific workplace should be discussed with the producers of the protective gloves.
Eye protection	:	Not required under normal conditions of use. Wear splash-proof safety goggles if material could be misted or splashed into eyes.
Skin and body protection	:	Wear as appropriate: impervious clothing Safety shoes Choose body protection according to the amount and concentration of the dangerous substance at the work place. Discard gloves that show tears, pinholes, or signs of wear.
Hygiene measures	:	Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the

product.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state	:	liquid
Colour	:	amber, light yellow
Odour	:	No data available
Odour Threshold	:	No data available
pH	:	4.0 - 5.5
Melting point/freezing point	:	18.1 °F / -7.7 °C
Boiling point/boiling range	:	212.0 °F / 100.0 °C
Flash point	:	Not applicable
Evaporation rate	:	No data available
Flammability (solid, gas)	:	No data available
Upper explosion limit	:	No data available
Lower explosion limit	:	No data available
Vapour pressure	:	17.500 mmHg
Relative vapour density	:	No data available
Relative density	:	No data available
Density	:	1.21 g/cm3
Solubility(ies)		
Water solubility	:	completely soluble
Solubility in other solvents	:	No data available
Partition coefficient: n-octanol/water	:	No data available
Thermal decomposition	:	No data available
Viscosity		

Viscosity, dynamic	:	No data available
Viscosity, kinematic	:	No data available
Oxidizing properties	:	No data available

SECTION 10. STABILITY AND REACTIVITY

Reactivity	:	No decomposition if stored and applied as directed.
Chemical stability	:	Stable under recommended storage conditions.
Possibility of hazardous reactions	:	Product will not undergo hazardous polymerization.
Incompatible materials	:	Oxidizing agents Strong acids
Hazardous decomposition products		carbon dioxide and carbon monoxide corrosive vapors hydrogen chloride phosphine Oxides of phosphorus Sodium oxides

SECTION 11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure	:	Inhalation Skin contact Eye Contact Ingestion

Acute toxicity
Not classified based on available information.
Skin corrosion/irritation
Not classified based on available information.
Serious eye damage/eye irritation
Not classified based on available information.
Product:
Remarks: Unlikely to cause eye irritation or injury.

Respiratory or skin sensitisation
Skin sensitisation: Not classified based on available information.
Respiratory sensitisation: Not classified based on available information.
Germ cell mutagenicity
Not classified based on available information.
Carcinogenicity
Not classified based on available information.
Reproductive toxicity
Not classified based on available information.
STOT - single exposure
Not classified based on available information.
STOT - repeated exposure
Not classified based on available information.
Aspiration toxicity
Not classified based on available information.
Further information
Product:
Remarks: No data available

Carcinogenicity:

IARC	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
OSHA	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.
NTP	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Product:

Toxicity to fish	:	LC 50 (Oncorhynchus mykiss (rainbow trout)): > 10,000 mg/l Exposure time: 96 h Test Type: static test LC 50 (Pimephales promelas (fathead minnow)): > 10,000 mg/l Exposure time: 96 h Test Type: static test

Toxicity to daphnia and other aquatic invertebrates : EC 50 (Water flea (Ceriodaphnia dubia)): 4,061 mg/l
Exposure time: 48 h
Test Type: static test

Ecotoxicology Assessment
Acute aquatic toxicity : Not classified based on available information.

Chronic aquatic toxicity : Not classified based on available information.

Persistence and degradability
No data available

Bioaccumulative potential
No data available

Mobility in soil
No data available

Other adverse effects
No data available

Product:
Additional ecological information : No data available

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

General advice : Do not dispose of waste into sewer.
Do not contaminate ponds, waterways or ditches with chemical or used container.
Send to a licensed waste management company.

Dispose of in accordance with all applicable local, state and federal regulations.

Contaminated packaging : Empty remaining contents.
Dispose of as unused product.
Empty containers should be taken to an approved waste handling site for recycling or disposal.
Do not re-use empty containers.

SECTION 14. TRANSPORT INFORMATION

International transport regulations

REGULATION

ID NUMBER	PROPER SHIPPING NAME	*HAZARD CLASS	SUBSIDIARY HAZARDS	PACKING GROUP	MARINE POLLUTANT / LTD. QTY.

MEXICAN REGULATION FOR THE LAND TRANSPORT OF HAZARDOUS MATERIALS AND WASTES

Not dangerous goods

INTERNATIONAL AIR TRANSPORT ASSOCIATION - PASSENGER

Not dangerous goods

INTERNATIONAL AIR TRANSPORT ASSOCIATION - CARGO

Not dangerous goods

INTERNATIONAL MARITIME DANGEROUS GOODS

Not dangerous goods

TRANSPORT CANADA - INLAND WATERWAYS

Not dangerous goods

TRANSPORT CANADA - RAIL

Not dangerous goods

TRANSPORT CANADA - ROAD

Not dangerous goods

U.S. DOT - INLAND WATERWAYS

Not dangerous goods

U.S. DOT - RAIL

Not dangerous goods

U.S. DOT - ROAD

Not dangerous goods

***ORM = ORM-D, CBL = COMBUSTIBLE LIQUID**

Marine pollutant		no

Dangerous goods descriptions (if indicated above) may not reflect quantity, end-use or region-specific exceptions that can be applied. Consult shipping documents for descriptions that are specific to the shipment.

SECTION 15. REGULATORY INFORMATION

SARA 311/312 Hazards : No SARA Hazards

SARA 313
Component(s)SARA 313 : This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

California Prop 65 Proposition 65 warnings are not required for this product based on the results of a risk assessment.

The components of this product are reported in the following inventories:

TSCA : On TSCA Inventory

DSL : This product contains one or several components that are not on the Canadian DSL nor NDSL.

AUSTR : Not in compliance with the inventory

ENCS : Not in compliance with the inventory

KECL : Not in compliance with the inventory

PHIL : Not in compliance with the inventory

IECSC : Not in compliance with the inventory

Inventories
AICS (Australia), DSL (Canada), IECSC (China), REACH (European Union), ENCS (Japan), ISHL (Japan), KECI (Korea), NZIoC (New Zealand), PICCS (Philippines), TSCA (USA)

SECTION 16. OTHER INFORMATION

Further information
Revision Date: 02/17/2016

Full text of H-Statements referred to under sections 2 and 3.

Further information

Sources of key data used to compile the Safety Data Sheet
Key literature references and sources of data
SOLENIS Internal data
SOLENIS internal data including own and sponsored test reports
The UNECE administers regional agreements implementing harmonised classification for labelling (GHS) and transport.

The information accumulated herein is believed to be accurate but is not warranted to be whether originating with the company or not. Recipients are advised to confirm in advance of need that the information is current, applicable, and suitable to their circumstances. This MSDS has been prepared by the Solenis Environmental Health and Safety Department.

List of abbreviations and acronyms that could be, but not necessarily are, used in this safety data sheet :

ACGIH : American Conference of Industrial Hygienists
BEI : Biological Exposure Index
CAS : Chemical Abstracts Service (Division of the American Chemical Society).
CMR : Carcinogenic, Mutagenic or Toxic for Reproduction
FG : Food grade
GHS : Globally Harmonized System of Classification and Labeling of Chemicals.
H-statement : Hazard Statement
IATA : International Air Transport Association.
IATA-DGR : Dangerous Goods Regulation by the "International Air Transport Association" (IATA).
ICAO : International Civil Aviation Organization
ICAO-TI (ICAO) : Technical Instructions by the "International Civil Aviation Organization"
IMDG : International Maritime Code for Dangerous Goods
ISO : International Organization for Standardization
logPow : octanol-water partition coefficient
LCxx : Lethal Concentration, for xx percent of test population
LDxx : Lethal Dose, for xx percent of test population.
ICxx : Inhibitory Concentration for xx of a substance
Ecxx : Effective Concentration of xx
N.O.S.: Not Otherwise Specified
OECD : Organization for Economic Co-operation and Development
OEL : Occupational Exposure Limit
P-Statement : Precautionary Statement

PBT : Persistent , Bioaccumulative and Toxic
PPE : Personal Protective Equipment
STEL : Short-term exposure limit
STOT : Specific Target Organ Toxicity
TLV : Threshold Limit Value
TWA : Time-weighted average
vPvB : Very Persistent and Very Bioaccumulative
WEL : Workplace Exposure Level

CERCLA : Comprehensive Environmental Response, Compensation, and Liability Act
DOT : Department of Transportation
FIFRA : Federal Insecticide, Fungicide, and Rodenticide Act
HMIRC : Hazardous Materials Information Review Commission
HMIS : Hazardous Materials Identification System
NFPA : National Fire Protection Association
NIOSH : National Institute for Occupational Safety and Health
OSHA : Occupational Safety and Health Administration
PMRA : Health Canada Pest Management Regulatory Agency
RTK : Right to Know
WHMIS : Workplace Hazardous Materials Information System

Univar
3075 Highland Pkwy STE 200
Downers Grove, IL 60515
425-889-3400

SAFETY DATA SHEET

1. Identification

Product identifier: SODIUM HYPOCHLORITE 10-16%

Other means of identification

Synonyms:	Liquichlor, Bleach
CAS NUMBERS:	7681-52-9
SDS number:	000100001054

Recommended use and restriction on use

Recommended use: Reserved for industrial and professional use.

Restrictions on use: Not known.

Manufacturer/Importer/Supplier/Distributor Information

Univar

3075 Highland Pkwy STE 200

Downers Grove, IL 60515

425-889-3400

Emergency telephone number:For emergency assistance Involving chemicals

call CHEMTREC day or night at: 1-800-424-9300. CHEMTREC INTERNATIONAL Tel# 703-527-3887

2. Hazard(s) identification

Hazard Classification

Physical Hazards

Corrosive to metal	Category 1

Health Hazards

Acute toxicity (Oral)	Category 5
Skin Corrosion/Irritation	Category 1
Serious Eye Damage/Eye Irritation	Category 1
Environmental Hazards Acute hazards to the aquatic environment	Category 1
Chronic hazards to the aquatic environment	Category 1

Label Elements

Hazard Symbol

Signal Word	Danger
Hazard Statement	May be corrosive to metals. Causes severe skin burns and eye damage. Causes serious eye damage. May be harmful if swallowed. Very toxic to aquatic life with long lasting effects. Very toxic to aquatic life.
Precautionary Statements	
Prevention	Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Do not breathe dust or mists. Wear protective gloves/protective clothing/eye protection/face protection.
Response	IF INHALED: Remove person to fresh air and keep comfortable for breathing. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water [or shower]. Immediately call a POISON CENTER/doctor. Wash contaminated clothing before reuse.

Storage	Store locked up.
Disposal	Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.
Other hazards which do not result in GHS classification	None.

3. Composition/information on ingredients

Substances

Chemical Identity	Common name and synonyms	CAS number	Content in percent (%)*
Sodium hypochlorite		7681-52-9	10 - 16%
Sodium hydroxide		1310-73-2	0.3 - 5%
Water		7732-18-5	80 - 89.7%

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. First-aid measures

General information:	Get medical advice/attention.
Ingestion:	Do NOT induce vomiting. Never give liquid to an unconscious person. Get medical attention immediately.
Inhalation:	Call a physician or poison control center immediately. If breathing stops, provide artificial respiration. Move to fresh air. If breathing is difficult, give oxygen.
Skin Contact:	Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
Eye contact:	If in eyes, hold eyes open, flood with water for at least 15 minutes and see a doctor.

Most important symptoms/effects, acute and delayed

Symptoms: No data available.

Indication of immediate medical attention and special treatment needed

Treatment:	Symptoms may be delayed.

5. Fire-fighting measures

General Fire Hazards:	No unusual fire or explosion hazards noted.

Suitable (and unsuitable) extinguishing media

Suitable extinguishing media:	Use: Foam. Carbon dioxide or dry powder.
Unsuitable extinguishing media:	No data available.
Specific hazards arising from the chemical:	During fire, gases hazardous to health may be formed.

Special protective equipment and precautions for firefighters

Special fire fighting procedures:	No data available.
Special protective equipment for fire-fighters:	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures:	Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Keep unauthorized personnel away.
Methods and material for containment and cleaning up:	Absorb spillage with non-combustible, absorbent material.
Notification Procedures:	Dike for later disposal. Prevent entry into waterways, sewer, basements or confined areas. Stop the flow of material, if this is without risk.
Environmental Precautions:	Do not contaminate water sources or sewer. Avoid release to the environment.

7. Handling and storage

Precautions for safe handling:	Use personal protective equipment as required. Do not taste or swallow. Wash hands thoroughly after handling. Do not get in eyes, on skin, on clothing.
Conditions for safe storage, including any incompatibilities:	Store locked up.

8. Exposure controls/personal protection

Control Parameters

Occupational Exposure Limits

Chemical Identity	Type	Exposure Limit Values	Source
Sodium hydroxide	Ceiling	2 mg/m3	US. Tennessee. OELs. Occupational Exposure Limits, Table Z1A (06 2008)
Sodium hydroxide - Particulate.	ST ESL	20 µg/m3	US. Texas. Effects Screening Levels (Texas Commission on Environmental Quality) (02 2013)
	AN ESL	2 µg/m3	US. Texas. Effects Screening Levels (Texas Commission on Environmental Quality) (02 2013)
Sodium hydroxide	Ceiling	2 mg/m3	US. California Code of Regulations, Title 8, Section 5155. Airborne Contaminants (02 2012)
	Ceiling	2 mg/m3	US. ACGIH Threshold Limit Values (03 2016)
	Ceil_Time	2 mg/m3	US. NIOSH: Pocket Guide to Chemical Hazards (2010)
	PEL	2 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (03 2016)
	Ceiling	2 mg/m3	US. OSHA Table Z-1-A (29 CFR 1910.1000) (1989)

Appropriate Engineering Controls Adequate ventilation should be provided so that exposure limits are not exceeded.

Individual protection measures, such as personal protective equipment

General information: Provide easy access to water supply and eye wash facilities. Use personal protective equipment as required. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing to remove contaminants. Discard contaminated footwear that cannot be cleaned.

Eye/face protection: Wear a full-face respirator, if needed. Wear safety glasses with side shields (or goggles) and a face shield.

Skin Protection

Hand Protection: Chemical resistant gloves

Other: Chemical resistant clothing

Respiratory Protection:	In case of inadequate ventilation use suitable respirator.
Hygiene measures:	Do not eat, drink or smoke when using the product. Wash hands after handling. Do not get in eyes. Observe good industrial hygiene practices. Wash contaminated clothing before reuse. Do not get this material in contact with skin. Wash hands before breaks and immediately after handling the product.

9. Physical and chemical properties

Physical state:	liquid
Form:	liquid
Color:	Pale yellow-green, Clear
Odor:	Odor of chlorine
Odor threshold:	No data available.
pH:	10 - 12
Melting point/freezing point:	-20 °C
Initial boiling point and boiling range:	> 107 °C
Flash Point:	No data available.
Evaporation rate:	No data available.
Flammability (solid, gas):	No data available.
Upper/lower limit on flammability or explosive limits	
Flammability limit - upper (%):	No data available.
Flammability limit - lower (%):	No data available.
Explosive limit - upper (%):	No data available.
Explosive limit - lower (%):	No data available.
Vapor pressure:	No data available.
Vapor density:	No data available.
Relative density:	1.224
Solubility(ies)	
Solubility in water:	Soluble
Solubility (other):	No data available.
Partition coefficient (n-octanol/water):	No data available.
Auto-ignition temperature:	No data available.
Decomposition temperature:	No data available.

Viscosity: No data available.

10. Stability and reactivity

Reactivity: No data available.
Chemical Stability: Material is stable under normal conditions.
Possibility of hazardous reactions: Stable
Conditions to avoid: Avoid heat or contamination.
Incompatible Materials: Oxidizers, acids Ammonia. Amines.
Hazardous Decomposition Products: By heating and fire, toxic vapors/gases may be formed.

11. Toxicological information

Symptoms related to the physical, chemical and toxicological characteristics

Ingestion: No data available.
Inhalation: No data available.
Skin Contact: No data available.
Eye contact: No data available.

Information on toxicological effects

Acute toxicity (list all possible routes of exposure)

Oral

Product: LD 50 (Rat): 3 - 5 g/kg

Dermal

Product: LD 50 (Rabbit): > 2 g/kg

Inhalation

Product: May be harmful if inhaled.

Repeated dose toxicity

Product: No data available.

Skin Corrosion/Irritation

Product: Causes severe skin burns.

Serious Eye Damage/Eye Irritation

Product: Causes serious eye damage.

Respiratory or Skin Sensitization

Product: Not a skin sensitizer.

Carcinogenicity

Product: No data available.

IARC Monographs on the Evaluation of Carcinogenic Risks to Humans:
No carcinogenic components identified

US. National Toxicology Program (NTP) Report on Carcinogens:
No carcinogenic components identified
US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050):
No carcinogenic components identified

Germ Cell Mutagenicity
In vitro
Product: No data available.
In vivo
Product: No data available.
Reproductive toxicity
Product: No data available.
Specific Target Organ Toxicity - Single Exposure
Product: No data available.
Specific Target Organ Toxicity - Repeated Exposure
Product: No data available.
Aspiration Hazard
Product: No data available.
Other effects: No data available.

12. Ecological information

Ecotoxicity:
Acute hazards to the aquatic environment:
Fish
Product: LC 50 (Shiner perch (Cymatogaster aggregata), 96 h): 0.033 - 0.097 mg/l LC 50 (Bluegill (Lepomis macrochirus), 48 h): 0.6 mg/l
Aquatic Invertebrates
Product: LC 50 (Aquatic crustacea): 1 mg/l LC 50 (Daphnia magna, 96 h): 2.1 mg/l
Chronic hazards to the aquatic environment:
Fish
Product: No data available.
Aquatic Invertebrates
Product: No data available.
Toxicity to Aquatic Plants
Product: EC 50 (Green algae (Dunaliella bioculata), 24 h): 0.6 mg/l
Persistence and Degradability
Biodegradation

Product:	The product solely consists of inorganic compounds which are not biodegradable.

BOD/COD Ratio

Product:	No data available.

Bioaccumulative potential

Bioconcentration Factor (BCF)

Product:	The product is not bioaccumulating.

Partition Coefficient n-octanol / water (log Kow)

Product:	No data available.
Mobility in soil:	No data available.

Known or predicted distribution to environmental compartments

Sodium hypochlorite	No data available.
Sodium hydroxide	No data available.
Water	No data available.

Known or predicted distribution to environmental compartments

Water	No data available.

13. Disposal considerations

Disposal instructions:	Discharge, treatment, or disposal may be subject to national, state, or local laws.
Contaminated Packaging:	Since emptied containers retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT

UN Number:	UN 1791
UN Proper Shipping Name:	Hypochlorite solutions(Sodium hypochlorite)
Transport Hazard Class(es)	
Class:	8
Label(s):	8
Packing Group:	III
Marine Pollutant:	Marine Pollutant

Special precautions for user: –

IMDG

UN Number: UN 1791
UN Proper Shipping Name: HYPOCHLORITE SOLUTION(Sodium hypochlorite)
Transport Hazard Class(es)
Class: 8
Label(s): 8
EmS No.: F-A, S-B
Packing Group: III
Marine Pollutant: Marine Pollutant
Special precautions for user: –

15. Regulatory information

US Federal RegulationsUS. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

None present or none present in regulated quantities.

CERCLA Hazardous Substance List (40 CFR 302.4):

Sodium hypochlorite Reportable quantity: 100 lbs.
Sodium hydroxide Reportable quantity: 1000 lbs.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories

[X] Acute (Immediate) [ ] Chronic (Delayed) [ ] Fire [ ] Reactive [ ] Pressure Generating

SARA 302 Extremely Hazardous Substance

None present or none present in regulated quantities.

SARA 304 Emergency Release Notification

Chemical Identity	RQ
Sodium hypochlorite	100 lbs.
Sodium hydroxide	1000 lbs.

SARA 311/312 Hazardous Chemical

Chemical Identity	Threshold Planning Quantity
Sodium hypochlorite	500 lbs
Sodium hydroxide	500 lbs

SARA 313 (TRI Reporting)

None present or none present in regulated quantities.

Clean Water Act Section 311 Hazardous Substances (40 CFR 117.3)

Sodium hypochlorite Reportable quantity: 100 lbs.
Sodium hydroxide Reportable quantity: 1000 lbs.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130):

None present or none present in regulated quantities.

US State Regulations

US. California Proposition 65

No ingredient regulated by CA Prop 65 present.

US. New Jersey Worker and Community Right-to-Know Act

Sodium hypochlorite	Listed
Sodium hydroxide	Listed

US. Massachusetts RTK - Substance List

Sodium hypochlorite	Listed
Sodium hydroxide	Listed

US. Pennsylvania RTK - Hazardous Substances

Sodium hypochlorite	Listed
Sodium hydroxide	Listed

US. Rhode Island RTK

Sodium hypochlorite	Listed
Sodium hydroxide	Listed

Inventory Status: Australia AICS:	On or in compliance with the inventory
Canada DSL Inventory List:	On or in compliance with the inventory
EU EINECS List:	On or in compliance with the inventory
EU ELINCS List:	On or in compliance with the inventory
Japan (ENCS) List:	On or in compliance with the inventory
EU No Longer Polymers List:	Not in compliance with the inventory.
China Inv. Existing Chemical Substances:	On or in compliance with the inventory
Korea Existing Chemicals Inv. (KECI):	On or in compliance with the inventory
Canada NDSL Inventory:	Not in compliance with the inventory.
Philippines PICCS:	On or in compliance with the inventory
New Zealand Inventory of Chemicals:	On or in compliance with the inventory
Japan ISHL Listing:	Not in compliance with the inventory.
Japan Pharmacopoeia Listing:	Not in compliance with the inventory.
US TSCA Inventory:	On or in compliance with the inventory

16.Other information, including date of preparation or last revision

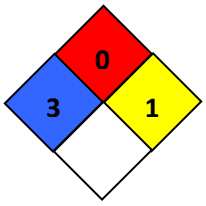
HMIS Hazard ID

Health		3
Flammability		0
Physical Hazards		1
PERSONAL PROTECTION		B

B - Safety Glasses & Gloves

Hazard rating: 0 - Minimal; 1 - Slight; 2 - Moderate; 3 - Serious; 4 - Severe; RNP - Rating not possible; *Chronic health effect

NFPA Hazard ID



Flammability
Health
Reactivity
Special hazard.

Hazard rating: 0 - Minimal; 1 - Slight; 2 - Moderate; 3 - Serious; 4 - Severe; RNP - Rating not possible

Issue Date:	08/08/2019
Revision Date:	No data available.
Version #:	1.9
Further Information:	No data available.

Univar USA Inc Material Safety Data Sheet

TOPAZ POWER GROUP, LC
LAREDO WLE, LP
7300 CPL ROAD
LAREDO
TX 78041

MSDS No:	CDS1518
Version No:	001 11/16/09
Order No:	CC310531

Univar USA Inc., 17425 NE Union Hill Rd., Redmond WA 98052
(425) 889 3400

Emergency Assistance

For emergency assistance involving chemicals call
Chemtrec - (800) 424-9300

COMPANY IDENTITY: UNIVAR USA INC. DATE: 11/16/09
PRODUCT IDENTITY: CAUSTIC SODA 30-39% SOLUTION PAGE 1 OF 7

MATERIAL SAFETY DATA SHEET

This Material Safety Data Sheet conforms to the requirements of ANSI Z400.1, using the International Chemical Safety Cards of the Global Harmonizing System.
THIS MSDS COMPLIES WITH 29 CFR 1910.1200 (HAZARD COMMUNICATION STANDARD)
IMPORTANT: Read this MSDS before handling & disposing of this product.
Pass this information on to employees, customers, & users of this product.

SECTION 1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND COMPANY

PRODUCT IDENTITY: CAUSTIC SODA 30-39% SOLUTION
MSDS NUMBER: CDS1518
NEW MSDS DATE: 11/16/2009
COMPANY IDENTITY: UNIVAR USA INC.
COMPANY ADDRESS: 17425 NE UNION HILL
COMPANY CITY: REDMOND, WA 98052
COMPANY PHONE: 1-425-889-3400
CHEMTREC PHONE: 1-800-424-9300

SECTION 2. COMPOSITION/INFORMATION ON INGREDIENTS

CONTAINS:
61-70% WATER (7732-18-5),
30-39% SODIUM HYDROXIDE (1310-73-2),
0- 2% SODIUM CHLORIDE (7647-14-5)

Number in parentheses is CAS #, number in brackets is European EC #.

SECTION 3. HAZARDS IDENTIFICATION

EXPOSURE PREVENTION: AVOID ALL CONTACT!

RISK STATEMENTS:
R35 Causes severe burns.

SAFETY STATEMENTS:
S1/2 Keep locked up and out of the reach of children.
S24/25 Avoid contact with skin and eyes.
S36/37 Wear suitable protective clothing and gloves.
S26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S45 In case of accident, or if you feel unwell, seek medical advice immediately. (Show the label where possible).

SECTION 4. FIRST AID MEASURES

EYE CONTACT:
For eyes, flush with plenty of water for 15 minutes & get medical attention.

SKIN CONTACT:
In case of contact with skin immediately remove contaminated clothing.
Wash thoroughly with soap & water. Wash contaminated clothing before reuse.

INHALATION:
After high vapor exposure, remove to fresh air. If breathing is difficult, give oxygen. If breathing has stopped, trained personnel should immediately begin artificial respiration. If the heart has stopped, trained personnel should immediately begin cardiopulmonary resuscitation (CPR).

SWALLOWING:
Rinse mouth. Give plenty of water to drink. Do NOT induce vomiting.
GET MEDICAL ATTENTION IMMEDIATELY. Do NOT give liquids to an unconscious or convulsing person.

SECTION 5. FIRE FIGHTING MEASURES

FIRE & EXPLOSION PREVENTIVE MEASURES
Not Applicable.

EXTINGUISHING MEDIA
In case of fire in surroundings, all extinguishing agents allowed.

SPECIAL FIRE FIGHTING PROCEDURES
Water spray may be ineffective on fire but can protect fire-fighters & cool closed containers. Use fog nozzles if water is used.
Do not enter confined fire-space without full bunker gear.
(Helmet with face shield, bunker coats, gloves & rubber boots).
Use NIOSH approved positive-pressure self-contained breathing apparatus.

UNUSUAL EXPLOSION AND FIRE PROCEDURES
Noncombustible.
Keep container tightly closed. Isolate from acids.
Closed containers may explode if exposed to extreme heat.
Applying to hot surfaces requires special precautions.

SECTION 6. ACCIDENTAL RELEASE MEASURES

PERSONAL PROTECTIVE MEASURES:
Keep unprotected personnel away.
Use complete chemical protective suit with self-contained breathing apparatus.

CONTAINMENT AND CLEAN-UP MEASURES:
Stop spill at source. Dike and contain.
Sweep spilled material into dry, sealable containers.
Wash away remainder with plenty of water.

SECTION 7. HANDLING AND STORAGE

HANDLING

Use only with adequate ventilation.
Do not get in eyes, on skin or clothing.
Wear OSHA Standard full face shield. Consult Safety Equipment Supplier. Wear gloves, apron & footwear impervious to this material. Wash clothing before reuse. NEVER pour water into this substance. When dissolving or diluting, always add it slowly to the water.

STORAGE

Keep separated from strong oxidants, strong acids, metals, food & feedstuffs.
Keep dry. Do not store above 49 C/120 F. Keep container tightly closed & upright when not in use to prevent leakage.
Wear full face shield, gloves & full protective clothing when opening or handling. When empty, drain completely, replace bungs securely.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION:

RESPIRATORY EXPOSURE CONTROLS

A respiratory protection program that meets OSHA 29 CFR 1910.134 and ANSI Z86.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant a respirator's use.

VENTILATION

LOCAL EXHAUST	: Necessary
MECHANICAL (GENERAL)	: Necessary
SPECIAL	: None
OTHER	: None

Please refer to ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

PERSONAL PROTECTIONS:

Wear OSHA Standard full face shield. Consult Safety Equipment Supplier. Wear gloves, apron & footwear impervious to this material. Wash clothing before reuse.

WORK & HYGIENIC PRACTICES:

Provide readily accessible eye wash stations & safety showers.
Wash at end of each workshift & before eating, smoking or using the toilet.
Promptly remove clothing that becomes contaminated. Destroy contaminated leather articles. Launder or discard contaminated clothing.

SECTION 9. PHYSICAL DATA

APPEARANCE :			Liquid, Water-White
ODOR :			None
BOILING RANGE :			Not Applicable
AUTO IGNITION TEMPERATURE :			Not Applicable
LOWER FLAMMABLE LIMIT IN AIR (% by vol):			Not Applicable
FLASH POINT (TEST METHOD):			Not Applicable
FLAMMABILITY CLASSIFICATION:			Non-Combustible
GRAVITY @ 68/68 F / 20/20 C :			
SPECIFIC GRAVITY (Water=1) :	30% = 1.33 39% = 1.43		
POUNDS/GALLON :	40% = 11.08 49% = 11.91		
VOC'S (>0.44 Lbs/Sq In) :	0.0 Vol. % /	0.0 g/L /	0.000 Lbs/Gal
TOTAL VOC'S (TVOC) :	0.0 Vol. % /	0.0 g/L /	0.000 Lbs/Gal
NONEXEMPT VOC'S (CVOC) :	0.0 Vol. % /	0.0 g/L /	0.000 Lbs/Gal
HAZARDOUS AIR POLLUTANTS (HAPS) :	0.0 Wt. % /	0.0 g/L /	0.000 Lbs/Gal
VAPOR PRESSURE (mm of Hg)@20 C			17.5
NONEXEMPT VOC PARTIAL PRESSURE (mm of Hg @ 20 C)			0.0
VAPOR DENSITY (air=1) :			0.6
WATER ABSORPTION :			Complete
pH (Neutrality) :			14.0
Freezing Point (F):	30% = approx 34 F 39% = approx 59 F		

SECTION 10. STABILITY & REACTIVITY

STABILITY
Stable under normal conditions.

CONDITIONS TO AVOID
Isolate from acids.

MATERIALS TO AVOID
Reacts violently with fire extinguishers containing water.
The substance is a strong base. Reacts violently with acids and is corrosive,
Reacts with water generating sufficient heat to ignite combustible materials.
Reacts violently with strong acids, causing fire & explosion hazard. Attacks many plastics, rubber, coatings ,many metals, such as aluminum, zinc, tin, & lead, forming flammable/explosive gas (hydrogen).
Reacts with ammonium salts to produce ammonia & causing fire hazard.
Rapidly absorbs carbon dioxide & water from the air.
Contact with moisture will generate heat.

HAZARDOUS DECOMPOSITION PRODUCTS
Sodium Oxide & Hydroxide, Hydrogen Chloride, Phosgene, from heating.

HAZARDOUS POLYMERIZATION
Will not occur.

SECTION 11. TOXICOLOGICAL INFORMATION

MATERIAL	CAS #	TWA (OSHA)	TLV (ACGIH)	HAP
Sodium Hydroxide*	1310-73-2	None Known	None Known	No
Water	7732-18-5	None Known	None Known	No
Sodium Chloride	7647-14-5	None Known	None Known	No

This product contains no EPA Hazardous Air Pollutants (HAP) in amounts > 0.1%.

SECTION 11. TOXICOLOGICAL INFORMATION (CONTINUED)

MATERIAL	CAS #	CEILING	STEL (OSHA/ACGIH)
Sodium Hydroxide*	1310-73-2	2 ppm	None Known

ACUTE HAZARDS

EYE & SKIN CONTACT:
Severe burns to skin, defatting, dermatitis.
Severe burns to eyes, redness, tearing, blurred vision.
Liquid can cause Severe skin & eye burns. Wash thoroughly after handling.

INHALATION:
Severe respiratory tract irritation may occur. Vapor harmful.
The applicable occupational exposure limit value should not be exceeded during any part of the working exposure.

SWALLOWING:
Harmful or fatal if swallowed.

SUBCHRONIC HAZARDS/CONDITIONS AGGRAVATED

CONDITIONS AGGREVATED:
None Known.

CHRONIC HAZARDS

CANCER, REPRODUCTIVE & OTHER CHRONIC HAZARDS:
This product has no carcinogens listed by IARC, NTP, NIOSH, OSHA or ACGIH, as of this date, greater or equal to 0.1%.

SECTION 12. ECOLOGICAL INFORMATION

MAMMALIAN INFORMATION:
No mammalian information is available on this product.

AQUATIC ANIMAL INFORMATION:
No aquatic environmental information is available on this product.
The substance may be hazardous in the environment.
Special attention should be given to water organisms.

MOBILITY
Mobility of this material has not been determined.

DEGRADABILITY
This product is completely biodegradable.

ACCUMULATION
Bioaccumulation of this product has not been determined.

SECTION 13. DISPOSAL CONSIDERATIONS

Processing, use or contamination may change the waste management options.
Recycle / dispose of observing national, regional, state, provincial and local health, safety & pollution laws. If in doubt, contact appropriate agencies.

SECTION 14. TRANSPORT INFORMATION

DOT SHIPPING NAME: UN1824, Sodium hydroxide solution, 8, PG-II
DRUM LABEL: (CORROSIVE)

IATA / ICAO: UN1824, Sodium hydroxide solution, 8, PG-II
IMO / IMDG: UN1824, Sodium hydroxide solution, 8, PG-II

EMERGENCY RESPONSE GUIDEBOOK NUMBER: 154

SECTION 15. REGULATORY INFORMATION

EPA REGULATION:
SARA SECTION 311/312 HAZARDS: Acute Health

All components of this product are on the TSCA list.

SARA Title III Section 313 Supplier Notification
This product contains the indicated <*> toxic chemicals subject to the reporting requirements of Section 313 of the Emergency Planning & Community Right-To-Know Act of 1986 & of 40 CFR 372. This information must be included in all MSDSs that are copied and distributed for this material.

COMPANY IDENTITY: UNIVAR USA INC. DATE: 11/16/09
PRODUCT IDENTITY: CAUSTIC SODA 30-39% SOLUTION

SECTION 15. REGULATORY INFORMATION (CONTINUED)

SARA TITLE III INGREDIENTS	CAS#	WT. %	(REG. SECTION)	RQ(LBS)
Sodium Hydroxide*	1310-73-2	61	(311,312)	1000

> 2564 LB / 1163 KG OF THIS PRODUCT IN 1 CONTAINER EXCEEDS THE "RQ" OF SODIUM HYDROXIDE.
Any release equal to or exceeding the RQ must be reported to the National Response Center (800-424-8802) and appropriate state and local regulatory agencies as described in 40 CFR 302.6 and 40 CFR 355.40 respectively.
Failure to report may result in substantial civil and criminal penalties.
State & local regulations may be more restrictive than federal regulations.

STATE REGULATIONS:
CALIFORNIA PROPOSITION 65: This product contains no chemicals known to the State of California to cause cancer & reproductive toxicity.

INTERNATIONAL REGULATIONS
The components of this product are listed on the chemical inventories of the following countries:
Australia, Canada, China, Europe (EINECS), Japan, Korea, United Kingdom.

SECTION 16. OTHER INFORMATION

HAZARD RATINGS:
HEALTH (NFPA): 3, HEALTH (HMIS): 3, FLAMMABILITY: 0, REACTIVITY: 2
(Personal Protection Rating to be supplied by user based on use conditions.)
This information is intended solely for the use of individuals trained in the NFPA & HMIS hazard rating systems.

EMPLOYEE TRAINING
See Section 3 for Risk & Safety Statements. Employees should be made aware of all hazards of this material (as stated in this MSDS) before handling it.

Univar USA Inc Material Safety Data Sheet

For Additional Information contact MSDS Coordinator during business hours, Pacific time: (425) 889-3400

Notice

Univar USA Inc. ("Univar") expressly disclaims all express or implied warranties of merchantability and fitness for a particular purpose, with respect to the product or information provided herein, and shall under no circumstances be liable for incidental or consequential damages.

Do not use ingredient information and/or ingredient percentages in this MSDS as a product specification. For product specification information refer to a product specification sheet and/or a certificate of analysis. These can be obtained from your local Univar sales office.

All information appearing herein is based upon data obtained from the manufacturer and/or recognized technical sources. While the information is believed to be accurate, Univar makes no representations as to its accuracy or sufficiency. Conditions of use are beyond Univar's control and therefore users are responsible to verify this data under their own operating conditions to determine whether the product is suitable for their particular purposes and they assume all risks of their use, handling, and disposal of the product, or from the publication or use of, or reliance upon, information contained herein.

This information relates only to the product designated herein, and does not relate to its use in combination with any other material or in any other process

SECTION 1. IDENTIFICATION

Product identifier

Trade name : Drewphos™ PT
deposit inhibitor
™ Trademark, Solenis or its subsidiaries or affiliates, registered in various countries

Recommended use of the chemical and restrictions on use

Use of the Substance/Mixture : Water treatment chemical

Details of the supplier of the safety data sheet	**Emergency telephone number**
Solenis LLC 942 Brant St. Canada L7R 3X8 Burlington, ON Canada RegulatoryRequestsNA@solenis.com	1-844-SOLENIS (844-765-3647) / 606-329-5705 **Product Information** 1-844-SOLENIS (844-765-3647)

SECTION 2. HAZARDS IDENTIFICATION

GHS Classification

Corrosive to metals : Category 1

Skin corrosion : Category 1

Serious eye damage : Category 1

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : H290 May be corrosive to metals.
H314 Causes severe skin burns and eye damage.

Precautionary statements : **Prevention:**

P234 Keep only in original packaging.
P264 Wash skin thoroughly after handling.

P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.

Response:

P301 + P330 + P331 IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353 IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water.
P304 + P340 + P310 IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/doctor.
P305 + P351 + P338 + P310 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/doctor.
P363 Wash contaminated clothing before reuse.
P390 Absorb spillage to prevent material damage.

Storage:

P405 Store locked up.

Disposal:

P501 Dispose of contents/ container to an approved waste disposal plant.

Other hazards

None known.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Mixture

Hazardous components

Chemical name	CAS-No.	Concentration (% w/w)
SODIUM HYDROXIDE	1310-73-2	>= 5 - < 10

SECTION 4. FIRST AID MEASURES

General advice : Move out of dangerous area.
Consult a physician.
Show this safety data sheet to the doctor in attendance.
Do not leave the victim unattended.

If inhaled : Move to fresh air.
If breathed in, move person into fresh air.
Keep patient warm and at rest.
If unconscious, place in recovery position and seek medical advice.
If symptoms persist, call a physician.

In case of skin contact : If on skin, rinse well with water.
Wash contaminated clothing before re-use.

In case of eye contact	:	In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Continue rinsing eyes during transport to hospital. Remove contact lenses. Protect unharmed eye.
If swallowed	:	Get medical attention immediately. Do NOT induce vomiting. Rinse mouth with water. Do not give milk or alcoholic beverages. Never give anything by mouth to an unconscious person. If symptoms persist, call a physician.
Most important symptoms and effects, both acute and delayed	:	Signs and symptoms of exposure to this material through breathing, swallowing, and/or passage of the material through the skin may include: irritation (nose, throat, airways) Cough lung edema (fluid buildup in the lung tissue) Difficulty in breathing Causes serious eye damage. Causes severe burns.
Notes to physician	:	No hazards which require special first aid measures.

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media	:	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment. Water spray Foam Carbon dioxide (CO2) Dry chemical
Unsuitable extinguishing media	:	High volume water jet
Specific hazards during fire-fighting	:	Do not allow run-off from fire fighting to enter drains or water courses.
Hazardous combustion products	:	corrosive vapors Sodium oxides toxic fumes carbon dioxide and carbon monoxide Oxides of phosphorus
Specific extinguishing methods	:	Product is compatible with standard fire-fighting agents.
Further information	:	Fire residues and contaminated fire extinguishing water must

be disposed of in accordance with local regulations.

Special protective equipment for firefighters : In the event of fire, wear self-contained breathing apparatus.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures : Use personal protective equipment.
Persons not wearing protective equipment should be excluded from area of spill until clean-up has been completed.
Comply with all applicable federal, state, and local regulations.

Environmental precautions : Prevent product from entering drains.
Prevent further leakage or spillage if safe to do so.
If the product contaminates rivers and lakes or drains inform respective authorities.

Methods and materials for containment and cleaning up : Keep in suitable, closed containers for disposal.

SECTION 7. HANDLING AND STORAGE

Advice on protection against fire and explosion : Normal measures for preventive fire protection.

Advice on safe handling : Do not breathe vapours/dust.
When diluting, always add the product to water. Never add water to the product.
Container hazardous when empty.
Avoid contact with skin and eyes.
Smoking, eating and drinking should be prohibited in the application area.
For personal protection see section 8.
Dispose of rinse water in accordance with local and national regulations.

Conditions for safe storage : Keep container tightly closed in a dry and well-ventilated place.
Containers which are opened must be carefully resealed and kept upright to prevent leakage.
Observe label precautions.
Electrical installations / working materials must comply with the technological safety standards.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value type	Control parame-	Basis

		(Form of exposure)	ters / Permissible concentration	
SODIUM HYDROXIDE	1310-73-2	CEILING	2 mg/m3	CAD AB OEL
		CEILING	2 mg/m3	CAD BC OEL
		CEILING	2 mg/m3	CAD ON OEL
		CEILING	2 mg/m3	OEL (QUE)
		CEILING	2 mg/m3	CAD AB OEL
		CEILING	2 mg/m3	CAD BC OEL
		CEILING	2 mg/m3	CAD ON OEL
		CEILING	2 mg/m3	OEL (QUE)
		CEILING	2 mg/m3	CAD MB OEL

Engineering measures : Provide sufficient mechanical (general and/or local exhaust) ventilation to maintain exposure below exposure guidelines (if applicable) or below levels that cause known, suspected or apparent adverse effects.

Personal protective equipment

Hand protection

Remarks : The suitability for a specific workplace should be discussed with the producers of the protective gloves.

Eye protection : Wear chemical splash goggles and face shield when there is potential for exposure of the eyes or face to liquid, vapor or mist.
Maintain eye wash station in immediate work area.

Skin and body protection : Wear resistant gloves (consult your safety equipment supplier).
Wear as appropriate:
Impervious clothing
Chemical resistant apron
Safety shoes
Choose body protection according to the amount and concentration of the dangerous substance at the work place.
Discard gloves that show tears, pinholes, or signs of wear.

Hygiene measures : Wash hands before breaks and at the end of workday.
When using do not eat or drink.
Ensure that eyewash stations and safety showers are close to the workstation location.
When using do not smoke.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	liquid
Colour	:	colourless
Odour	:	No data available
Odour Threshold	:	No data available
pH	:	> 13.7
Melting point/freezing point	:	-4.4 °C
Boiling point/boiling range	:	100 °C
Flash point	:	Not applicable
Evaporation rate	:	No data available
Flammability (solid, gas)	:	No data available
Upper explosion limit	:	No data available
Lower explosion limit	:	No data available
Vapour pressure	:	23.3333333 hPa (20 °C) Calculated Vapor Pressure
Relative vapour density	:	No data available
Relative density	:	1.06
Density	:	1.06 g/cm3
Solubility(ies)		
Water solubility	:	soluble
Solubility in other solvents	:	No data available
Partition coefficient: n-octanol/water	:	No data available
Decomposition temperature	:	No data available
Viscosity		
Viscosity, dynamic	:	No data available
Viscosity, kinematic	:	No data available
Oxidizing properties	:	No data available

SECTION 10. STABILITY AND REACTIVITY

Reactivity	:	No decomposition if stored and applied as directed.
Chemical stability	:	Stable under recommended storage conditions.
Possibility of hazardous reactions	:	Product will not undergo hazardous polymerization.
Conditions to avoid	:	Exposure to sunlight. Exposure to moisture
Incompatible materials	:	Acids halogenated hydrocarbons Metals organic nitro compounds Strong oxidizing agents water
Hazardous decomposition products	:	**corrosive vapors** **Sodium oxides** **toxic fumes**

SECTION 11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Inhalation
Skin contact
Eye Contact
Ingestion

Acute toxicity

Not classified based on available information.

Product:

Acute oral toxicity	:	Acute toxicity estimate: > 5,000 mg/kg Method: Calculation method

Components:

SODIUM HYDROXIDE:

Acute oral toxicity	:	LD Lo (Rabbit): 500 mg/kg

Skin corrosion/irritation

Causes severe burns.

Product:

Remarks: **Causes severe skin burns and eye damage.**
The feeling of irritation or pain may be delayed.

Components:

SODIUM HYDROXIDE:

Assessment: Corrosive to skin
Result: Corrosive to skin

Serious eye damage/eye irritation

Causes serious eye damage.

Product:

Remarks: May cause irreversible eye damage.

Components:

SODIUM HYDROXIDE:

Result: Corrosive to eyes
Assessment: Corrosive to eyes

Respiratory or skin sensitisation

Skin sensitisation

Not classified based on available information.

Respiratory sensitisation

Not classified based on available information.

Germ cell mutagenicity

Not classified based on available information.

Carcinogenicity

Not classified based on available information.

Reproductive toxicity

Not classified based on available information.

STOT - single exposure

Not classified based on available information.

STOT - repeated exposure

Not classified based on available information.

Aspiration toxicity

Not classified based on available information.

Further information

Product:

Remarks: No data available

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Product:

Toxicity to fish : LC 50 (Oncorhynchus mykiss (rainbow trout)): 7,071 mg/l
Exposure time: 96 h
Test Type: static test

LC 50 (Pimephales promelas (fathead minnow)): 7,033 mg/l
Exposure time: 96 h
Test Type: static test

Toxicity to daphnia and other aquatic invertebrates : LC 50 (Water flea (Ceriodaphnia dubia)): 5,744 mg/l
Exposure time: 48 h
Test Type: static test

Components:

SODIUM HYDROXIDE

Toxicity to fish : LC 50 (Western mosquitofish (Gambusia affinis)): 125 mg/l
Exposure time: 96 h
Method: Static
Remarks: Mortality

Toxicity to daphnia and other aquatic invertebrates : EC 50 (Water flea (Daphnia magna)): 34.59 - 47.13 mg/l
Exposure time: 48 h
Remarks: Intoxication

Persistence and degradability

No data available

Bioaccumulative potential

No data available

Mobility in soil

No data available

Other adverse effects

Product:

Additional ecological information : No data available

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues : Do not dispose of waste into sewer.
Do not contaminate ponds, waterways or ditches with chemical or used container.

Send to a licensed waste management company.

Dispose of in accordance with all applicable local, state and federal regulations.

Contaminated packaging : Empty remaining contents.
Dispose of as unused product.
Empty containers should be taken to an approved waste handling site for recycling or disposal.
Do not re-use empty containers.

SECTION 14. TRANSPORT INFORMATION

International Regulation

IATA-DGR

UN/ID No.	:	UN 3266
Proper shipping name	:	Corrosive liquid, basic, inorganic, n.o.s. ()
Class	:	8
Packing group	:	III
Labels	:	Corrosive
Packing instruction (cargo aircraft)	:	856
Packing instruction (passenger aircraft)	:	852

IMDG-Code

UN number	:	UN 3266
Proper shipping name	:	CORROSIVE LIQUID, BASIC, INORGANIC, N.O.S. ()
Class	:	8
Packing group	:	III
Labels	:	8
EmS Code	:	F-A, S-B
Marine pollutant	:	no

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable for product as supplied.

National Regulations

TDG

UN number	:	UN 3266
Proper shipping name	:	CORROSIVE LIQUID, BASIC, INORGANIC, N.O.S. ()
Class	:	8
Packing group	:	III
Labels	:	8
Marine pollutant	:	no

SECTION 15. REGULATORY INFORMATION

The components of this product are reported in the following inventories:

AICS	On the inventory, or in compliance with the inventory
DSL	On the inventory, or in compliance with the inventory
ENCS	On the inventory, or in compliance with the inventory
IECSC	On the inventory, or in compliance with the inventory
KECI	On the inventory, or in compliance with the inventory
PICCS	On the inventory, or in compliance with the inventory
TSCA	On the inventory, or in compliance with the inventory

SECTION 16. OTHER INFORMATION

Further information
Revision Date: 05/05/2017

Full text of H-Statements referred to under sections 2 and 3.

Further information

Sources of key data used to compile the Safety Data Sheet
Key literature references and sources of data
SOLENIS Internal data
SOLENIS internal data including own and sponsored test reports
The UNECE administers regional agreements implementing harmonised classification for labelling (GHS) and transport.

The information accumulated herein is believed to be accurate but is not warranted to be whether originating with the company or not. Recipients are advised to confirm in advance of need that the information is current, applicable, and suitable to their circumstances. This MSDS has been prepared by the Solenis Environmental Health and Safety Department.

List of abbreviations and acronyms that could be, but not necessarily are, used in this safety data sheet :
ACGIH : American Conference of Industrial Hygienists
BEI : Biological Exposure Index
CAS : Chemical Abstracts Service (Division of the American Chemical Society).

CMR : Carcinogenic, Mutagenic or Toxic for Reproduction
FG : Food grade
GHS : Globally Harmonized System of Classification and Labeling of Chemicals.
H-statement : Hazard Statement
IATA : International Air Transport Association.
IATA-DGR : Dangerous Goods Regulation by the “International Air Transport Association” (IATA).

ICAO : International Civil Aviation Organization
ICAO-TI (ICAO) : Technical Instructions by the “International Civil Aviation Organization”
IMDG : International Maritime Code for Dangerous Goods
ISO : International Organization for Standardization
logPow : octanol-water partition coefficient
LCxx : Lethal Concentration, for xx percent of test population
LDxx : Lethal Dose, for xx percent of test population.
ICxx : Inhibitory Concentration for xx of a substance
Ecxx : Effective Concentration of xx
N.O.S.: Not Otherwise Specified
OECD : Organization for Economic Co-operation and Development
OEL : Occupational Exposure Limit
P-Statement : Precautionary Statement
PBT : Persistent , Bioaccumulative and Toxic
PPE : Personal Protective Equipment
STEL : Short-term exposure limit
STOT : Specific Target Organ Toxicity
TLV : Threshold Limit Value
TWA : Time-weighted average
vPvB : Very Persistent and Very Bioaccumulative
WEL : Workplace Exposure Level

CERCLA : Comprehensive Environmental Response, Compensation, and Liability Act
DOT : Department of Transportation
FIFRA : Federal Insecticide, Fungicide, and Rodenticide Act
HMIRC : Hazardous Materials Information Review Commission
HMIS : Hazardous Materials Identification System
NFPA : National Fire Protection Association
NIOSH : National Institute for Occupational Safety and Health
OSHA : Occupational Safety and Health Administration
PMRA : Health Canada Pest Management Regulatory Agency
RTK : Right to Know
WHMIS : Workplace Hazardous Materials Information System

29 CFR 1910.1200 (OSHA HazCom 2012)

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product identifier

Trade name : SODIUM HYDROXIDE 25%

Recommended use of the chemical and restrictions on use

Details of the supplier of the safety data sheet	**Emergency telephone number**
Solenis LLC 500 Hercules Road Wilmington, Delaware 19808 United States of America RegulatoryRequestsNA@solenis.com	1-844-SOLENIS (844-765-3647) / 606-329-5705 **Product Information** 1-844-SOLENIS (844-765-3647)

SECTION 2. HAZARDS IDENTIFICATION

GHS Classification

Corrosive to Metals : Category 1

Skin corrosion : Category 1

Serious eye damage : Category 1

GHS Label element

Hazard pictograms :

Signal Word : Danger

Hazard Statements : May be corrosive to metals.
Causes severe skin burns and eye damage.
Causes serious eye damage.

Precautionary Statements : **Prevention:**

Keep only in original container.
Wash skin thoroughly after handling.
Wear protective gloves/ protective clothing/ eye protection/ face protection.
Response:
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER or doctor/ physician.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/ physician.
Wash contaminated clothing before reuse.
Absorb spillage to prevent material damage.
Storage:
Store locked up.
Store in corrosive resistant stainless steel container with a resistant inner liner.
Disposal:
Dispose of contents/ container to an approved waste disposal plant.

Other hazards

None known.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Mixture

Hazardous components

Chemical Name	CAS-No.	Classification	Concentration (%)
SODIUM HYDROXIDE	1310-73-2	Met. Corr. 1; H290 Skin Corr. 1; H314 Eye Dam. 1; H318	>= 20.00 - < 30.00

Trade Secret Composition - conceal concentration

SECTION 4. FIRST AID MEASURES

General advice	:	Move out of dangerous area. Consult a physician. Show this safety data sheet to the doctor in attendance. Do not leave the victim unattended.
If inhaled	:	Move to fresh air. If breathed in, move person into fresh air. Keep patient warm and at rest. If unconscious place in recovery position and seek medical advice. If symptoms persist, call a physician.
In case of skin contact	:	If on skin, rinse well with water. Wash contaminated clothing before re-use.
In case of eye contact	:	In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Continue rinsing eyes during transport to hospital. Remove contact lenses. Protect unharmed eye.
If swallowed	:	Get medical attention immediately. Do NOT induce vomiting. Rinse mouth with water. Do not give milk or alcoholic beverages. Never give anything by mouth to an unconscious person. If symptoms persist, call a physician.
Most important symptoms and effects, both acute and delayed	:	Signs and symptoms of exposure to this material through breathing, swallowing, and/or passage of the material through the skin may include: irritation (nose, throat, airways) Cough lung edema (fluid buildup in the lung tissue) Difficulty in breathing Causes serious eye damage. Causes severe burns.
Notes to physician	:	No hazards which require special first aid measures.

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media	:	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Water spray
Foam
Carbon dioxide (CO2)
Dry chemical

Unsuitable extinguishing media : High volume water jet

Specific hazards during firefighting : Do not allow run-off from fire fighting to enter drains or water courses.

Hazardous combustion products : corrosive vapors
Sodium oxides
toxic fumes

Specific extinguishing methods :

Product is compatible with standard fire-fighting agents.

Further information : Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations.

Special protective equipment for firefighters : In the event of fire, wear self-contained breathing apparatus.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures : Use personal protective equipment.
Persons not wearing protective equipment should be excluded from area of spill until clean-up has been completed.

Environmental precautions : Prevent product from entering drains.
Prevent further leakage or spillage if safe to do so.
If the product contaminates rivers and lakes or drains inform respective authorities.

Methods and materials for containment and cleaning up : Keep in suitable, closed containers for disposal.

Other information : Comply with all applicable federal, state, and local regulations.

SECTION 7. HANDLING AND STORAGE

Advice on safe handling : Do not breathe vapours/dust.
When diluting, always add the product to water. Never add

water to the product.
Container hazardous when empty.
Avoid contact with skin and eyes.
Smoking, eating and drinking should be prohibited in the application area.
For personal protection see section 8.
Dispose of rinse water in accordance with local and national regulations.

Conditions for safe storage : Keep container tightly closed in a dry and well-ventilated place.
Containers which are opened must be carefully resealed and kept upright to prevent leakage.
Observe label precautions.
Electrical installations / working materials must comply with the technological safety standards.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
SODIUM HYDROXIDE	1310-73-2	Ceiling	2 mg/m3	ACGIH
		Ceil_Time	2 mg/m3	NIOSH/GUIDE
		PEL	2 mg/m3	OSHA_TRANS
		Ceiling	2 mg/m3	TN OEL

Engineering measures : Provide sufficient mechanical (general and/or local exhaust) ventilation to maintain exposure below exposure guidelines (if applicable) or below levels that cause known, suspected or apparent adverse effects.

Personal protective equipment

Hand protection

Remarks : The suitability for a specific workplace should be discussed with the producers of the protective gloves.

Eye protection : Wear chemical splash goggles and face shield when there is potential for exposure of the eyes or face to liquid, vapor or mist.
Maintain eye wash station in immediate work area.

Skin and body protection	:	Wear as appropriate: impervious clothing Chemical resistant apron Safety shoes Choose body protection according to the amount and concentration of the dangerous substance at the work place. Discard gloves that show tears, pinholes, or signs of wear. Wear resistant gloves (consult your safety equipment supplier).
Hygiene measures	:	Wash hands before breaks and at the end of workday. When using do not eat or drink. Ensure that eyewash stations and safety showers are close to the workstation location. When using do not smoke.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state	:	liquid
Colour	:	transparent
Odour	:	No data available
Odour Threshold	:	No data available
pH	:	> 13
Melting point/freezing point	:	No data available
Boiling point/boiling range	:	No data available
Flash point	:	does not flash
Evaporation rate	:	No data available
Flammability (solid, gas)	:	No data available
Upper explosion limit	:	No data available
Lower explosion limit	:	No data available
Vapour pressure	:	No data available
Relative vapour density	:	No data available
Relative density	:	+/- 9 1,274.00 (20.00 °C)

Density	:	+/- 9 1,274.00 g/cm3 (20.00 °C)
Solubility(ies)		
Water solubility	:	No data available
Solubility in other solvents	:	No data available
Partition coefficient: n-octanol/water	:	No data available
Thermal decomposition	:	No data available
Viscosity		
Viscosity, dynamic	:	No data available
Viscosity, kinematic	:	No data available
Oxidizing properties	:	No data available

SECTION 10. STABILITY AND REACTIVITY

Reactivity	:	No decomposition if stored and applied as directed.
Chemical stability	:	Stable under recommended storage conditions.
Possibility of hazardous reactions	:	Product will not undergo hazardous polymerization.
Conditions to avoid	:	Exposure to sunlight. Exposure to moisture
Incompatible materials	:	Acids halogenated hydrocarbons Metals organic nitro compounds Strong oxidizing agents water
Hazardous decomposition products		corrosive vapors Sodium oxides toxic fumes

SECTION 11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure : Inhalation
Skin contact
Eye Contact
Ingestion

Acute toxicity
Not classified based on available information.
Components:
SODIUM HYDROXIDE**:**
Acute oral toxicity : LD Lo (Rabbit): 500 mg/kg

Skin corrosion/irritation
Causes severe burns.
Product:
Remarks: Causes severe skin burns and eye damage., The feeling of irritation or pain may be delayed.

Components:
SODIUM HYDROXIDE**:**
Result: Corrosive to skin

Serious eye damage/eye irritation
Causes serious eye damage.
Product:
Remarks: May cause irreversible eye damage.

Components:
SODIUM HYDROXIDE**:**
Result: Corrosive to eyes

Respiratory or skin sensitisation
Skin sensitisation: Not classified based on available information.
Respiratory sensitisation: Not classified based on available information.
Germ cell mutagenicity
Not classified based on available information.
Carcinogenicity
Not classified based on available information.
Reproductive toxicity
Not classified based on available information.
STOT - single exposure
Not classified based on available information.
STOT - repeated exposure
Not classified based on available information.
Aspiration toxicity
Not classified based on available information.

Further information
Product:
Remarks: No data available

Carcinogenicity:

IARC	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
OSHA	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.
NTP	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Components:
SODIUM HYDROXIDE**:**

Toxicity to fish	:	LC 50 (Western mosquitofish (Gambusia affinis)): 125 mg/l Exposure time: 96 h Method: Static Remarks: Mortality
Toxicity to daphnia and other aquatic invertebrates	:	EC 50 (Water flea (Daphnia magna)): 34.59 - 47.13 mg/l Exposure time: 48 h Remarks: Intoxication

Persistence and degradability

Components:
No data available

Bioaccumulative potential

Components:
No data available

Mobility in soil

Components:
No data available

Other adverse effects

No data available

Product:

Additional ecological information : An environmental hazard cannot be excluded in the event of unprofessional handling or disposal., Harmful to aquatic life.

Components:

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

General advice : The product should not be allowed to enter drains, water courses or the soil.
Do not contaminate ponds, waterways or ditches with chemical or used container.
Send to a licensed waste management company.

Dispose of in accordance with all applicable local, state and federal regulations.

Contaminated packaging : Empty remaining contents.
Dispose of as unused product.
Empty containers should be taken to an approved waste handling site for recycling or disposal.
Do not re-use empty containers.

SECTION 14. TRANSPORT INFORMATION

International transport regulations

REGULATION

ID NUMBER	PROPER SHIPPING NAME	*HAZARD CLASS	SUBSIDIARY HAZARDS	PACKING GROUP	MARINE POLLUTANT / LTD. QTY.

U.S. DOT - ROAD

UN	1824	Sodium hydroxide solution	8	II	

U.S. DOT - RAIL

UN	1824	Sodium hydroxide solution	8	II	

U.S. DOT - INLAND WATERWAYS

UN	1824	Sodium hydroxide solution	8	II	

TRANSPORT CANADA - ROAD

UN	1824	SODIUM HYDROXIDE SOLUTION	8	II

TRANSPORT CANADA - RAIL

UN	1824	SODIUM HYDROXIDE SOLUTION	8	II

INTERNATIONAL MARITIME DANGEROUS GOODS

UN	1824	SODIUM HYDROXIDE SOLUTION	8	II

INTERNATIONAL AIR TRANSPORT ASSOCIATION - CARGO

UN	1824	Sodium hydroxide solution	8	II

INTERNATIONAL AIR TRANSPORT ASSOCIATION - PASSENGER

UN	1824	Sodium hydroxide solution	8	II

MEXICAN REGULATION FOR THE LAND TRANSPORT OF HAZARDOUS MATERIALS AND WASTES

UN	1824	HIDROXIDO DE SODIO EN SOLUCION	8	II

***ORM = ORM-D, CBL = COMBUSTIBLE LIQUID**

Marine pollutant		no

Dangerous goods descriptions (if indicated above) may not reflect quantity, end-use or region-specific exceptions that can be applied. Consult shipping documents for descriptions that are specific to the shipment.

SECTION 15. REGULATORY INFORMATION

EPCRA - Emergency Planning and Community Right-to-Know Act

CERCLA Reportable Quantity

Components	CAS-No.	Component RQ (lbs)	Calculated product RQ (lbs)

SODIUM HYDROXIDE	1310-73-2	1000	3921.568627

SARA 311/312 Hazards : Acute Health Hazard

US State Regulations

Pennsylvania Right To Know

SODIUM HYDROXIDE	1310-73-2	0.00 - 0.00
Trade Secret Composition - conceal concentration		
WATER	7732-18-5	0.00 - 0.00

New Jersey Right To Know

SODIUM HYDROXIDE	1310-73-2	0.00 - 0.00
Trade Secret Composition - conceal concentration		
WATER	7732-18-5	0.00 - 0.00

California Prop 65 This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

The components of this product are reported in the following inventories:

TSCA : On TSCA Inventory

DSL : All components of this product are on the Canadian DSL.

AUSTR : On the inventory, or in compliance with the inventory

NZIOC : On the inventory, or in compliance with the inventory

ENCS : On the inventory, or in compliance with the inventory

KECL : On the inventory, or in compliance with the inventory

PHIL : On the inventory, or in compliance with the inventory

IECSC : On the inventory, or in compliance with the inventory

Inventories

AICS (Australia), DSL (Canada), IECSC (China), REACH (European Union), ENCS (Japan), ISHL (Japan), KECI (Korea), NZIoC (New Zealand), PICCS (Philippines), TSCA (USA)

SECTION 16. OTHER INFORMATION

Further information
Revision Date: 01/26/2016

Full text of H-Statements referred to under sections 2 and 3.

H290	May be corrosive to metals.
H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.
H402	Harmful to aquatic life.

Further information

Sources of key data used to compile the Safety Data Sheet
Key literature references and sources of data
SOLENIS Internal data
SOLENIS internal data including own and sponsored test reports
The UNECE administers regional agreements implementing harmonised classification for labelling (GHS) and transport.

The information accumulated herein is believed to be accurate but is not warranted to be whether originating with the company or not. Recipients are advised to confirm in advance of need that the information is current, applicable, and suitable to their circumstances. This MSDS has been prepared by the Solenis Environmental Health and Safety Department.

List of abbreviations and acronyms that could be, but not necessarily are, used in this safety data sheet :

ACGIH : American Conference of Industrial Hygienists
BEI : Biological Exposure Index
CAS : Chemical Abstracts Service (Division of the American Chemical Society).
CMR : Carcinogenic, Mutagenic or Toxic for Reproduction
FG : Food grade
GHS : Globally Harmonized System of Classification and Labeling of Chemicals.
H-statement : Hazard Statement
IATA : International Air Transport Association.
IATA-DGR : Dangerous Goods Regulation by the “International Air Transport Association” (IATA).
ICAO : International Civil Aviation Organization
ICAO-TI (ICAO) : Technical Instructions by the “International Civil Aviation Organization”
IMDG : International Maritime Code for Dangerous Goods
ISO : International Organization for Standardization
logPow : octanol-water partition coefficient
LCxx : Lethal Concentration, for xx percent of test population
LDxx : Lethal Dose, for xx percent of test population.
ICxx : Inhibitory Concentration for xx of a substance
Ecxx : Effective Concentration of xx
N.O.S.: Not Otherwise Specified

OECD : Organization for Economic Co-operation and Development
OEL : Occupational Exposure Limit
P-Statement : Precautionary Statement
PBT : Persistent , Bioaccumulative and Toxic
PPE : Personal Protective Equipment
STEL : Short-term exposure limit
STOT : Specific Target Organ Toxicity
TLV : Threshold Limit Value
TWA : Time-weighted average
vPvB : Very Persistent and Very Bioaccumulative
WEL : Workplace Exposure Level

CERCLA : Comprehensive Environmental Response, Compensation, and Liability Act
DOT : Department of Transportation
FIFRA : Federal Insecticide, Fungicide, and Rodenticide Act
HMIRC : Hazardous Materials Information Review Commission
HMIS : Hazardous Materials Identification System
NFPA : National Fire Protection Association
NIOSH : National Institute for Occupational Safety and Health
OSHA : Occupational Safety and Health Administration
PMRA : Health Canada Pest Management Regulatory Agency
RTK : Right to Know
WHMIS : Workplace Hazardous Materials Information System

COMPANY IDENTITY: Univar
PRODUCT IDENTITY: CITRIC ACID, SOLUTION

SDS DATE: 12/05/2013
REPLACES: 07/22/2013

SAFETY DATA SHEET

This Safety Data Sheet conforms to ANSI Z400.5, and to the format requirements and the International Chemical Safety Cards of the Global Harmonizing System.
THIS SDS COMPLIES WITH 29 CFR 1910.1200 (HAZARD COMMUNICATION STANDARD)
IMPORTANT: Read this SDS before handling & disposing of this product.
Pass this information on to employees, customers, & users of this product.

SECTION 1. IDENTIFICATION OF THE SUBSTANCE OR MIXTURE AND OF THE SUPPLIER

PRODUCT IDENTITY: CITRIC ACID, SOLUTION
SDS NUMBER: CDS-2171
COMPANY IDENTITY: Univar
COMPANY ADDRESS: 17425 NE Union Hill Road
COMPANY CITY: Redmond, WA 98052
COMPANY PHONE: 1-425-889-3400
EMERGENCY PHONES: CHEMTREC: 1-800-424-9300 (USA)
CANUTEC: 1-613-996-6666 (CANADA)

SECTION 2. HAZARDS IDENTIFICATION

WARNING!

HAZARD STATEMENTS:
H100s = General, H200s = Physical, H300s = Health, H400s = Environmental
H315 Causes skin irritation.
H320 Causes eye irritation.

PRECAUTIONARY STATEMENTS:
P100s = General, P200s = Prevention, P300s = Response, P400s = Storage, P500s = Disposal
P262 Do not get in eyes, on skin, or on clothing.
P280 Wear protective gloves/protective clothing/eye protection/face protection.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

MATERIAL	CAS#	EINECS#	WT %
Water	7732-18-5	231-791-2	55-65
Citric Acid	77-92-9	-	45-50

TRACE COMPONENTS: Trace ingredients (if any) are present in < 1% concentration, (< 0.1% for potential carcinogens, reproductive toxins, respiratory tract mutagens, and sensitizers). None of the trace ingredients contribute significant additional hazards at the concentrations that may be present in this product. All pertinent hazard information has been provided in this document, per the requirements of the Federal Occupational Safety and Health Administration Standard (29 CFR 1910.1200), U.S. State equivalents, and Canadian Hazardous Materials Identification System Standard (CPR 4).

SEE SECTIONS 8, 11 & 12 FOR TOXICOLOGICAL INFORMATION.

SECTION 4. FIRST AID MEASURES

GENERAL ADVICE:
First Aid responders should pay attention to self-protection and use the recommended protective clothing (chemical resistant gloves, splash protection). If potential for exposure exists, refer to Section 8 for specific personal protective equipment.

EYE CONTACT:
If this product enters the eyes, open eyes while under gently running water. Use sufficient force to open eyelids. "Roll" eyes to expose more surface. Minimum flushing is for 15 minutes. Seek immediate medical attention.

SKIN CONTACT:
If the product contaminates the skin, immediately begin decontamination with running water. Minimum flushing is for 15 minutes. Remove contaminated clothing, taking care not to contaminate eyes. If skin becomes irritated and irritation persists, medical attention may be necessary. Wash contaminated clothing before reuse, discard contaminated shoes.

INHALATION:
After high vapor exposure, remove to fresh air. If breathing is difficult, give oxygen. If breathing has stopped, trained personnel should immediately begin artificial respiration. If the heart has stopped, trained personnel should immediately begin cardiopulmonary resuscitation (CPR). Seek immediate medical attention.

SWALLOWING:
If swallowed, CALL PHYSICIAN OR POISON CONTROL CENTER FOR MOST CURRENT INFORMATION. If professional advice is not available, give two glasses of water to drink. DO NOT INDUCE VOMITING. Never induce vomiting or give liquids to someone who is unconscious, having convulsions, or unable to swallow. Seek immediate medical attention.

NOTES TO PHYSICIAN:
There is no specific antidote. Treatment of overexposure should be directed at the control of symptoms and the clinical condition of the patient. Any material aspirated during vomiting may cause lung injury. Therefore, emesis should not be induced mechanically or pharmacologically. If it is considered necessary to evacuate the stomach contents, this should be done by means least likely to cause aspiration (such as: Gastric lavage after endotracheal intubation).

SECTION 5. FIRE FIGHTING MEASURES

FIRE & EXPLOSION PREVENTIVE MEASURES
Isolate from strong oxidizers, extreme heat and open flame.

EXTINGUISHING MEDIA
Use appropriate extinguishing media.

SPECIAL FIRE FIGHTING PROCEDURES
Water spray may be ineffective on fire but can protect fire-fighters & cool closed containers. Use fog nozzles if water is used.
Do not enter confined fire-space without full bunker gear.
(Helmet with face shield, bunker coats, gloves & rubber boots).
Use NIOSH approved positive-pressure self-contained breathing apparatus.

SECTION 5. FIRE FIGHTING MEASURES (CONTINUED)

UNUSUAL EXPLOSION AND FIRE PROCEDURES
Reacts with most metals producing hydrogen which is extremely flammable & may explode. Applying to hot surfaces requires special precautions. Closed containers may explode if exposed to extreme heat.

SECTION 6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE AND ENVIRONMENTAL PRECAUTIONS:
Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a spill, clear the affected area, protect people, and respond with trained personnel.

PERSONAL PROTECTIVE EQUIPMENT
The proper personal protective equipment for incidental releases (such as: 1 Liter of the product released in a well-ventilated area), use impermeable gloves (triple-gloves (rubber gloves and nitrile gloves, over latex gloves), goggles, face shield, and appropriate body protection. In the event of a large release, use impermeable gloves, specific for the material handled, chemically resistant suit and boots, and hard hat. Self-Contained Breathing Apparatus or respirator may be required where engineering controls are not adequate or conditions for potential exposure exist. When respirators are required, select NIOSH/MSHA approved based on actual or potential airborne concentrations in accordance with latest OSHA and/or ANSI recommendations.

ENVIRONMENTAL PRECAUTIONS:
Stop spill at source. Construct temporary dikes of dirt, sand, or any appropriate readily available material to prevent spreading of the material. Close or cap valves and/or block or plug hole in leaking container and transfer to another container. Keep from entering storm sewers and ditches which lead to waterways, and if necessary, call the local fire or police department for immediate emergency assistance.

CONTAINMENT AND CLEAN-UP MEASURES:
Absorb spilled liquid with polypads or other suitable absorbent materials. If necessary, neutralize using suitable buffering material, (acid with soda ash or base with phosphoric acid), and test area with litmus paper to confirm neutralization. Clean up with non-combustible absorbent (such as: sand, soil, and so on). Shovel up and place all spill residue in suitable containers. dispose of at an appropriate waste disposal facility according to current applicable laws and regulations and product characteristics at time of disposal (see Section 13 - Disposal Considerations).

SECTION 7. HANDLING AND STORAGE

HANDLING
Use only with adequate ventilation. Do not get in eyes, on skin or clothing.
Wear OSHA Standard full face shield. Consult Safety Equipment Supplier. Wear goggles, face shield, gloves, apron & footwear impervious to material. Wash clothing before reuse.

STORAGE
Isolate from strong oxidants. Do not store above 49 C/120 F.
Keep container tightly closed & upright when not in use to prevent leakage.
Reacts with most metals producing hydrogen which is extremely flammable & may explode.
Wear full face shield, gloves & full protective clothing when opening or handling.
When empty, drain completely, replace bungs securely.

SECTION 7. HANDLING AND STORAGE (CONTINUED)

NONBULK: CONTAINERS:
Store containers in a cool, dry location, away from direct sunlight, sources of intense heat, or where freezing is possible. Material should be stored in secondary containers or in a diked area, as appropriate. Store containers away from incompatible chemicals (see Section 10, Stability and Reactivity). Post warning and "NO SMOKING" signs in storage and use areas, as appropriate. Empty containers should be handled with care. Never store food, feed, or drinking water in containers which held this product.

BULK CONTAINERS:
All tanks and pipelines which contain this material must be labeled. Perform routine maintenance on tanks or pipelines which contain this product. Report all leaks immediately to the proper personnel.

TANK CAR SHIPMENTS:
Tank cars carrying this product should be loaded and unloaded in strict accordance with tank-car manufacturer's recommendation and all established on-site safety procedures. Appropriate personal protective equipment must be used (see Section 8, Engineering Controls and Personal Protective Equipment.). All loading and unloading equipment must be inspected, prior to each use. Loading and unloading operations must be attended, at all times. Tank cars must be level, brakes must be set or wheels must be locked or blocked prior to loading or unloading. Tank car (for loading) or storage tanks (for unloading) must be verified to be correct for receiving this product and be properly prepared, prior to starting the transfer operations. Hoses must be verified to be in the correct positions, before starting transfer operations. A sample (if required) must be taken and verified (if required) prior to starting transfer operations. All lines must be blown-down and purged before disconnecting them from the tank car or vessel.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT:
Follow practices indicated in Section 6 (Accidental Release Measures). Make certain application equipment is locked and tagged-out safely. Always use this product in areas where adequate ventilation is provided. Collect all rinsates and dispose of according to applicable Federal, State, Provincial, or local procedures.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

MATERIAL	CAS#	EINECS#	TWA (OSHA)	TLV (ACGIH)
Water	7732-18-5	231-791-2	None Known	None Known
Citric Acid	77-92-9	-	None Known	None Known

This product contains no EPA Hazardous Air Pollutants (HAP) in amounts > 0.1%.

RESPIRATORY EXPOSURE CONTROLS
A respiratory protection program that meets OSHA 29 CFR 1910.134 and ANSI Z86.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant a respirator's use.

VENTILATION

LOCAL EXHAUST:	Necessary	MECHANICAL (GENERAL):	Acceptable
SPECIAL:	None	OTHER:	None

Please refer to ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

PERSONAL PROTECTIONS:
Wear OSHA Standard goggles or face shield. Consult Safety Equipment Supplier. Wear goggles, face shield, gloves, apron & footwear impervious to material. Wash clothing before reuse.

WORK & HYGIENIC PRACTICES:
Provide readily accessible eye wash stations & safety showers.
Wash at end of each workshift & before eating, smoking or using the toilet.
Promptly remove clothing that becomes contaminated. Destroy contaminated leather articles. Launder or discard contaminated clothing.

COMPANY IDENTITY: Univar SDS DATE: 12/05/2013
PRODUCT IDENTITY: CITRIC ACID, SOLUTION REPLACES: 07/22/2013

SECTION 9. PHYSICAL & CHEMICAL PROPERTIES

APPEARANCE:	Liquid, Water-White
ODOR:	None
ODOR THRESHOLD:	Not Available
pH (Neutrality):	< 2.0
MELTING POINT/FREEZING POINT:	Not Available
BOILING RANGE (IBP,50%,Dry Point):	100 100 100* C/212 212 212* F(*=End Point)
FLASH POINT (TEST METHOD):	Not Applicable
EVAPORATION RATE (n-BUTYL ACETATE=1):	Not Applicable
FLAMMABILITY CLASSIFICATION:	Non-Combustible
LOWER FLAMMABLE LIMIT IN AIR (% by vol):	Not Applicable
UPPER FLAMMABLE LIMIT IN AIR (% by vol):	Not Available
VAPOR PRESSURE (mm of Hg)@20 C	17.5
VAPOR DENSITY (air=1):	0.670
GRAVITY @ 68/68 F / 20/20 C:	
SPECIFIC GRAVITY (Water=1):	1.240
POUNDS/GALLON:	10.329
WATER SOLUBILITY:	Complete
PARTITION COEFFICIENT (n-Octane/Water):	Not Available
AUTO IGNITION TEMPERATURE:	Not Applicable
DECOMPOSITION TEMPERATURE:	Not Available
VOCs (>0.044 Lbs/Sq In) :	0.0 Vol% /0.0 g/L / 0.000 Lbs/Gal
TOTAL VOC'S (TVOC)*:	0.0 Vol% /0.0 g/L / 0.000 Lbs/Gal
NONEXEMPT VOC'S (CVOC)*:	0.0 Vol% /0.0 g/L / 0.000 Lbs/Gal
HAZARDOUS AIR POLLUTANTS (HAPS):	0.0 Wt% /0.0 g/L / 0.000 Lbs/Gal
NONEXEMPT VOC PARTIAL PRESSURE (mm of Hg @ 20 C)	0.0

* Using CARB (California Air Resources Board Rules).

SECTION 10. STABILITY & REACTIVITY

STABILITY
Stable but Reacts with most metals producing hydrogen which is extremely flammable & may explode.

CONDITIONS TO AVOID
Isolate from extreme heat and open flame

MATERIALS TO AVOID
Isolate from alkalis.

HAZARDOUS DECOMPOSITION PRODUCTS
Carbon Oxides from heating.

HAZARDOUS POLYMERIZATION
Will not occur.

SECTION 11. TOXICOLOGICAL INFORMATION

ACUTE HAZARDS

EYE & SKIN CONTACT:
Severe irritation to skin, defatting.
Severe irritation to eyes, redness, tearing, blurred vision.
Wash thoroughly after handling.

INHALATION:
May be irritating to the respiratory system.

SWALLOWING:
May be irritating to the digestive system.

SUBCHRONIC HAZARDS/CONDITIONS AGGRAVATED

CONDITIONS AGGRAVATED:
None Known.

CHRONIC HAZARDS

CANCER, REPRODUCTIVE & OTHER CHRONIC HAZARDS:
This product has no carcinogens listed by IARC, NTP, NIOSH, OSHA or ACGIH, as of this date, greater or equal to 0.1%.

IRRITANCY OF PRODUCT: This product is irritating to contaminated tissue.
SENSITIZATION TO THE PRODUCT: No component of this product is known to be a sensitizer.
MUTAGENICITY: This product is not reported to produce mutagenic effects in humans.
EMBRYOTOXICITY: This product is not reported to produce embryotoxic effects in humans.
TERATOGENICITY: This product is not reported to produce teratogenic effects in humans.
REPRODUCTIVE TOXICITY: This product is not reported to cause reproductive effects in humans.

A mutagen is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generational lines. An embryotoxin is a chemical which causes damage to a developing embryo (such as: within the eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A teratogen is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance which interferes in any way with the reproductive process.

MAMMALIAN TOXICITY INFORMATION

No mammalian information is available on this product.

SECTION 12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

EFFECT OF MATERIAL ON PLANTS AND ANIMALS:
This product may be harmful or fatal to plant and animal life if released into the environment. Refer to Section 11 (Toxicological Information) for further data on the effects of this product's components on test animals.

EFFECT OF MATERIAL ON AQUATIC LIFE:
No aquatic environmental information is available on this product.

MOBILITY IN SOIL
Mobility of this material has not been determined.

DEGRADABILITY
This product is completely biodegradable.

ACCUMULATION
Bioaccumulation of this product has not been determined.

SECTION 13. DISPOSAL CONSIDERATIONS

Processing, use or contamination may change the waste disposal requirements. Do not dispose of on land, in surface waters, or in storm drains. Waste should be recycled or disposed of in accordance with regulations. Large amounts should be collected for reuse or consigned to licensed hazardous waste haulers for disposal.
ALL DISPOSAL MUST BE IN ACCORDANCE WITH ALL FEDERAL, STATE, PROVINCIAL, AND LOCAL REGULATIONS. IF IN DOUBT, CONTACT PROPER AGENCIES. EPA CHARACTERISTIC: D002

SECTION 14. TRANSPORT INFORMATION

DOT/TDG SHIP NAME: Not Regulated
DRUM LABEL: None
IATA / ICAO: Not Regulated
IMO / IMDG: Not Regulated
EMERGENCY RESPONSE GUIDEBOOK NUMBER: None

SECTION 15. REGULATORY INFORMATION

EPA REGULATION:
SARA SECTION 311/312 HAZARDS: Acute Health

All components of this product are on the TSCA list.
This material contains no known products restricted under SARA Title III, Section 313 in amounts greater or equal to 1%.

STATE REGULATIONS:
CALIFORNIA SAFE DRINKING WATER & TOXIC ENFORCEMENT ACT (PROPOSITION 65):
This product contains no chemicals known to the State of California to cause cancer or reproductive toxicity.

INTERNATIONAL REGULATIONS
The components of this product are listed on the chemical inventories of the following countries:
Australia (AICS), Canada (DSL or NDSL), China (IECSC), Europe (EINECS, ELINCS)G
Japan (METI/CSCL, MHLW/ISHL), South Korea (KECI), New Zealand (NZIoC),
Philippines (PICCS), Switzerland (SWISS), Taiwan (NECSI), USA (TSCA).

SECTION 15. REGULATORY INFORMATION (CONTINUED)

CANADA: WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS)
D2B: Irritating to skin / eyes.
E: Corrosive Material.

This product has been classified in accordance with hazard criteria of the Controlled Products Regulations (CPR) and the SDS contains all the information required by the CPR.

SECTION 16. OTHER INFORMATION

HAZARD RATINGS:
HEALTH (NFPA): 1, HEALTH (HMIS): 1, FLAMMABILITY: 0, PHYSICAL HAZARD: 0
(Personal Protection Rating to be supplied by user based on use conditions.)
This information is intended solely for the use of individuals trained in the NFPA & HMIS hazard rating systems.

EMPLOYEE TRAINING
See Section 2 for Risk & Safety Statements. Employees should be made aware of all hazards of this material (as stated in this SDS) before handling it.

Univar USA Inc Material Safety Data Sheet

For Additional Information contact MSDS Coordinator during business hours, Pacific time: (425) 889-3400

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CHEMQUEST CHEMICALS
Custom Blending and Processing

9730 Bay Area Blvd.
Pasadena, TX 77507
(281) 291-9966office | (281) 291-9988fax
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www.chemquestchemicals.com

MATERIAL SAFETY DATA SHEET
SULFURIC ACID 50% SOLUTION

REVISION DATE: 6/27/12

PRODUCT NAME: SULFURIC ACID 50% SOLUTION
PRODUCT CODE: CQ-SLS-FPS-4006.50
BILLING CODE: 4006.50

CAS #: 7664-93-9 FORMULA: H_2SO_4

TRADE NAME: SULFURIC ACID

MANUFACTURERS NAME: CHEMQUEST CHEMICALS, LLC.
9730 BAY AREA BLVD.
PASADENA, TEXAS 77507
(281) 291-9966

EMERGENCY PHONE NUMBER: (800) 424-9300 CHEMTREC

DOT SHIPPING NAME: SULFURIC ACID

DOT CLASSIFICATION: CLASS 8, UN 2796, PACKING II

DOT LABELS: CORROSIVE

REPORTABLE QUANITY: 1,000 LBS.

SECTION I INGREDIENTS/SUMMARY OF HAZARDS

COMPONENT	CAS NO.	PERCENT
SULFURIC ACID	7664-93-9	50%
WATER	7732-18-5	BALANCE

WARNING STATEMENTS: DANGER! CAUSES SEVERE BURNS-REACTS VIOLENTLY WITH WATER. CONTENTS MAY BE UNDER PRESSURE OF EXPLOSIVE HYDROGEN GAS. HIGHLY REACTIVE AND CAPABLE OF IGNITING COMBUSTIBLE MATERIAL ON CONTACT.

DO NOT GET IN EYES, ON SKIN, ON CLOTHING. DO NOT BREATHE VAPOR OR MISTS. DO NOT TAKE INTERNALLY. USE ONLY WITH ADEQUATE VENTILATION. WEAR GOGGLES, FACE SHIELD, RUBBER GLOVES AND APPROPRIATE PROTECTIVE CLOTHING WHEN HANDLING. WASH THOROUGHLY AFTER HANDLING. KEEP FROM CONTACT WITH CLOTHING AND WITH OTHER COMBUSTIBLE MATERIALS. DO NOT STORE NEAR COMBUSTIBLE MATERIALS. DO NOT ALLOW WATER TO GET INTO CONTAINER BECAUSE OF VIOLENT REACTION. WHEN DILUTING, ADD ACID SLOWLY TO WATER WITH STIRRING TO AVOID SPATTERING.

HMIS RATING:	NFPA RATING:
HEALTH: 3	3
FLAMMABILITY: 0	0
REACTIVITY: 2	2
SPECIAL: 0	WATER REACTIVE

SARA TITLE III HAZARD CLASSIFICATION:
IMMEDIATE (ACUTE): YES
DELAYED (CHRONIC): NO
FIRE: NO
SUDDEN RELEASE: NO
REACTIVE: YES

SECTION II PHYSICAL DATA

SPECIFIC GRAVITY: 1.035-1.068
BOILING POINT: 760 mm Hg, °C - 235°F
MELTING POINT: -4.4°C OR 24.0°F
MOLECULAR WEIGHT: 98.08
VAPOR PRESSURE, mm Hg @ 37.8°C: <1 mm HG (SULFURIC ACID COMPONENT)
VAPOR DENSITY (AIR=1): 3.4 (SULFURIC ACID COMPONENT)
SOLUBILITY IN WATER: MISCIBLE
APPEARANCE AND ODOR: CLEAR, COLORLESS TO CLOUDY, OILY LIQUID; ODORLESS.

SECTION III FIRE AND EXPOLOSION HAZARD DATA

FLASH POINT: NOT COMBUSTIBLE
FLAMMABLE LIMITS IN AIR: NOT APPLICABLE
AUTOIGNITION TEMPERATURE: NOT APPLICABLE

EXTINGUISHING MEDIA: EXPECT VIOLENT REACTION WITH WATER. FOR SMALL FIRES USE DRY CHEMICAL, CARBON DIOXIDE OR HALON. FOR LARGE FIRES, FLOOD FIRE AREA WITH WATER FROM A DISTANCE. DO NOT GET SOLID STREAM OF WATER ON SPILLED MATERIAL.

SPECIAL FIRE FIGHTING PROCEDURES: WEAR A NIOSH/MSHA APPROVED SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING. FOR FIGHTING FIRES IN CLOSE/PROXIMITY TO SPILL OR VAPORS, USE ACID RESISTANT PERSONAL PROTECTIVE EQUIPMENT EVACUATE RESIDENTS WHO ARE DOWNWIND OF FIRE. PREVENT UNAUTHORIZED ENTRY TO FIRE AREA. DIKE AREA TO PREVENT RUNOFF AND CONTAMINATION OF WATER SOURCES. COOL CONTAINERS THAT ARE EXPOSED TO FLAME WITH STREAMS OF WATER UNTIL FIRE IS OUT.

PERSONS WHO MAY HAVE BEEN EXPOSED TO CONTAMINATED SMOKE SHOULD BE IMMEDIATELY RELIEVED FROM DUTY AND CHECKED FOR SYMPTOMS OF POISONING. THESE SHOULD NOT BE MISTAKEN FOR HEAT EXHAUSTION OR SMOKE INHALATION. SEE SECTION VI, HEALTH HAZARD DATA FOR SYMPTOMS OF POISONING, FIRST AID PROCEDURES AND NOTES TO PHYSICIAN.

UNUSUAL FIRE AND EXPLOSION HAZARDS: THERMAL DECOMPOSITION PRODUCTS MAY BE HAZARDOUS. THESE MAY INCLUDE SULFUR OXIDES. USE CARE. WATER APPLIED DIRECTLY TO THIS ACID RESULTS IN EVOLUTION OF HEAT, SPATTERING AND CAUSES A VIOLENT REACTION. HIGH CONCENTRATIONS MAY CAUSE NEARBY COMBUSTIBLE LIQUIDS AND SOLIDS TO IGNITE UPON CONTACT. CONTACT WITH COMMON METALS WILL EVOLVE FLAMMABLE AND POTENTIALLY EXPLOSIVE HYDROGEN GAS.

SECTION IV REACTIVITY DATA

STABILITY: STABLE AT AMBIENT TEMPERATURE AND PRESSURE.
CONDITIONS TO AVOID: WHEN DILUTING, ACID SHOULD BE ADDED TO DILUENT. DO NOT ADD DILUENT TO ACID.
MATERIALS TO AVOID: ORGANICS, CHLORATES, CARBIDES, FULMINATES, PICRATES, METALS. REACT EXOTHERMICALLY WITH WATER. SULFURIC ACID IN CONTACT WITH METAL SURFACES CAN GENERATE FLAMMABLE AND EXPLOSIVE HYDROGEN GAS. THERE CAN BE A FIRE RISK ON CONTACT WITH ORGANIC MATERIALS AND CHEMICALS SUCH AS NITRATES, CARBIDES, AND CHLORATES.
HAZARDOUS DECOMPOSITION PRODUCTS: SULFUR OXIDES
HAZARDOUS POLYMERIZATION: WILL NOT OCCUR.

SECTION V HEALTH HAZARD DATA/FIRST AID PROCEDURES

EXPOSURE LIMITS:	ACGIH (TLV)	OSHA (TWA)
SULFURIC ACID	1mg/m^3 (TWA) 3 mg/m^3 (STEL)	1 mg/m^3

TOXICOLOGY DATA:
ORAL LD_{50} (RATS): 2140 mg/kg BODY WEIGHT (1)
DERMAL LD_{50} (RABBIT): NO INFORMATION AVAILABLE
INHALATION LC_{50} (RAT-4 HR EXPOSURE): 510 mg/m^3 (1)
SKIN EFFECTS (RABBIT) SEVERE IRRITATION (1)
EYE EFFECTS (RABBIT) SEVERE IRRITATION (1)

*THE ESTIMATED LETHAL DOSE FOR ADULT HUMANS IS BETWEEN 1 TSP AND ½ OZ. OF CONCENTRATED SULFURIC ACID.

CARCINOGENICITY: THIS PRODUCT DOES NOT CONTAIN ANY INGREDIENT DESIGNATED BY IARC, NTP, ACGIH OR OSHA AS A PROBABLY HUMAN CARCINOGEN. THE INTERNATIONAL AGENCY FOR RESEARCH ON CANCER (IARC) HAS CLASSIFIED STRONG INORGANIC ACID MISTS CONTAINING SULFURIC ACID AS A KNOWN HUMAN CARCINOGEN (IARC CATEGORY 1). THIS CLASSIFICATION APPLIES ONLY TO SULFURIC ACID WHEN IT IS GENERATED AS A MIST. THERE IS STILL DEBATE IN THE SCIENTIFIC COMMUNITY WHETHER THE STUDIES REVIEWED BY IARC ADEQUATELY CONTROLLED FOR CONFOUNDING OCCUPATIONAL EXPOSURES AND PERSONAL HABITS SUCH AS CIGARETTE SMOKING AND ALCOHOL CONSUMPTION. A FEW EPIDEMIOLOGY STUDIES HAVE SUGGESTED A POSSIBLE ASSOCIATION BETWEEN SULFURIC ACID EXPOSURE AND LARYNGEAL OR LUNG CANCER; HOWERVER, IN ALL THESE STUDIES, WORKERS WERE EXPOSED TO MANY OTHER CHEMICALS, SOME OF WHICH ARE RECOGNIZED CARCINOGENS, SUCH AS DIETHYLSULFATE AND NICKEL. CONSIDERING THE MULTIPLE CHEMICAL EXPOSURES AND OTHER LIMITATIONS OF THE STUDIES, WE DISAGREE WITH IARC'S CONCLUSION THAT A CAUSE AND EFFECT RELATIONSHIP BETWEEN CANCER AND EXPOSURE TO STRONG INORGANIC ACID MIST CONTAINING SULFURIC ACID HAS BEEN DEMONSTRATED.

EFFECTS OF SINGLE OVEREXPOSURE:
SWALLOWING: CORROSIVE. CAN CAUSE BURNS OF THE MOUTH, THROAT, ESOPHAGUS AND STOMACH. SWALLOWING THIS PRODUCT MAY CAUSE SEVERE INJURY SUCH AS GASTRIC PERFORATION OR PERITONITIS AND DEATH.
SKIN ABSORPTION: NO INFORMATION AVAILABLE.
INHALATION: CORROSIVE TO MUCOUS MEMBRANES. SYMPTOMS OF EXPOSURE MAY INCLUDE A BURNING SENSATION, TICKLING OF THE NOSE AND THROAT, SNEEZING,

COUGHING, WHEEZING, LARYNGITIS, SHORTNESS OF BREATH. BREATHING OF MISTS OR SPRAYS MAY CAUSE SERIOUS DAMAGE TO LUNG TISSUE.
SKIN CONTACT: CORROSIVE. CAUSES BURNING OR CHARRING OF THE SKIN AS A RESULT OF THE GREAT AFFINITY OF SULFURIC ACID FOR, AND STRONG EXOTHERMIC REACTION WITH WATER.
EYE CONTACT: CORROSIVE. CAUSES IRREVERSIBLE EYE DAMAGE AND POSSIBLE BLINDNESS. SPRAYS AND MISTS ARE SEVERELY IRRITATING TO THE EYES.
EFFECTS OF REPEATED OVEREXPOSURE: REPEATED EXPOSURE MAY LEAD TO CONTACT DERMATITIS, MAY CAUSE CORROSION OF DENTAL ENAMEL, CAN CAUSE BRONCHITIS WITH COUGH, PHLEGM, SHORTNESS OF BREATH AND EMPHYSEMA, CAN CAUSE CHRONIC RUNNY NOSE, TEARING OF THE EYES, NOSEBLEEDS AND STOMACH UPSETS.
EXISTING MEDICAL CONDITIONS POSSIBLY AGGRAVATED BY EXPOSURE: SKIN IRRITATION MAY BE AGGRAVATED IN INDIVIDUALS WITH EXISTING SKIN LESIONS. BREATHING OF VAPORS OR SPRAYS (MISTS) MAY AGGRAVATE ACUTE OR CHRONIC ASTHMA AND CHRONIC PULMONARY DISEASE SUCH AS EMPHYSEMA AND BRONCHITIS.
EMERGENCY AND FIRST AID PROCEDURES: QUICKLY REMOVE THIS MATERIAL FROM CONTACT WITH THE BODY IS OF PRIMARY IMPORTANCE. START FIRST AID AT ONCE!
PRECAUTION: PERSONS ATTENDING TO THE VICTIM SHOULD AVOID DIRECT CONTACT WITH HEAVILY CONTAMINATED CLOTHING AND VOMITUS. WEAR IMPERVIOUS GLOVES WHILE DECONTAMINATING SKIN AND HAIR. REMOVE THE PATIENT FROM IMMEDIATE SOURCE OF EXPOSURE AND ASSURE THAT THE INDIVIDUAL IS BREATHING. IF NOT BREATHING, USE ARTIFICAL RESPIRATION. GET MEDICAL ATTENTION.
SWALLOWING: IF VICTIM IS CONSCIOUS AND ALERT, GIVE TWO OR MORE GLASSES OF WATER OR MILK TO DRINK. DO NOT INDUCE VOMITING. IF VOMITING OCCURS, GIVE FLUIDS AGAIN. DO NOT GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS OR CONVULSING PERSON. GET MEDICAL ATTENTION.
SKIN: IMMEDIATELY WIPE AWAY EXCESS MATERIAL FROM SKIN WITH A DRY CLOTH. WASH ALL AFFECTED AREAS WITH PLENTY OF SOAP AND WATER WHILE UNDER A SAFETY SHOWER FOR AT LEAST 15 MINUTES, WHILE REMOVING CONTAMINATED CLOTHING AND SHOES. DO NOT ATTEMPT TO NEUATRALIZE WITH CHEMICAL AGENTS. SEEK MEDICAL ATTENTION IMMEDIATELY. DISCARD HEAVILY CONTAMINATED CLOTHING AND SHOES IN A MANNER WHICH LIMITS FURTHER EXPOSURE. OTHERWISE, WASH CLOTHING SEPARATELY BEFORE REUSE.
INHALATION: REMOVE PATIENT TO FRESH AIR. IF NOT BREATHING, ADMINISTER CARDIOPULMONARY RESUSICIATION OR ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT OR IRRITATION DEVELOPS, GET MEDICAL ATTENTION.
EYES: IMMEDIATELY FLUSH EYES WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES USING AN EYEWASH FOUNTAIN, IF AVAILABLE. LIFT UPPER AND LOWER LIDS AND RINSE WELL UNDER THEM. GET MEDICAL ATTENTION.

NOTES TO PHYSICIAN: ALL TREATMENTS WOULD BE BASED ON OBSERVED SIGNS AND SYMPTOMS OF DISTRESS IN THE PATIENT. CONSIDERATION SHOULD BE GIVEN TO THE POSSIBILITY THAT OVEREXPOSURE TO MATERIALS OTHER THAN THIS PRODUCT MAY HAVE OCCURRED.
EYE OR SKIN CONTACT- CONTINUE WASHING OFF THE AFFECTED AREA. COLD OR ICED WATER WILL BE HELPFUL IN REMOVING THE LAST TRACES OF SULFURIC ACID. CREAMS OR OINTMENTS SHOULD NOT BE APPLIED BEFORE OR DURING THE WASHING PHASE OF TREATMENT.
INGESTION- TREAT ASPHYXIA FROM GLOTTAL EDEMA BY MAINTAINING AN ADEQUATE AIRWAY. TREAT SHOCK-MAINTAIN NORMAL BLOOD PRESSURE BY TRANSFUSION AND BY THE ADMINISTRATION OF 5% DEXTROSE IN SALINE. CIRCULATORY SHOCK IS OFTEN THE IMMEDIATE CAUSE OF DEATH. IF SYMPTOMS ARE SEVERE AND PERFORMATION OF THE STOMACH OR ESOPHAGUS IS SUSPECTED, GIVE NOTHING BY MOUTH UNTIL ENDOSCOPIC EXAMINATION HAS BEEN DONE. MAINTAIN NUTRITION BY GIVING CARBOHYDRATE OR HYPERALIMENTARY FLUID INTRAVENOUSLY. GIVE PREDNISOLONE, 2 MG/KG/D IN

DIVIDIED DOSES FOR 10 DAYS, TO REDUCE THE POSSIBILITY OF PROGRESSIVE LUNG DAMAGE. ESOPHAGEAL STRICTURE MAY REQUIRE DILATION.
INHALATION- GIVE ARTIFICIAL RESPIRATION, PREFERABLY MOUTH-TO-MOUTH. TREAT SHOCK. TREAT PULMONARY EDEMA. TREAT BACTERIAL PNEUMONIA WITH ORGANISM-SPECIFIC CHEMOTHERAPY.

SECTION VI PRECAUTIONS FOR SAFE HANDLING AND USE

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED: PERSONNEL INVOLVED IN CLEANING UP A SPILL OR STOPPING A LEAK SHOULD WEAR APPROPRIATE PROTECTIVE CLOTHING. VENTILATE SPILL AREA. ANY LEAK OCCURRING IN PIPELINES OR EQUIPMENT SHOULD BE CONSIDERED AN ACID LEAK UNTIL PROVEN OTHERWISE. ADJUST ALL APPROPRIATE VALVES TO ISOLATE THE SYSTEM AND STOP FURTHER LEAKAGE. SMALL SPILLS SHOULD BE COVERED WITH SODIUM BICARBONATE, SODA ASH, OR LIME, TAKING CARE TO AVOID FOAMING OR SPATTERING. INSURE THAT ALL LIQUID IS ABSORBED ON DRY MATERIAL. TRANSFER ABSORBED SPILL MATEIRAL AND ANY UNDERLYING SOIL TO A SUITABLE CHEMICAL WASTE CONTAINER. WASHING DOWN SPILLS WITH WATER IS NOT RECOMMENDED. LARGE SPILLS SHOULD BE HANDLED ACCORDING TO A PREDETERMINED PLAN. PREVENT SULFURIC ACID FROM GETTING INTO SEWERS. DO NOT FLUSH MATEIRAL TO PUBLIC SEWER SYSTEMS OR ANY WATERWAYS. ENSURE ADEQUATE DECONTAMINATION OF TOOLS AND EQUIPMENT FOLLOWING CLEANUP.

WASTE DISPOSAL MEHTOD: DISPOSE OF IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS.

NOTE: THIS MATERIAL IS RCRA HAZARDOUS WASTE D002, CORROSIVE, D003, REACTIVE. SPILLS ARE SUBJECT TO CERCLA REPORTING REQUIREMENTS OF RQ= 1,000 LBS.

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING: WEAR APPROPRIATE PROTECTIVE CLOTHING. DO NOT BREATHE SPRAYS OR MISTS. DO NOT INGEST. DO NOT GET IN EYES, ON SKIN OR ON CLOTHING. STORE IN A COOL, DRY, WELL-VENTILATED PLACE IN TIGHTLY CLOSED CONTAINERS AWAY FROM SUNLIGHT AND IN AN AREA WITH AN ACID-RESISTANT CEMENT FLOOR. WHEN DILUTING, ALWAYS ADD THE ACID SLOWLY TO THE WATER. DO NOT ADD WATER TO THE ACID; DOING SO WILL PRODUCE LARGE AMOUNTS OF HEAT AND LOCALIZED BOILING AND SPATTERING MAY OCCUR.

SECTION VII SPECIAL PROTECTION INFORMATION

PROTECTIVE EQUIPMENT SHOULD BE USED DURING THE FOLLOWING PROCEDURES: MANUFACTURE OR FORMULATION OF THIS PRODUCT; REPAIR AND MAINTENANCE OF CONTAMINATED EQUIPMENT; CLEAN UP OF LEAKS AND SPILLS; AND ANY OTHER ACTIVITY WHICH MAY RESULT IN HAZARDOUS EXPOSURES.

RESPIRATORY PROTECTION: USE NIOSH/MSHA APPROVED MIST FILTER, ACID GAS CARTRIDGE RESPIRATOR. USE POSITIVE PRESSURE SELF-CONTAINED BREATHING APPARATUS FOR EMERGENCY OR OTHER CONDITIONS REQUIRING A HIGHER LEVEL OF PROTECTION.

VENTILATION: USE LOCAL EXHAUST VENTILATION.

PROTECTIVE CLOTHING: FULL-BODY PROTECTIVE CLOTHING, ACID-RESISTANT GLOVES AND BOOTS MADE OF NATURAL RUBBER, NEOPRENE OR NITRILE.

EYE PROTECTION: FACE SHIELD WITH CHEMICAL WORKER GOGGLES.

OTHER PROTECTIVE EQUIPMENT: MAINTAIN A SINK, SAFETY SHOWER AND EYEWASH FOUNTAIN IN THE WORK AREA. HAVE OXYGEN READILY AVAILABLE.

SECTION VIII REGULATORY STATUS

TSCA INVENTORY STATUS: THIS PRODUCT IS LISTED ON THE TSCA INVENTORY.
TRANSPORTATION STATUS: DOT

PROPER SHIPPING NAME: SULFURIC ACID
HAZARD CLASS: CORROSIVE MATEIRAL
ID#: UN 2796
LABEL: CORROSIVE

SARA TITLE III:
SECTION 302 EXTREMELY HAZARDOUS SUBSTANCE LIST: SULFURIC ACID
SECTION 313 TOXIC CHEMICALS: SULFURIC ACID

RCRA HAZARDOUS WASTE: D002 CORROSIVE
D003 REACTIVE

STATE/INTERNATIONAL RIGHT-TO-KNOW REGULATIONS:
CALIFORNIA: NOT LISTED
CONNECTICUT: SURVEY
FLORIDA: TOXIC SUBSTANCES RTK
ILLINOIS: TOXIC, CHEM
LOUISIANA: RTK, SPILL RQ=1,000 LBS.
MASSACHUSETTS: RTK; EHS, 1 PPM THRESHOLD, SPILL RQ=50 LBS.
NEW JERSEY: ID# 1761, RTK, SPECIAL HAZARD; CORROSIVE, REACTIVE; TAX
NEW YORK: SPILL: AIR RQ=1,000 LBS, L/W RQ=100 LBS.
PENNSYLVANIA: RTK, ENV.
PHODE ISLAND: RTK, HAZ. CODES: FLAMMABLE, TOXIC
CANADA: LIST, 1%, NO. 1485

SECTION IX REFERENCES

1) RTECS, 4/91
2) SITTIG, HANDBOOK OF TOXIC AND HAZARDOUS CHEMICALS AND CARCINOGENS, 2ND ED.
3) SAX, DANGEROUS PROPERTIES OF INDUSTRIAL MATERIALS, 6TH ED
4) MERCK INDEX, 11TH ED.
5) DOCUMENTATION OF TLVS AND BEIS, ACGIH
6) SULFURIC ACID HAZARDOUS SUBSTANCE FACT SHEET, NEW JERSEY DEPARTMENT OF HEALTH
7) DRIESBACH, HANDBOOK OF POISONING, 12TH ED.

JEFFCOOL® P150N

Version	Revision Date:	SDS Number:	Date of last issue: -
1.0	07/20/2017	400001020320	Date of first issue: 07/20/2017

SECTION 1. IDENTIFICATION

Product name : JEFFCOOL® P150N

Manufacturer or supplier's details

Company name of supplier : Huntsman International LLC
Address : 2795 Slough Avenue
Mississauga, ON L4T 1G2,
Canada
Telephone : +1 905 678 9150

E-mail address of person responsible for the SDS : MSDS@huntsman.com

Emergency telephone number : Chemtrec: (800) 424-9300 or (703) 527-3887

Recommended use of the chemical and restrictions on use

Recommended use : Heat transfer fluids

SECTION 2. HAZARDS IDENTIFICATION

GHS classification in accordance with the Hazardous Products Regulations

Acute aquatic toxicity : Category 3

GHS label elements

Hazard statements : H402 Harmful to aquatic life.

Precautionary statements : **Prevention:**
P273 Avoid release to the environment.
Response:
Not available
Storage:
Not available
Disposal:
P501 Dispose of contents/container to an approved facility in accordance with local, regional, national and international regulations.

Other hazards

THIS PRODUCT IS NOT TO BE USED TO PRODUCE FOGS OR MISTS IN THEATRICAL, MUSICAL, OR OTHER ENTERTAINMENT PERFORMANCES. THIS PRODUCT IS NOT TO BE USED AS A COMPONENT OF THE LIQUID USED IN ELECTRONIC CIGARETTE (E-CIGARETTE) PRODUCTS.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Mixture

Hazardous components

Chemical name	CAS-No.	Concentration (% w/w)
sodium nitrite	7632-00-0	0.25 - 1

SECTION 4. FIRST AID MEASURES

General advice	:	Do not leave the victim unattended.
If inhaled	:	If unconscious, place in recovery position and seek medical advice. If symptoms persist, call a physician.
In case of skin contact	:	Wash with water and soap as a precaution.
In case of eye contact	:	Remove contact lenses. Protect unharmed eye. If eye irritation persists, consult a specialist.
If swallowed	:	Keep respiratory tract clear. Do not give milk or alcoholic beverages. Never give anything by mouth to an unconscious person. If symptoms persist, call a physician.
Most important symptoms and effects, both acute and delayed	:	None known.

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media	:	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Unsuitable extinguishing media	:	High volume water jet
Specific hazards during firefighting	:	Do not allow run-off from fire fighting to enter drains or water courses.
Hazardous combustion products	:	No hazardous combustion products are known
Specific extinguishing methods	:	No data is available on the product itself.
Further information	:	Collect contaminated fire extinguishing water separately. This must not be discharged into drains. Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations.
Special protective equipment for firefighters	:	Wear self-contained breathing apparatus for firefighting if necessary.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	Use personal protective equipment.
Environmental precautions	:	Prevent product from entering drains. If the product contaminates rivers and lakes or drains inform respective authorities.
Methods and materials for containment and cleaning up	:	Wipe up with absorbent material (e.g. cloth, fleece). Keep in suitable, closed containers for disposal.

SECTION 7. HANDLING AND STORAGE

Advice on protection against fire and explosion	:	Normal measures for preventive fire protection.
Advice on safe handling	:	For personal protection see section 8. Smoking, eating and drinking should be prohibited in the application area.
Conditions for safe storage	:	Containers which are opened must be carefully resealed and kept upright to prevent leakage. Electrical installations / working materials must comply with the technological safety standards.
Materials to avoid	:	No materials to be especially mentioned.
Further information on storage stability	:	No decomposition if stored and applied as directed.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Contains no substances with occupational exposure limit values.

Personal protective equipment

Respiratory protection	:	No personal respiratory protective equipment normally required.
Hand protection Remarks	:	The suitability for a specific workplace should be discussed with the producers of the protective gloves.
Eye protection	:	Safety glasses
Skin and body protection	:	Protective suit
Hygiene measures	:	General industrial hygiene practice.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	liquid
Colour	:	blue
Odour	:	mild
Odour Threshold	:	No data is available on the product itself.
pH	:	9.9
Melting point	:	< -60 °C
Boiling point	:	186.7 °C
Flash point	:	100 °C Method: closed cup
Evaporation rate	:	No data is available on the product itself.
Flammability (solid, gas)	:	No data is available on the product itself.
Flammability (liquids)	:	No data is available on the product itself.
Upper explosion limit / Upper flammability limit	:	No data is available on the product itself.
Lower explosion limit / Lower flammability limit	:	No data is available on the product itself.
Vapour pressure	:	< 1.333 hPa (20 °C)
Relative vapour density	:	2.6
Relative density	:	1.055
Density	:	No data is available on the product itself.
Solubility(ies)		
Water solubility	:	No data is available on the product itself.
Solubility in other solvents	:	No data is available on the product itself.
Partition coefficient: n-octanol/water	:	No data is available on the product itself.
Auto-ignition temperature	:	No data is available on the product itself.
Thermal decomposition	:	No data is available on the product itself.
Self-Accelerating decomposition temperature (SADT)	:	No data is available on the product itself.

Viscosity
Viscosity, kinematic : < 20 mm2/s (40 °C)

Explosive properties : No data is available on the product itself.

Oxidizing properties : No data is available on the product itself.

Particle size : No data is available on the product itself.

SECTION 10. STABILITY AND REACTIVITY

Reactivity : No dangerous reaction known under conditions of normal use.
Chemical stability : Stable under normal conditions.
Possibility of hazardous reactions : No hazards to be specially mentioned.
Conditions to avoid : None known.

Incompatible materials : None known.

Hazardous decomposition products : Aldehydes

Carbon oxides

Ketones

SECTION 11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure : No data is available on the product itself.

Acute toxicity

Acute oral toxicity - Product : Acute toxicity estimate : > 5,000 mg/kg
Method: Calculation method

Acute inhalation toxicity : No data available

Components:

sodium nitrite**:**
Acute dermal toxicity : LD50 :

Acute toxicity (other routes of administration) : No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Assessment: No data available

Germ cell mutagenicity

Genotoxicity in vitro : No data available

Genotoxicity in vivo : No data available

Carcinogenicity

No data available

Carcinogenicity - Assessment : No data available

ACGIH No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

Reproductive toxicity

Effects on fertility : No data available

Effects on foetal development : No data available

Reproductive toxicity - Assessment : No data available

STOT - single exposure

No data available

STOT - repeated exposure

No data available

Repeated dose toxicity

Components:

sodium nitrite**:**
Species: Rat, male
NOEL: 10 mg/kg/d
Application Route: Ingestion
Method: Chronic toxicity

Repeated dose toxicity - Assessment : No data available

Aspiration toxicity

No data available

Experience with human exposure

General Information: No data available

Inhalation: No data available

Skin contact: No data available

Eye contact: No data available

Ingestion: No data available

Toxicology, Metabolism, Distribution

No data available

Neurological effects

No data available

Further information

Product:

Remarks: No data available

Other health hazards

No data available

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Components:

sodium nitrite:

Toxicity to fish : LC50 (Oncorhynchus mykiss (rainbow trout)): 0.54 - 26.3 mg/l
Exposure time: 96 h
Test Type: flow-through test
Test substance: Fresh water

Components:

sodium nitrite:

Toxicity to daphnia and other aquatic invertebrates : EC50 (Daphnia magna (Water flea)): 15.4 mg/l
Exposure time: 48 h
Test Type: static test
Test substance: Fresh water

Components:

sodium nitrite:

Toxicity to algae : ErC50: > 100 mg/g

Exposure time: 72 h
Test Type: static test
Test substance: Fresh water
Method: OECD Test Guideline 201

Components:

sodium nitrite:
M-Factor (Acute aquatic toxicity) : 1

Components:

sodium nitrite:
Toxicity to fish (Chronic toxicity) : NOEC (Cyprinus carpio (Carp)): 1.05 - 21 mg/l
Exposure time: 30 d
Test Type: Other guidelines
Test substance: Fresh water

Components:

sodium nitrite:
Toxicity to daphnia and other aquatic invertebrates (Chronic toxicity) : NOEC (Other): 9.86 mg/l
Exposure time: 80 d
Test Type: semi-static test
Test substance: Marine water

M-Factor (Chronic aquatic toxicity) : No data available

Toxicity to microorganisms : No data available

Toxicity to soil dwelling organisms : No data available

Plant toxicity : No data available

Sediment toxicity : No data available

Toxicity to terrestrial organisms : No data available

Ecotoxicology Assessment
Acute aquatic toxicity : No data available

Chronic aquatic toxicity : No data available

Toxicity Data on Soil : No data available

Other organisms relevant to the environment : No data available

Persistence and degradability

Biodegradability : No data available

Biochemical Oxygen : No data available

Demand (BOD)

Chemical Oxygen Demand (COD)	:	No data available
BOD/COD	:	No data available
ThOD	:	No data available
BOD/ThOD	:	No data available
Dissolved organic carbon (DOC)	:	No data available
Physico-chemical removability	:	No data available
Stability in water	:	No data available
Photodegradation	:	No data available
Impact on Sewage Treatment	:	No data available

Bioaccumulative potential

Bioaccumulation	:	No data available
Partition coefficient: n-octanol/water	:	No data available

Mobility in soil

Mobility	:	No data available
Distribution among environmental compartments	:	No data available
Stability in soil	:	No data available

Other adverse effects

Environmental fate and pathways	:	No data available
Results of PBT and vPvB assessment	:	No data available
Endocrine disrupting potential	:	No data available
Adsorbed organic bound halogens (AOX)	:	No data available

Hazardous to the ozone layer

Ozone-Depletion Potential	Not applicable

Additional ecological information - Product	:	An environmental hazard cannot be excluded in the event of unprofessional handling or disposal. Harmful to aquatic life.
Global warming potential (GWP)	:	No data available

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues	:	The product should not be allowed to enter drains, water courses or the soil.

SECTION 14. TRANSPORT INFORMATION

International Regulations

TDG
Not regulated as dangerous goods

IATA
Not regulated as dangerous goods

IMDG
Not regulated as dangerous goods

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code
Not applicable for product as supplied.

National Regulations

TDG
Not regulated as dangerous goods

SECTION 15. REGULATORY INFORMATION

The components of this product are reported in the following inventories:

CH INV	:	The formulation contains substances listed on the Swiss Inventory, On the inventory, or in compliance with the inventory
DSL	:	All components of this product are on the Canadian DSL
AICS	:	On the inventory, or in compliance with the inventory
NZIoC	:	Not in compliance with the inventory
ENCS	:	Not in compliance with the inventory

KECI	:	On the inventory, or in compliance with the inventory
PICCS	:	On the inventory, or in compliance with the inventory
IECSC	:	On the inventory, or in compliance with the inventory
TCSI	:	On the inventory, or in compliance with the inventory
TSCA	:	On the inventory, or in compliance with the inventory

Inventories

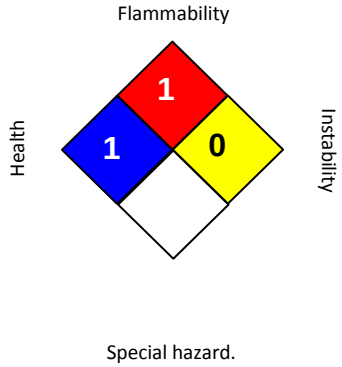
AICS (Australia), DSL (Canada), IECSC (China), REACH (European Union), ENCS (Japan), ISHL (Japan), KECI (Korea), NZIoC (New Zealand), PICCS (Philippines), TCSI (Taiwan), TSCA (USA)

Canada. CEPA 1999 Significant New Activity (SNAc) List
No substances are subject to a Significant New Activity Notification.

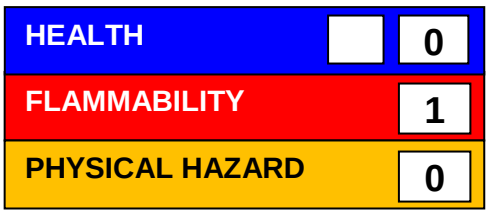
SECTION 16. OTHER INFORMATION

Further information

NFPA:



HMIS® IV:



HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. The "*" represents a chronic hazard, while the "/" represents the absence of a chronic hazard.

Revision Date : 07/20/2017

The information and recommendations in this publication are to the best of our knowledge, information and belief accurate at the date of publication, NOTHING HEREIN IS TO BE CONSTRUED AS A WARRANTY, EXPRESS OR OTHERWISE.

IN ALL CASES, IT IS THE RESPONSIBILITY OF THE USER TO DETERMINE THE APPLICABILITY OF SUCH INFORMATION AND RECOMMENDATIONS AND THE SUITABILITY OF ANY PRODUCT FOR ITS OWN PARTICULAR PURPOSE.

THE PRODUCT MAY PRESENT HAZARDS AND SHOULD BE USED WITH CAUTION. WHILE CERTAIN HAZARDS ARE DESCRIBED IN THIS PUBLICATION, NO GUARANTEE IS MADE THAT THESE ARE THE ONLY HAZARDS THAT EXIST.

Hazards, toxicity and behaviour of the products may differ when used with other materials and are dependent upon the manufacturing circumstances or other processes. Such hazards, toxicity and behaviour should be determined by the user and made known to handlers, processors and end users.

NO PERSON OR ORGANIZATION EXCEPT A DULY AUTHORIZED HUNTSMAN EMPLOYEE IS AUTHORIZED TO PROVIDE OR MAKE AVAILABLE DATA SHEETS FOR HUNTSMAN PRODUCTS. DATA SHEETS FROM UNAUTHORIZED SOURCES MAY CONTAIN INFORMATION THAT IS NO LONGER CURRENT OR ACCURATE.

ATTACHMENT D
CONTRACT LABORATORY INFORMATION
(TECHNICAL REPORT 1.0, WORKSHEET 2.0, p. 16, ITEM 2.c)

The following TPDES permit renewal analysis was conducted on-site:

Table 1
Pollutant
Dissolved Oxygen
Temperature
Total Residual Chlorine
pH

The following TPDES permit renewal analysis was conducted by:

A&B Labs
10100 East Freeway, Suite 100, Houston, TX 77029
tel: 713-453-6060, fax: 713-453-6091
Shantall Carpenter, Senior Projec t Manager / scarpenter@ablabs.com

Table 1
Pollutant
BOD (5-day)
CBOD (5-day)
Chemical oxygen demand
Total organic carbon
Ammonia nitrogen
Total suspended solids
Nitrate nitrogen
Total organic nitrogen
Total phosphorus
Oil and grease
Total residual chlorine
Total dissolved solids
Sulfate
Chloride
Fluoride
Total alkalinity (mg/L as CaCO3)

Table 2
Pollutant
Aluminum, total
Antimony, total
Arsenic, total
Barium, total
Beryllium, total
Cadmium, total
Chromium, total
Chromium, hexavalent
Chromium, trivalent
Copper, total
Cyanide, available
Lead, total
Nickel, total
Selenium, total
Thallium, total
Zinc, total

Table 3			
Pollutant			
Acrylonitrile	m-Cresol [3-Methylphenol]	1,3-Dichloropropene	Phenanthrene
Anthracene	o-Cresol [2-Methylphenol]	[1,3-Dichloropropylene]	Polychlorinated biphenyls (PCBs)
Benzene	p-Cresol [4-Methylphenol]	2,4-Dimethylphenol	Pyridine
Benzidine	1,2-Dibromoethane	Di-n-Butyl phthalate	1,2,4,5-Tetrachlorobenzene
Benzo(a)anthracene	m-Dichlorobenzene	Ethylbenzene	1,1,2,2-Tetrachloroethane
Benzo(a)pyrene	[1,3-Dichlorobenzene]	Fluoride	Tetrachloroethene
Bis(2-chloroethyl)ether	o-Dichlorobenzene	Hexachlorobenzene	[Tetrachloroethylene]
Bis(2-ethylhexyl)phthalate	[1,2-Dichlorobenzene]	Hexachlorobutadiene	Toluene
Bromodichloromethane	p-Dichlorobenzene	Hexachlorocyclopentadiene	1,1,1-Trichloroethane
[Dichlorobromomethane]	[1,4-Dichlorobenzene]	Hexachloroethane	1,1,2-Trichloroethane
Bromoform	3,3'-Dichlorobenzidine	Methyl ethyl ketone	Trichloroethene
Carbon tetrachloride	1,2-Dichloroethane	Nitrobenzene	[Trichloroethylene]
Chlorobenzene	1,1-Dichloroethene	N-Nitrosodiethylamine	2,4,5-Trichlorophenol
Chlorodibromomethane	[1,1-Dichloroethylene]	N-Nitroso-di-n-butylamine	TTHM (Total trihalomethanes)
[Dibromochloromethane]	Dichloromethane	Nonylphenol	Vinyl chloride
Chloroform	[Methylene chloride]	Pentachlorobenzene	
Chrysene	1,2-Dichloropropane	Pentachlorophenol	

Table 6

Pollutants
Bromide
Color (PCU)
Nitrate-Nitrite (as N)
Sulfide (as S)
Sulfite (as SO_3)
Boron, total
Cobalt, total
Iron, total
Magnesium, total
Manganese, total
Molybdenum, total
Tin, total
Titanium, total

Table 8

Pollutant
Acrolein
Acrylonitrile
Benzene
Bromoform
Carbon tetrachloride
Chlorobenzene
Chlorodibromomethane
Chloroethane
2-Chloroethylvinyl ether
Chloroform
Dichlorobromomethane [Bromodichloromethane]
1,1-Dichloroethane
1,2-Dichloroethane
1,1-Dichloroethylene [1,1-Dichloroethene]
1,2-Dichloropropane
1,3-Dichloropropylene [1,3-Dichloropropene]
Ethylbenzene
Methyl bromide [Bromomethane]
Methyl chloride [Chloromethane]
Methylene chloride [Dichloromethane]
1,1,2,2-Tetrachloroethane
Tetrachloroethylene [Tetrachloroethene]
Toluene
1,2-Trans-dichloroethylene [1,2-Trans-dichloroethene]
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethylene [Trichloroethene]
Vinyl chloride

Table 9

Pollutant
2-Chlorophenol
2,4-Dichlorophenol
2,4-Dimethylphenol
4,6-Dinitro-o-cresol
2,4-Dinitrophenol
2-Nitrophenol
4-Nitrophenol
p-Chloro-m-cresol
Pentachlorophenol
Phenol
2,4,6-Trichlorophenol

The following TPDES permit renewal analysis was conducted by:

Summit Environmental Technologies, Inc. Analytical Laboratories (Subcontractor of A&B Labs)
3310 Win St., Cuyahoga Falls, OH 44223
tel: 330-253-8211, fax: 330-253-4489
Holly Florea, Project Manager

Table 2
Pollutant
Mercury

The following TPDES permit renewal analysis was conducted by:

Envirodyne Laboratories, Inc. (Subcontractor of A&B Labs)
1101 Brooklet Dr., #230, Houston, TX 77099
tel: 281-568-7880
Monica Smith, Client Services Representative

Table 6
Pollutant
Surfactants

The following TPDES permit renewal analysis was conducted by:

ALS Environmental
10450 Stancliff Rd., Suuite 210, Houston, TX 77099
tel: 281-530-5656
Bernadette Fini, Project Manager

Table 2
Pollutant
Silver

ATTACHMENT E
COOLING WATER INTAKE STRUCTURE COMPLIANCE REPORTS
(TECHNICAL REPORT 1.0, WORKSHEETS 11.0, 11.1, 11.2, AND 11.3)

ATTACHMENT E

WORKSHEETS 11.0, 11.1, 11.2, & 11.3

Prepared for
NUECES BAY, LLC
NUECES BAY POWER STATION
Corpus Christi, Texas

March 2020

THE WCM GROUP, INC.
110 S. Bender Ave.
Humble, TX 77338
phone 281.446.7070 | fax 281.446.3348
wcmgroup.com

TABLE OF CONTENTS

NUECES BAY POWER STATION
TPDES Permit No. WQ0001244000
316(b) Compliance Report

EXECUTIVE SUMMARY

Nueces Bay, LLC owns and operates Nueces Bay Power Station (NBPS), a 633-megawatt (MW) electric power generating facility, located at 2002 East Navigation Boulevard in Corpus Christi, Nueces County, Texas. In accordance with TPDES Permit No. WQ0001244000, NBPS is authorized to discharge once-through cooling water, low volume waste sources, stormwater, and metal cleaning waste at a daily average flow not to exceed 500 million gallons per day (MGD) via Outfall 001.

Other Requirement No. 13 of the NBPS TPDES permit identifies cooling water intake structure (CWIS) requirements. This requirement states:

> "The permittee shall prepare all application materials required by 40 CFR § 122.21(r) for all provisions that apply to the facility. The deadline submission of these materials is to be determined by the TCEQ upon the subsequent application for renewal of this permit. The permittee shall provide all completed application materials required by 40 CFR §121.21(r) upon the subsequent application for renewal, along with a proposed schedule, which must include a proposed deadline and a reasonable timeline for the completion of the remaining application materials. Completion of the application materials is to occur as soon as is practicable, but in no case may the proposed deadline exceed 54 months after the date of issuance of a subsequent renewal of this permit action."

All completed reports have been included herein, as well as a schedule for completion of the remaining reports not finalized at the time of submittal of this application.

40 CFR 122.21(r)(2)
SOURCE WATER PHYSICAL DATA

40 CFR 122.21(r)(2) - SOURCE WATER PHYSICAL DATA

BACKGROUND

Nueces Bay, LLC owns and operates Nueces Bay Power Station (NBPS), a 633-megawatt (MW) electric power generating facility, located at 2002 East Navigation Boulevard in Corpus Christi, Nueces County, Texas. The facility is physically located on approximately 63 acres on the north shore of the Corpus Christi Inner Harbor (CCIH) (Figures 1 and 2). NBPS was initially constructed in the mid-1930s to provide electrical power to the power grid. A Repowering Project was completed at the facility in 2010. The Repowering Project replaced the Unit 7 Boiler with two (2) new combustion turbines and associated duct-fired heat recovery steam generators (HRSGs) which, in combination with the steam turbine-generator, comprise a combined cycle power plant. NBPS currently consists of the cooling water intake structure (CWIS) and screens, two (2) natural gas-fired combustion turbines (Units 8 and 9), two (2) HRSGs, one (1) steam turbine (STG7), a Power Distribution Center, Firewater Pump House, Continuous Emission Monitoring (CEM) Buildings, and a warehouse. As part of the repowering, Units 1-7 (natural gas-fired boilers) were demolished and removed from NBPS.

NBPS is authorized to divert up to 680,000 acre feet per year of water (equivalent to approximately 607 million gallons per day [MGD]) from the CCIH/Corpus Christi Ship Channel for industrial (cooling) purposes pursuant to Certificate of Adjudication No. 22-4505. Water withdrawn from the Corpus Christi Ship Channel is used for once through cooling. NBPS is authorized to discharge 605 million gallons per day (MGD) of once through cooling water to Nueces Bay pursuant to Texas Pollutant Discharge Elimination System (TPDES) Permit No. WQ0001244000.

The following paragraphs provide the information required pursuant to §122.21(r)(2).

(i) **A narrative description and scaled drawings showing the physical configuration of all source water bodies used by your facility, including areal dimensions, depths, salinity and temperature regimes, and other documentation that supports your determination of the waterbody type where each cooling water intake structure is located.**

Water withdrawn from the CCIH, identified as the final 8.5 miles of the Corpus Christi Ship Channel (CCSC), is used for once-though cooling at NBPS. The CCSC is an approximately 45-foot deep channel that extends from deep water in the Gulf of Mexico (Gulf) through a jettied entrance channel and across Corpus Christi Bay, 34 miles inland to the Port of Corpus Christi. The CCSC is highly utilized commercial traffic – oil tankers, barges, and private fishing and recreational vessels that share navigation in the area (U.S. Army Corps of Engineers, 2012, p1).

The CCIH extends approximately 9.9 miles inland from the point at which the ship channel crosses the west shore of Corpus Christi Bay under the US Highway 181/State Highway 35 bridge to its terminus at the Viola Turning Basin (U.S. Army Corps of Engineers, 2003, p9). The CCIH is bound by land on three sides and was originally dredged through the south side of Nueces Bay. The dredged materials were used to form the north shore of the CCIH (Figure 3). The CCIH ranges from approximately 200 feet to 1200 feet wide, with the widest points located in the turning basins. The NBPS CWIS is located approximately 1.7 miles west of the point where the CCIH opens into Corpus Christi Bay (Figure 4). The width of the CCIH at the CWIS location is approximately 800 feet.

Temperature and salinity of the incoming cooling water was measured during impingement and entrainment sampling, which was conducted September 2016 through September 2018. Sampling was typically conducted twice monthly during this period. The average water temperature at the NBPS CWIS on the CCIH (measured downstream of the inverted weir) was 74°F, and the average salinity was 31.6 practical salinity units (psu). Water quality data collected during the impingement and entrainment sampling is provided below.

WATER QUALITY DATA SEPTEMBER 2016 – SEPTEMBER 2018

Time	Depth (feet)	Water Temperature (°C)	Specific Conductance (µS/cm)	Salinity (psu)	pH	Oxygen (mg/liter)	Oxygen (% saturation)	Approx. Air Temperature (°C)	Wind Direction	Wind Speed (mph)	Percent Clouds
9/6/16 19:16	1	30.64	53458	35.5	7.76	5.39	87	30.6	SE	11	20
9/6/16 23:47	1	30.39	53410	35.4	7.79	4.98	80.3	28.9	SSE	4	20
9/7/16 6:47	1	30.29	53511	35.4	7.71	4.53	73	27.8	NW	15	10
9/7/16 11:34	1	30.34	53470	35.4	7.77	4.41	71.2	33.8	S	8	5
9/20/16 12:59	3	31.24	52536	34.69	7.71	4.87	79	32	--	0	20
9/20/16 6:42	3	31.31	52374	34.36	7.83	5.22	84.4	35	E	7	10
9/20/16 12:15	3	31.21	51942	34.29	7.83	5.04	82	28	--	0	10
9/21/16 6:55	3	31.10	51914	34.22	7.9	4.76	77.1	28	--	0	10
10/3/16 18:20	1	28.07	50771	33.41	7.82	4.95	76.3	27	ESE	5	5
10/3/16 23:25	2	28.02	50619	33.3	7.87	4.8	74.1	27	E	7	10
10/4/16 6:45	1	27.87	50800	33.34	7.84	4.75	72.9	25	SE	0	10
10/4/16 12:38	1	27.97	50689	33.31	7.87	4.83	74.1	29	ENE	1	20
10/17/16 12:45	3	28.00	48932	32.09	8.04	6.36	101.4	33	SE	5	10
10/17/16 18:47	1	28.54	48559	31.73	8.06	6.62	105.5	29	SE	10	10
10/17/16 0:08	2	28.34	48411	31.66	8.08	6.17	98.1	27	SE	12	5
10/18/16 7:15	1	28.23	48655	31.79	8.04	5.85	92.8	26	S	5	5
10/31/16 17:58	3	26.67	48371	31.63	7.87	4.72	72.6	29	E	12	10
10/31/16 23:25	2	26.46	48143	31.46	7.93	4.58	70.2	26	SE	7	0
11/1/16 6:50	2	26.50	48110	31.45	7.92	4.49	68.9	24	SE	5	0
11/1/16 12:04	2	26.66	48057	31.41	7.89	4.58	70.5	30	SE	12	20
11/14/16 17:06	3	23.73	47764	31.2	7.77	5.31	77.8	24	SE	5	10
11/14/16 23:45	3	23.43	47880	32.25	7.82	5.28	76.8	23	SE	7	5
11/15/16 6:07	3	23.31	47827	31.24	7.81	5.18	75	17	NW	5	0
11/15/16 11:25	3	23.50	47910	31.29	7.77	5.37	78.3	25	NW	5	0

WATER QUALITY DATA SEPTEMBER 2016 - SEPTEMBER 2018

Time	Depth (feet)	Water Temperature (°C)	Specific Conductance (µS/cm)	Salinity (psu)	pH	Oxygen (mg/liter)	Oxygen (% saturation)	Approx. Air Temperature (°C)	Wind Direction	Wind Speed (mph)	Percent Clouds
NO TRIP											
12/12/16 13:40	1	16.83	47132	30.71	7.77	--	--	20	N	3	60
12/12/16 17:53	1	16.50	47315	30.85	7.86	--	--	20	N	3	20
12/12/16 23:48	1	16.62	47048	30.64	7.85	--	--	19	N	4	30
12/13/16 6:42	1	16.64	47314	30.85	7.83	--	--	18	N	1	100
12/27/16 13:34	2	17.09	46211	30.05	7.95	8.58	106.1	26	ESE	6	25
12/27/16 17:52	1	17.13	46150	30	8.04	8.31	102.6	21	ESE	5	100
12/27/16 23:50	1	17.36	46117	29.99	8.07	8.59	106.5	21	ESE	5	100
12/28/16 8:10	1	17.25	46125	29.99	8.04	8.17	101.2	21	SE	4	90
1/9/17 13:26	3	14.59	44636	28.9	7.98	8.59	100	21	S	17	10
1/9/17 17:55	3	13.66	45133	29.27	8.07	8.64	87.6	19	SE	4	0
1/9/17 23:45	3	14.26	44986	29.17	8.09	7.52	87	19	SSE	4	5
1/10/17 8:03	3	14.11	45081	29.21	8.09	7.39	85.3	17	SSE	10	80
1/23/17 13:07	3	18.24	45270	29.37	7.45	7.47	93.5	22	SW	5	3
1/23/17 17:15	3	18.42	45327	29.4	7.84	7.32	92.5	21	SE	5	0
1/24/17 0:05	3	18.15	45236	29.34	7.89	7.2	91.3	20	S	12	0
1/24/17 7:28	3	18.07	45176	29.31	7.84	7.17	90.5	18	SSE	7	0
2/6/17 17:25	3	17.72	48200	31.49	7.94	7.53	95.8	22	E	12	10
2/6/17 23:50	3	17.70	48205	31.5	7.99	7.46	94.6	20	SSE	10	5
2/7/17 7:20	3	17.78	47947	31.32	8	7.35	93.1	19	W	5	40
2/7/17 11:48	3	17.86	47920	31.31	7.95	7.38	93.6	26	SE	4	20
2/20/17 13:24	2	20.48	47865	31.27	7.82	6.4	85.1	25	NNE	11	60
2/20/17 17:24	2	20.48	48222	31.52	7.88	6.15	82	18	E	2	40
2/20/17 23:45	2	20.41	47939	31.33	7.87	6.1	81.3	17	S	8	10

WATER QUALITY DATA SEPTEMBER 2016 – SEPTEMBER 2018

Time	Depth (feet)	Water Temperature (°C)	Specific Conductance (µS/cm)	Salinity (psu)	pH	Oxygen (mg/liter)	Oxygen (% saturation)	Approx. Air Temperature (°C)	Wind Direction	Wind Speed (mph)	Percent Clouds
2/21/17 6:25	2	20.08	47677	31.13	7.86	6.29	83.3	14	SW	5	0
3/6/17 11:38	2	20.35	48233	31.52	7.77	7.18	95.4	25	SSE	19	70
3/6/17 17:31	2	20.53	48218	31.51	7.77	7.36	98.1	24	SSE	12	25
3/6/17 23:30	2	20.51	48267	31.55	7.85	7.17	95.7	22	SSE	16	25
3/7/17 6:04	2	20.40	48504	31.72	7.82	7.08	94.6	21	SSW	5	100
3/20/17 14:35	1	21.94	46404	30.2	7.89	7.3	99.4	25	SSE	19	5
3/20/17 19:02	1	22.12	46804	30.49	7.91	7.36	100.2	24	ESE	13	0
3/20/17 23:40	1	22.05	46760	30.44	7.91	7.31	99.4	22	SSE	12	0
3/21/17 6:50	1	21.91	46788	30.47	7.9	6.9	93.6	19.5	SSE	6	0
4/3/17 13:00	2	24.00	48150	31.5	7.9	6.0	85.59	28	SW	7	0
4/3/17 20:00	2	24.00	48150	31.5	7.9	6.9	98.43	26	SE	15	10
4/4/17 7:10	2	24.10	48150	31.5	7.9	5.1	72.75	15	SE	7	17
4/4/17 1:30	2	24.00	48150	31.5	7.9	6.2	88.45	20	S	13	0
4/17/17 14:15	2	24.57	49756	32.7	7.85	6.42	92.9	26	ESE	6	30
4/17/17 19:45	1	27.74	50158	32.9	7.88	6.65	96.8	22	E	14	80
4/17/17 23:45	2	24.60	49392	32.36	7.91	6.47	94.5	22	E	10	0
4/18/17 6:40	1	26.43	50067	32.89	7.9	6.15	89.4	23	SW	5	30
NO TRIP											
NO TRIP											
NO TRIP											
NO TRIP											
6/19/17 12:35	1	29.94	50124	32.91	7.73	5.44	86	30	E	10	30
6/19/17 20:29	1	29.94	50157	32.94	7.75	5.43	87.6	29	ESE	6	75
6/19/17 22:54	1	29.88	50183	32.94	7.78	5.57	87.9	29	ESE	6	0

WATER QUALITY DATA SEPTEMBER 2016 – SEPTEMBER 2018

Time	Depth (feet)	Water Temperature (°C)	Specific Conductance (µS/cm)	Salinity (psu)	pH	Oxygen (mg/liter)	Oxygen (% saturation)	Approx. Air Temperature (°C)	Wind Direction	Wind Speed (mph)	Percent Clouds
6/20/17 6:45	1	29.74	50329	33.04	7.78	5.27	83.6	26	--	0	0
7/5/17 14:20	1	30.44	51150	33.67	7.8	5.09	81.6	26	ESE	14	10
7/5/17 19:45	1	30.69	51093	33.62	7.86	5.56	89.7	30	ESE	15	20
7/5/17 1:10	1	30.40	50999	33.56	7.87	5.39	86.7	28	SE	9	15
7/6/17 6:30	1	30.33	51047	33.59	7.87	5.08	81.2	27	SE	4	20
7/17/17 14:20	1	30.40	53187	35.17	7.78	4.95	80	28.9	ESE	7	30
7/17/17 21:09	1	30.49	53349	35.29	7.88	4.95	80.1	28.9	SE	13	15
7/17/17 23:40	1	30.41	53453	35.38	7.89	4.69	75.5	28.9	SSE	9	20
7/18/17 7:27	1	30.30	53312	35.28	7.86	4.59	74.1	27.8	S	4	40
7/31/17 13:16	1	30.64	53874	35.66	7.9	5.75	96.1	34	E	3	30
7/31/17 20:37	1	30.67	53818	35.64	7.97	6.01	100.7	30	ESE	8	20
7/31/17 23:05	1	30.60	53718	35.56	7.92	5.7	95.2	30	ESE	6	20
8/1/17 6:57	1	30.44	53727	35.58	7.9	5.37	89.9	25	--	0	10
8/14/17 13:30	1	30.97	54999	36.56	7.96	5.14	87	32	SSE	15	5
8/14/17 20:17	1	31.01	55389	36.84	8	5.96	101.7	32	SE	18	5
8/14/17 22:10	1	30.94	55342	36.8	8	5.18	88.9	32	SE	3	0
8/15/17 6:58	1	30.71	55644	37	7.98	4.69	79.7	26	S	9	0
8/30/17 14:02	1	25.55	56897	37.93	7.88	5.92	90.5	31	NNW	1	5
8/30/17 19:57	1	25.72	56823	37.9	7.96	6.08	92.8	32	--	0	0
8/30/17 0:05	1	25.63	56832	37.91	7.87	6.08	91.5	26.6	SSW	6	0
8/31/17 6:45	1	24.36	56700	37.93	7.85	5.9	90.2	25	SSW	3	0
9/11/17 13:00	1	27.74	53655	35.56	7.99	5.17	80.3	29	NNE	10	5
9/11/17 20:49	1	27.82	54011	35.82	7.99	5.23	81.7	26	--	0	0
9/11/17 1:05	1	27.80	53877	35.82	7.99	5.2	81.5	26	--	0	0

WATER QUALITY DATA SEPTEMBER 2016 - SEPTEMBER 2018

Time	Depth (feet)	Water Temperature (°C)	Specific Conductance (µS/cm)	Salinity (psu)	pH	Oxygen (mg/liter)	Oxygen (% saturation)	Approx. Air Temperature (°C)	Wind Direction	Wind Speed (mph)	Percent Clouds
9/12/17 7:24	1	27.18	53045	35.03	8.08	6.19	95.3	20	--	0	0
9/25/17 13:46	1	29.45	49376	32.36	7.8	4.4	69.4	32	SW	0	30
9/25/17 17:15	1	29.55	49311	32.3	7.86	4.59	72.5	31	SSW	0	70
9/25/17 0:07	1	29.32	49321	32.3	7.9	4.45	70.3	31	ESE	13	50
9/26/17 7:41	1	29.25	42979	32.29	7.83	4.26	66.8	28	E	4	50
10/9/17 14:15	1	28.96	46499	30.3	8.06	5.94	91.5	31	SSE	17	5
10/9/17 19:02	1	29.10	46411	30.2	8.1	6.4	98.9	29	SE	16	10
10/9/17 23:40	1	29.08	46188	30.04	8.17	7.09	90.1	28	SE	8	10
10/10/17 7:00	1	29.01	46427	30.2	8.15	6.01	92.8	28	NE	4	90
10/23/17 12:50	5	26.24	43570	28.18	7.94	6.06	89.8	25	SW	5	0
10/23/17 18:30	5	26.34	43760	28.29	7.95	6.43	94.1	23	SW	5	0
10/23/17 23:45	5	26.01	43786	28.29	8.03	6.42	93.1	21	SW	5	0
10/24/17 7:45	5	25.88	43976	28.45	7.95	6.18	89.4	20	N	10	0
11/6/17 13:32	1	23.70	45742	29.7	7.82	6.46	90.2	29	S	17	5
11/6/17 17:15	1	23.90	45677	29.65	7.94	6.74	94.5	29	SSE	20	0
11/6/17 23:06	1	23.90	46049	29.9	7.92	6.55	92.1	20	SSE	13	0
11/7/17 7:25	1	23.90	46149	30.01	7.87	6.33	89.1	23	S	5	0
11/20/17 13:00	1	22.50	46268	30.1	7.62	5.41	74.3	19	ENE	10	70
11/20/17 17:05	1	22.45	46356	30.14	7.72	5.37	73.6	18	E	9	100
11/20/17 23:50	1	22.40	46350	30.11	7.72	5.4	73.5	18	SSW	2	100
11/21/17 7:30	1	22.06	46255	30.07	7.73	5.35	72.9	16	WNW	3	60
NO TRIP											
NO TRIP											
1/2/18 17:15	1	12.38	45766	29.73	7.71	7.2	80.9	3	N	17	100

WATER QUALITY DATA SEPTEMBER 2016 – SEPTEMBER 2018

Time	Depth (feet)	Water Temperature (°C)	Specific Conductance (µS/cm)	Salinity (psu)	pH	Oxygen (mg/liter)	Oxygen (% saturation)	Approx. Air Temperature (°C)	Wind Direction	Wind Speed (mph)	Percent Clouds
1/2/18 1:00	1	11.40	46500	29.8	7.75	6.95	80.5	0	N	10	50
1/3/18 7:15	1	11.90	45725	29.7	7.84	7.12	79.4	1	NW	10	20
1/3/18 11:50	1	11.75	45731	29.7	7.4	7.33	81.5	5.5	N	8	0
1/15/18 12:50	1	12.28	45672	29.73	7.92	7.69	86.5	19	SE	16	70
1/15/18 17:48	1	12.48	45636	29.64	7.97	7.85	88.5	19	SSE	6	100
1/15/18 1:08	1	12.40	45640	29.7	7.95	7.8	86.5	14	SSE	6	100
1/16/18 8:33	1	12.40	45612	29.6	7.86	7.6	85.4	2	N	11	100
1/29/18 14:00	1	12.42	44928	29.14	7.67	9.55	105.3	18	N	14	40
1/29/18 17:35	1	12.55	44965	29.15	7.87	9.58	105.9	22	NNE	10	25
1/29/18 0:05	1	12.50	44970	29.15	7.81	9.5	105.9	13	NNE	11	10
1/30/18 7:45	1	12.34	44917	29.11	7.82	9.24	101.5	8	NNE	12	0
2/12/18 13:28	1	14.01	44831	29.07	7.58	8.26	94.7	8	NE	6	60
2/12/18 18:24	1	14.01	44797	29.03	7.81	8.41	96.2	9	E	8	100
2/12/18 0:05	1	13.96	44839	29.05	7.78	8.38	95.2	8	NE	10	100
2/13/18 7:13	1	13.87	44779	29.02	7.81	8.29	94.4	8	N	9	100
2/26/18 13:45	1	19.21	44867	29.07	7.75	7.73	97.4	17	NE	14	80
2/26/18 17:58	1	19.34	44894	29.09	7.81	7.61	96.2	18	ENE	15	100
2/26/18 23:30	1	19.35	44952	29.17	7.83	7.49	94.1	16	E	5	100
2/27/18 7:10	1	19.40	44986	29.15	7.81	7.29	92.3	21	SE	8	100
3/12/18 12:50	1	20.00	44515	28.8	7.7	6.9	90.1	15	NE	14	60
3/12/18 16:42	1	20.15	44437	28.75	7.62	6.92	90.4	17	SE	4	80
3/12/18 0:10	1	20.10	44500	25.77	7.7	6.92	90.3	16	SSE	4	0
3/13/18 6:47	1	19.85	44337	28.69	7.74	6.75	87.8	14	SE	1	10
3/26/18 13:23	1	22.51	44926	29.11	7.83	7.23	101.7	25	SE	25	90

WATER QUALITY DATA SEPTEMBER 2016 – SEPTEMBER 2018

Time	Depth (feet)	Water Temperature (°C)	Specific Conductance (µS/cm)	Salinity (psu)	pH	Oxygen (mg/liter)	Oxygen (% saturation)	Approx. Air Temperature (°C)	Wind Direction	Wind Speed (mph)	Percent Clouds
3/26/18 17:33	1	22.69	45006	29.14	7.85	7.25	102	24	SE	14	90
3/26/18 23:50	1	22.51	45000	29.16	7.85	7.25	101.3	24	SE	14	90
3/27/18 7:26	1	22.50	44875	29.08	7.73	6.49	90.8	22	SE	12	100
4/9/18 14:30	1	21.94	45781	29.74	7.73	6.77	92.2	20	NE	15	100
4/9/18 20:45	1	21.73	45934	29.85	7.67	6.77	91.8	18	NE	17	100
4/9/18 23:50	1	21.73	45930	29.77	7.69	6.77	91.9	18	NE	15	100
4/10/18 7:08	1	21.53	45974	29.57	7.69	6.7	90.6	17	NE	15	90
4/23/18 13:00	1	22.75	46850	30.51	7.63	6.86	94	24	ESE	10	20
4/23/18 19:40	1	22.92	47036	30.67	7.66	7.12	98.1	24	SSE	13	0
4/23/18 0:10	1	22.78	47153	30.73	7.74	6.89	94.9	20	S	5	0
4/24/18 7:05	1	22.76	46818	30.4	7.71	7.12	97.7	17	SSE	2	0
5/7/18 14:30	1	25.74	49211	32.24	7.59	6.14	89.6	31	ESE	11	10
5/7/18 20:25	1	25.89	49184	32.23	7.66	6.39	93.5	27	SE	14	0
5/7/18 1:20	1	25.65	48886	32.3	7.63	6.11	88.6	18	SE	8	0
5/8/18 7:18	1	25.53	48824	31.95	7.62	6.04	87.6	17	SW	4	0
5/21/18 14:57	1	27.00	50724	33.36	7.78	4.44	90.3	25	E	8	60
5/21/18 20:31	1	27.71	50852	33.46	7.83	--	--	26	SE	7	0
5/21/18 1:03	1	26.54	50735	33.4	7.83	--	--	25	SE	9	60
5/22/18 6:47	1	27.51	50752	33.37	7.78	5.89	90.6	24	--	0	60
6/4/18 13:12	1	26.56	51011	33.55	7.95	5.88	93.3	27	ESE	8	30
6/4/18 20:25	1	29.68	51114	33.66	7.97	6.15	98	29	SE	6	40
6/4/18 23:00	1	29.60	51115	33.5	7.96	6.13	97	26	SE	10	0
6/5/18 6:27	1	29.41	51146	33.67	7.95	5.66	89.9	25	S	4	10
6/18/18 13:02	1	29.75	52553	34.77	7.83	5.24	83.6	25.5	NE	5	100

WATER QUALITY DATA SEPTEMBER 2016 – SEPTEMBER 2018

Time	Depth (feet)	Water Temperature (°C)	Specific Conductance (µS/cm)	Salinity (psu)	pH	Oxygen (mg/liter)	Oxygen (% saturation)	Approx. Air Temperature (°C)	Wind Direction	Wind Speed (mph)	Percent Clouds
6/18/18 20:30	1	29.82	53408	35.34	7.95	5.24	83.7	32	S	10	80
6/18/18 12:30	1	29.80	52550	35.3	7.92	5.24	83.7	25	S	10	100
6/19/18 7:20	1	29.51	52478	34.68	7.97	4.83	76.4	24	SE	15	100
7/2/18 14:30	1	29.74	49245	32.24	7.92	5.62	88.2	32	SE	10	10
7/2/18 19:45	1	29.89	49288	32.29	8.02	6.1	96.1	29	SE	16	70
7/2/18 1:15	1	29.80	49263	32.26	8	6.1	95.8	28	SE	12	71
7/3/18 7:05	1	29.61	49183	32.22	7.98	5.55	86.7	26	S	6	10
7/16/18 13:37	1	30.27	50389	33.11	7.88	4.97	78.9	34	SE	15	0
7/16/18 20:24	1	30.40	50502	33.17	7.98	5.43	86.4	28	SE	7	0
7/16/18 1:00	1	30.32	50515	33.14	7.98	5.4	83.2	26	SE	6	0
7/17/18 6:43	1	30.60	50343	33.07	7.89	4.92	77.9	26	--	0	10
7/30/18 14:20	1	30.60	52272	33.04	7.95	5.83	93.7	35	SSE	7	20
7/30/18 20:30	1	30.77	52420	34.6	8.01	6.7	108.3	32	SE	13	10
7/30/18 0:03	1	30.68	52398	33.7	8.01	6.65	108	32	SE	12	10
7/31/18 7:10	1	30.44	52441	34.63	7.93	5.38	86.8	28	SSW	5	10
8/13/18 13:51	1	30.07	52367	34.57	7.76	5.31	85.7	31	SSE	20	5
8/13/18 20:01	1	30.02	52504	34.65	7.83	5.47	88.3	29	N	11	10
8/13/18 1:00	1	30.00	52490	34.65	7.8	5.42	88.1	27	N	10	10
8/14/18 6:16	1	29.75	52481	34.66	7.85	5.14	82.2	27	N	3	5
8/27/18 14:10	1	30.48	53960	35.75	7.79	5.71	92.7	32	SE	15	30
8/27/18 18:10	1	30.66	54039	35.8	7.78	6.43	104.6	30	SE	18	5
8/27/18 1:00	1	30.68	53963	35.8	7.73	6.44	105	30	SE	18	0
8/28/18 7:15	1	30.38	53948	35.75	7.73	5.52	89.4	27	S	9	0

The CCIH is identified in the 2010 Texas Surface Water Quality Standards (SWQS) as having intermittent aquatic life and non-contact recreation use (TCEQ, 2010, p135). The SWQS establish explicit goals for the quality of streams, rivers, lakes, and bays throughout the state and are developed to maintain the quality of surface waters in Texas. These standards identify appropriate uses for the state's surface waters, including aquatic life, recreation, and public water supply sources.

(ii)(1) Identification and characterization of the source waterbody's hydrological features

Hydrologically, there are two principal types of water exchanges in the Corpus Christi Bay system: one is bidirectional, involving the tidal exchange of the bay system with the Gulf and between components of the bay system, and the other is unidirectional, involving freshwater flow into the system and through-flow to the Gulf.
Due to the constriction caused by the Corpus Christi Jetty Channel, the diurnal tide is severely dampened and the semidiurnal tide is dampened even further. Because of the tidal range's longer period, the "quasi-periodic" and semi-annual rise and fall of Gulf waters pass into the bays with almost no attenuation, leading to high water levels in the spring and fall and low water levels in the winter and summer (Ward, as cited in USACE, 2003, p FEIS-35).

(ii)(2) Identification and characterization of the source waterbody's geomorphological features

The CCIH is located in the Nueces River Valley in South Texas. The CCIH portion of the CCSC was originally excavated along the south side of Nueces Bay. Nueces Bay is part of the Nueces River Valley that was flooded during the last few thousand years by a rise in sea level (USACE, 2003, p3). The Nueces River Valley and its sediments were formed during the Quaternary Period (the current and most recent period in the geologic time scale). The Quaternary Period includes the Pleistocene and Holocene epochs. The Holocene is the current geological epoch (including the past 10,000 years) and was preceded by the Pleistocene (2.6 million to 10,000 years ago). The last 120,000 years of the Pleistocene are the Sangamonian interglacial and Wisconsinan glacial ages.

Interglacial and Glacial periods were not times of uniformly rising and falling sea level, with uniform deposition and erosion respectively. Stadials and interstadials represent minor times of global cooling and warming, respectively. During stadials, there was erosion of river valleys; during interstadials, there were minor rises in sea level and the rivers filled in their valleys with terrace deposits (Baskin & Thomas, 2016, p4). The Beaumont Formation, which underlies the coastal region of Texas, was deposited approximately 120,000 to 50,000 years ago during the Sangamonian interglacial. The Beaumont Formation

represents mainly stream, floodplain, delta and coastal deposits (Aronow, as cited in Baskin & Thomas, 2016, p4).

(ii)(3) Methods you used to conduct any physical studies to determine your intake's area of influence within the waterbody and the results of such studies

Due to the readily available published hydrological and geomorphological data, no additional studies were conducted to determine the intake's area of influence within the waterbody.

(iii) Locational maps

Locational maps depicting the location of the facility and CWIS in relation to the source water body are provided as Figures 1 through 4.

(iv) For new offshore oil and gas facilities that are not fixed facilities, a narrative description and/or locational maps providing information on predicted locations within the water body during the permit term in sufficient detail for the Director to determine the appropriateness of additional impingement requirements under §125.134(b)(4).

NBPS is not a new offshore oil and gas facility; therefore, the information required pursuant to §122.21(r)(2)(iv) is not required.

REFERENCES

Baskin, J.A. & Thomas, R.G. (2016). “Geology and Paleontology of the Lower Nueces River Valley.”

Texas Commission on Environmental Quality (TCEQ). (2010). “Chapter 207 – Texas Surface Water Quality Standards.”

U.S. Army Corps of Engineers – Galveston District. (2012). “Corpus Christi Ship Channel, TX.” Fact Sheet.

U.S. Army Corps of Engineers. (2003). Corpus Christi Ship Channel, Texas. “Channel Improvement Project Feasibility Report and Environmental Impact Statement. Volume I. Final Feasibility Report and Final Environmental Impact Statement” Accessed April 25, 2018.

ENVIRONMENTAL PROFESSIONALS
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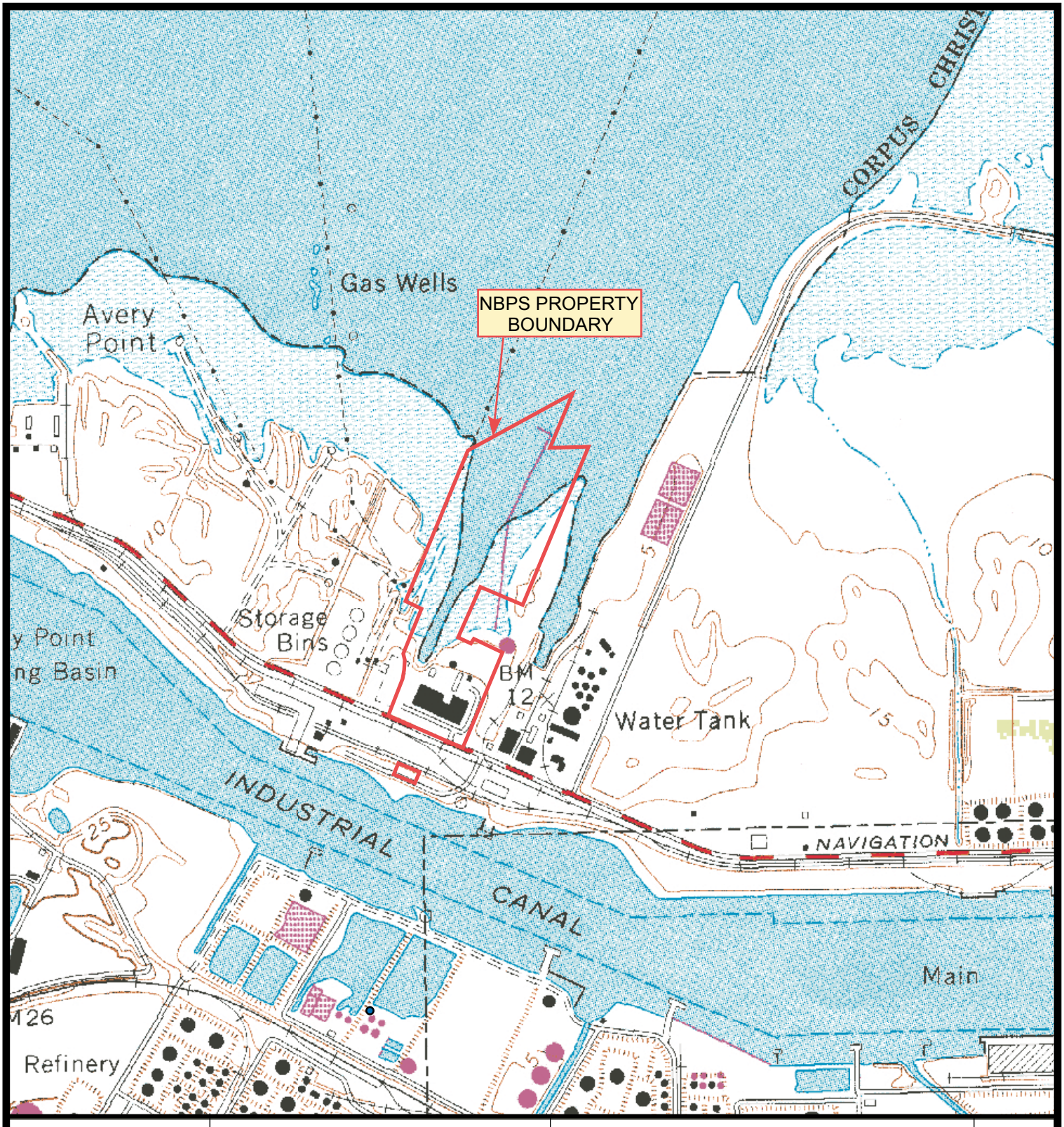
The WCM Group, Inc.
P. O. Box 3247
Humble, TX 77347-3247
(281) 446-7070 Fax (281) 446-3348

Facility Location Map

NUECES BAY, LLC
Nueces Bay Power Station
Corpus Christi, Nueces County, Texas

FIGURE
1

DRAWN BY:	HJC
DATE:	07/15/2017
REV. DATE:	
DRAWING ID:	Y:\NUE\CC\316B19_22111\1584525372\r2



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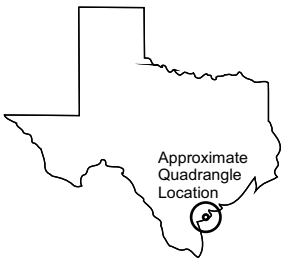
Humble, TX 77347-3247
(281) 446-7070 Fax (281) 446-3348

Location on 7.5 Minute USGS Topo Quads: Corpus Christi, Texas; Zone 14



SITE TOPOGRAPHIC MAP

NUECES BAY, LLC; Nueces Bay Power Station
2002 E. Navigation Blvd.
Corpus Christi, Texas

FIGURE 2

DRAWN BY:	AKD/hjc
DATE:	1/19/2010
REV. DATE:	7/15/2017
DRAWING ID:	Y:\NUE\CC\316B19_22111\1584525372\r2

SCALE 1:12,000
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0 500 1000

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CORPUS CHRISTI SHIP CHANNEL & INNER HARBOR
NUECES BAY, LLC
Nueces Bay Power Station
Corpus Christi, Nueces County, Texas

FIGURE
3

DRAWN BY:	HJC
DATE:	07/15/2017
REV. DATE:	
DRAWING ID:	Y:\NUE\CC\316B19_22111\1584525372\r2

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COOLING WATER INTAKE STRUCTURE LOCATION
NUECES BAY, LLC
Nueces Bay Power Station
Corpus Christi, Nueces County, Texas

FIGURE
4

DRAWN BY:	HJC
DATE:	07/15/2017
REV. DATE:	
DRAWING ID:	Y:\NUE\CC\316B19_22111\1584525372\r2

40 CFR 122.21(r)(3)
COOLING WATER INTAKE STRUCTURE DATA

40 CFR 122.21(r)(3) - COOLING WATER INTAKE STRUCTURE DATA

BACKGROUND

Nueces Bay, LLC owns and operates Nueces Bay Power Station (NBPS), a 633-megawatt (MW) electric power generating facility, located at 2002 East Navigation Boulevard in Corpus Christi, Nueces County, Texas. The facility is physically located on approximately 63 acres on the north shore of the Corpus Christi Inner Harbor (CCIH) (Figures 1 and 2). NBPS was initially constructed in the mid-1930s to provide electrical power to the power grid. A Repowering Project was completed at the facility in 2010. The Repowering Project replaced the Unit 7 Boiler with two (2) new combustion turbines and associated duct-fired heat recovery steam generators (HRSGs) which, in combination with the reuse of the existing steam turbine-generator, comprise a combined cycle power plant. NBPS currently consists of the cooling water intake structure (CWIS) and screens, two (2) natural gas-fired combustion turbines (Units 8 and 9), two (2) Heat Recovery Steam Generators (HRSGs), one (1) steam turbine (STG7), a Power Distribution Center, Firewater Pump House, Continuous Emission Monitoring (CEM) Buildings, and a warehouse. As part of the repowering, Units 1-7 (natural gas-fired boilers) were demolished and removed from NBPS.

NBPS is authorized to divert up to 680,000 acre feet per year of water (equivalent to approximately 607 million gallons per day [MGD]) from the CCIH/Corpus Christi Ship Channel for industrial (cooling) purposes pursuant to Certificate of Adjudication No. 22-4505. Water withdrawn from the Corpus Christi Ship Channel is used for once through cooling. NBPS is authorized to discharge 605 million gallons per day (MGD) of once through cooling water to Nueces Bay pursuant to Texas Pollutant Discharge Elimination System (TPDES) Permit No. WQ0001244000.

The following paragraphs provide the information required pursuant to §122.21(r)(3).

(i) A narrative description of the configuration of each of your cooling water intake structures and where it is located in the waterbody and in the water column

Water withdrawn from the CCIH passes through bar screens at a bulkhead on the north shore of the CCIH, then through a 165-foot long underground concrete-lined intake chamber. The diverted water, once thru the bar screen, passes under an inverted weir which extends from the top of the chamber to a depth of 20 feet. This design is to facilitate water diverted from the Inner Harbor which emanates from a depth of 20 to 45 feet below the water's surface. The bar screens prevent objects, debris, and marine life greater than three inches in diameter from entering the concrete-lined intake chamber. From the intake chamber, water flows through two parallel concrete rectangular tunnels (8 feet deep by 9.75 feet wide) and passes through two (2) 3/8-inch square steel mesh screens (Figure 3)

(Freese and Nichols, Inc., 2016). Cooling water is then pumped under East Navigation Boulevard to the power plant and is subsequently discharged to the southern shore of Nueces Bay.

NBPS's cooling water intake structure consists of:

- A concrete-lined intake chamber;
- Bar screen;
- Inverted weir;
- Two parallel concrete rectangular tunnels;
- Concrete basin;
- Two (2) 3/8 inch square steel mesh screens; and
- Two (2) circulating inlet water pumps.

(ii) Latitude and longitude in degrees, minutes, and seconds for each of your cooling water intake structures

NBPS's CWIS is located at the following latitude and longitude: 27°49'01.92"N and 97°25'16.22"W (Figure 3).

(iii) A narrative description of the operation of each of your cooling water intake structures, including design intake flows, daily hours of operation, number of days of the year in operation and seasonal changes, if applicable

As described in item (i) above, cooling water is withdrawn from the CCIH and passes through bar screens on the North Shore of the CCIH. The water then passes through the underground concrete-lined intake chamber, under an inverted weir, through two parallel concrete rectangular tunnels, thence through two (2) 3/8-inch square steel mesh screens. The ¾-inch square steel mesh screens are visually inspected daily by NBSP operating personnel and may be manually cleaned as necessary to remove impinged material (e.g., objects, debris, and marine life that passed through the bar screens).

To ensure that the diverted water passes through these two (2) ¾-inch square steel mesh screens during cleaning, each of the screens is rinsed in series. A screen is raised above ground level and washed with a high-pressure water spray (water is obtained from the Inner Harbor or is potable water) while the second screen remains in place. Impinged material washed from the screen is rinsed into an in-ground concrete-lined sump. The second screen in the series remains in place while the first screen is rinsed. After the first

screen is rinsed, it is lowered and returned to its operating position upstream of the circulating pumps and the second screen is raised and rinsed in the same manner. This process ensures there is at least one screen upstream of the circulating pumps during operation. Impinged organisms are pumped from the sump, through an underground pipeline to Nueces Bay via the discharge canal.

The circulating pumps and associated CWIS are operated 24 hours per day, 365 days per year; however, the volume of water diverted for once through cooling fluctuates based on market demand for electricity production. The flow through the CWIS is 238,000 gallons per minute (gpm) or 342.8 MGD based on the PBS&J 2010 study, however the permitted daily maximum wastewater discharge flow volume is 500 MGD.

(iv) A flow distribution and water balance diagram that includes all sources of water to the facility, recirculating flows, and discharges

A flow distribution and water balance diagram is provided as Figure 4.

(iii) Engineering drawings of the cooling water intake structure

Engineering drawings of the CWIS are provided in Figure 5.

REFERENCES

Freese and Nichols, Inc. 2016. “Nueces Bay Power Station Entrainment Characterization Study Plan.” Prepared for Talen Energy. Freese and Nichols, Inc., Austin. August 2016.

ENVIRONMENTAL PROFESSIONALS

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Humble, TX 77347-3247
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Facility Location
NUECES BAY, LLC
Nueces Bay Power Station
Corpus Christi, Nueces County, Texas

FIGURE
1

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DATE:	07/15/2017
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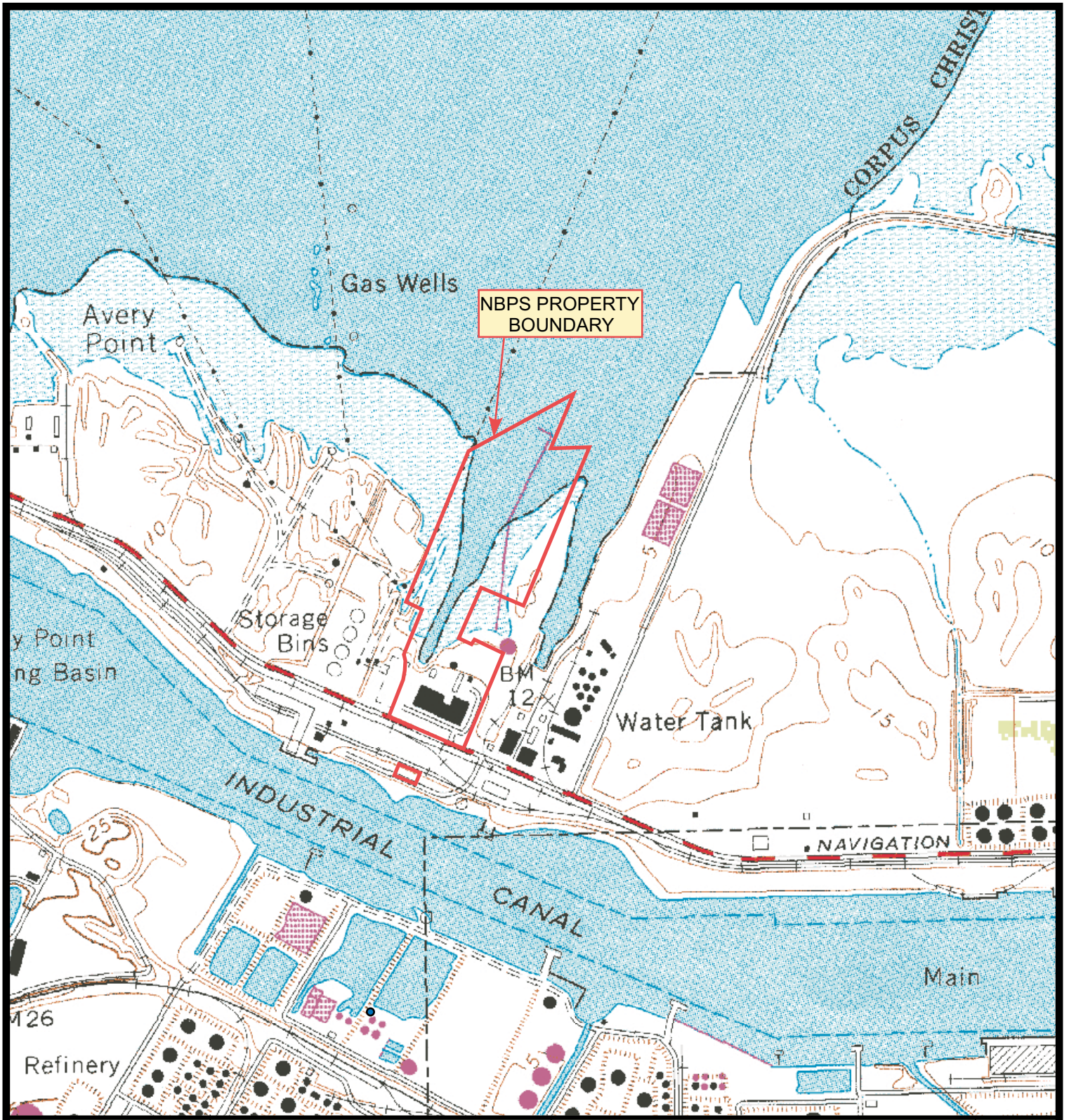
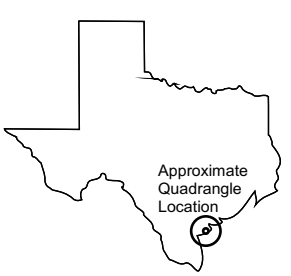


SITE TOPOGRAPHIC MAP

NUECES BAY, LLC; Nueces Bay Power Station
2002 E. Navigation Blvd.
Corpus Christi, Texas

FIGURE 2

Location on 7.5 Minute USGS Topo Quads: Corpus Christi, Texas; Zone 14



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SCALE 1:12,000
Scale in Feet
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N

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Humble, TX 77347-3247
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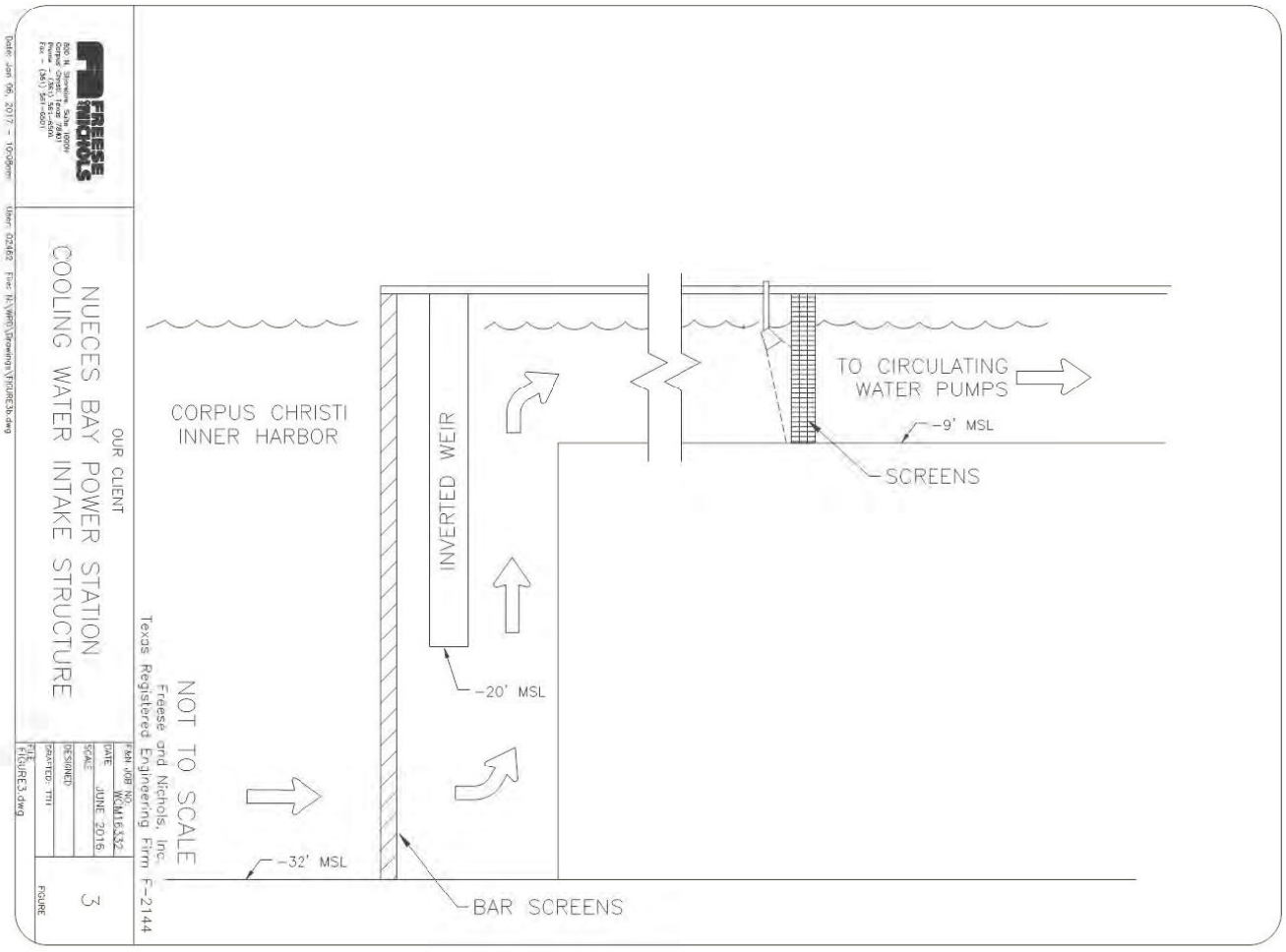

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COOLING WATER INTAKE STRUCTURE DIAGRAM

NUECES BAY, LLC; Nueces Bay Power Station
2002 E. Navigation Blvd.
Corpus Christi, Texas

FIGURE 3

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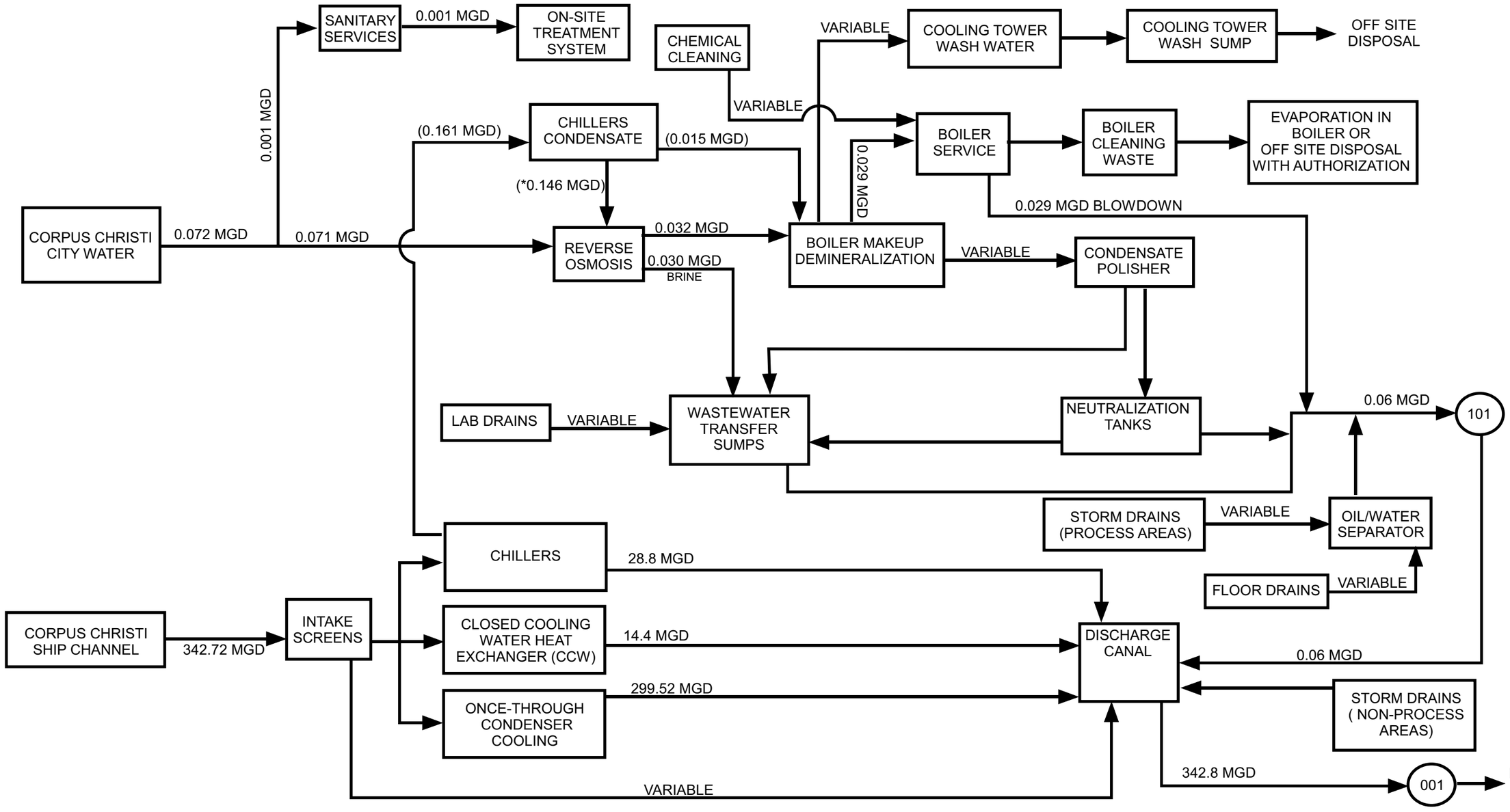
REV. DATE:	**3/15/2020**
DRAWING ID:	**Y:\NUE\CC\316B19_22111\1584525372\r3**



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MGD - Million Gallons Per Day

FLOW DISTRIBUTION DIAGRAM
NUECES BAY, LLC
Nueces Bay Power Station
Corpus Christi, Nueces County, Texas

FIGURE
4

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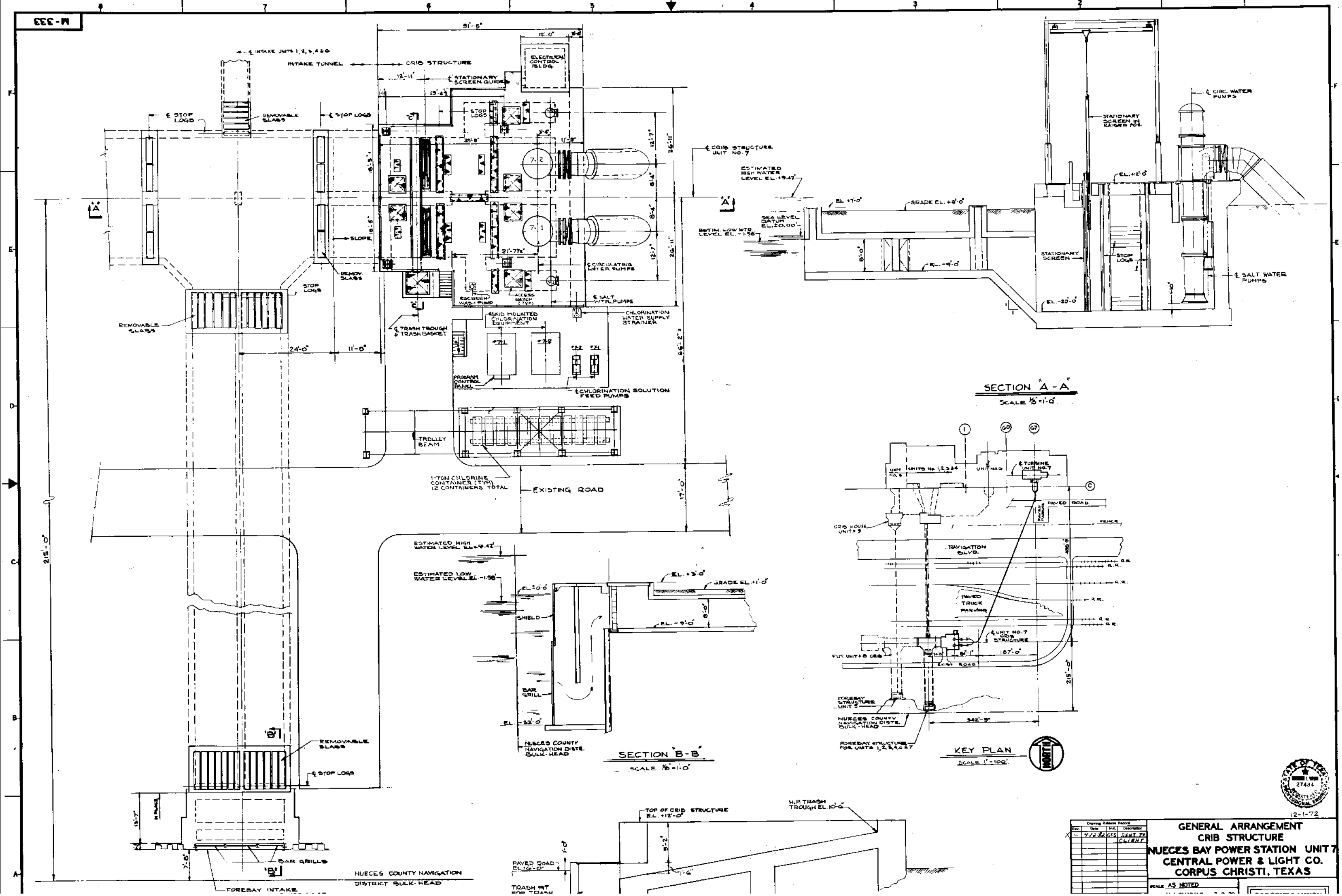
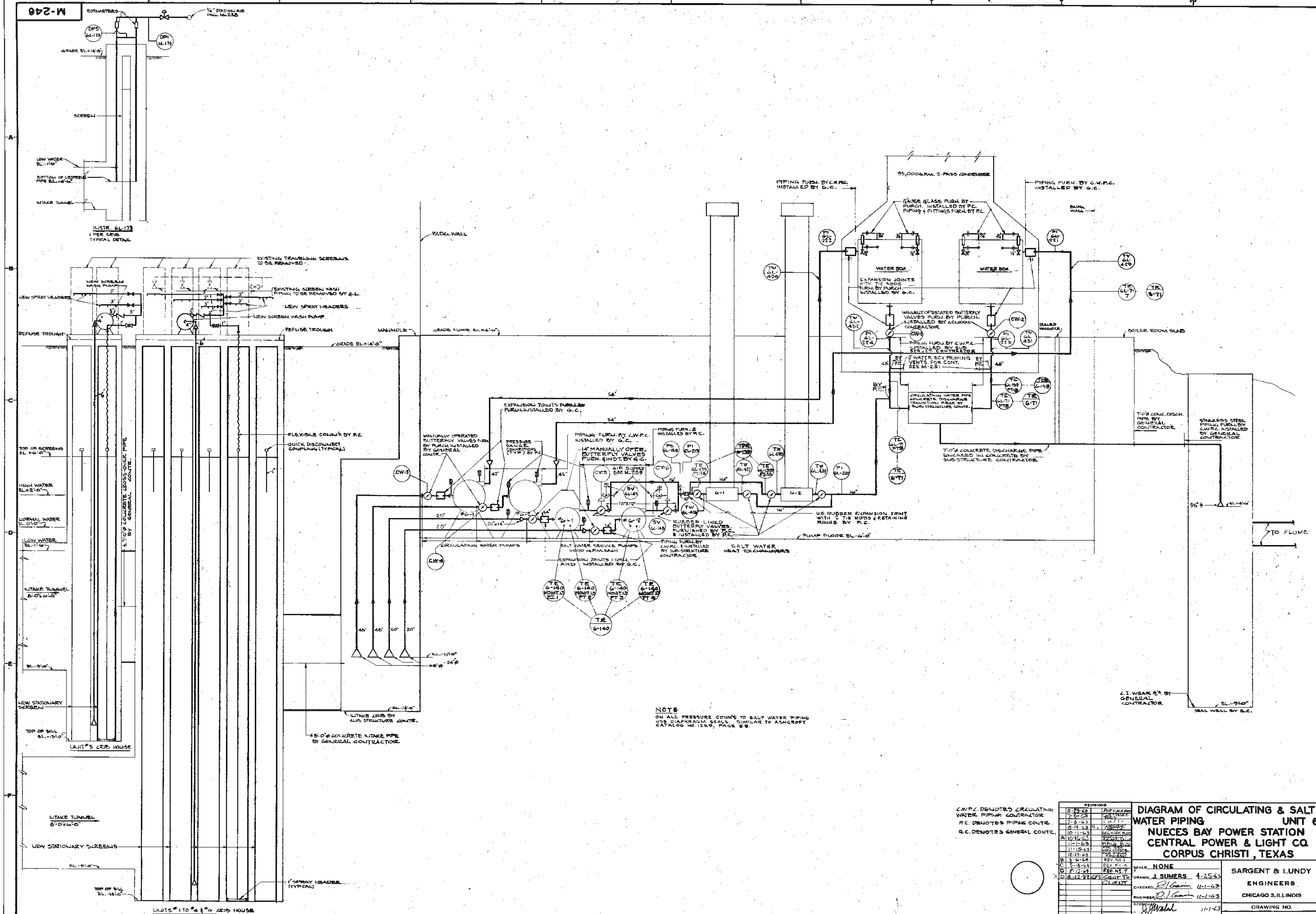

M-333
℄ INTAKE UNITS 1, 2, 3, 4 & 6
INTAKE TUNNEL
CRIB STRUCTURE
ELECTRICAL CONTROL BLDG.
℄ STATIONARY SCREEN GUIDES
℄ STOP LOGS
REMOVABLE SLABS
STOP LOGS
SLOPE
REMOV. SLABS
℄ CIRCULATING WATER PUMPS
℄ SALT WTR. PUMPS
SCREEN WASH PUMP
ACCESS HATCH (TYP)
℄ TRASH TROUGH & TRASH BASKET
SKID MOUNTED CHLORINATION EQUIPMENT
CHLORINATION WATER SUPPLY STRAINER
PROGRAM CONTROL PANEL
℄ CHLORINATION SOLUTION FEED PUMPS
TROLLEY BEAM
1-TON CHLORINE CONTAINER (TYP) 12 CONTAINERS TOTAL
EXISTING ROAD
℄ CRIB STRUCTURE UNIT NO. 7
ESTIMATED HIGH WATER LEVEL EL. +9.42'
SEA LEVEL DATUM EL. ±0.00'
ESTIM. LOW WTR. LEVEL EL. -1.56'
GRADE EL. +9'-0"
STATIONARY SCREEN IN RAISED POS.
℄ CIRC. WATER PUMPS
STATIONARY SCREEN
STOP LOGS
℄ SALT WATER PUMPS
SECTION "A-A"
SCALE 1/8" = 1'-0"
ESTIMATED HIGH WATER LEVEL EL. +9.42'
ESTIMATED LOW WATER LEVEL EL. -1.56'
SHIELD
BAR GRILL
NUECES COUNTY NAVIGATION DISTR. BULK-HEAD
SECTION "B-B"
SCALE 1/8" = 1'-0"
UNITS No. 1, 2, 3 & 4
℄ TURBINE UNIT NO. 7
PAVED ROAD
CRIB HOUSE UNIT 5
NAVIGATION BLVD.
PAVED TRUCK PARKING
℄ UNIT NO. 7 CRIB STRUCTURE
FUT. UNIT 8 CRIB
EXIST. ROAD
FOREBAY STRUCTURE UNIT 5
NUECES COUNTY NAVIGATION DISTR. BULK-HEAD
FOREBAY STRUCTURE FOR UNITS 1, 2, 3, 4, 6 & 7
KEY PLAN
SCALE 1" = 100'
NORTH
BAR GRILLS
NUECES COUNTY NAVIGATION DISTRICT BULK-HEAD
FOREBAY INTAKE
TOP OF CRIB STRUCTURE EL. +12'-0"
H.P. TRASH TROUGH EL. 10'-6"
PAVED ROAD EL. +6'-0"
TRASH PIT FOR TRASH
STATE OF TEXAS 27484 REGISTERED PROFESSIONAL ENGINEER
12-1-72
GENERAL ARRANGEMENT
CRIB STRUCTURE
NUECES BAY POWER STATION UNIT 7
CENTRAL POWER & LIGHT CO.
CORPUS CHRISTI, TEXAS
SCALE AS NOTED



C.W.P.C. DENOTES CIRCULATING WATER PIPING CONTRACTOR
P.C. DENOTES PIPING CONTR.
G.C. DENOTES GENERAL CONTR.

REVISIONS			
	5-29-63		FOR C.W.P.C. BIDS
	7-5-63		
	7-8-63		C.W.P.C.
	8-19-63		
	10-1-63		GEN. WORK BIDS
A	10-16-63		
	11-1-63		PIPING BIDS
	11-15-63		FOR GEN. WORK CONSTR.
	12-23-63		FOR PIPING CONTRACT
B	3-6-64		REV. No. 1
C	5-18-64		REV. No. 4
D	8-12-64		REV. No. 9
D	4-12-82	GFS	SENT TO CLIENT

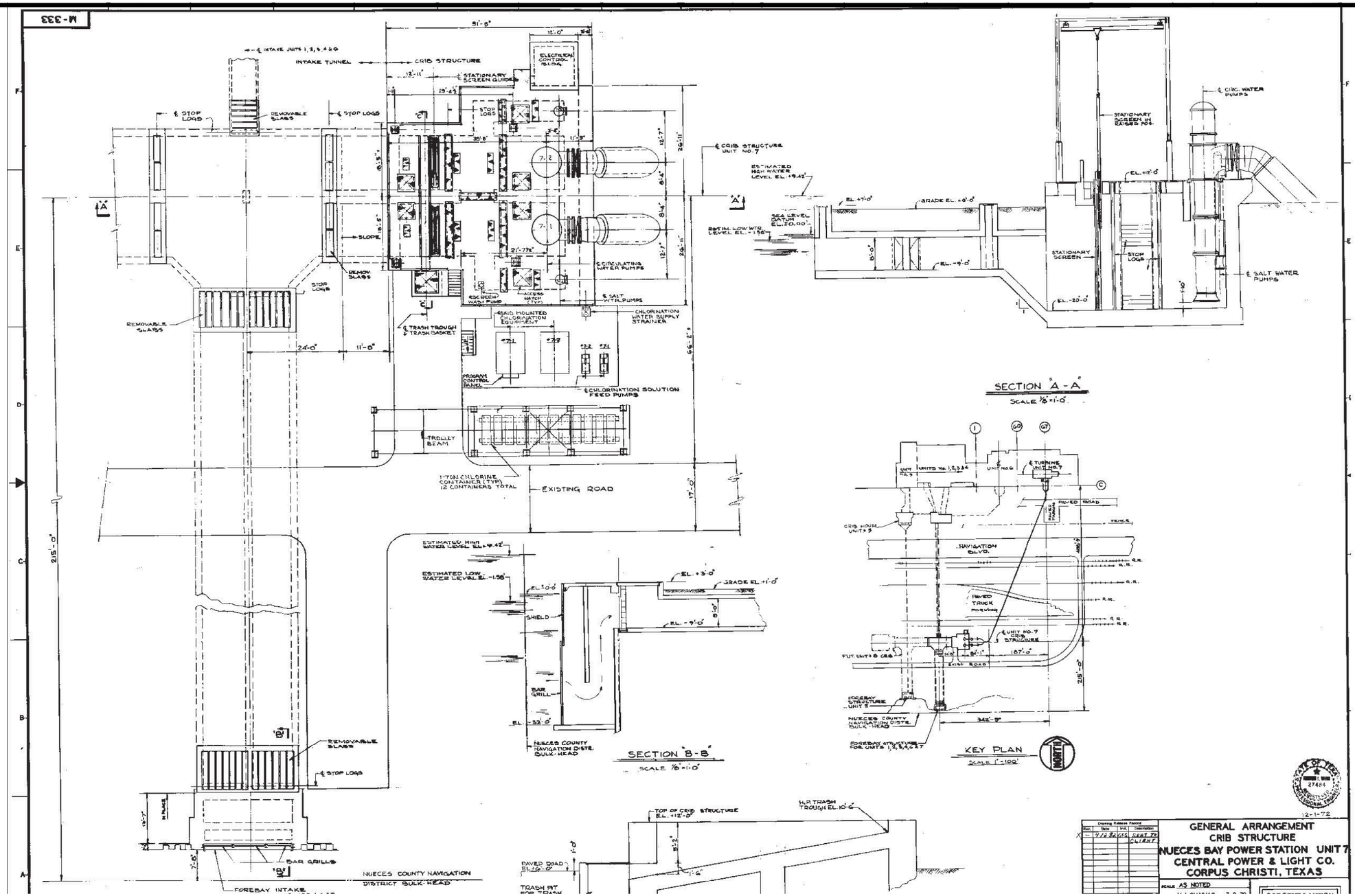
DIAGRAM OF CIRCULATING & SALT WATER PIPING UNIT 6
NUECES BAY POWER STATION
CENTRAL POWER & LIGHT CO.
CORPUS CHRISTI, TEXAS

SCALE NONE
DRAWN J SUMERS 4-25-63
CHECKED R. J. Gavin 11-1-63
ENGINEER R. J. Gavin 11-1-63
APPROVED J. J. Walsh 11-1-63
JOB NO. 3198

SARGENT & LUNDY
ENGINEERS
CHICAGO 3, ILLINOIS

DRAWING NO. M-246

M-333



Drawing Release Record			
Rev.	Date	Init.	Description
X	7/28/72	CCS	CONF. TO CLIENT

GENERAL ARRANGEMENT
CRIB STRUCTURE
NUECES BAY POWER STATION UNIT 7
CENTRAL POWER & LIGHT CO.
CORPUS CHRISTI, TEXAS

SCALE AS NOTED

12-1-72

ENVIRONMENTAL PROFESSIONALS

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CWIS ENGINEERING DRAWINGS
NUECES BAY, LLC
Nueces Bay Power Station
Corpus Christi, Nueces County, Texas

FIGURE
5A

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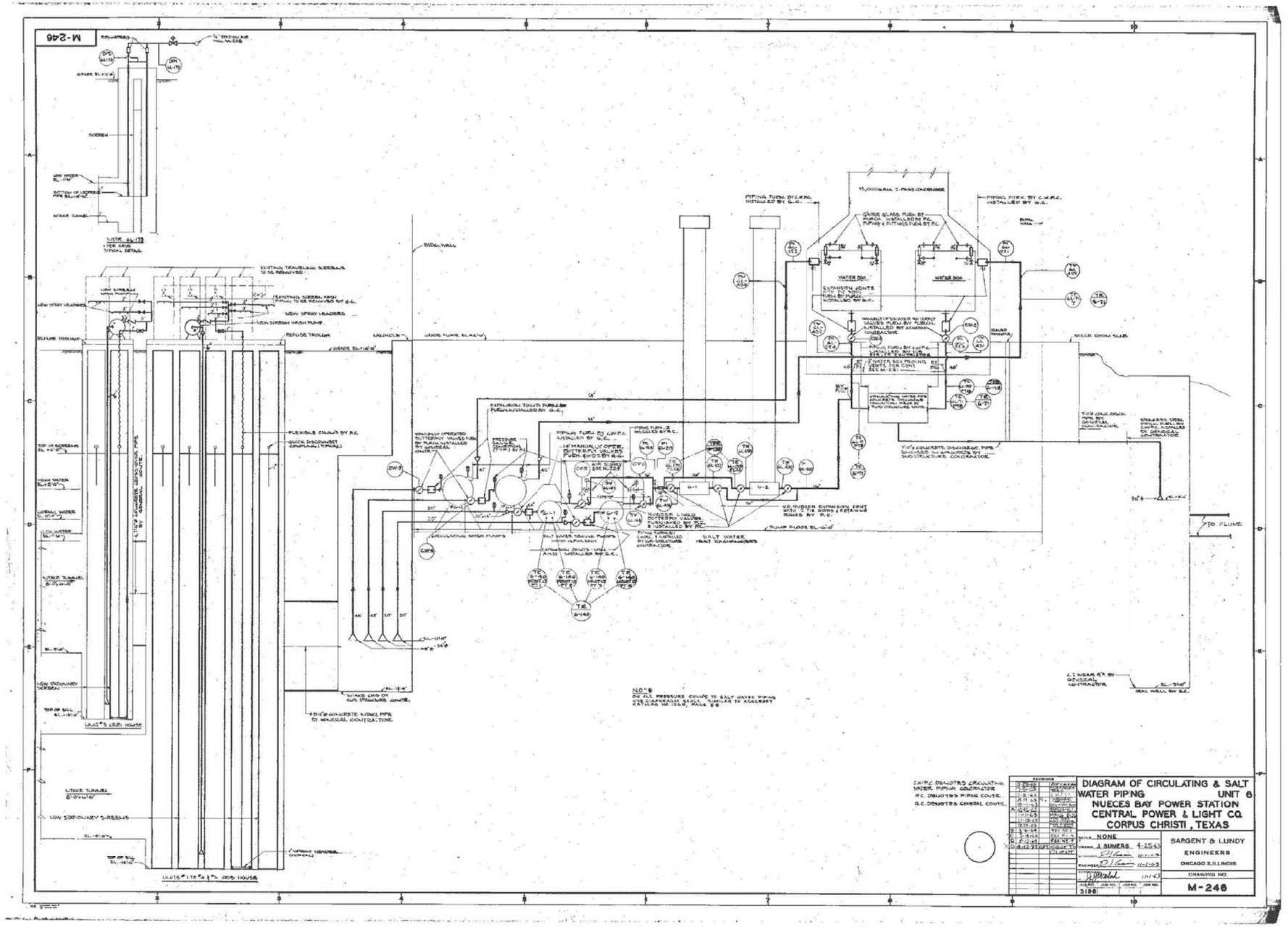

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(281) 446-7070 Fax (281) 446-3348

CWIS ENGINEERING DRAWINGS
NUECES BAY, LLC
Nueces Bay Power Station
Corpus Christi, Nueces County, Texas

FIGURE
5B

DRAWN BY:	**HJC**
DATE:	**07/15/2017**
REV. DATE:	
DRAWING ID:	Y:\NUE\CC\316B19_22111\1584525372\r3

40 CFR 122.21(r)(4)
SOURCE WATER BASELINE BIOLOGICAL CHARACTERIZATION DATA

40 CFR §122.21(r)(4) - SOURCE WATER BASELINE BIOLOGICAL CHARACTERIZATION DATA

40 CFR §122.21(r)(4) states:

"*Source water baseline biological characterization data*. This information is required to characterize the biological community in the vicinity of the cooling water intake structure and to characterize the operation of the cooling water intake structures. The Director may also use this information in subsequent permit renewal proceedings to determine if your Design and Construction Technology Plan as required in §125.86(b)(4) or §125.136(b)(3) of this chapter should be revised. This supporting information must include existing data (if they are available). However, you may supplement the data using newly conducted field studies if you choose to do so. The information you submit must include:

(i) A list of the data in paragraphs (r)(4)(ii) through (vi) of this section that are not available and efforts made to identify sources of the data;

(ii) A list of species (or relevant taxa) for all life stages and their relative abundance in the vicinity of the cooling water intake structure;

(iii) Identification of the species and life stages that would be most susceptible to impingement and entrainment. Species evaluated should include the forage base as well as those most important in terms of significance to commercial and recreational fisheries;

(iv) Identification and evaluation of the primary period of reproduction, larval recruitment, and period of peak abundance for relevant taxa;

(v) Data representative of the seasonal and daily activities (e.g., feeding and water column migration) of biological organisms in the vicinity of the cooling water intake structure;

(vi) Identification of all threatened, endangered, and other protected species that might be susceptible to impingement and entrainment at your cooling water intake structures;

(vii) Documentation of any public participation or consultation with Federal or State agencies undertaken in development of the plan; and

(viii) If you supplement the information requested in paragraph (r)(4)(i) of this section with data collected using field studies, supporting documentation for the Source Water Baseline Biological Characterization must include a description of all methods and quality assurance procedures for sampling, and data analysis including a description of the study area; taxonomic identification of sampled and evaluated biological assemblages (including all life stages of fish and shellfish); and sampling and data analysis methods. The sampling and/or data analysis methods you use must be appropriate for a quantitative survey and based on consideration of methods used in other biological studies performed within the same source water body. The study area should include, at a minimum, the area of influence of the cooling water intake structure.

(ix) In the case of the owner or operator of an existing facility or new unit at an existing facility, the Source Water Baseline Biological Characterization Data is the information in paragraphs (r)(4)(i) through (xii) of this section.

(x) For the owner or operator of an existing facility, identification of protective measures and stabilization activities that have been implemented, and a description of how these measures and activities affected the baseline water condition in the vicinity of the intake.

(xi) For the owner or operator of an existing facility, a list of fragile species, as defined at 40 CFR §125.92(m), at the facility. The applicant need only identify those species not already identified as fragile at 40 CFR §125.92(m). New units at an existing facility are not required to resubmit this information if the cooling water withdrawals for the operation of the new unit are from an existing intake.

(xii) For the owner or operator of an existing facility that has obtained incidental take exemption or authorization for its cooling water intake structure(s) from the U.S. Fish and Wildlife Service or the National Marine Fisheries Service, any information submitted in order to obtain that exemption or authorization may be used to satisfy the permit application information requirement of paragraph 40 CFR §125.95(f) if included in the application."

STATUS OF 40 CFR §122.21(r)(4) REPORT

Other Requirement No. 13 of NBPS' TPDES Permit No. WQ0001244000, issued on April 11, 2017, includes requirements for the development of studies and/or reports identified in 40 CFR §122.21(r).

Other Requirement No. 13 states:

> "The permittee shall prepare all application materials required by 40 CFR §122.21(r) for all provisions that apply to the facility. The deadline submission of these materials is to be determined by the TCEQ upon the subsequent application for renewal of this permit. The permittee shall provide all completed application materials required by 40 CFR §121.21(r) upon the subsequent application for renewal, along with a proposed schedule, which must include a proposed deadline and a reasonable timeline for the completion of the remaining application materials. Completion of the application materials is to occur as soon as is practicable, but in no case may the proposed deadline exceed 54 months after the date of issuance of a subsequent renewal of this permit action."

In accordance with this provision, development of the required information is ongoing and will be complete prior to the deadline of "54 months after the date of issuance of a subsequent renewal of this permit action." A subsequent renewal of the permit has not yet been issued, therefore a deadline date cannot be established. Although an absolute deadline cannot be established for

completion of all materials, NBPS anticipates the completion of §122.21(r)(4) by September 30, 2020, which is in compliance with Other Requirement No. 13.

40 CFR 122.21(r)(5)
COOLING WATER SYSTEM DATA

40 CFR 122.21(r)(5) - COOLING WATER SYSTEM DATA

BACKGROUND

Nueces Bay, LLC owns and operates Nueces Bay Power Station (NBPS), a 633-megawatt (MW) electric power generating facility, located at 2002 East Navigation Boulevard in Corpus Christi, Nueces County, Texas. The facility is physically located on approximately 63 acres on the north shore of the Corpus Christi Inner Harbor (CCIH) (Figures 1 and 2). NBPS was initially constructed in the mid-1930s to provide electrical power to the power grid. A Repowering Project was completed at the facility in 2010. The Repowering Project replaced the Unit 7 Boiler with two (2) new combustion turbines and associated duct-fired heat recovery steam generators (HRSGs) which, in combination with the reuse of the existing steam turbine-generator, comprise a combined cycle power plant. NBPS currently consists of the cooling water intake structure (CWIS) and screens, two (2) natural gas-fired combustion turbines (Units 8 and 9), two (2) Heat Recovery Steam Generators (HRSGs), one (1) steam turbine (STG7), a Power Distribution Center, Firewater Pump House, Continuous Emission Monitoring (CEM) Buildings, and a warehouse. As part of the repowering, Units 1-7 (natural gas-fired boilers) were demolished and removed from NBPS.

NBPS is authorized to divert up to 680,000 acre feet per year of water (equivalent to approximately 607 million gallons per day [MGD]) from the CCIH/Corpus Christi Ship Channel for industrial (cooling) purposes pursuant to Certificate of Adjudication No. 22-4505. Water withdrawn from the Corpus Christi Ship Channel is used for once through cooling. NBPS is authorized to discharge 605 million gallons per day (MGD) of once through cooling water to Nueces Bay pursuant to Texas Pollutant Discharge Elimination System (TPDES) Permit No. WQ0001244000.

The following paragraphs provide the information required pursuant to §122.21(r)(5).

(i)(1) A narrative description of the cooling water system and its relationship to the cooling water intake structures (CWIS).

The combined cycle power plant incorporates a two-on-one configuration (i.e., two [2] combustion turbine/duct-fired HRSG sets with one [1] steam turbine) to generate electricity. The exhaust gases from each combustion turbine pass through an HRSG that recovers exhaust heat from the combustion turbine that would otherwise be exhausted through the stack. Each HRSG is equipped with duct burners to provide additional heat input to the combustion gases used to generate steam. The steam is used to drive the steam turbine to generate additional electricity.

After steam has passed through the steam turbine, it must be condensed (i.e., cooled) back into water before it can be reused to produce more electricity. The cooling water

passes through the steam condensers to absorb the waste heat. The function of the steam condensers is to condense the exhaust steam from the steam turbine to liquid condensate by transferring the thermal energy of the steam to the cooling water passing through the condenser.

Cooling water is withdrawn from the CCIH, identified as the final 8.5 miles of the Corpus Christi Ship Channel. Water withdrawn from the CCIH passes through bar screens at a bulkhead on the north shore of the Inner Harbor, then through a 165-foot long underground concrete-lined intake chamber. The diverted water, once thru the bar screen, passes under an inverted weir which extends from the top of the chamber to a depth of 20 feet. This design is to ensure withdrawal of water from depths greater than approximately 20 feet. The bar screens prevent objects, debris, and marine life greater than three inches in diameter from entering the concrete-lined intake chamber. From the intake chamber, water flows through two parallel concrete rectangular tunnels (8 feet deep by 9.75 feet wide) and passes through two (2) 3/8-inch square steel mesh screens. The cooling water that passes through the screens is then pumped under East Navigation Boulevard to NBPS where it passes through the steam condensers to absorb waste heat. The once-through cooling water is subsequently discharged to the southern shore of Nueces Bay.

(i)(2) The proportion of the design intake flow that is used in the system.

Total Design Intake Flow (DIF)	344 Million Gallons per Day (MGD)
Total Actual Intake Flow (AIF)[1]	183-326 MGD

[1] Based on 2016-2017 total seawater withdrawal (monthly average flow rates, MGD).

(i)(3) The number of days of the year the cooling water system is in operation and seasonal changes in the operation of the system.

The cooling water system may operate up to 365 days per year. The cooling water system is operated during times the electric generating units (EGUs) (i.e., Units 8 and 9) are operating. NBPS is located in the Electric Reliability Council of Texas (ERCOT) electric power market. ERCOT dispatches power to the electric grid based on demand for electricity. Typically, peak demand for electricity occurs during the warmer spring and summer months, primarily due to air conditioning use in homes and businesses. Colder than usual winter weather conditions can also drive the demand for electricity.

(i)(4) The proportion of design intake flow for contact cooling, non-contact cooling, and process uses.

Intake Flow Uses (%)	
Contact cooling	0%
Non-contact cooling	100%
Process Uses	0%
Other	0%

(i)(5) A distribution of water reuse to include cooling water reused as process water, process water reused for cooling, and the use of gray water for cooling.

Cooling water is not reused as process water, process water is not reused for cooling, and gray water is not used for cooling; therefore, the information related to the distribution of water reuse is not applicable.

(i)(6) A description of reductions in total water withdrawals including cooling water intake flow reductions already achieved through minimized process water withdrawals.

Process water withdrawals do not occur; therefore, the information related to reductions in total water withdrawals is not applicable.

(i)(7) A description of any cooling water that is used in a manufacturing process either before or after it is used for cooling, including other recycled process water flows.

Cooling water is not used in a manufacturing process; therefore, the information related to cooling water that is used in a manufacturing process is not applicable.

(i)(8) The proportion of the source waterbody withdrawn (on a monthly basis).

The CCIH is the final 8.5 miles of the Corpus Christi Ship Channel. The Corpus Christi Ship Channel is an approximately 45-foot deep channel that extends from deep water in the Gulf of Mexico through a jettied entrance channel and across Corpus Christi Bay, 34 miles inland to the Port of Corpus Christi. The CCIH ranges from approximately 200 feet to 1200 feet wide, with the widest points being located in the turning basins. The NBPS CWIS is located approximately 1.7 miles west of the point where the CCIH opens into Corpus Christi Bay. The width of the Inner Harbor at the CWIS location is approximately 800 feet.

Based on an 8.5 mile length, average depth of 45 feet and average width of 400 feet (Brogan, 2001) the volume of the Inner Harbor is approximately 18,545 acre-feet. Based on the average monthly seawater withdrawn during calendar year 2016 (i.e., 26,499 acre-feet per month), the percent proportion of the source waterbody withdrawn on a monthly basis is approximately 143%. However, as previously noted, the Corpus Christi Ship Channel extends from deep water in the Gulf of Mexico through a jettied entrance channel and across Corpus Christi Bay; therefore, the Corpus Christi Ship Channel allows the free circulation of water between the Gulf of Mexico, Corpus Christi Bay and the CCIH, so tidal currents replenish any water that is withdrawn from the CCIH.

(ii) Design and engineering calculations prepared by a qualified professional and supporting data.

The water balance for NBPS, including the cooling water system design flow rates, is provided as Figure 3.

(iii) Description of existing impingement and entrainment technologies or operational measures.

Water withdrawn from the CCIH passes through bar screens at a bulkhead located on the north shore of the CCIH, then through a 165-foot long underground concrete-lined intake chamber. The bar screens prevent objects, debris, and marine life greater than three inches in diameter from entering the concrete-lined intake chamber. The diverted cooling water, after passing through the bar screen, then passes under an inverted weir which extends from the top of the chamber to a depth of 20 feet. This design is to facilitate water diverted from the Inner Harbor which emanates from a depth of 20 to 32 feet below the water's surface. From the intake chamber, water flows through two (2) parallel concrete rectangular tunnels (8 feet deep by 9.75 feet wide) for approximately 150 feet to an underground concrete basin where the cooling water from both tunnels mix.

From the concrete basin, the cooling water flows into one of two intake bays through a series of two (2) 3/8-inch square steel mesh screens. There are two (2) screens in series for each intake bay for a total of four (4) screens. Each screen is 24 feet high and 12 feet wide. The 3/8-inch square steel mesh screens are visually inspected daily by NBSP operating personnel and are cleaned manually as necessary to remove impinged material (e.g., objects, debris, and marine life that collect on the bar screens). To ensure that the diverted water passes through one of the 3/8-inch square steel mesh screens during cleaning, each of the screens is rinsed in series. A screen is raised above ground level using a pulley and washed with a high pressure water spray (water is obtained from the Ship Channel or is potable water) while the second screen remains in place. Impinged material washed from the screen is rinsed into an in-ground concrete-lined sump. The

second screen in the series remains in place while the first screen is being rinsed. After the first screen is rinsed, it is lowered and returned to its operating position upstream of the circulating pumps and the second screen is raised and rinsed in the same manner. This process ensures there is at least one screen is on service upstream of the circulating pumps during operation. The wash water and any debris and organisms removed from the screens flows the in-ground sump which is pumped by a fish friendly pump via underground pipeline to the discharge canal.

REFERENCES

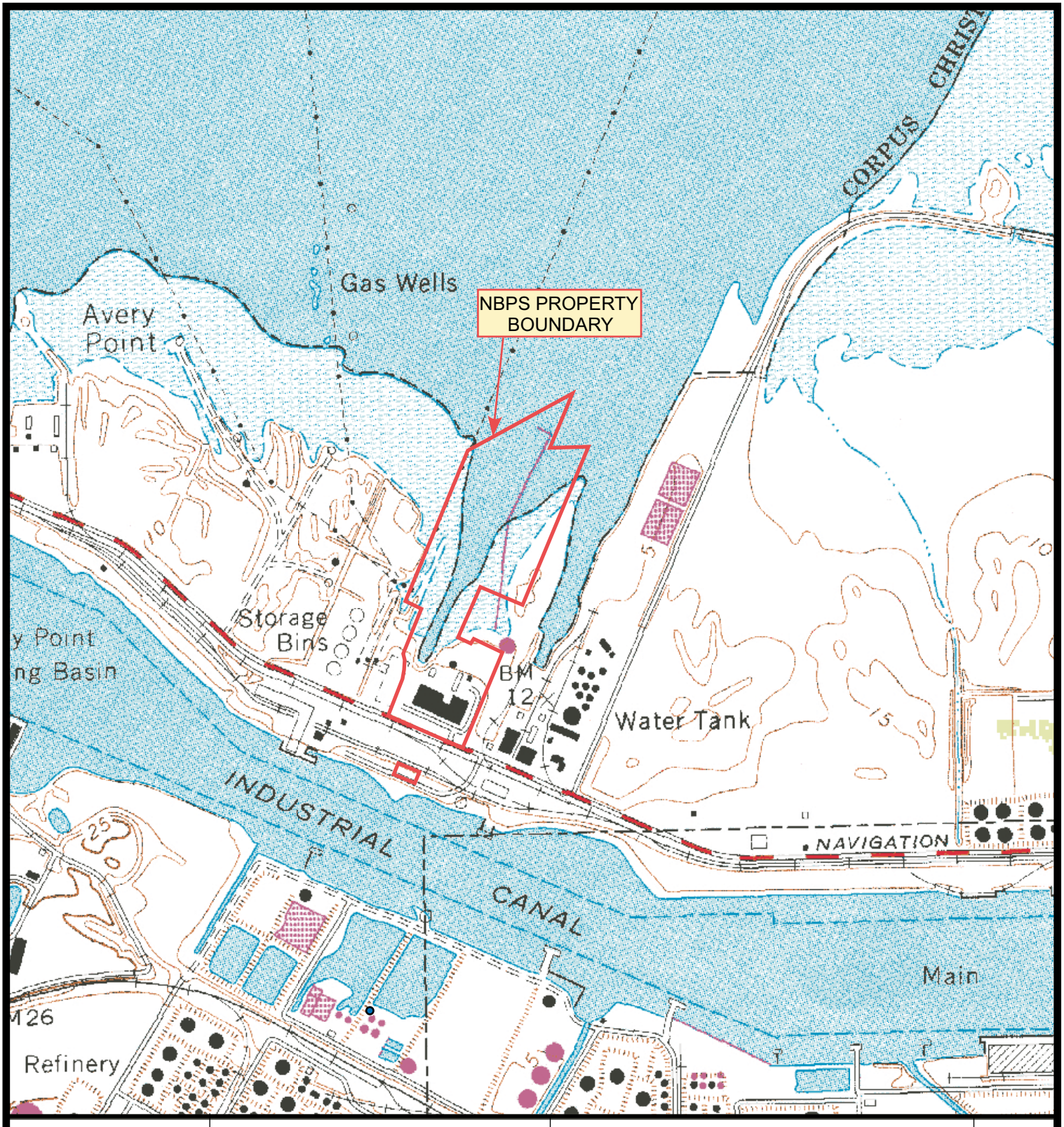
Brogan, Frank C. P.E., R.P.L.S. “Port of Corpus Christi Building for the Future.” 2001. Accessed May 23, 2018.
http://onlinepubs.trb.org/onlinepubs/archive/conferences/2001SummerPorts/Session3Brogan.pdf

ENVIRONMENTAL PROFESSIONALS
WCM
The WCM Group, Inc.
P. O. Box 3247
Humble, TX 77347-3247
(281) 446-7070 Fax (281) 446-3348

Facility Location
NUECES BAY, LLC
Nueces Bay Power Station
Corpus Christi, Nueces County, Texas

FIGURE
1

DRAWN BY:	**HJC**
DATE:	**07/15/2017**
REV. DATE:	
DRAWING ID:	Y:\NUE\CC\316B19_22111\1584525372\r5



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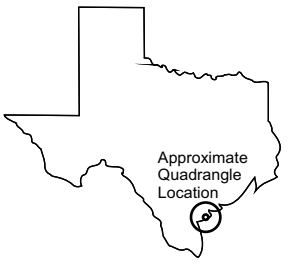
Humble, TX 77347-3247
(281) 446-7070 Fax (281) 446-3348

Location on 7.5 Minute USGS Topo Quads: Corpus Christi, Texas; Zone 14



SITE TOPOGRAPHIC MAP

NUECES BAY, LLC; Nueces Bay Power Station
2002 E. Navigation Blvd.
Corpus Christi, Texas

FIGURE 2

DRAWN BY:	AKD/hjc
DATE:	1/19/2010
REV. DATE:	7/15/2017
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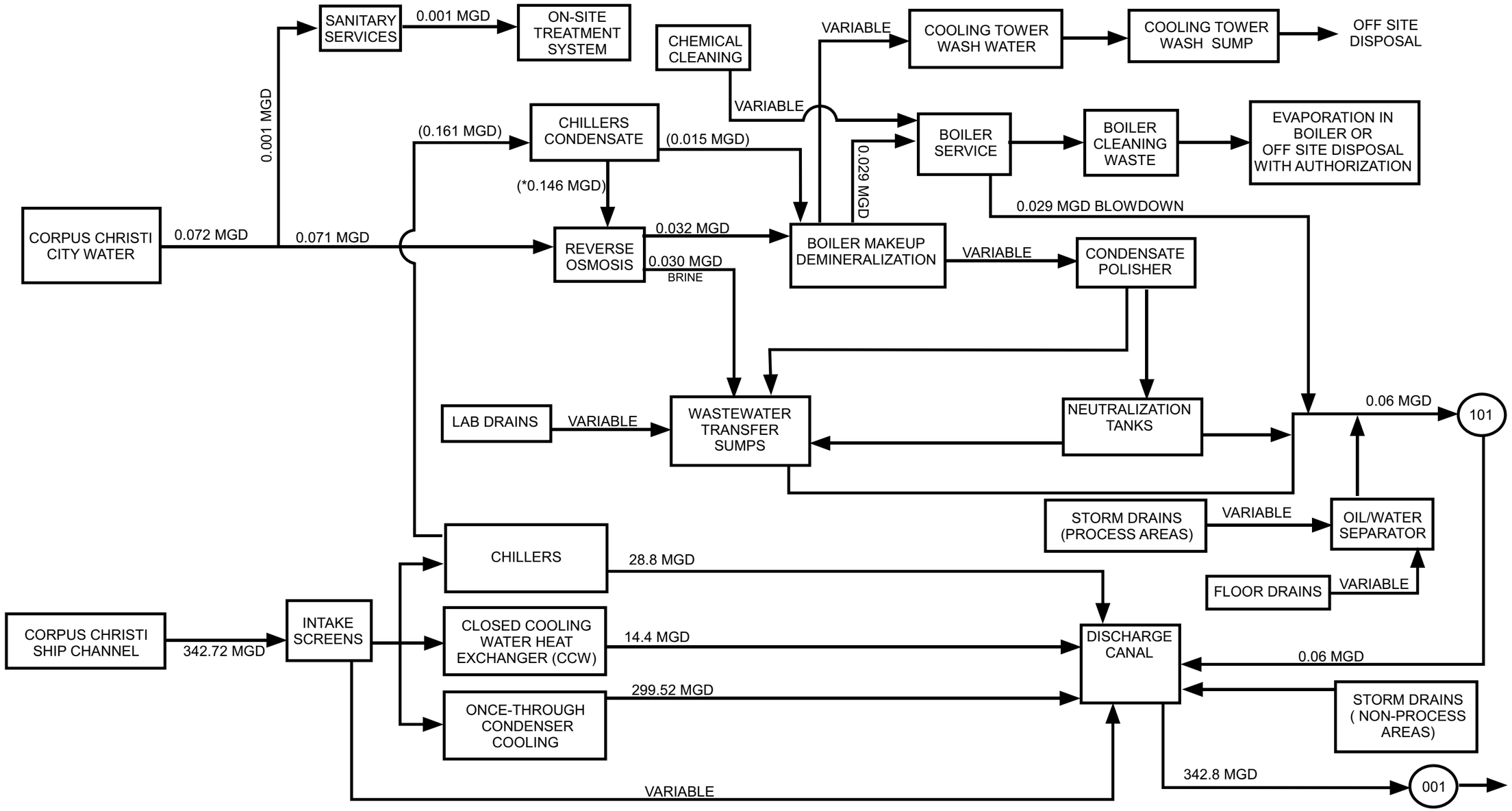

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MGD - Million Gallons Per Day

FLOW DISTRIBUTION DIAGRAM
NUECES BAY, LLC
Nueces Bay Power Station
Corpus Christi, Nueces County, Texas

FIGURE 3

DRAWN BY:	HJC
DATE:	07/15/2017
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40 CFR 122.21(r)(6)
CHOSEN METHOD(S) OF COMPLIANCE WITH IMPINGEMENT MORTALITY STANDARD

40 CFR 122.21(r)(6) - CHOSEN METHOD(S) OF COMPLIANCE WITH IMPINGEMENT MORTALITY STANDARD

40 CFR §122.21(r)(6) states:

"The owner or operator of the facility must identify the chosen compliance method for the entire facility; alternatively, the applicant must identify the chosen compliance method for each cooling water intake structure at its facility. The applicant must identify any intake structure for which a BTA determination for Impingement Mortality under 40 CFR §125.94 (c)(11) or (12) is requested. In addition, the owner or operator that chooses to comply via 40 CFR §125.94 (c)(5) or (6) must also submit an *impingement technology performance optimization study* as described below:

(i) If the applicant chooses to comply with 40 CFR §125.94(c)(5), subject to the flexibility for timing provided in 40 CFR §125.95(a)(2), the *impingement technology performance optimization study* must include two years of biological data collection measuring the reduction in impingement mortality achieved by the modified traveling screens as defined at 40 CFR §125.92(s) and demonstrating that the operation has been optimized to minimize impingement mortality. A complete description of the modified traveling screens and associated equipment must be included, including, for example, type of mesh, mesh slot size, pressure sprays and fish return mechanisms. A description of any biological data collection and data collection approach used in measuring impingement mortality must be included:

(A) Collecting data no less frequently than monthly. The Director may establish more frequent data collection;
(B) Biological data collection representative of the impingement and the impingement mortality at the intakes subject to this provision;
(C) A taxonomic identification to the lowest taxon possible of all organisms collected;
(D) The method in which naturally moribund organisms are identified and taken into account;
(E) The method in which mortality due to holding times is taken into account;
(F) If the facility entraps fish or shellfish, a count of entrapment, as defined at 40 CFR §125.92(j), as impingement mortality; and
(G) The percent impingement mortality reflecting optimized operation of the modified traveling screen and all supporting calculations.

(ii) If the applicant chooses to comply with 40 CFR §125.94(c)(6), the *impingement technology performance optimization study* must include biological data measuring the reduction in impingement mortality achieved by operation of the system of technologies, operational measures and best management practices, and demonstrating that operation

of the system has been optimized to minimize impingement mortality. This system of technologies, operational measures and best management practices may include flow reductions, seasonal operation, unit closure, credit for intake location, and behavioral deterrent systems. The applicant must document how each system element contributes to the system's performance. The applicant must include a minimum of two years of biological data measuring the reduction in impingement mortality achieved by the system. The applicant must also include a description of any sampling or data collection approach used in measuring the rate of impingement, impingement mortality, or flow reductions.

(A) *Rate of Impingement.* If the demonstration relies in part on a credit for reductions in the rate of impingement in the system, the applicant must provide an estimate of those reductions to be used as credit towards reducing impingement mortality, and any relevant supporting documentation, including previously collected biological data, performance reviews, and previously conducted performance studies not already submitted to the Director. The submission of studies more than 10 years old must include an explanation of why the data are still relevant and representative of conditions at the facility and explain how the data should be interpreted using the definitions of impingement and entrapment at 40 CFR §125.92(n) and (j), respectively. The estimated reductions in rate of impingement must be based on a comparison of the system to a once-through cooling system with a traveling screen whose point of withdrawal from the surface water source is located at the shoreline of the source waterbody. For impoundments that are waters of the United States in whole or in part, the facility's rate of impingement must be measured at a location within the cooling water intake system that the Director deems appropriate. In addition, the applicant must include two years of biological data collection demonstrating the rate of impingement resulting from the system. For this demonstration, the applicant must collect data no less frequently than monthly. The Director may establish more frequent data collection.

(B) *Impingement Mortality.* If the demonstration relies in part on a credit for reductions in impingement mortality already obtained at the facility, the applicant must include two years of biological data collection demonstrating the level of impingement mortality the system is capable of achieving. The applicant must submit any relevant supporting documentation, including previously collected biological data, performance reviews, and previously conducted performance studies not already submitted to the Director. The applicant must provide a description of any sampling or data collection approach used in measuring impingement mortality. In addition, for this demonstration the applicant must:

(1) Collect data no less frequently than monthly. The Director may establish more frequent data collection;

(2) Conduct biological data collection that is representative of the impingement and the impingement mortality at an intake subject to this provision. In addition, the applicant must describe how the location of the cooling water intake structure in the waterbody and the water column are accounted for in the points of data collection;
(3) Include a taxonomic identification to the lowest taxon possible of all organisms to be collected;
(4) Describe the method in which naturally moribund organisms are identified and taken into account;
(5) Describe the method in which mortality due to holding times is taken into account; and
(6) If the facility entraps fish or shellfish, a count of the entrapment, as defined at 40 CFR §125.92(j), as impingement mortality.

(C) *Flow reduction.* If the demonstration relies in part on flow reduction to reduce impingement, the applicant must include two years of intake flows, measured daily, as part of the demonstration, and describe the extent to which flow reductions are seasonal or intermittent. The applicant must document how the flow reduction results in reduced impingement. In addition, the applicant must describe how the reduction in impingement has reduced impingement mortality.

(D) *Total system performance.* The applicant must document the percent impingement mortality reflecting optimized operation of the total system of technologies, operational measures, and best management practices and all supporting calculations. The total system performance is the combination of the impingement mortality performance reflected in paragraphs (r)(6)(ii)(A), (B), and (C) of this section."

STATUS OF 40 CFR 122.21(r)(6) REPORT

Other Requirement No. 13 of NBPS' TPDES Permit No. WQ0001244000, issued on April 11, 2017, includes requirements for the development of studies and/or reports identified in 40 CFR §122.21(r).

Other Requirement No. 13 states:

"The permittee shall prepare all application materials required by 40 CFR §122.21(r) for all provisions that apply to the facility. The deadline submission of these materials is to be determined by the TCEQ upon the subsequent application for renewal of this permit. The permittee shall provide all completed application materials required by 40 CFR §121.21(r) upon the subsequent application for renewal, along with a proposed schedule, which must include a proposed deadline and a reasonable timeline for the completion of the remaining application materials. Completion of the application materials is to occur as soon as is

practicable, but in no case may the proposed deadline exceed 54 months after the date of issuance of a subsequent renewal of this permit action."

In accordance with this provision, development of the required information is ongoing and will be complete prior to the deadline of "54 months after the date of issuance of a subsequent renewal of this permit action." A subsequent renewal of the permit has not yet been issued, therefore a deadline date cannot be established. Although an absolute deadline cannot be established for completion of all materials, NBPS anticipates the completion of §122.21(r)(6) by March 31, 2021, which is in compliance with Other Requirement No. 13.

40 CFR 122.21(r)(7)
ENTRAINMENT PERFORMANCE STUDIES

40 CFR 122.21(r)(7) - ENTRAINMENT PERFORMANCE STUDIES

40 CFR §122.21(r)(7) states:

"The owner or operator of an existing facility must submit any previously conducted studies or studies obtained from other facilities addressing technology efficacy, through-facility entrainment survival, and other entrainment studies. Any such submittals must include a description of each study, together with underlying data, and a summary of any conclusions or results. Any studies conducted at other locations must include an explanation as to why the data from other locations are relevant and representative of conditions at your facility. In the case of studies more than 10 years old, the applicant must explain why the data are still relevant and representative of conditions at the facility and explain how the data should be interpreted using the definition of entrainment at 40 CFR §125.92(h)."

A copy of the previously conducted studies is provided herein.

ENVIRONMENTAL PROFESSIONALS

The WCM Group, Inc.

March 30, 2010

Mr. Tres Koenings
Texas Commission on Environmental Quality
Wastewater Permitting Section (MC 148)
Water Quality Division
12100 Park 35 Circle
Austin, TX 78753

LONE STAR OVERNIGHT
AIRBILL NUMBER
45318404

Reference: TPDES Permit No. WQ0001244000
Nueces Bay WLE, LP; Nueces Bay Power Station
Corpus Christi, Nueces County, Texas
RN100552181; CN602656639

Dear Mr. Koenings:

On behalf of Nueces Bay WLE, LP, The WCM Group, Inc. (WCM) is providing two (2) copies of the attached Cooling Alternatives and Appendix A, Impingement and Entrainment Monitoring Study, for the above-referenced permit in support of the pending Texas Pollution Discharge Elimination System (TPDES) Permit Renewal with Application. The studies, Attachment A and Attachment B herein, is being provided at the recommendation of the Texas Commission on Environmental Quality (TCEQ) in response to the *EPA DRAFT Fact Sheet: Development of BPJ-Based Section 316(b) NPDES Permit Conditions 1 (December 2007),* provided herein as Attachment C.

If there are any questions or comments, please do not hesitate to contact me at (281) 446-7070.

Sincerely,

Donny A. Hearn
Vice President, Technical Services

DAH/nb
28150:6720410.letrpt.doc

Attachments

cc: D. Lebsack
T. Elizondo
B. Burnfield
File: NBP.180.45

ATTACHMENT A

COOLING ALTERNATIVES

Nueces Bay Power Station –
Cooling Alternatives

PBS&J®

An employee-owned company

Document No. 090005
PBS&J Job No. 100003802

NUECES BAY POWER STATION – COOLING ALTERNATIVES

Prepared for:

Nueces Bay WLE, LP
2705 Bee Caves Road, Suite 340
Austin, Texas 78746

Prepared by:

PBS&J
6504 Bridge Point Parkway
Suite 200
Austin, Texas 78730

March 2010

Printed on recycled paper

Contents

Appendices:

Figures

Tables

Acronyms and Abbreviations

AEI	adverse environmental impact
BPJ	best professional judgment
BTA	best technology available
CWIS	cooling-water intake structures
EPA	Environmental Protection Agency
ft	feet/foot
ft/sec	foot per second
ft^2	square foot
g	gravity
GBNEP	Galveston Bay National Estuary Program
gpm	gallons per minute
HL&P	Houston Lighting and Power
HRSG	Heat Recovery Steam Generator
I&E	impingement and entrainment
IM&E	impingement mortality and entrainment
Inner Harbor	Corpus Christi Inner Harbor
mg/L	milligrams per liter
mgd	million gallons per day
mm	millimeter
MW	megawatts
NAE	National Academy of Engineering
NBPS	Nueces Bay Power Station
NOAA	National Oceanic and Atmospheric Administration
O&M	operation and maintenance
PIC	Proposal for Information Collection
study	monitoring study
TCEQ	Texas Commission on Environmental Quality
TPDES	Texas Pollutant Discharge Elimination System
TPWD	Texas Parks and Wildlife Department

Executive Summary

The Nueces Bay Power Station (NBPS) is an existing facility that is located on and withdraws cooling water from the Corpus Christi Inner Harbor (Inner Harbor). Nueces Bay WLE, LP began repowering the facility in 2007 to improve its thermal efficiency, which will in turn reduce its air emissions and required cooling-water volume. The facility has not operated since 2003.

The NBPS is regulated under the Clean Water Act Section 316(b) rules, which requires that the location, design, construction, and capacity of cooling water intake structures (CWIS) use the best technology available (BTA) for minimizing adverse environmental impacts (AEI). In preparation for the Texas Pollutant Discharge Elimination System permit renewal, the facility's cooling system was reviewed with respect to these rules. In addition, a 1-year study of the marine community was conducted to help estimate future impingement and entrainment and the possible need for additional fish-protection technologies.

The data collected suggests that approximately 439,000 age-1 equivalent of representative species might be entrained under a design operating flow of 343 million gallons per day. Although it was not possible to measure impingement since the plant is not operating, comparison to another Texas coastal power plant suggests an annual impingement mortality rate might approximate 0.052 fish and shellfish per million gallons. This mortality estimate may be conservatively high because it was derived from a different facility and many of the organisms in the estimate are shellfish, which have relatively high impingement survival rates.

The possible retrofit of the existing CWIS with additional fish-protection technologies was evaluated with respect to applicability, efficacy, and cost relative to benefit. Many of the technologies with possible application at the NBPS, including submerged cylindrical wedgewire screens (which was the Environmental Protection Agency modeled technology) cannot be used in the Inner Harbor since they would interfere with navigation. The use of coarse-mesh traveling screens and fish-handling and return systems would not be cost-effective since impingement is expected to be low. Entrainment of immature shellfish is expected to be relatively high. The most applicable technology for reducing entrainment would be the use of fine-mesh traveling screens with fish handling and return systems. However, this technology would significantly increase impingement and could result in mortality comparable or higher than the mortality from entrainment. One approach that could be evaluated for feasibility is the use of variable-speed circulating-water pumps. Depending on the facility operations, reducing flows during periods of low cooling water demand may be more cost effective than other alternatives.

The existing location of the CWIS is believed to be important for reducing the potential for AEI. The Inner Harbor is classified as "Intermediate Aquatic Life Use" and offers relatively little suitable nursery habitat for juvenile organisms. Additionally, the transfer of early life stages from the Inner Harbor to Nueces Bay, which is an important nursery, could provide some ecosystem and economic benefits. Considering the significant reductions in cooling-water flow relative to historic operations, limitations of available technologies, and the possible benefits associated with the transfer of organisms from the Inner Harbor to Nueces Bay, Nueces Bay WLE, LP believes that the existing CWIS is BTA for minimizing AEI.

1.0 INTRODUCTION

Section 316(b) of the Clean Water Act requires the location, design, construction, and capacity of cooling water intake structures (CWIS) to use the best technology available (BTA) for minimizing adverse environmental impact (AEI). Compliance with the current regulation requires best professional judgment (BPJ) of BTA for minimizing AEI on a case-by-case basis (40 CFR 125.90[b]).

In January 2007, the Environmental Protection Agency's (EPA) Phase II Section 316(b) rule for existing facilities was remanded to the EPA in *Riverkeeper, Inc., et al.* v. *EPA*. As a result, the EPA is presently revising the rule and has provided limited interim guidance to the states for using BPJ (EPA, 2007). In accordance with the EPA guidance, the Texas Commission on Environmental Quality (TCEQ) is requesting information during the permit-renewal process that can be used to develop BPJ-based permit requirements. This information is expected to include an overview of the facility with respect to the implementation of BTA and potential for AEI. The TCEQ also indicated that submittal of additional information may be required after permits are renewed.

Nueces Bay WLE, LP began renovations of the Nueces Bay Power Station (NBPS) in Corpus Christi, Texas, during 2007. The renovations are an example of redevelopment of aged-industrial infrastructure and a project that will provide a substantial improvement in the facility's energy efficiency, reduce its air emissions, and reduce the volume of cooling water that the plant requires. This report provides a description of the facility changes with respect to the cooling system, with possible implications for 316(b) compliance.

In preparation for the facility's Texas Pollutant Discharge Elimination System (TPDES) permit renewal (TPDES 0003581), a 1-year impingement and entrainment (I&E) monitoring study (study) was conducted to describe the fish and shellfish communities that would be susceptible to I&E in the Inner Harbor and Nueces Bay. This document utilizes information from the study and its results are provided in Appendix A. The study describes the differences among the communities at various locations at the CWIS on the Inner Harbor and in Nueces Bay. The location of cooling-water withdrawal is particularly important with respect to the location and design aspect of 316(b) rule implementation. In particular, the NBPS is rather unique in its location, withdrawing water from the Inner Harbor, which has the aquatic life use designation of "Intermediate Aquatic Life Use" (TCEQ, 2008). The Inner Harbor has limited habitat since it is an artificial environment that is used for industrial purposes. The facility discharges cooling water to Nueces Bay, which is classified as "Exceptional Aquatic Life Use" (TCEQ, 2008). As described in this report, the early facility design and future operations include, what is believed to be, the best location option available for reducing AEI.

2.0 NUECES BAY POWER STATION

The NBPS is a natural gas fired electric generating facility. The original four units were constructed in the early 1940s and were retired in the 1960s. When the plant was mothballed in 2003, there were three

generating units with a design capacity of 559 megawatts (MW). Unit 5 went online in 1949 and was rebuilt in 1983. It had a design capacity of 30 MW, with peak operation in the summer and winter. Unit 6 went online in 1965 followed by Unit 7 in 1974. Unit 6 had a design capacity of 161 MW, and Unit 7 had a design capacity of 368 MW. Units 6 and 7 could operate on fuel oil, if necessary. Until 2002, the facility operated continuously with output changing with electrical demand.

All units withdrew once-through cooling water from the north shore of the Inner Harbor. The cooling water was then discharged to Nueces Bay along its southern shore (Figure 2-1). The permitted cooling-water flow is 500 million gallons per day (mgd). The maximum discharge temperature specified in the TPDES permit is 106 degrees Fahrenheit (°F) (41 degrees Celsius [°C]). Units 5 and 6 were mothballed in 2002, and Unit 7 was mothballed in 2003.*

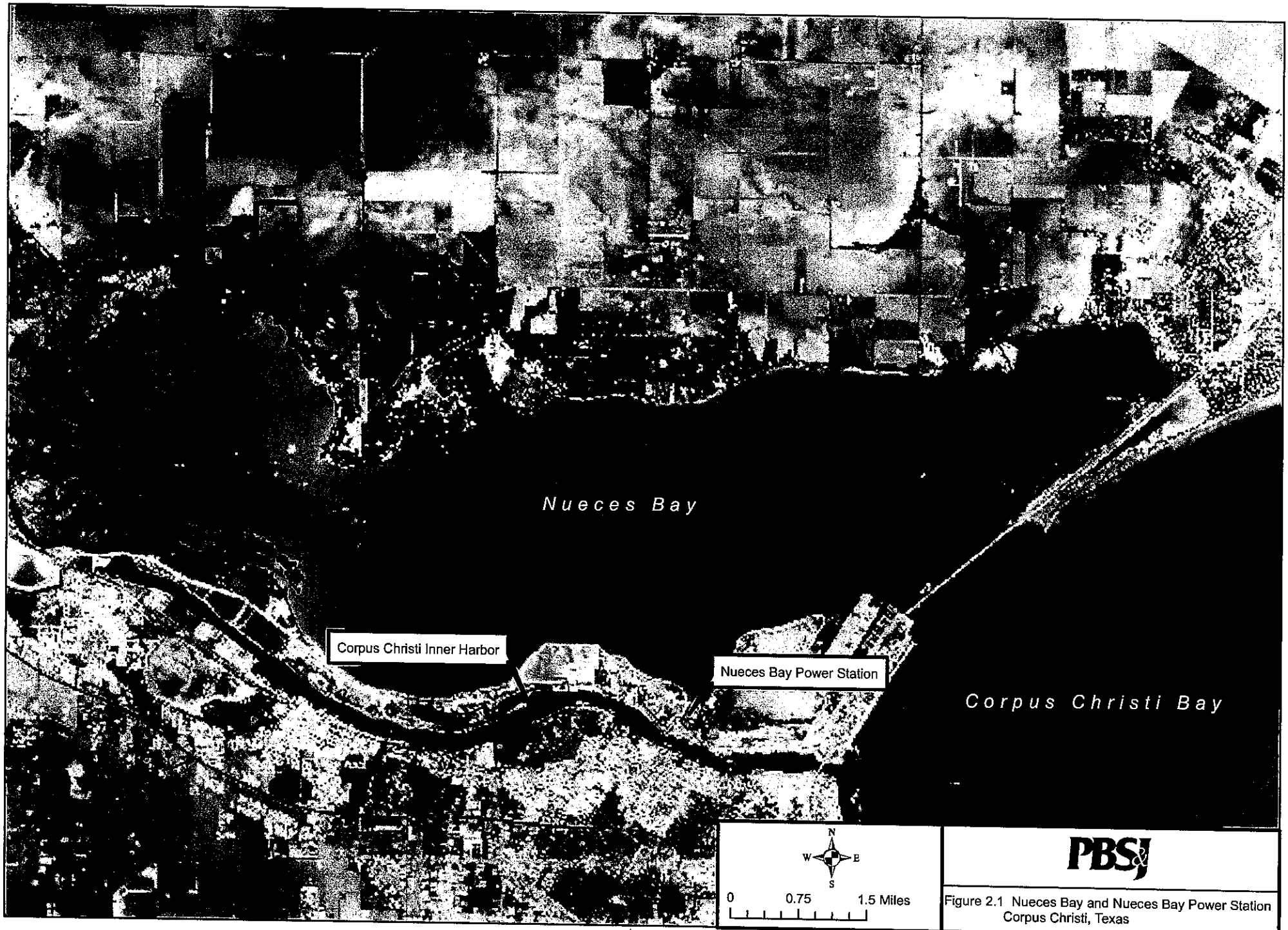
The NBPS renovation will substantially change the facility and cooling-water system. Units 5 and 6 have been dismantled. Part of Unit 7 will be retained and will support two new natural-gas turbines, identified as units 8 and 9. The new units will be rated at 175 MW each. Each unit consists of a natural-gas turbine that drives an electric generator with the hot turbine exhaust gas leading into a Heat Recovery Steam Generator (HRSG) or boiler. The two HRSGs will provide high-pressure steam to the Unit 7 steam turbine. The exhaust steam will be condensed in the old Unit 7 condenser and recycled to the HRSGs. When operating at best efficiency, the facility will produce 550 MW. It will be capable of producing 700 MW using less efficient duct burners, but this extra capacity is only expected to be employed during peak demand situations.

The cooling needs of the repowered facility will be reduced while the overall thermal efficiency will be substantially increased. Approximately twice the electrical power will be produced for a given volume of natural gas than was previously produced at the facility.

Figure 2-2 is a schematic view of the new cooling-water system. The CWIS for Unit 7 will be used in its current configuration. Maximum flow through the CWIS will be 238,000 gallons per minute (gpm) (342.8 mgd), which is a reduction in flow relative to the permit of approximately 157 mgd. The cooling water will be withdrawn from the Inner Harbor through a bar screen and then through a $^{3}/_{8}$-inch square-mesh screen. Cooling water will flow through the Unit 7 steam condensers and then into a discharge canal that flows into Nueces Bay. It is expected that the maximum temperature rise through the Unit 7 system will be approximately 10°F (5.6°C) under normal, high efficiency operation. During short peaks, a maximum of temperature use could be 19°F (10.6°C).

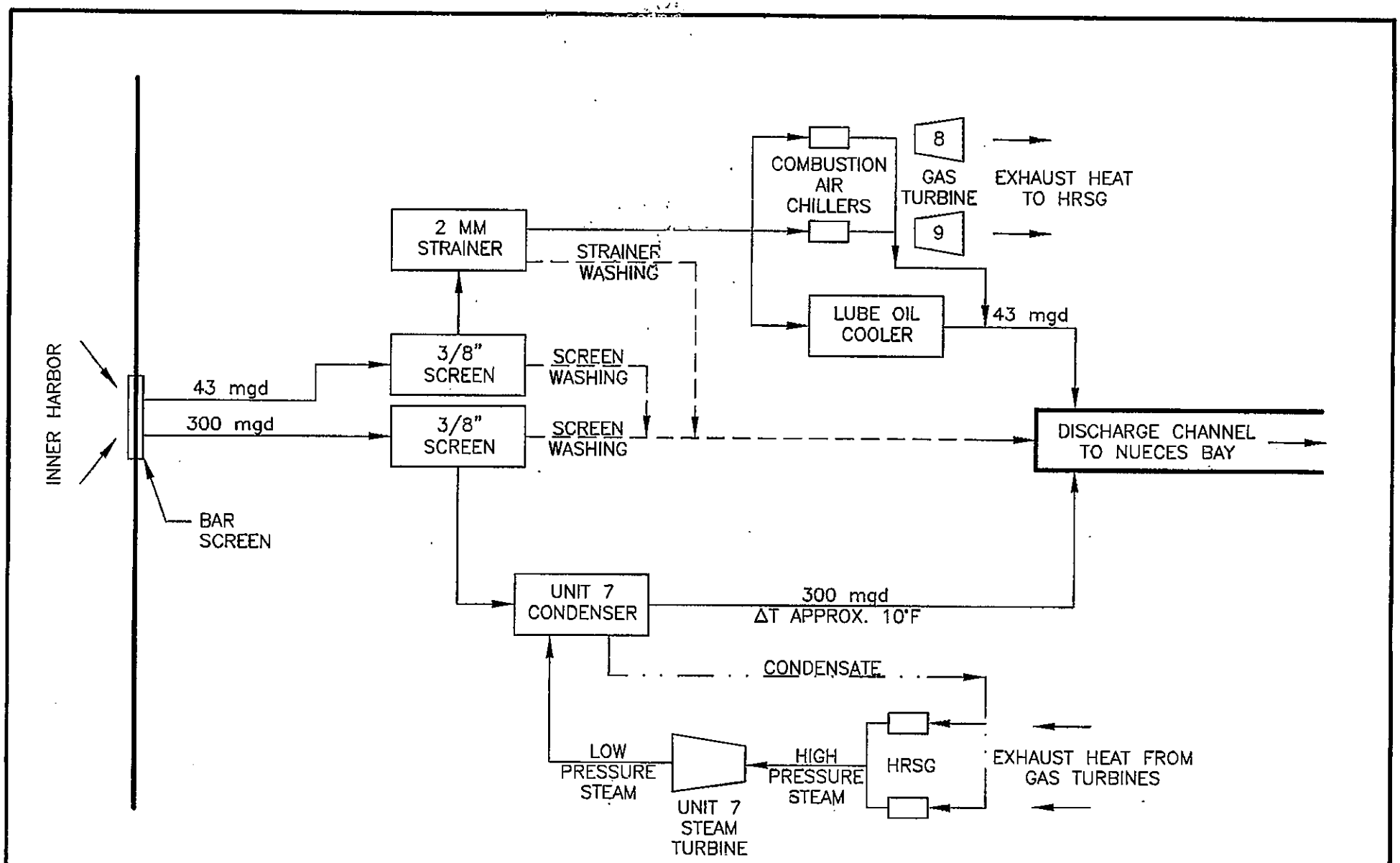
Plant personnel who previously operated the facility said the intake screens were usually cleaned once per day. The exception to this was when dense congregations of jellyfish were in the Inner Harbor and facility staff had to clean the screens almost continuously. The screens were hand-washed with power sprayers.

*The facility is being repowered by replacing the boilers with combined-cycle technology, which is much more efficient.



PBS&J

Figure 2.1 Nueces Bay and Nueces Bay Power Station
Corpus Christi, Texas



PBSJ
6504 BRIDGE POINT PARKWAY, SUITE 200
AUSTIN, TEXAS 78730- (512) 327-6840

FIGURE 2–2
COOLING SYSTEM
FLOW SCHEMATIC OF
MODIFIED NBPS

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This involved inserting a secondary screen into the CWIS and lifting the primary screen with a pulley for washing. The wash water flowed into a sluice and then into a pipeline, which was conveyed via gravity to the discharge canal. The screens are expected to be cleaned using the same method when the facility resumes operation. Control of biofouling on the heat exchanger will be accomplished using plastic balls, which will be circulated through the condenser, eliminating the need for antifouling agents, such as chlorine.

A limited amount of cooling water will also be withdrawn through the CWIS previously used for Unit 6. The intake pumps will be much smaller in size (30,000 gpm or 43 mgd) compared to the old pumps for Unit 6 that had a total capacity of 100,000 gpm (143 mgd). Flow will pass through a similar $^{3}/_{8}$-inch square-mesh screen (with wash water routed to the discharge canal). A seawater strainer system will employ a 2-millimeter (mm) screen mesh that will remove particles >2 mm in diameter. Material strained from the seawater at this point will flow to the discharge canal. The filtered water will be used to cool the turbine lubricating oil for units 7, 8, and 9, and the combustion air refrigeration system used to cool the gas turbine inlets. The overall temperature rise for these cooling functions is estimated to be 20°F (9.4°C) for the oil coolers and 10°F (5.6°C) for the air chillers.

The maximum temperature rise across the condensers is expected to be less than 11°F (6.1°C) in normal operations. The facility is capable of a maximum temperature rise of 19°F (10.6°C) in responding to peak demands. This condition is expected to be infrequent because it involves a loss of efficiency. Assuming an average velocity through the cooling system of 1 foot per second (ft/sec), water would move from the Inner Harbor through the facility to the open waters of Nueces Bay in about 40 minutes. Approximately one-half of this travel time includes the distance from the Inner Harbor to the condensers, where the temperature increase is negligible. The actual flow time across the condensers will be approximately 3–4 minutes.

In summary, the maximum flow for the new facility will be 343 mgd, significantly less than the 500 mgd flow required for the old facility. Although the amount of water withdrawn for once-through cooling will be considerably less than what was used for the facility prior to this renovation, there are no plans at this point to reduce the permitted flow or change the maximum temperature limits in the permit.

3.0 IMPINGEMENT AND ENTRAINMENT MONITORING STUDY SUMMARY

A study of the marine community in the vicinity of the NBPS was conducted in accordance with the Proposal for Information Collection (PIC) that was prepared and submitted by Nueces Bay WLE, LP to the TCEQ (PBS&J, 2007). The study results are described in detail in Appendix A. The following section provides a brief summary of the study results with specific references to the possible effects of the facility operation on the marine community.

Analysis focuses on seven representative species, which include commercially and recreationally important species. While only representative species are discussed in this report, it should be noted that other organisms were collected over the course of the study, including fish eggs (probably bay anchovy [*Anchoa mitchilli*]), post-larval caridean shrimp (primarily grass shrimp [*Palaemonetes*]), and mysid shrimp.

Regulatory requirements put in place by the EPA after the facility ceased operation in 2003 and the need to obtain data prior to the facility's resumption of operations made it necessary to conduct the I&E study when the facility was not operating. Therefore the monitoring study sampled organisms that might be susceptible to cooling-water flow so that I&E due to facility operation could be estimated when the facility resumes operating.

3.1 IMPINGEMENT

Very few impinged fish were collected primarily because of the small sample surface area (approximately 0.36 square foot [ft^2]) of each sample pipe intake. As a result, the data collected could not be used to develop estimates of expected, annualized impingement. Instead, Section 4 uses representative data from other facilities and the NBPS staff observations of historic impingement to provide an estimate of expected annual impingement. The impingement samples did offer some insight into the relative differences between the Nueces Bay and Inner Harbor locations, which is an important consideration for the location aspect of the CWIS.

Over the course of the study, a total of 16 fish, shellfish, and jellyfish species were collected from the $^3/_8$-inch mesh screens in the barrel sampler (Appendix A). The majority (75%) of these were from the Nueces Bay sample station, which was expected due to the differences in habitat quality between the two areas.

Nine organisms were collected with Inner Harbor samples including pinfish (*Lagodon rhomboides*), sheepshead (*Archosargus probatocephalus*), jellyfish (*Aurelia aurita* and one unidentified jellyfish), and an unidentified crab. Sheepshead prefer oyster reefs and other hard structures and pinfish occasionally are associated with hard structures. Although these two species were collected during this study, they are not abundant in impingement samples from other power plants on the Texas Gulf Coast (Galveston Bay National Estuary Program [GBNEP], 1993; TCEQ, 2003). It is believed that sheepshead and pinfish were collected because they were feeding on the biological community living on the oysters, mussels, and algae encrusting the bar screens and because they intentionally swam into the sample collection pipe. Once power plant operation is resumed, the NBPS will maintain the bar screen to keep oysters and other organisms from creating fouling communities on the bar screen. This is expected to reduce the numbers of pinfish and sheepshead in the vicinity of the bar screen. Therefore, sheepshead and pinfish are not expected to impinge on the NBPS screens in appreciable numbers.

Twenty-seven organisms were collected from the Nueces Bay station and included brown shrimp (*Farfantepenaeus aztecus*), pink shrimp (*F. duorarum*), grass shrimp (*Palaemonetes* sp.), blue catfish (*Ictalurus furcatus*), tidewater silverside (*Menidia beryllina*), sheepshead, pinfish, spot (*Leiostomus*

xanthurus), striped blenny (*Chasmodes bosquianus*), skilletfish (*Gobiesox strumosus*), and one unidentified shrimp, one unidentified crab, and one unidentified fish.

3.2 ENTRAINMENT

Table 1 summarized the entrainment data for each sampling site. The majority of representative species susceptible to entrainment were shellfish, blue crabs, and penaeid shrimp. Naked goby (*Gobiosoma bosc*) was the most abundant representative finfish entrained, followed in abundance by silver perch (*Bairdiella chrysoura*), and spotted seatrout (*Cynoscion nebulosus*).

Highest entrainment rates were at the Nueces Bay station, with a mean for the representative species of approximately 27,000/mg (Table 1). The most pronounced difference between the Nueces Bay station and the Inner Harbor locations was among the shellfish community. Penaeid shrimp were collected in higher numbers from the Nueces Bay station, making up 59% of the total numbers entrained at this location. Conversely, megalopae/juvenile *Callinectes* (primarily blue crab) was the dominant taxon at the Inner Harbor locations, making up 30 to 50% of the total entrainment rate for the representative species; at the Nueces Bay station, these crabs made up 8% of the sample total.

The highest rate of entrainment for finfish (37% of total entrainment for the representative species) was at the Inner Harbor bottom station, whereas, the proportion of finfish at the other Inner Harbor locations ranged from 7 to 8% of the sample totals. Representative species of finfish from the Nueces Bay station made up 33% of the total representative species entrainment and the majority of these were naked goby.

Entrainment in the Inner Harbor appeared to be mostly influenced by spawning of various organisms. It was recognized early in the study that the entrainment samples collected from the Inner Harbor adjacent to the bar screens were dominated by organisms associated with the oyster/algae community living on the bar screens. This potential bias led to the addition of a third sample location approximately 17 feet (ft) offshore mid-way through the study. The entrained community is expected to better reflect samples that were collected from the offshore location and which generally had lower concentrations of the representative species than did the locations near the bar screens.

When evaluating the AEI of entrainment, a number of factors including the relative abundance of early life stages, value (commercial, recreational, and ecological), entrainment survival, entrainment benefits, and entrainment mortality compared to natural mortality rates must be considered. Since the Inner Harbor is a "dead end" artificial system with relatively little nursery habitat, the fate of organisms susceptible to entrainment, but which are not entrained is unclear. Unfortunately, there is very little information with respect to the marine life in the Inner Harbor. The organisms that are entrained and survive would likely have a positive contribution to the surrounding bay ecosystems.

Entrainment estimates are reported as age-equivalents. The use of age equivalents "... provides a convenient means of converting losses of fish eggs and larvae into units of individual fish and provides a

Table 1. Average Annual Entrainment Rates Per Million Gallons of Representative Species Collected at Each Sampling Site at NBPS (according to Nelson et al., 2004)

		Inner Harbor Surface		Inner Harbor Bottom		Inner Harbor Offshore		Nueces Bay	
Common Name	Scientific Name	Entrainment Rate (No./mg)	% of Total	Entrainment Rate (No./mg)	% of Total	Entrainment Rate (No./mg)	% of Total	Entrainment Rate (No./mg)	% of Total
Penaeid shrimp, post larval	Penaeidae, post-larval	0.8	0.03	0	0	0	0	0	0
Penaeid shrimp	Penaeidae	23.6	0.75	0	0	0	0	0	0
Brown shrimp, juvenile	*Farfantepenaeus aztecus*, juveniles	0	0	0.6	0.03	0	0	0	0
Brown shrimp, post larval	*F. aztecus*, post-larval	163.7	5.24	195.5	11.71	0	0	1,114.3	4.14
Brown shrimp	*F. aztecus*	0	0	0	0	0	0	4.5	0.02
Pink shrimp, post larval	*F. duorarum,* post-larval	1,108.9	35.48	353.3	21.15	401.8	50.58	14,289.5	53.13
Pink shrimp	*F. duorarum*	0.0	0.00	0.8	0.05	1.3	0.16	5.5	0.02
White shrimp, post larval	*Litopenaeus setiferus*, post-larval	115.8	3.71	58.8	3.52	0	0	538.5	2.00
White shrimp	*L. setiferus*	0	0	0	0	0	0	0.6	0.00
	Peneaid Shrimp Total	1,413		609		403		15,953	
Blue crab megalops	*Callinectes sapidus*, megalops	1,361.5	43.56	281.1	16.83	295.7	37.23	1,639.9	6.10
Blue crab	*C. sapidus*	6.8	0.22	16.9	1.01	0	0	9.8	0.04
Callinectes sp., megalops	*Callinectes* (swimming crab), megalops	28.2	0.90	9.1	0.54	0	0	54.3	0.20
Callinectes sp.	*Callinectes* (swimming crab)	64.3	2.06	142.9	8.56	39.9	5.02	367.6	1.37
	Blue Crab Total	1,460.8		450.0		335.6		2,071.6	
Silver perch	*Bairdiella chrysoura*	77.0	2.46	88.3	5.29	0	0	7.6	0.03
Spotted seatrout	*Cynoscion nebulosus*	2.1	0.07	4.4	0.26	0.6	0.08	1.8	0.01
Atlantic croaker	*Micropogonias undulatus*	3.4	0.11	57.1	3.42	12.9	1.62	91.8	0.34
Red drum	*Sciaenops ocellatus*	0.6	0.02	0.3	0.02	2.0	0.25	13.7	0.05
Naked goby	*Gobiosoma bosc*	169.1	5.41	461.0	27.60	40.2	5.06	8,754.8	32.55
Naked goby, juvenile	*G. bosc,* juveniles	0	0	0	0	0	0	0.9	0.00
	Finfish Total	252.1		611		56		8,871	
	Total	3,125.8		1,670.0		794.4		26,895.1	

standard metric for comparing losses among species, years, and regions" (EPA, 2004). Use of age-equivalent analysis requires life-stage specific mortality rates. The following discussion utilizes age-1 equivalents that represent the number of eggs and/or larval organisms that would survive for 1 year. Appendix A provides a discussion of the entrainment totals with respect to age-1 equivalents.

4.0 PREDICTING ANNUAL IMPINGEMENT MORTALITY AND ENTRAINMENT AT NBPS

I&E are estimated to help evaluate AEI resulting from cooling water use, location of the CWIS, and to facilitate the consideration of possible fish protection technologies. Analysis of impingement and entrainment focuses on representative species that meet one or more of the following criteria: (1) commercially or recreationally valuable, (2) occur in high numbers, and (3) inhabit the water column likely to be used for cooling. Some taxa, including mysid shrimp, post-larval caridean shrimp (probably grass shrimp), and unidentified fish eggs were not included in this analysis. For example, the post-larval caridean shrimp were not used because it is believed they originated primarily from the oyster/algal community fouling the bar screens and they would not be expected to be there under normal facility operation. Other small crustacea are considered "plankton" and are not typically reported in entrainment studies.

It is important to note that the estimates for the NBPS assume continuous operations at a design flow of 343 mgd. While this is a considerable reduction from the permitted flow of 500 mgd, it leads to overestimates of annual I&E since it is unlikely the facility will operate at 100% capacity throughout the entire year. Therefore actual I&E is expected to be lower than the estimates developed in this report.

4.1 IMPINGEMENT

As described in Section 3, characterizing impingement through the monitoring study was difficult in the absence of facility flow. While the data provided insight into the species that might be susceptible to impingement, there were not enough fish collected to develop a reasonable estimate of impingement. Therefore, information from other data sources was used to illustrate possible annual impingement mortality.

4.1.1 Annual Impingement

There are few published impingement-monitoring studies for the Texas coast. Barney Davis Power Station is the only facility in the area for which impingement data are readily available. However, Barney Davis Power Station employs fine-mesh screens and withdraws cooling water from the Laguna Madre; therefore, it is not comparable to NBPS in terms of technology or the marine community. Impingement monitoring data from the Houston Lighting and Power (HL&P) Deepwater Plant (Deepwater Plant) was the only data set located that was believed appropriate to use for comparison, but due to the spatial difference, it clearly has some limitations.

The Deepwater Plant is located on and withdraws water from the Houston Ship Channel (TCEQ, 2003) with traveling-screens with ½-inch wire mesh. The facility flows are considerably different with the Deepwater Plant flow at 146 mgd during the latter part of the study and the flow used to estimate annual impingement at NBPS was 343 mgd.

The Houston Ship Channel is different from the Inner Harbor because salinities vary widely due to Buffalo Bayou and the influence of treated wastewater from the City of Houston. Therefore, significant differences in the marine community might exist.

Table 2 provides the estimated annual impingement total for the representative species that might be collected at the NBPS. These values were determined by using the list of 10 most numerous taxa impinged at the HL&P Deepwater Plant and calculating an impingement rate from the hourly impingement rate for each taxon at a flow of 143 mgd (the average intake flow at the HL&P Deepwater Plant). Expanding the impingement rates with an annual average flow of 343 mgd would indicate that 1.52 million organisms might be impinged annually at the NBPS.

It is important to note that the majority (62%) of organisms are blue crab and penaeid shrimp. It is possible that these species are more abundant in the Houston Ship Channel due to the influence of its freshwater and nutrient-rich environment. However, there are no source water data available for the Inner Harbor in which comparisons could be made.

Table 2. Estimated Annual Impingement Mortality for the NBPS Based on Mortality Rates of Impinged Organisms at the HL&P Deepwater Plant (GBNEP, 1993) and a 63% Mean for Finfish Provided by Radal and Calaban (2002).

	Column			
	A	B	C	D
Species	Estimated Annual Impingement at NBPS	% Mortality from HL&P Deepwater Plant	Annual Impingement Mortality [Columns A (x) B]	Annual Impingement Mortality using 63% Mortality [Column A (x) 0.63]
Blue crab	485,688	13%	63,139	305,983
White shrimp	407,484	7%	28,524	256,715
Atlantic croaker	269,598	48%	129,407	169,847
Sand seatrout	170,814	26%	44,412	107,613
Gulf menhaden	74,088	15%	11,113	46,675
Bay anchovy	63,798	30%	19,139	40,193
Brown shrimp	37,044	16%	5,927	23,338
Sheepshead minnow*	2,058	48%	988	1,297
Gulf killifish*	4,116	48%	1,976	2,593
Lined sole*	4,116	48%	1,976	2,593
Total	**1,518,804**		**306,601**	**956,847**

*Data were not available for sheepshead minnow, Gulf killifish, or lined sole. The mortality rate for Atlantic croaker was used in Column B for these species.

4.1.2 Impingement Survival

Impinged organisms generally fit in one or more of three categories: (1) individuals weakened or killed due to environmental stressors, (2) juveniles or small adults that are too large to pass through the screen openings, but not strong enough to swim against the current passing through the screens, and (3) individuals feeding on objects impinged on the screens or feeding on objects drawn towards the screens with the flowing water. When an organism is trapped against the screens by the water current, it may be injured or die if not removed from the screen in a timely manner.

Survival of impinged organisms depends on several physical and biological factors including water quality, temperature, organism health, impingement duration, screen mesh size, and life stage. Survival rates for impinged crustaceans, when measured immediately after removal from traveling intake screens with fish-return systems, was greater than 95% for white shrimp (*Litopenaeus setiferus*), brown shrimp, and blue crab (GBNEP, 1993). Survival rates for most species of fish were greater than 70% immediately following removal from the screens. One cause of injury to impinged organisms was predation by blue crabs while they were impinged on the screens. Impingement rates of small organisms and juveniles appeared to increase when intake velocities exceeded 1.1 ft/s.

When operating, the NBPS uses stationary screens that are lifted at least once each day and rinsed with a high-pressure spray wash. Debris and organisms washed from the screens flowed through a fish-return sluice to Nueces Bay. With the exception of blue crab, it is assumed that the mortality rate at the NBPS would be 100% due to the use of fixed-panel screens, absence of a fish-handling system, and relatively low frequency of washing compared to most current traveling screen systems. Section 5.1.2 provides a discussion on the possible benefits and negative impacts of the addition of traveling screens with fish-handling and return technologies at the NBPS. Using the estimates provided in Table 2 and excluding blue crab, annual impingement mortality might be 1.03 million fish and shellfish.

4.2 ANNUAL ENTRAINMENT

The estimated annual entrainment for representative species was based on a facility flow of 343 mgd and continuous operation. Results are presented as age-1 equivalents (Table 3). Methods for estimating age-1 equivalents and survival rates are provided in Appendix B. The entrainment rate for representative species at the Nueces Bay sampling location was about 14 times greater than the average entrainment rate for the Inner Harbor sample locations. As a result of the elevated entrainment rate at the Nueces Bay location, an estimated total of 7.0 million age-1 equivalents would have been entrained if the cooling water had been withdrawn from that location in Nueces Bay at the proposed rate of 343 mgd/day. A total of only 483,000 age-1 equivalents would have been entrained if the cooling water had been withdrawn from the Inner Harbor at a rate of 343 mgd during the study. Penaeid shrimp juveniles and post-larvae were numerically dominant in entrainment samples over the year. *Callinectes* megalopae and juveniles, likely blue crabs, and naked goby also occurred in high numbers in the entrainment samples.

Table 3. Calculation Baseline, Annual Total Entrainment, and Annual Total Age-1 Equivalents Entrained for Representative Species from February 2007 through January 2008
Nueces Bay Power Station

	Nueces Bay, Discharge Canal, Rate of 343 mgd		Inner Harbor, Rate of 343 mgd		Calculation Baseline (Inner Harbor at 500 mgd)
Species	Total Entrained	Total Age-1 Equivalents Entrained	Total Entrained	Total Age-1 Equivalents Entrained	Total Age-1 Equivalents Entrained
Atlantic croaker	11,786,655	244	3,075,547	64	93
Callinectes megalopae and juveniles	268,192,159	31,922	99,049,808	10,741	15,658
Naked goby	1,134,808,918	3,746,290	36,782,019	121,427	177,007
Penaeid shrimp juveniles and post-larvae	1,276,788,424	3,192,286	119,047,077	298,068	434,502
Red drum	1,965,454	45,851	74,254	1,732	2,525
Silver perch	1,077,507	14,271	3,835,258	50,797	9,369
Spotted seatrout	237,975	358	350,703	527	769
Total	2,694,857,091	7,031,222	262,214,666	483,357	639,922

Inner Harbor values calculated as an average of data from all three sampling locations on the Inner Harbor.
Callinectes megalopae and juveniles includes primarily blue crab, *Callinectes sapidus* , megalopae.

Penaeid shrimp juveniles and post-larvae include primarily pink shrimp post-larvae but also white and brown shrimp post larvae.

4.3 ENTRAINMENT SURVIVAL

Facilities that withdraw large volumes of cooling water generally entrain fish eggs and juvenile stages of fish too small to impinge on the intake screens. Entrainment does not necessarily kill the entrained organisms and, in many situations, survival rates can be high. Survival of entrained organisms is important to consider when evaluating the potential impacts to marine ecosystems and selecting the most appropriate ways to manage entrainment effects. Furthermore, entrainment commonly consists of hundreds of millions or billions of juvenile organisms annually at facilities that withdraw water from coastal ecosystems. It is easy to understand that entrainment numbers might be striking to those unfamiliar with marine ecosystems. Therefore, it is very important to evaluate entrainment in a manner that keeps entrainment in perspective

4.3.1 Entrainment Survival Background

The preponderance of entrainment research was conducted in the 1970s, shortly after the inception of the Clean Water Act. Those studies rapidly filled a void in preparation for new Section 316(b) rules. Implementation and enforcement of the rules were deferred to the states and in many cases were not implemented until recently. Although the recent Phase II rule stimulated a renaissance in the field, the rule relied largely on historic information due to the rapid pace of implementation. Since the rule did not require entrainment mortality reductions (only entrainment reduction), there are few new or recent studies on entrainment survival.

Many earlier studies focused on understanding entrainment stressors and the ecological ramifications of entrainment. Recent studies have focused more on methods for assessing ecosystem impacts of entrainment rather than addressing the actions during entrainment that injure and/or kill organisms. The stressors experienced by entrained organisms have not been addressed to an extent where entrainment survival can be accurately quantified. Most ichthyoplankton are sensitive to handling stress and have life history requirements difficult to replicate in laboratory settings. Researchers found it very difficult to distinguish between mortality from entrainment and mortality from sampling (Cada and Hergenrader, 1978). The majority of studies cited by Cada and Hergenrader (1973) attempted to measure initial and latent survival of entrained organisms by simply counting the number of live and dead organisms. A few studies attempted to retain entrained organisms and observe survival/mortality after entrainment in a controlled setting. Additional studies attempted to recreate part or all of the stressors associated with passage through a cooling system in laboratory settings.

All the entrainment-survival studies reviewed recognized the uncertainty inherent in the results. Problems associated with evaluating entrainment survival were one reason the EPA chose to employ an "entrainment reduction" performance standard rather than an "entrainment survival" performance standard. Problems determining entrainment survival also discouraged the development of a performance standard based on reducing overall environmental effects.

The majority of entrainment survival information has been developed for the east coast of the U.S. where there has been more state regulation of entrainment. As a result, almost all entrainment-survival studies focused on near-shore Atlantic species. Unfortunately, there is relatively little entrainment-survival data for Gulf of Mexico facilities.

The probability of an organism surviving entrainment is related to a number of variables including the health of the individual organism, temperature tolerances of entrained species, exposure to temperature extremes, time of exposure to higher temperature, travel time in cooling systems, pressure changes, abrasives in the cooling water, and mixing with receiving waters. Therefore, it is important to note that there are no "off-the-shelf" survival probabilities that can be applied to every facility and for every species. In some cases, there is adequate information to evaluate the tolerance of specific species to some stressors associated with entrainment. In addition, information for some east coast species might be applicable to the Gulf of Mexico species. This information can help assess the level of stress and probability of mortality associated with entrainment.

Table 4 lists the entrainment survival probabilities for selected species from various data sources. The survival estimates are generally presented as ranges, representing values from multiple studies, which are summarized in EPA (1976), Jensen (1977), GBNEP (1993), and Mayhew et al. (2000). The species included occur in the Gulf of Mexico or are believed to be similar in sensitivity to some of the species that might be entrained at NBPS.

Table 4. Approximate Range of Entrainment Survival Rates for Selected Species Presented in the Literature

Species	Number of studies	Lower Survival Probability (%)	Upper Survival Probability (%)
Penaeid shrimp	1	–	70
Blue crab	2	50	80
Bay anchovy	21	0	74
Spot	2	4	74
Naked goby	2	88	98
Striped bass	31	0	92

There have been few entrainment-survival studies for the species expected to be entrained at NBPS. Impingement and entrainment at several coastal facilities in the Houston-Galveston area were studied in the 1970s; however, it is apparent that very little of the work focused on entrainment survival. A review of these studies is provided in GBNEP (1993) and TCEQ (2003).

The species most commonly studied is striped bass (*Morone saxatilis*), which is an economically important species along the Atlantic coast of the U. S. but does not occur along the southern Texas coast. Striped bass are probably more sensitive than Gulf of Mexico species since they are less tolerant to high

temperatures. Shellfish, including pink, brown, and white shrimp and blue crab have relatively high survival probabilities. The limited information indicates survival of the shellfish listed in Table 4 ranges from 50 to 80%. In general, some short-lived forage species, such as the clupeids, are very sensitive to entrainment stress and have low survival probabilities (e.g., <10%), while others, including anchovies, are more tolerant with similar survival rates to those for shellfish. Predatory finfish tend to be more resistant to entrainment stress, although there is very little information for the species common to the Texas coast.

4.3.2 Entrainment Survival at NBPS

The calculation baseline proposed for entrainment at NBPS is 640,000 age-1 equivalent organisms, which is the number estimated to be entrained at the maximum permitted cooling water intake flow of 500 mgd at the Inner Harbor (see Table 3). This baseline is determined by estimating entrainment using concentrations of representative fish and shellfish collected during the February 2007 through January 2008 study from the Inner Harbor cooling water intake and an intake rate of 500 mgd, which the facility previously used for cooling water. The calculation baseline also assumes 100% mortality of all entrained organisms.

Table 5 illustrates the possible effect of entrainment survival on the total age-1 equivalent fish and shellfish lost to entrainment from the Inner Harbor. At the maximum survival rate for different representative species, the number of age-1 equivalents lost to entrainment would drop about 52% from the calculation baseline to about 307,000 age-1 equivalents.

One possible environmental benefit of the current CWIS is the transfer of entrained organisms from the Inner Harbor to Nueces Bay. The Inner Harbor historically had lower dissolved oxygen, particularly near the bottom, than has Nueces Bay. The diurnal dissolved oxygen standard for the Inner Harbor is 3 milligrams per liter (mg/L) compared to 5 mg/L for Nueces Bay. Additionally, with its relatively steep shorelines, much of which is bulkheaded, the Inner Harbor has proportionally less nursery habitat for marine organisms than does Nueces Bay. Although there is some mortality of entrained organisms, the entrained organisms that survive are transferred from a system with generally lower dissolved oxygen and limited habitat to a system with generally higher dissolved oxygen and more nursery habitat. This suggests that there is a potential environmental benefit resulting from transferring ichthyoplankton from the Inner Harbor to Nueces Bay.

4.4 CAUSES OF INJURY OR DEATH DURING ENTRAINMENT

Entrained organisms are generally small, typically less than 10 mm in length, but larger organisms, such as juvenile fish and shellfish may also be entrained, depending on their swimming ability, health, intake currents, and intake screen-mesh size. Organisms passing through the intake screens are subject to a variety of thermal, physical, and chemical stressors. Circulating-water pumps create velocity shear forces, pressure changes, and abrasion when sediments are present. Passage through condensers may include

Table 5. Calculation Baseline, Annual Total Entrainment, and Annual Total Age-1 Equivalents Entrained for Representative Species from February 2007 through January 2008 Nueces Bay Power Station (Survival rates are from Table 4)

	Inner Harbor			Calculation Baseline (Inner Harbor at 500 mgd)
Species	Total Age-1 Equivalents Entrained	Total Age-1 Equivalents Entrained Using Minimum Survival Rates	Total Age-1 Equivalents Entrained Using Maximum Survival Rates	Total Age-1 Equivalents Entrained
Atlantic croaker	64	64	5	93
Callinectes megalopae and juveniles	10,741	8,346	6,909	15,658
Naked goby	121,427	14,571	2,429	177,007
Penaeid shrimp juveniles and post-larvae	298,068	265,515	263,074	434,502
Red drum	1,732	1,732	1,054	2,525
Silver perch	50,797	50,797	33,178	9,369
Spotted seatrout	527	527	63	769
Total	483,357	341,553	306,711	639,922

pressure changes, as well as rapid temperature increases. Depending on the discharge configuration and receiving waters, rapid exposure to substantially lower temperatures may follow entrainment. Several early studies focused on the physical and thermal stressors associated with passage through cooling systems. Schubel and Marcy (1978) provide detailed discussion of this issue and a compilation of the entrainment survival studies during the 1970s. They concluded that physical and thermal sources of stress were important. Other studies suggested temperature changes and the upper temperature limit for species may be more important factors.

4.4.1 Temperature

Most studies described survival related to temperature. King (1977) studied entrainment of larval freshwater fish and found survival was approximately 30% at temperatures ranging from 29 to 37°C (84.2 to 98.6°F). Cannon et al. (1977) found entrainment mortality was 0 to 30% when temperatures were below the lethal thermal thresholds and that striped bass and clupeid mortality occurred at temperatures in excess of 30°C (86°F).

There are two important considerations with respect to temperature when evaluating entrainment survival. These are (1) the magnitude and duration of exposure to elevated temperatures, and (2) the maximum thermal tolerance for the species and/or life stages of interest (Jensen, 1977; Schubel et al., 1978). The magnitude of the stress associated with the temperature rise across the condensers is a dose-response relationship that is related to a species' upper thermal tolerance (National Academy of Engineering [NAE], 1972; Schubel and Marcy, 1978). Most organisms can tolerate relatively high temperatures as long as the exposure time is short (NAE, 1972; Jensen, 1977; Schubel and Marcy, 1978). The NAE (1972) recommended that the condenser system design apply the following formula:

(t) multiplied by (T) $\leq$ 2,000

Where: t = exposure time (seconds) to elevated temperatures in the condensers
T = temperature rise (°C) across the condenser

The chance of survival decreases with increasing ambient temperature, particularly when organisms are exposed to temperatures near or in excess of their thermal maximum. It is important to note that many marine and estuarine species spawn during the spring when water temperatures are not at their maxima. As a result, early life stages of many species that might be entrained are generally not present during periods in which their upper thermal tolerances are reached. The highest Δt across the condensers usually occurs during the warmest season, typically late summer, which does not coincide with spawning for most organisms. When evaluating the relationship between temperature change and entrainment survival, it is therefore more appropriate to consider the Δt likely to occur during the spawning season instead of using the maximum facility Δt and the species' maximum thermal tolerance (Jensen, 1977). This requires understanding the upper thermal tolerances of juvenile life stages for the species of interest. Unfortunately, these maximum temperature tolerances are not known for many species.

The sensitivity of various life stages (e.g., eggs, yolk-sac larvae, larvae, etc.) to thermal stress is species dependent (Cannon et al., 1977; Schubel et al., 1978). In general, Δt of up to 10°C (18°F) from spawning temperatures does not appreciably increase mortality of eggs or larvae. One study found that Δt of 12°C (21.6°F) did not cause appreciable mortality of spot. However, the same study suggested that rapid cooling of the embryos did more damage than gradual cooling (Hetter and Clements, 1977). The Δt at NBPS is expected to be on the order of 6°C (11°F), in most operating conditions but could reach approximately 10°C (18°F) for short periods when the plant is at maximum output.

Table 6 shows the maximum temperature rise of 11°F added to the mean monthly temperature measured in the Inner Harbor at the cooling water intake during the study compared to the thermal maxima for the representative species. Penaeid shrimp post-larvae and larval silver perch appear most susceptible to higher temperatures with 6 months for each taxon exceeding the temperature maxima for those species. Atlantic croaker and juvenile penaeid shrimp may be least impacted by temperature rises. At no time during the study did the maximum temperature rise added to the mean monthly Inner Harbor temperature exceed the thermal maxima for Atlantic croaker and penaeid shrimp juveniles.

4.4.2 Physical Stress

Organisms entrained in a once-through cooling system are exposed to physical stresses in addition to temperature stress. Physical stresses include pressure, shear, acceleration, impact, and abrasion. The magnitude of these stresses could be vastly different at different power plants. The type of outfall determines to some extent how long the surviving organisms remain exposed to thermal and chemical stresses after discharge. The following is a brief description of what an entrained organism could experience in a once-through cooling system (Schubel & Marcy, 1978) using the design parameters for NBPS.

An organism drawn into the water moving toward the intake would drift at 0.49 to 0.98 ft/s. Near the intake screens, the velocities increase to 0.98 to 1.97 ft/s. Acceleration in the turbulent flow is about one-tenth of the acceleration of gravity (0.1 g). The shear stress near the screen may reach 20 dynes/cm^2. However, these magnitudes of shears and accelerations are not damaging to most entrained organisms.

Disturbances increase abruptly between the intake screen and the pump. An organism entrained from a depth of 33 ft would experience a drop in absolute pressure from 2 atmospheres to 0.3 atmospheres. Velocities increase to 3.28 to 6.56 ft/s and turbulent accelerations reach 0.4 to 1.6 g. Shear stresses near the surface of the conduit are 100 to 200 dynes/cm^2, still at sublethal level. Besides physical stresses, entrained organisms experience chemical stresses due to injection of biocide into the flow to prevent fouling. Control of biofouling on the heat exchanger will be accomplished using plastic balls that will be circulated through the condenser, eliminating the need for such antifouling agents and reducing this source of stress and mortality.

Table 6. Monthly Average Water Temperature in the Inner Harbor, NBPS
(Shaded areas represent months when water temperatures in the facility may exceed upper temperature limits)

			Taxa and their upper temperature limits							
Trip	Inner Harbor mean monthly temperature (°F)	Mean monthly temperature (°F) plus 11°F	Atlantic croaker, 100.4°F	*Callinectes* megalopae, 94.1°F	*Callinectes* juveniles, 95.0°F	Penaeid shrimp post-larvae, 87.1°F	Penaeid shrimp juveniles, 100.4°F	Silver perch larvae, 89.2°F	Spotted seatrout, 96.8°F	Red drum, 94.8°F
February-07	61.50	72.50								
March-07	68.22	79.22								
April-07	69.78	80.78								
May-07	78.74	89.74								
June-07	83.35	94.35								
July-07	83.96	94.96								
August-07	86.05	97.05								
September-07	85.08	96.08								
October-07	80.74	91.74								
November-07	73.09	84.09								
December-07	64.96	75.96								
January-08	57.45	68.45								

The most severe shocks occur within the pump. The pressure increases rapidly by 1.5 atmospheres. Some organisms may be entrained into the boundary layer of the impeller where viscous stresses are 103 to 104 dynes/cm^2. It was estimated that about 2 to 5% of the entrained organisms would collide directly with the impeller. The impact velocity is estimated to be about 25.49 ft/s.

Between the pump and the water box conditions are equivalent to those ahead of the pump. Then water velocities increase to about 8.20 ft/s in the water boxes. Turbulent flow accelerations of 10 g are common. Shear stresses at the walls of the box could exceed 200 dynes/ cm^2.

In the condenser tubes, the organisms experience thermal stress due to heat absorbed from condensing turbine steam. The velocities are about 6.56 to 19.67 ft/s. Accelerations of turbulent flow are between 2 to 14 g. Shear stresses near the tube walls are over 500 dynes/ cm^2.

At the exit of the water boxes physical conditions are comparable to those at the entrance to the water boxes, except that the organisms experience the lowest absolute pressure (0.3 atmospheres) of the journey through the once-through cooling system.

If a finer screen is used at the intake, the number of entrained organisms will be reduced. An organism would be trapped against the fine screen for a period of time, washed off by a power jet, and carried to the Inner Harbor or Nueces Bay through a pipe. The stresses experienced by the organisms are difficult to quantify. However, they may be as severe or more severe than those experienced by organisms entrained in the once-through cooling system.

5.0 TECHNOLOGY ASSESSMENT AND BENEFIT VALUE

The EPA (2004) listed 14 technologies for reducing impingement mortality and entrainment in the Phase II rules (Table 9-1). Technologies, construction, and operation and maintenance (O&M) costs were modeled at facilities for which data were available. For the NBPS, installation of a cylindrical wedge-wire screen with 0.76-mm screen opening was the modeled technology. This section reviews a full range of alternative technologies, and whenever possible, estimates of capital and O&M costs are provided.

5.1 CYLINDRICAL WEDGEWIRE SCREEN

The EPA (2004) modeled the installation of a passive, cylindrical wedgewire screen with 0.76-mm mesh as the applicable technology for the NBPS. This technology is effective for reducing entrainment of early life stages and reduces impingement mortality with the frequent use of air or water back-flush systems. Shear flow across the screens, such as that provided by tidal or river currents, is required to flush debris and impinged orgamisms away from the screens so they would not impinge again.

The use of cylindrical wedgewire screens would require placement offshore in the Inner Harbor. To maintain relatively low through-screen velocities, the cylindrical screens would need to be large. Even if the cylindrical screens could be located immediately in front of the existing CWIS, it cannot be overstated

that the structure would be at high risk of damage by ship traffic and would possibly pose a threat to shipping. For this reason alone, submerged cylindrical wedgewire screens are not an applicable technology for NBPS. The dead-end nature of the Inner Harbor and microtidal forces, result in tidal velocities that are generally low. Therefore, water currents would probably be inadequate to remove debris and organisms from the screens, resulting in extended periods of impingement. The small mesh size would effectively prevent entrainment of many life stages. However mortality of early life stages would be expected to be high as a result of the physical trauma associated with impingement. Finally, biofouling by oysters and algae is high in the Inner Harbor. It is likely that fine-mesh screening would easily clog and would require a high level of maintenance.

The EPA modeled annual capital and O&M cost for this technology is $336,000. This technology is not applicable, and this cost is believed to be an order of magnitude underestimate of the real annual cost due to the maintenance costs associated with biofouling and frequent repair of damage from vessels.

5.2 TRAVELING SCREENS AND FISH-HANDLING AND RETURN SYSTEM

The most common technology employed at CWISs are traveling screens with ⅜-inch square mesh. However, most facilities are not equipped with fish-handling and return systems. When used with fish-handling and return systems, traveling screens generally work well to reduce impingement mortality. Screens are rotated and washed either continuously or on a regular basis. Wash frequency usually increases when debris loading is high or when there is a large number of stressed or dead fish present. Debris and organisms are rinsed into a trough and then flow to a sluice or other conveyance that transports the rinse water, debris, and organisms to the source waterbody away from the CWIS. Ristroph-modified traveling screens use buckets at the bottom of the screen panels to reduce injury to organisms after they are rinsed from the screens.

A variety of factors influence the effectiveness of traveling screens in reducing injury or mortality to impinged organisms. The benefit of fish-handling and return systems for reducing mortality of impinged fish is based on screen-mesh size, life stage, individual health, and duration of impingement. Juvenile life stages are more sensitive to impingement and handling. Therefore, the effectiveness of this technology in terms of mortality reduction decreases with decreasing mesh size. In cases where traveling screens are not operated continuously, mortality increases as the duration of impingement increases. Once impinged, the degree of physical trauma an organism experiences pressed against the screen increases with the amount of time between screen cleaning and the relative force of the water causing it to be impinged. Blue crabs have been found living on screens and feeding on organisms that were impinged on the screens (TCEQ, 2003; Ringger, 2000). As the screen clogs with debris between rinses, the water pressure on the screens and impinged objects will increase.

The addition of fish-handling and return systems was the most common technology modeled for facilities required to meet the impingement-mortality reduction standard (EPA, 2004). However, use of this

technology with 3/8-inch mesh would not reduce entrainment of most juvenile life stages, which are small enough to pass through the screens. Therefore, fine-mesh screens would be required to reduce entrainment. Very few facilities use traveling, fine-mesh screens, therefore, no studies were found that could be used to determine the costs and benefits associated with the use of fine-mesh traveling screens.

One study evaluated mortality of fish impinged on Ristroph-modified traveling screens at Salem Generating Station on the Delaware Estuary in New Jersey (Strait, 2005). Species for which survival data are available from the Salem Generating Station, which may also be encountered at the NBPS included bay anchovy, Atlantic croaker, and spot (Table 7). Mortality studies from 1997 to 2000 indicated that a monthly average of 42% of bay anchovies survived impingement, with a range of survival from 16 to 72%. Ninety-three percent of spot survived impingement during the 1 month for which data were available.

Table 7. Survival of fish on Ristroph-modified traveling screens at Salem Generating Station, New Jersey, from 1997 through 2000 Calculated as abundance-weighted monthly survival (modified from Strait, 2005)

Species	Mean Annual Survival %	Minimum Monthly Survival %	Maximum Monthly Survival %	Total Number Sampled
Spot	93	*	*	132
Atlantic croaker	77	55	96	35,186
Bay anchovy	42	16	72	10,235

*Numbers of spot were high enough to allow calculation of mortality only during one month.

Other studies evaluated the effectiveness of traveling screens with fish-return systems in reducing impingement mortality. Ringger (2000) reported annual percent survival of all species impinged ranged from 59 to 89%. The data were collected at the Calvert Cliffs Nuclear Power Plant on Chesapeake Bay in Maryland from 1975 to 1995. One study showed survival of 99.5% for blue crabs, 68% for bay anchovy, 84% for spot, and 19% for Atlantic croaker (McLean, 2005). A third study showed 78.1% survival rate over 24-hour post-impingement by Ristroph-modified traveling screens (Radle and Calaban, 2003).

The EPA (2004) modeled the cost of adding fish-handling and return systems to existing traveling screens (⅜-inch mesh) for numerous facilities. The capital and O&M costs generally ranged from $500,000 to $1,500,000 for this retrofit. However, the EPA did not model the replacement of an existing CWIS with a traveling screen (coarse or fine-mesh). Therefore, the costs associated with replacing the fixed-panel screens with traveling screens would be considerably higher than the costs associated with only the addition of the fish-handling and return systems. The current configuration and location at the intake and the power plant would make it very difficult and costly to replace the fixed panels with traveling screens equipped with a fish handling and return system. The power plant has limited space adjacent to the Inner Harbor for physical modifications or expansion.

5.3 WEDGEWIRE SCREENS

In comparison with wire mesh and perforated metal screens, wedgewire screens have more open area, very precise openings, are stronger, more durable, and less likely to clog or abrade organisms that contact the screens. These screens do not appear to exclude fish shorter than 5 mm in length (on screens with 1-, 2-, and 3-mm mesh). Data collected from the Inner Harbor showed that 50% (10,039) of all organisms collected in entrainment samples were <5 mm. All fish >10 mm are excluded by screens with these mesh sizes (McLean, 2003). Of the organisms collected at the NBPS, 15% (3,075) were >10 mm. Three factors influence the effectiveness of these screens: (1) slot width relative to the size of aquatic organisms, (2) through-slot velocity, and (3) velocity of currents sweeping across the face of the screen (Dey, 2005).

The use of fixed-panel wedgewire screens at the NBPS does not appear applicable for a number of reasons. The use of wedgewire screens, similar to fine-mesh screens, would increase impingement of early life stages, which are more sensitive to handling. In addition, wedgewire screens require shear flow to help carry organisms away from the screens. Weak tidal currents in the Inner Harbor would reduce the ability to transport organisms away from the screens.

The replacement of the existing fixed-panel coarse mesh screens with wedgewire screens would require significant capital and O&M costs. The existing location of the fixed-panel screens would not be conducive for wedgewire screens since they are recessed in the CWIS. Instead, the screens would need to be moved onto the face of the CWIS and exposed to the currents of the Inner Harbor. This would require construction that would extend a marginal distance into the Inner Harbor, posing navigation problems and risk for screen damage. In addition, biofouling would be a significant issue due to the small screen openings (Taft et al., 2005). This technology would require frequent cleaning to maintain the adequate porosity, significantly increasing maintenance costs.

5.4 AQUATIC FILTER BARRIERS

Aquatic filter barriers can pass up to 10 gpm per square foot of barrier, which means a large surface area is required. Pore sizes can be as small as 0.5-mm in diameter, which reduces entrainment and prevents impingement. The use of aquatic filter barriers would not be possible in the Inner Harbor. The surface area required to maintain low velocities would require placement of the filter barrier well into the Inner Harbor, which would cause significant shipping safety concerns. In addition, an aquatic filter barrier would be susceptible to high rates of fouling. Costs for this technology vary depending on species present, flow, currents, waves, the need for a cleaning system, and maintenance frequency (Taft et al., 2005).

5.5 BARRIER NETS

Barrier nets are comparable to filter barriers in construction, but consist of coarse (e.g., ¼-inch) mesh. Most barrier net designs include a surface area sufficient for reducing through–net velocity to <0.5 ft/s, which is effective for reducing impingement mortality. Barrier nets are subject to biofouling and the

accumulation of debris. As with the aquatic filter barriers, it would not be possible to place a barrier net in the Inner Harbor because of the space required and the increased risk to shipping in the Inner Harbor.

Site-specific costs of barrier nets vary depending on the flow, currents and waves, and extent of biofouling (Taft et al., 2005). Regular inspection and maintenance and impingement monitoring is important to ensure the net stays intact and in contact with the bottom. Barrier nets can reduce time spent removing debris from the trash rack (Radle and Calaban, 2003).

One facility, with a flow of 720 mgd, installed two barrier nets where the primary cost was the installation of the support pilings. One set of nets cost $13,000 (1984 dollars) and nets are now replaced once every 3 years. Installation costs were $100,000 and operation and maintenance costs were $75,000 to $88,000 per year (Bailey, 2005). Estimated reductions in impingement from the period without barrier nets were 82% for blue crab, 85% for Atlantic menhaden (*Brevoortia. tyrannus*), 98% for spot, 83% for hogchoker (*Trinectes maculatus*), and 95% for white perch (*Morone. americana*).

Barrier nets do not reduce entrainment, although some entrainment reduction might be expected with mesh sizes smaller than ⅜-inch. In the case of NBPS, most organisms would pass through the mesh and would entrain. Since impingement is expected to be relatively low, a barrier net would not provide a significant additional reduction of impingement.

5.6 VELOCITY CAPS

Velocity caps have limited effectiveness in reducing impingement (Taft et al., 2005). Construction of velocity caps would not be practical because the intake structure with the velocity cap would have to be extended from the shore into the Inner Harbor, creating a navigation hazard. Velocity caps would also not be practical because of the size of velocity caps that would need to be constructed in the Inner Harbor to accommodate the facility's intake flow.

5.7 DIVERSION SYSTEMS

Diversion systems are used to reduce impingement of healthy fish. Angled screens require uniform flow conditions, relatively constant approach velocity, and a low through-screen velocity. Survival is variable and efficiency varies with species (Taft and Cook, 2005). Modular-inclined screens require high velocities ranging from 2 to 10 ft/s. One experiment showed latent mortality as low as 5%. This is new technology and as of 2003 modular-inclined screens had not been constructed or evaluated in any full-scale facility (Taft and Cook, 2005).

Louver systems consist of evenly spaced, vertical slats, across a channel at a specified angle and leading to a bypass for impingement reduction. In some cases, louvers have been shown to divert 70 to 95% of the individuals of a wide variety of species. This is still relatively new technology and little is known of its effectiveness (Taft and Cook, 2005). Fish guidance rates as high as 90 to 100% can be achieved depending on species, fish size, and guidance array design (Amaral, 2005). Since there is no uniform flow

available to allow this to work, and impingement is expected to be relatively low at the NBPS, the use of diversion technology does not appear to be practical.

5.8 BEHAVIORAL BARRIERS

Behavioral barriers, such as bubble curtains, electrical barriers, chain, and cable barriers are used to deter larger, selected species from impingement. Studies indicated they were not effective for a wide range of species and environmental conditions (Galya et al., 2003). Lights, sounds, air bubble curtains, pneumatic guns, poppers, and electrified nets were evaluated for use at the intake for the San Onofre Nuclear Generating Station Units 2 and 3 in California (California Coastal Commission, 2000). It was concluded that most deterrents were inconsistent, either from site to site or from species to species and therefore not likely to be effective or feasible. Some deterrents caused adverse effects to marine life and installation and maintenance concerns were associated with some deterrents.

The "Fish Startle" system is an example of a sound deterrent system that emits a high frequency broad-band sound (122–128 KHz) at a source level of 190 decibels. The system reduced the number of fish in front of the intake by 81 to 87% in one study. In another study, impingement was reduced 84% by the system. This system has only been shown to be effective for certain clupeids (alewife, blueback herring, and American shad). The cost for one power plant was about $525,000 (1993 dollars) to install and $120,000 to operate (Radle and Calaban, 2003). A second study from England with an acoustic fish deterrent system indicated it was only effective in deterring clupeids (diversion efficiency ranged from 80 to 95%) and only when arrayed in a manner to ensure clupeids were moved out of the zone of no-return. Because of the need for annual maintenance, these systems need to be designed for easy removal and replacement (Turnpenny and Nedwell, 2005). Since impingement is expected to be relatively low at the NBPS, the use of behavioral barriers would have limited benefit value.

5.9 CHANGING SOURCE WATER

In some cases, source water locations have been chosen to withdraw deeper, cooler waters from nearer the bottom; however, at times these waters are low in oxygen and may incapacitate fish in the intake embayment, increasing impingement (McLean, 2003). The only other water body adjacent to the power plant is Nueces Bay. The power plant evaluated the possibility of changing the intake location to Nueces Bay and discharging cooling water to the Inner Harbor during the 1990s and concluded it would not be a practical approach. The construction of an adequately-sized intake system would extend a considerable distance into Nueces Bay and require a part of the bay to be dredged. Additionally, this study and other ichthyoplankton studies of Nueces Bay reflect its value as nursery habitat for a wide variety of early life stages of ecologically and economically important species. If the cooling water intake had been withdrawn from Nueces Bay at a rate of 343 mgd during the study, more than 7.03 million age-1 equivalent fish and shellfish would have been entrained compared to 0.48 million, which might have been entrained with intake of 343 mgd from the Inner Harbor (see Table 3). Therefore, the existing CWIS location is believed to be the best location for the facility.

5.10 SEASONALLY TIMED OUTAGES TO MINIMIZE ENTRAINMENT OR IMPINGEMENT

Power plants that operate as peaking power plants or which have flexibility regarding operating times may be able to stop operating during seasons when relatively large numbers of organisms may be susceptible to impingement and entrainment. The demand for power from the NBPS is expected to occur year-round, and therefore the facility is not expected to have the flexibility to stop operating during seasons of high abundance. While there are periods in which juvenile life stages are present in the Inner Harbor, the entrainment of these organisms has not been noted to be a significant issue in the past, indicating that there would be little benefit in seasonal stopping electrical production.

5.11 VARIABLE SPEED PUMPS AND LOAD-BASED FLOW STRATEGY

Variable speed pumps used in combination with a load-based flow strategy focused on using only the necessary flow that would be required to ensure wastewater permit requirements, particularly the temperature limit, continue to be met. In one study reviewed (unrelated to NBPS), cooling water use could have been reduced by 63 to 70% with variable speed pumps. The reduction in cooling water volume would have in turn reduced 89 to 91% of striped bass entrainment mortality and still allowed the wastewater discharge permit requirement for temperature to be met (Young, 2005). However, as noted above, with the repowering of the facility, the facility's expected cooling water flow has already been substantially reduced over the baseline. Further, given the lack of operating history for the repowered facility, it is quite difficult to predict the facility's load profile. Without said load profile, it is nearly impossible to predict the amount of reduction in overall cooling water usage that the facility would realize with the use of variable speed pumps. And, as the cooling water reduction is unknown, the reduction in impingement and entrainment mortality cannot be predicted. If further reductions are sought in the future, the use of this approach for reducing cooling-water flow at NBPS could be investigated. Flow reductions would result in proportional entrainment reductions and would periodically decrease through-screen velocities.

5.12 BENEFIT VALUATION

The following sections assign monetary values to the estimates of I&E losses representative species. The values are included so that comparisons can be made to the costs of implementing various fish-protection technologies. Although cost-benefit was remanded from the 316(b) requirements, comparing technology costs to the benefits of those technologies remains a reasonable screening tool. In essence, the efficacy of the technologies is quantified in monetary values, which were developed from commercial and recreational fishing values.

5.12.1 Economic Value of Impinged Fish and Shellfish

As described in Section 4.1, data from the HL&P Deepwater Plant suggest annual impingement mortality could be as high as 1.52 million fish and shellfish at NBPS. While this estimate reflects survival, the numbers of organisms impinged is believed to be an overestimation since observations of the NBPS staff indicate that historic impingement is generally low for these species. Table 8 presents estimates of the annual economic losses associated with impingement mortality using mortality rates of 100%, which was summarized in Section 4. The basis for calculating the economic value of taxa likely to be impinged is summarized in Appendix C. The economic value of impinged fish and shellfish is approximately $161,000. Approximately one-half of the value is associated with blue crab and white and brown shrimp. Since many of the blue crab are believed to survive impingement on the fixed panel screen, this predicted value probably overstates the actual value of organisms lost to impingement at NBPS.

Table 8. Estimated Annual Economic Value (2007 dollars) of Fish and Shellfish that May Be Lost to Impingement at NBPS

Taxa	Estimated Annual Mortality (# of organisms) at 100% mortality	Economic Value from NOAA+ (2008)	Economic Value ($) at 100% mortality
Blue crab	485,688	$0.80/pound	$ 25,990
White shrimp	407,484	$2.09/pound	53,228
Atlantic croaker	269,598	$7.60/pound	15,367
Sand seatrout	170,814	$0.32/fish	54,660
Gulf menhaden	74,088	$0.05/pound	116
Bay anchovy	63,798	$0.10/fish	6,380
Brown shrimp	37,044	$1.97/pound	4,561
Sheepshead minnow*	2,058	$0.10/fish	206
Gulf killifish*	4,116	$0.10/fish	412
Lined sole*	4,116	$0.10/fish	412
Total	1,518,804		$ 161,332

+NOAA = National Oceanic and Atmospheric Administration

* Impingement and survival data were not available for sheepshead minnow, Gulf killifish, or lined sole. The survival rate for Atlantic croaker was used as the survival rate for these species since it is a conservative survival rate. Actual survival of these species is expected to be higher because they are generally considered species, which are more tolerant to stress than other species.

**One study reported a survival rate of 37.6% for 6 species of fish impinged on stationary screens.

5.12.2 Economic Value of Entrained Fish

As described in Section 4, the monitoring data suggest that approximately 0.483 million age-1 equivalent fish and shellfish could potentially entrain at the NBPS under the maximum design flow of 343 mgd. The estimated annual value of fish and shellfish entrained under the maximum design flow is $239,000 (Table 9). This value assumes 100% mortality, and therefore very likely overestimates the value of the fish and shellfish that might be entrained. Most of the value consists of red drum. Although the estimated numbers of age-1 red drum that might be entrained is relatively low compared to the blue crab and shrimp, the

value of the red drum incorporates a recreational value, which is $93.38 per age-1 equivalent fish (Appendix B).

An example of the economic benefits associated with the flow reduction and the CWIS location is also provided in Table 9. Under the previous maximum design flow of 500 mgd, the estimated economic value associated with entrainment organisms would be $328,000 per year. This indicates that the flow reduction results in a benefit value of $110,000 per year.

The benefit associated with withdrawal of cooling water from the Inner Harbor is also important to consider. As described in Section 4, the number of organisms is considerably lower with the existing location than the Nueces Bay system. The value of entrained organisms associated with a CWIS location on Nueces Bay is estimated at $5.06 million, indicating that the benefit value associated with the existing locations is approximately $4.58 million per year.

6.0 ASSESSMENT OF BEST TECHNOLOGY AVAILABLE

Annualized capital and O&M costs of different technologies to reduce impingement mortality and entrainment (IM&E) range from approximately $58,000 for deterrents to $29,000,000 for aquatic filer barriers. The cost estimate developed from several sources, including Taft and Cook (2005), and considerations and benefits of different technology options for reducing IM&E are summarized in Table 10. These costs are important to consider with respect to their effectiveness for reducing the potential for AEI and the benefit values.

The benefit values in terms of the economic importance of fish and shell fish expected to be lost to IM&E at the NBPS are low in comparison to the cost of adding fish-protection technologies. There are four major issues associated with retrofitting the NBPS CWIS with fish-protection technologies. Each of these are described in more detail below. First, the location of the cooling-water withdrawal and the reduction in flow associated with the facility repowering reduces impacts below calculation baseline conditions by at least 24%. Second, some of the technologies with possible application would require locating at least part of the structure in the Inner Harbor, which would interfere with ship traffic and expose the added technologies to increased risk of damage from shipping. Third, technologies that employ fine-mesh screens decrease entrainment, but result in proportionally higher impingement or do not have the hydraulic conditions to work effectively. Impingement survival of early life stages is generally poor, particularly when washing and handling is involved, reducing the benefit value. Fourth, most of the technologies would require major modifications to the existing CWIS, which would be cost prohibitive in relation to the relatively low benefit value. With the possible exception of the use of variable-speed circulating-water pumps, for which the benefit is unknown given the lack of operating history for the repowered facility, there are no technologies that could be justified based on need or cost.

Table 9. Estimated Mortality of Adult Equivalents of the Representative Species Due to Entrainment from the Inner Harbor at a Rate of 343 mgd (these values assume 100% mortality)

Species	Nueces Bay, Discharge Canal, 343 mgd		Calculation Baseline, Inner Harbor, 500 mgd		Inner Harbor at 343 mgd	
	Age-1 Equivalents	Economic Value	Age-1 Equivalents	Economic Value	Age-1 Equivalents	Economic Value
Atlantic croaker	244	$407	93	$155	64	$106
Blue crab juveniles and meglopae	31,922	$184	15,658	$90	10,741	$62
Naked goby	3,746,290	$374,629	177,007	$17,701	121,427	$12,143
Penaeid shrimp juveniles and post-larvae	3,192,286	$393,050	434,502	$53,498	298,068	$36,700
Red drum	45,851	$4,281,596	2,525	$235,797	1,732	$161,757
Silver perch	14,271	$4,567	9,369	$2,998	50,797	$16,255
Spotted seatrout	358	$8,377	769	$17,996	527	$12,345
Total	7,031,222	$5,062,810	639,922	$328,235	483,357	$239,368

With the exception of blue crab and the seasonal abundance of penaeid shrimp, impingement on coarse-mesh screens is expected to be relatively low at NBPS. There are several approaches to reducing impingement and/or impingement mortality. As described in EPA (2004), reducing through-screen velocities to <0.5 ft/s would likely remain as an acceptable regulatory alternative for reducing impingement mortality. Velocities at the NBPS will be low (approximately 1 ft/s) with the flow reduction, but will not meet this threshold under design flow. Reducing flow to <0.5 ft/s would require an approximate doubling of the existing screen area, which would require a major modification of the CWIS. This would likely reduce impingement of healthy finfish, but would probably not reduce blue crab impingement since they are using the screens as a foraging surface. In addition, reducing velocity would not reduce entrainment. Therefore, the benefit of this modification would be very low.

Similar to increasing the screen surface area, the addition of coarse-mesh traveling screens with a fish-return and handling system would be very expensive. This technology might help reduce mortality of impinged finfish and shrimp, but might have a detrimental effect on blue crab due to increased handling stress. The use of coarse-mesh traveling screens would not reduce entrainment.

Entrainment-reduction technologies involve the use of fine-mesh screens. The technology with merit is the use of submerged, cylindrical wedgewire screens, which is the EPA modeled technology for the NBPS (EPA, 2004). However, for this and other wedgewire screens to function effectively, shear flow across the screens is required to carry organisms away from the screens once they are cleaned with air- or water-flushing systems. Shear flow would be present for limited times of tidal exchange. Otherwise, organisms would remain impinged for extended periods of time resulting in higher mortality rates than those associated with entrainment. Furthermore, submerged, cylindrical wedgewire screens are not applicable at the NBPS because they would require installation of the screens in the Inner Harbor, which would pose a navigation hazard.

Barrier nets are very effective for reducing impingement when designed for velocities <0.5 ft/s and filter fabrics are effective for reducing both impingement and entrainment. However, both of these technologies would require placement in the Inner Harbor, which would interfere with ship traffic. While barrier nets can be feasible, they do not reduce entrainment, significantly reducing their benefit value. Filter barriers are expensive and prone to fouling and clogging by the abundant debris in the Inner Harbor, resulting in maintenance liabilities.

Behavioral deterrents have some limited application for reducing impingement of selected species, but are applicable only to larger, healthy organisms that are capable of responding to stimuli. Since juvenile life stages are the primary concern for the NBPS, deterrents would have little benefit value even if they were effective.

The NBPS will implement a reduced cooling water use strategy, which will reduce the intake flow from the permitted 500 to 343 mgd, a 31% reduction in flow, which should provide a corresponding 31% reduction in entrainment from entrainment rates at 500 mgd. The reduced flow through the same area of

screen area will result in reduced through-screen velocities, which is expected to reduce impingement rates. The flow reduction could possibly be enhanced by the use of variable-speed circulating-water pumps. When the facility is idle or the demand for cooling flow is less during cooler weather, reducing flows would further reduce the potential for IM&E. There would be a cost associated with this type of modification. Therefore, the estimated flow reduction and the time of year in which flows might be reduced could be used to estimate benefits.

Finally, there are ecological and economic benefits associated with the location of the CWIS in comparison to the surrounding bay systems. The Inner Harbor is not considered important nursery habitat while Nueces Bay does provide this habitat. This bay habitat may provide improved access to shelter and food for these larval fish, shrimp and crabs compared to conditions in the Inner Harbor

Table 10. Summary of Different Technologies to Reduce Impingement and Entrainment and Factors Relevant to NBPS

	Capital and O&M Costs			
Technologies	Low	High	Comments	Cost Consideration
Addition of coarse-mesh traveling screens and fish-handling system	$981,794	$9,021,890	• 3/8-inch screens • Impingement-mortality reduction only • Ristroph screens • Assumes the use of the existing return system • Potential improvement of impingement survival from assumed 0% with current screens to 85%. No change in entrainment rates.	• Maximum annual benefit value of $161,300. This is the value of fish assuming a 100% increase in survival over an assumed 0% survival under existing conditions. • Benefit value is probably an overestimate since some blue crab survive under existing conditions and survival with a modified screen would not be 100%.
Addition of fine-mesh traveling screens and fish handling system	$721,751	$10,136,359	• 1.8-mm screens • Ristroph screens • Reduces entrainment of early life stages by approximately 50% • Increases impingement • Handling system improves survival of larger organisms, but mortality of early life stages high • Involves major modification of CWIS • Fine mesh may clog or foul	• Maximum annual benefit value of $282,300 ($161,300 impingement mortality reduction plus $121,000 entrainment reduction) • Benefit value is probably an overestimate, as described above and since mortality of impinged juvenile life stages might be high • Maintenance cost of fine-mesh screen potentially high due to fouling
Submerged cylindrical wedgewire screens in a new intake structure (EPA modeled technology) **(Technology not applicable due to ship traffic)**	$5,284,365	$22,879,556	• Increased survival of impinged fish greater than 1 inch • Reduced entrainment of larval fish and shellfish by approximately 50% • Possible increased mortality of juvenile life stages due to impingement stress • Involves construction of a new, expanded, intake structure	• Maximum annual benefit value of $282,300 ($161,300 impingement mortality reduction plus $121,000 entrainment reduction) • Benefit value is probably an overestimate, as described above and since mortality of impinged juvenile life stages might be high • Maintenance cost of fine-mesh screen probably high due to

Technologies	Capital and O&M Costs		Comments	Cost Consideration
	Low	High		
			• Not applicable because there is not adequate shear flow in the Inner Harbor to keep the screens clean	fouling
Addition of fixed fine-mesh wedgewire screens in the existing CWIS	$2,555,077	$15,736,954	• Same as above except the structure would not extend into the ship channel	• Same as above
Aquatic filter barriers **(Technology not applicable due to ship traffic)**	$6,798,259	$28,710,837	• Effective for reducing IM&E with velocity design of <0.5 ft/s • Would require approximately 24,305 square feet of filter barrier surface area for the NBPS (at a rate of 10 gallons/min/ft^2) • Reduce cleaning cost of screens • Requires placement in the Inner Harbor and would conflict with navigation • Effective operation may require an air-burst cleaning system • Subject to fouling and requiring cleaning (Henderson and Seaby, 2003)	• Maintenance costs high due to fouling
Barrier nets **(Technology not applicable due to ship traffic)**	$58,377	$3,401,783	• Effective for reducing IM with a velocity deign of <0.5 ft/s • Subject to fouling with litter, algae, and debris in the Inner Harbor • Reduce cleaning costs of screens • Requires placement in the Inner Harbor and would conflict with navigation • Does not reduce entrainment	• Maximum annual benefit value of $153,265 assuming 95% IM reduction (Radle and Calaban, 2003) • Maintenance costs high due to fouling and debris loading
Velocity cap **(Technology not applicable due to ship traffic)**	$429,867	$695,216	• Limited effectiveness for reducing impingement • No entrainment reduction • Requires construction extending into the Inner Harbor which would interfere with navigation	• Negligible reduction in value of impinged organisms
Modular Inclined Screens **(Technology not applicable because of inadequate velocities in the Inner Harbor)**	$1,172845	$6,527,603	• Possible IM reduction • No entrainment reduction • Require high and constant velocities from 2 to 10 ft/s, which do not typically occur in the Inner Harbor • As of 2003, there were no facilities using these features therefore there is little practical experience with their actual effectiveness	• Maximum annual benefit value <$161,332 as a result of reduced IM

	Capital and O&M Costs			
Technologies	Low	High	Comments	Cost Consideration
Deterrents	$58,377	$4,526,866	• Possible IM reduction of healthy fish • No entrainment reduction • There is little indication these systems are effective in deterring the fish and shellfish present in the Inner Harbor	• Maximum annual benefit value <$161,332 as a result of reduced IM
Operational Modifications				
Changing source water			• The only other source water is Nueces Bay. This option was evaluated in 1994 but was determined to be infeasible because of the cost and the negative ecological impact to Nueces Bay.	• There would be increase in the economic impact associated with using Nueces Bay for cooling water. Monitoring data suggests that the species and numbers impinged and entrained with this change in location could be as high as $5.06 million,.
Seasonally-timed outages			• The NBPS is expected to operate at near full-capacity without seasonal outages. There may be reduced generation at certain times of the year which would have proportional reductions in entrainment and impingement.	• Value of reduced entrainment and impingement would be proportional to reduced generation time and seasons during which generation time was reduced
Variable speed pumps			• This may be a reasonable alternative for reducing flows when the facility is idle or during cooler periods. More repowered facility operating history is needed to estimate potential flow reduction and benefits.	• Value of reduced entrainment and impingement would be proportional to reduced volumes and seasons during which intake volumes were reduced • Cost of the technology would depend on whether the pumps are replaced or whether the existing pump motors could be modified.

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Appendix A

Nueces Bay Power Station Impingement and Entrainment Monitoring Study (bound separately)

Appendix B

Calculations of Age-1 Equivalents

Appendix B
Calculations of Age-1 Equivalents

Age-1 equivalents were calculated for the representative species primarily using natural mortality rates and equations provided by the EPA (2004) with modifications by Normandeau Associates, Inc. (Lindsay, 2008). The Normandeau Associates, Inc. equation adjusts the mortality value for the life stage entrained to a median mortality for that life stage. Fecundity hindcasting was used to calculate age-1 equivalents of penaeid shrimp.

All the representative species may reach reproductive age by 1 year except red drum. Therefore the age-1 equivalent value would be considered the same as the adult equivalent value for those species. Red drum may reach reproductive age by age-3; therefore the equation for red drum includes mortality for age-1 and age-2 fish to obtain an adult-equivalent value for red drum. EPA (2004) provides mortality rates due to fishing, which may occur prior to age-1 for blue crab, penaeid shrimp, red drum, and spotted seatrout. Mortality rates for fishing were not included in the calculations for this report therefore the actual number of age-1 equivalents is probably lower than that calculated.

Normandeau Associates, Inc./EPA (2004) Equations and Natural Mortality Rates

In the equations below, EXP equals e raised to the power of the value in parenthesis and LN equals the natural log of the value in parenthesis

Red drum:

Adult equivalents = # entrained * EXP(LN(2)-LN(1+EXP(-3.06))-3.06-(1.15+0.0977+0.0977))

Spotted seatrout:

Age-1 equivalents = # entrained*EXP(LN(2)-LN(1+EXP(-6.92))-6.92-(0.272))

Atlantic croaker:

Age-1 equivalents = # entrained* EXP(LN(2)-LN(1+EXP(-8.1))-8.1-3.38)

Silver perch:

Age-1 equivalents = # entrained* EXP(LN(2)-LN(1+EXP(-3.27))-3.27-1.71)

Naked goby:

Age-1 equivalents = # entrained* EXP(LN(2)-LN(1+EXP(-4.09))-4.09-2.3)

Callinectes spp:

All specimens counted as *Callinectes*, blue crab, and Gulf crab were placed in this group. Although it is believed the majority of these crabs were probably blue crab, *Callinectes sapidus*, it is difficult to distinguish between small blue crabs and Gulf crabs, *Callinectes similis*.

The equation for *Callinectes* spp is the same equation used above but it incorporates an additional mortality rate. Patillo et al. (1997) cited studies that described juvenile blue crab mortality rates for crabs 5–20 mm (carapace width) ranging from 25–91% per day. The mean carapace width for blue crab juveniles in this study averaged 5.5 mm and ranged from 1.9 to 24 mm (sample size = 115). EPA (2004) recommends a mortality rate of 1.73 for juvenile blue crabs. Etherington et al. (2003) describe variability in emigration and mortality rates for juvenile blue crabs from 0 to 46 days after transformation from the megalopae stage. Since the juvenile stage of blue crab is highly variable in length and lasts for several months, an additional mortality rate of 7 (assumes 50% mortality each day for the first 10 days after transformation from the megalopae stage) was inserted into the age-1 equivalent equation. The 50% daily mortality was used because it provided a mortality rate value mid-way between those identified by Patillo et al. (1997). Etherington et al. (2003) also showed loss rates due to mortality of juvenile crabs (0-46 days after transformation from megalopae) ranging from 0.25 to 0.67/6 hr in their experiment.

Age-1 equivalents = # entrained* EXP(LN(2)-LN(1+EXP(-1.3))-1.3-7-1.7)

Penaeid shrimp:

All specimens counted as white shrimp, brown shrimp, and pink shrimp post-larvae were placed in this group. The value calculated for these shrimp was derived from a fecundity hindcasting equation (Tenera Environmental, 2005).

Number of breeding females = (# entrained/(300000*(EXP(-3.22)*EXP(-1.7)*EXP(-1.7))))

The value of 300,000 is the estimated number of eggs spawned per female in one year and it assumes the females only spawn once. The number of eggs produced by a pink shrimp ranges from 44,000 to 534,000, for white shrimp the range is 500,000 to 1,000,000, and for brown shrimp it is about 264,000 (Patillo et al., 1997).

Appendix C

Basis for Economic Value Calculations

Appendix C
Basis for Economic Value Calculations

The values of impinged organisms were determined using commercial values for Texas. The annual economic value was the factor of the annual impingement mortality estimates and the value-per-unit:

- *Blue crab value*: The assumption was made that each blue crab was of legal harvest size, which is 0.27 pound (lbs) at a minimum carapace width of 5 inches. According to NOAA (2008), 3,309,044 pounds of blue crab were commercially harvested in Texas and sold for $2,660,051 during 2007 at $0.80/pound.
- *Penaeid shrimp value*: According to NOAA (2008), 27,160,444 lbs of white shrimp were commercially harvested in Texas and sold for $56,847,983 during 2007 at $2.09 per pound; 42, 841,648 lbs of white shrimp were commercially harvested in Texas and sold for $84,258,622 during 2007 in Texas at $1.97 per pound. There were 11,156 lbs of pink shrimp harvested in Texas during the same time and sold for $20,685. It was assumed that 16 shrimp make up a pound. The value used was $1.97/lb was is the average value of the 2007 value for all three species.
- *Atlantic croaker value*: The assumption was made that the average weight of impinged Atlantic croaker was 0.12 ounce per fish (GBNEP, 1993). According to NOAA (2008), 54,926 lbs of Atlantic croaker were commercially harvested in Texas and sold for $417,341 during 2007 at $7.60 per lb.
- *Gulf menhaden value*: Gulf menhaden greater than 3.5 inches length are not considered susceptible to impingement (GBNEP, 1993). It was assumed that a 3.5-inch long Gulf menhaden weighs approximately 0.03 lb. Therefore, the weight of fish lost to impingement mortality was 735 lbs. There are not commercial harvest data for Texas; therefore, the values for Louisiana were used. According to NOAA (2008), 789,620,750 lbs of Gulf menhaden were commercially harvested and sold for $41,367,977 during 2007 in Louisiana at $0.052 per pound.
- *Sand seatrout, Gulf killifish, bay anchovy, lined sole*: Values were used from Texas Parks and Wildlife Department (TPWD) civil restitution program for 2008 (Contreras personal communication, 2008). The values for generally determined from the cost of raising a fish of a species to the size, which might be impinged.
- *Red drum and spotted seatrout*: The value used for these species was the TPWD civil restitution value for 2008 (Contreras personal communication, 2008), which incorporates a recreational value for the species.

ATTACHMENT B

APPENDIX A: IMPINGEMENT AND ENTRAINMENT MONITORING STUDY

Appendix A
Nueces Bay Power Station
Impingement and Entrainment
Monitoring Study

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APPENDIX A
NUECES BAY POWER STATION
IMPINGEMENT AND ENTRAINMENT
MONITORING STUDY

Prepared for:

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Contents

Figures

Tables

Acronyms and Abbreviations

°C	degrees Celsius
°F	degrees Fahrenheit
BPJ	Best Professional Judgment
CWIS	cooling water intake structure
EPA	U.S. Environmental Protection Agency
ft	feet/foot
ft/s	foot per second
GBNEP	Galveston Bay National Estuary Program
Gulf	Gulf of Mexico
HL&P	Houston Lighting and Power
I&E	impingement and entrainment
Inner Harbor	Corpus Christi Inner Harbor
mg/L	milligrams per liter
mgd	million gallons per day
mm	millimeters
NBPS	Nueces Bay Power Station
NOAA	National Oceanic and Atmospheric Administration
PIC	Proposal for Information Collection
TCEQ	Texas Commission on Environmental Quality
TCOON	Texas Coastal Ocean Observing Network
TDWR	Texas Department of Water Resources
TPDES	Texas Pollutant Discharge Elimination System
TPWD	Texas Parks and Wildlife Department
TWDB	Texas Water Development Board
UTMSI	University of Texas at Austin Marine Science Institute

1.0 INTRODUCTION

The Clean Water Act Section 316(b) Phase II requirements regulate impingement mortality and entrainment of aquatic life at power-generating facilities withdrawing waters of the U.S. for cooling purposes. These requirements were promulgated in 2004 by the U.S. Environmental Protection Agency (EPA) and regulated existing facilities that withdraw 50 million gallons per day (mgd) or more of water for cooling purposes. Nueces Bay Power Station (NBPS) is owned by Nueces Bay WLE, LP and withdraws water from the Corpus Christi Inner Harbor (Inner Harbor) and is regulated under the Phase II rules. NBPS started operation over 50 years ago and the earliest permit on file with the state for cooling water discharge was issued on June 5, 1967. The facility has not operated or withdrawn cooling water since 2003.

A January 2007 decision of the U.S. Second Circuit Court of Appeals remanded significant provisions of the rule. The court's decision profoundly impacted implementation of the Phase II rules, created considerable regulatory uncertainty at the federal and state levels, and altered the previous compliance approach and schedule for NBPS. Remanded provisions affecting compliance strategies for Nueces Bay WLE, LP include:

- The EPA's determination of the Best Technology Available;
- Performance standards for reductions in impingement and entrainment (I&E);
- The cost-cost and cost-benefit compliance alternatives; and
- Restoration as an alternative to I&E reduction.

Since the court's decision, the EPA officially suspended the rules in July 2007. The EPA has since encouraged states to proceed in the interim with permitting under "Best Professional Judgment" (BPJ) as allowed under the Clean Water Act.

Prior to the Phase II rule remand, facilities located on estuaries, such as NBPS, were required to reduce impingement mortality by a minimum of 80% and entrainment by a minimum of 60% from a calculation baseline (40 CFR 125.93). The calculation baseline was to be determined from historic data or from data collected by conducting an Impingement Mortality and Entrainment Study [40 CFR 125.94(b)(1 and 2)].

The Texas Commission on Environmental Quality (TCEQ) has not developed a specific regulatory path, but expects facilities to remain focused on Phase II compliance. In the short term, the TCEQ expects facilities to submit I&E studies and any other supporting studies. Preliminary guidance by the TCEQ indicates that they will require submittal of the I&E studies within the timeframe of each facility's Texas Pollutant Discharge Elimination System (TPDES) industrial wastewater discharge permit renewal.

This report presents results of the I&E monitoring study conducted at NBPS by PBS&J. The study was performed in accordance with the Proposal for Information Collection (PIC) prepared and submitted by

Nueces Bay WLE, LP to the TCEQ (PBS&J, 2007). The PIC was reviewed by the TCEQ, and they replied on July 10, 2007 with no comments. The I&E study was conducted over the course of 1 year – February 13, 2007 through February 5, 2008. In accordance with the PIC, the objectives of the impingement and entrainment monitoring and data analysis were to:

- Describe the abundance of eggs, larval, and juvenile organisms in the Inner Harbor;
- Describe the difference in species diversity and abundance of fish and shellfish between the surface and bottom of the Inner Harbor through concurrent sampling;
- Similar to above, compare the Inner Harbor to Nueces Bay out the NBPS discharge canal;
- Measure water quality to help explain differences in species composition, abundance, or distribution; and
- Use the data to estimate potential I&E once the facility resumes operation.

For the purpose of this report, seven representative species were chosen for analysis, which represent commercially and recreationally important species. This report describes the results of ichthyoplankton monitoring conducted at the cooling-water intake structure (CWIS) and in the former discharge canal for NBPS.

2.0 STUDY AREA DESCRIPTION

The Corpus Christi Ship Channel begins 4.3 miles offshore in the Gulf of Mexico (Gulf), passes through the inlet connecting the Gulf to Corpus Christi Bay at Port Aransas, and extends 21 miles westward to Corpus Christi (U.S. Army Corps of Engineers, 2003). The last 8.5 miles of the ship channel is called the Inner Harbor and extends inland from the point at which the ship channel crosses the west shore of Corpus Christi Bay under the U.S. Highway 181/State Highway 35 bridge to its terminus at the Viola Turning Basin. The Inner Harbor was originally dredged through the south side of Nueces Bay with the dredged material used to form the north shore of the Inner Harbor (Figure 1). The NBPS is located on the north side of the Inner Harbor about 2.4 kilometers (1.5 miles) from the point where the Inner Harbor opens into Corpus Christi Bay. The Inner Harbor is about (400 feet [ft] to 500 ft wide and is maintained to a depth of 45 ft in this reach.

Nueces Bay is a secondary bay connected to the northwest side of Corpus Christi Bay. Water depths in the bay range from 1 to 6 ft and average 3 ft. The bottom consists of sand, silt, and clay. Salinities drop to near 0 ppt during periods of high freshwater inflow and become hypersaline (greater than 40 ppt) particularly in the western, deltaic, portion of the bay when there is little freshwater inflow. The shallow, well-mixed bay covers about 128,000 acres (Newstead, 2003). It extends from its connection with Corpus

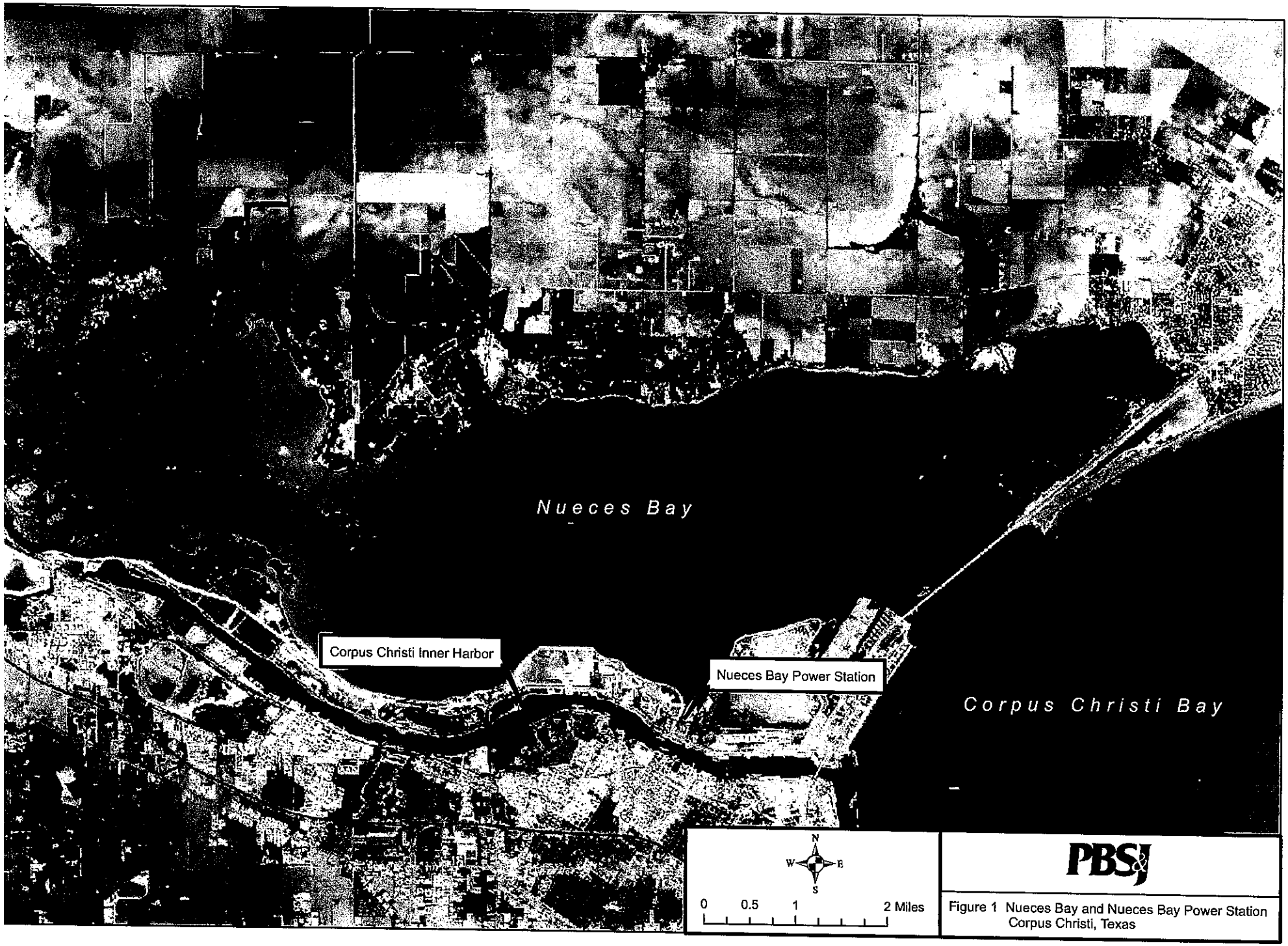

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Figure 1 Nueces Bay and Nueces Bay Power Station
Corpus Christi, Texas

Christi Bay towards the west about 11 miles to the Nueces delta. The Nueces River, entering the bay south of the delta, is the primary source of freshwater inflow to the ecosystem.

NBPS's cooling water is discharged to the south shore of Nueces Bay about 3 miles west of Corpus Christi Bay. The cooling water flows through a dredged channel approximately 6 ft deep and 600 ft long into Nueces Bay. Permit compliance for the cooling water discharge is measured at Outfall 001 approximately 400 ft from the shoreline into the bay (TCEQ, 2005). Nueces Bay in this area is shallow, 1 to 5 ft deep, with a bare mud and sand bottom. Historically, power plant personnel observed periods when Nueces Bay water level dropped enough to expose substantial areas of the near-shore bay bottom to air.

Prevailing winds blow from the southeast except for occasional strong north winds associated with cold front passage. Average evaporation rate of 39 inch/year exceeds average precipitation of 28 inch/year. Average air temperatures range from 8 degrees Celsius (°C) (46 degrees Fahrenheit [°F]) in the winter to 33°C (91°F) in the summer (Tolan and Newstead, 2003).

3.0 FISHERIES RESOURCES

The Texas Parks and Wildlife Department (TPWD) has monitored fish communities and basic physical and chemical conditions in Nueces Bay since 1975, and those data are available from the TPWD's Coastal Fisheries database (TPWD, 2007a). Monitoring includes bag seines along the shorelines, open-water trawls, and shoreline gill nets. Population data for the bay is important for considering the location benefits associated with the CWIS location on the Inner Harbor. However, the TPWD does not monitor the Inner Harbor. It is likely that some similarity exists among the fish and shellfish communities in the Inner Harbor, Nueces Bay, and Corpus Christi Bay because of their close proximity and hydrological connections to each other. Lacson and Lee (1997) describe the results of nearly 20 years of fishery monitoring for the Corpus Christi Bay system including Nueces Bay. Although there has been much work in recent years by the University of Texas at Austin Marine Science Institute and Texas A&M Corpus Christi on the Corpus Christi Bay system, and an inventory of the living resources within the area was compiled by Tunnel et al. (1996), information is limited from these sources regarding the Inner Harbor.

The TCEQ has monitored water quality in Nueces Bay and the Inner Harbor from October 1973 to the present and the results are available through the Nueces River Authority and the TCEQ. Additionally, the TCEQ published several reports analyzing water quality in the Inner Harbor and Nueces Bay (Texas Water Quality Board, 1975; Texas Department of Water Resources [TDWR], 1978, 1984a, 1984b, 1985).

The Texas Water Development Board (TWDB) conducted continuous water quality monitoring in Nueces Bay from 1986 through 1990 through its Bay and Estuary Water Quality Monitoring Program (TWDB, 2007a). This agency also conducted intensive hydrographic surveys of the Corpus Christi Bay system including Nueces Bay and the Inner Harbor in 1987, 1994, and 2000 (TWDB, 2007b). The TWDB modeled circulation and salinity patterns in the Corpus Christi Bay system including Nueces Bay and the Inner Harbor under contract to the Coastal Bend Bays and Estuaries Program (TWDB, 2007c). In addition

to conducting extensive analysis on its own, the TWDB funded several different studies describing different aspects of the Nueces Bay ecosystem through its Research and Planning Fund Grants program (TWDB, 2007d).

The Texas Coastal Ocean Observing Network (TCOON) began installation of water level measurement systems combined with water quality and meteorological data collection in 1989 (TCOON, 2007). Stations were located in Nueces Bay and one currently operating station is near the mouth of the Inner Harbor at the Texas State Aquarium. Water level and air temperature data from this station are recorded at 6-minute intervals and can be accessed in near-real time.

4.0 IMPINGEMENT AND ENTRAINMENT STUDY METHODS

At the time of the study, the NBPS was not in operation. Therefore, sample methods were developed that characterized the marine community at the CWIS and in Nueces Bay that might be susceptible to I&E if the facility were operating. Sampling was conducted biweekly from February 13, 2007 through February 5, 2008 (Table 1) for a total of 26 sample events. An additional sample event was conducted on March 19, 2008. Three locations were sampled for each sample event (beginning August 28, 2007, 4 locations were sampled for each event) (Figure 2):

- Inner Harbor bottom, CWIS at 20 ft (as deep as practical without disturbing bottom sediments);
- Inner Harbor surface, CWIS at 5 ft (to represent surface waters);
- Inner Harbor offshore, 20 ft offshore of the CWIS at a depth of 5 ft. Sampling began at this point on August 28, 2007 to represent organisms in the offshore waters in front of the CWIS;
- Inner Harbor. An ichthyoplankton tow was conducted in the middle of the Inner Harbor channel at a depth of 5 ft. on June 19, 2007. Due to homeland security issues, this was the only time sampling was performed; and
- Nueces Bay, former cooling water discharge channel, about 50 ft from the south shore, 1.5 ft below the surface, representative of mid-depth.

Each sample event included four, 2-hour macrofauna and ichthyoplankton samples over a 24-hour period. Sample collections were made at approximately 6-hour intervals, beginning in the afternoon and generally corresponding to the time periods: 12:00–14:00, 18:00–20:00, 00:00–02:00, and 06:00–08:00. Early morning and late evening samples represented the transition from night to dawn and dusk to dark (see Table 1).

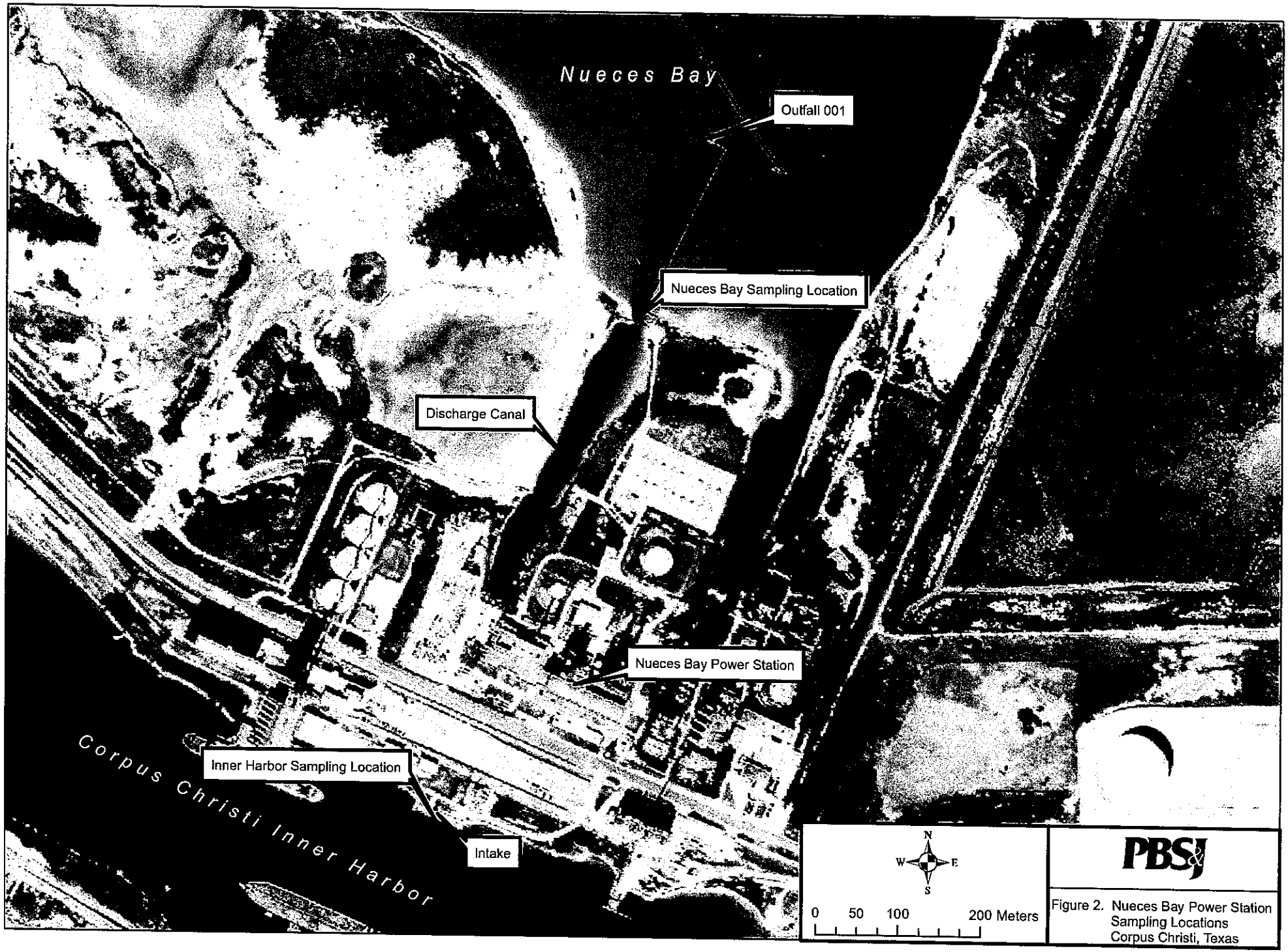

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Figure 2. Nueces Bay Power Station Sampling Locations Corpus Christi, Texas

Table 1. NBPS Impingement and Entrainment Sampling Schedule

Date	1 (Day)	2 (Day)	3 (Night)	4 (Night)
Tuesday, February 13, 2007	12:00–14:00	19:00–21:00	00:00–02:00	07:00–09:00
Tuesday, February 27, 2007	11.34–13:34	17.47–19:47	23:43–01:43	05:38–07:38
Tuesday, March 13, 2007	12:31–14:31	18:55–20:55	00:39–02:39	06:23–08:23
Tuesday, March 27, 2007	12:26–14:26	19:03–21:03	00:34–02:34	06:06–08:06
Tuesday, April 10, 2007	12:22–14:22	19:12–21:12	00:31–02:31	05:49–07:49
Tuesday, April 24, 2007	12:19–14:19	19:23–21:23	00:28–02:28	05:33–07:33
Tuesday, May 08, 2007	12:17–14:17	19:34–21:34	00:26–02:26	05:18–07:18
Tuesday, May 22, 2007	12:18–14:18	19:45–21:45	00:27–02:27	05:07–07:07
Tuesday, June 05, 2007	12:19–14:19	19:55–21:55	00:28–02:28	05:01–07:01
Tuesday, June 19, 2007	12:22–14:22	20:01–22:01	00:31–02:31	05:01–07:01
Monday, July 02, 2007	12:25–14:25	20:02–22:02	00:34–02:34	05:06–07:06
Tuesday, July 17, 2007	12:27–14:27	19:57–21:57	00:36–02:36	05:15–07:15
Tuesday, July 31, 2007	12:28–14:28	19:47–21:47	00:37–02:37	05:26–07:26
Tuesday, August 14, 2007	12:26–14:26	19:33–21:33	00:35–02:35	05:36–07:36
Tuesday, August 28, 2007	12:23–14:23	19:16–21:16	00:31–02:31	05:46–07:46
Tuesday, September 11, 2007	12:18–14:18	18:58–20:58	00:28–02:28	05:54–07:54
Tuesday, September 25, 2007	12:13–14:13	18:41–20:41	00:22–02:22	06:02–08:02
Tuesday, October 09, 2007	12:08–14:08	18:25–20:25	00:17–02:17	06:09–08:09
Tuesday, October 23, 2007	12:05–14:05	18:12–20:12	00:15–02:15	06:17–08:17
Tuesday, November 06, 2007	11:04–13:04	17:02–19:02	23:13–01:13	05:25–07:25
Monday, November 19, 2007	11:06–13:06	16:57–18:57	23:45–01:45	05:33–07:33
Tuesday, December 04, 2007	11:11–13:11	16:57–18:57	23:50–01:50	05:43–07:43
Tuesday, December 18, 2007	11:18–13:18	17:02–19:02	23:27–01:27	05:51–07:51
Tuesday, January 08, 2008	11:28–13:28	17:14–19:14	23:37–01:37	05:59–07:59
Tuesday, January 22, 2008	11:33–13:33	17:23–19:23	23:41–01:41	05:59–07:59
Tuesday, February 05, 2008	11:35–13:35	17:33–19:33	23:44–01:44	05:54–07:54

The first sample interval was near mid-day and attempted to include the hour before through the hour after solar noon. This was the only sample collected completely during daylight hours. The second sample interval was scheduled to start 2 hours before the end of astronomical dusk. The third sample interval was scheduled to occur midway between the end of astronomical dusk and the beginning of astronomical dawn the next morning. This was the only sample collected completely in the dark. Finally, the fourth sample interval began at the beginning of the astronomical dawn and lasted 2 hours. Samples collected during the first two sample intervals at each location were usually composited into the same sample container to produce a sample representing daylight entrainment rates. Samples collected during the last two sample intervals at each location were usually composited into the same sample container to produce a sample representing entrainment during the night. The Inner Harbor offshore sample was the only one for which all sample periods were composited into the same container.

The intake end of each of the 3-inch intake pipes was fitted with a rectangular wooden intake box. The intake boxes had horizontal widths of 5 inches, and vertical heights of 10.5 inches. This area, in combination with the sample pump rates, which was conservatively higher that the design velocities of the former CWIS, yielded an intake velocity of 1 foot per second (ft/s).

During the first sampling trip, the intake PVC pipes and boxes were installed at the CWIS and Nueces Bay locations. Piping remained in place throughout the study. Samples were collected at each location with a 3-inch, gasoline-powered water pump connected to the PVC pipe intakes. Pump capacity was approximately 12,000 gallons/hour.

Water from the pump entered the top of a 50-gallon barrel with a ⅜-inch square mesh screen placed about ⅓ the distance from the bottom of the barrel. The screen was the same diameter as the barrel, therefore requiring all water to pass through the screen as it drained out the barrel. The screen retained organisms large enough to be impinged while allowing passage of smaller organisms. Water drained out the side of the barrel near the bottom through a 4-inch diameter PVC pipe. From the barrel drain, the water passed through an ichthyoplankton net. The ichthyoplankton net was 30 inches in diameter by 84 inches long with 500-µm nylon netting. The net had a vented, removable, cod end for sample removal. Figures 3 through 6 show the sampling apparatus at the Inner Harbor and Nueces Bay locations.

Pump rate (gallons per second) was calculated by measuring the time to pump 50 gallons into the barrel. Time required to pump 50 gallons was measured three times at the beginning and three times at the end of each 24-hour sample event for each pump and the average time of those six measurements was used to determine each pump's rate during the sample event. The total volume of water pumped per sample was calculated by multiplying pump rate by the duration of pumping. Pumps ran approximately 2 hours during each sample interval, which typically allowed from 85,000 to 155,000 gallons to be sampled at each location during each sample trip. After each 2-hour sample period, the I&E samples were removed and preserved with 10% formalin for laboratory processing.

Two entrainment samples (one for day and another for night) for each location and sample trip were processed by Scott Holt's laboratory staff at the University of Texas at Austin Marine Science Institute (UTMSI) in Port Aransas. Impinged fish and shellfish were processed by PBS&J.

All specimens were identified to the lowest practical taxon, assigned a life stage (e.g., egg, larvae, and juvenile for fish), enumerated by taxon, and measured to standard length (millimeters [mm]). In cases where large numbers of individuals were present, standard subsampling was conducted. A voucher collection was retained consisting of two specimens of each species or taxonomic group.

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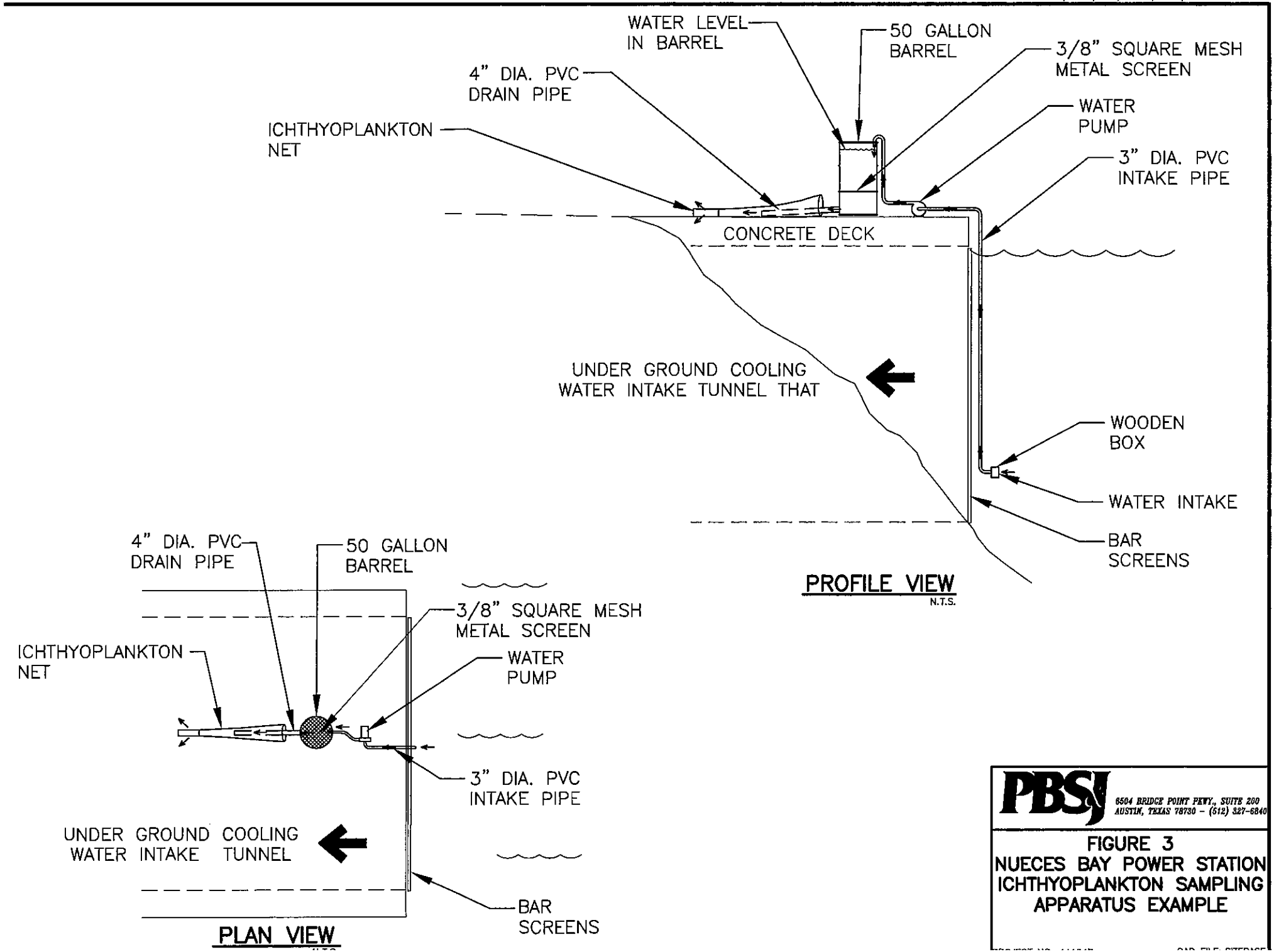


PBSJ
6504 BRIDGE POINT PKWY., SUITE 200
AUSTIN, TEXAS 78730 – (512) 327-6840

FIGURE 3
NUECES BAY POWER STATION
ICHTHYOPLANKTON SAMPLING APPARATUS EXAMPLE

Figure 4. Inner Harbor Surface, Bottom, and Offshore Sampling Setup showing the intake pipes, hoses, pumps, and barrel samplers

Figure 5. Inner Harbor sampling setup for surface and bottom samples, including nets on the discharge of the barrel sampler

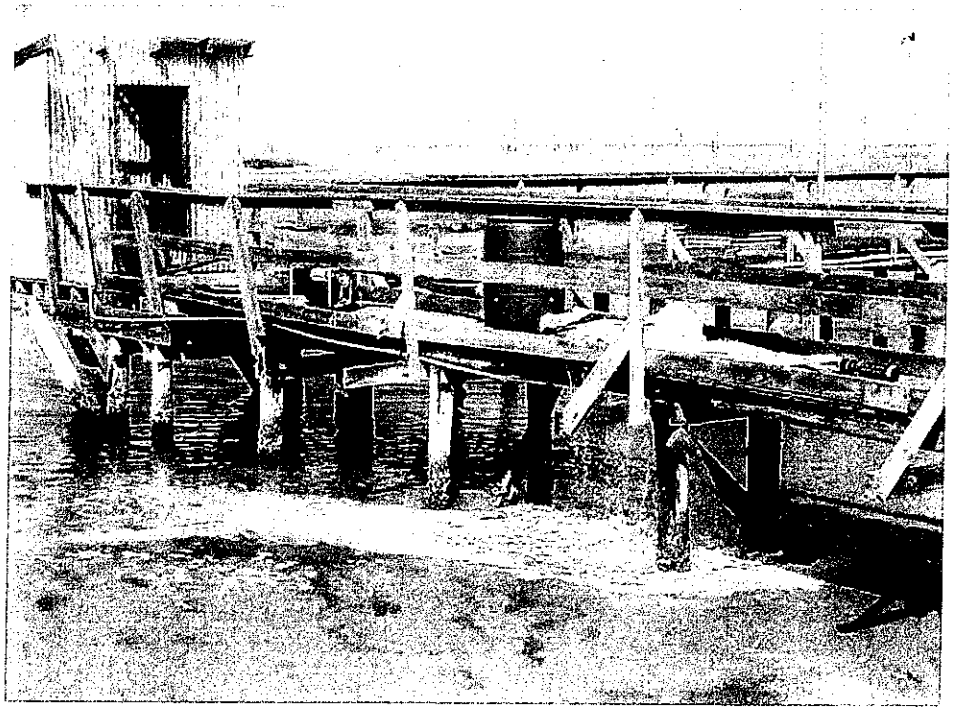


Figure 6. Nueces Bay sampling setup

Dissolved oxygen (milligrams per liter [mg/L]), temperature (°C), salinity (ppt), conductivity (µmho/cm), and pH (standard units) were measured with a water quality meter at the beginning and end of each sample period at each sample location. Secchi disk measurements were taken at each sample location during the afternoon sampling period. Observations of weather and tidal cycles were noted in the field data book and obtained from the National Oceanographic and Atmospheric Administration (NOAA) Tides and Currents website and the TCOON. Other activities that might influence impingement and entrainment were noted.

The water quality meter was calibrated before and after each sample trip according to the manufacturer's specifications. A calibration log was maintained.

5.0 RESULTS

While only representative species are discussed in this report, it should be noted that the vast majority of the organisms collected over the course of the study included fish eggs (probably bay anchovy [*Anchoa mitchilli*]) and crustaceans (post-larval caridean shrimp and mysid shrimp [*Americamysis bahia*]). Because few species were collected in impingement samples, all species collected are discussed. For discussion purposes, the three larval/juvenile/adult penaeid shrimp species were combined into the penaeid shrimp category and the megalops/juvenile blue crabs have been combined into the *Callinectes* spp. category. In some cases, all finfish species were combined into a finfish category.

5.1 IMPINGEMENT

Organisms impinged during the study are presented in Table 2. Many of the impinged organisms were partially destroyed when they went through the pump and as a result were unidentifiable.

Table 2. Number of Organisms Impinged at Each Station, NBPS

Common Name	Scientific Name	Inner Harbor Surface	Inner Harbor Bottom	Nueces Bay
Moon jelly	*Aurelia aurita*	1	1	0
Unidentified jellyfish		0	1	1
Brown shrimp	*Farfantepenaeus aztecus*	0	0	1
Pink shrimp	*F. duorarum*	0	0	2
Grass shrimp	*Palaemonetes* sp.	0	0	1
Unidentified shrimp		0	0	1
Unidentified crab		0	1	1
Blue catfish	*Ictalurus furcatus*	0	0	1
Tidewater silverside	*Menidia beryllina*	0	0	5
Sheepshead	*Archosargus probatocephalus*	0	1	3
Pinfish	*Lagodon rhomboides*	3	0	3
Spot	*Leiostomus xanthurus*	0	0	1
Striped Blenny	*Chasmodes bosquianus*	0	0	1
Skilletfish	*Gobiesox strumosus*	0	0	2
Unidentified fish (Bay anchovy or Gulf menhaden)		0	0	3
Unidentified fish		1	0	1
	Total	5	4	27

Over the course of the study, a total of 36 fish, shellfish, and jellyfish (Ulmaridae) species were collected from the ⅜-inch mesh screens in the barrel sampler. The majority (75%) of these were from the Nueces Bay sample station, the differences were also reflective of the differences in habitat quality between the two areas.

Nine organisms were collected from the Inner Harbor locations and included pinfish (*Lagodon rhomboides*), sheepshead (*Archosargus probatocephalus*), jellyfish (*Aurelia aurita* and one unidentified), an unidentified fish, and an unidentified crab. Sheepshead are known to prefer oyster reefs and other hard structures and pinfish are occasionally associated with hard structures. Although these two species were collected during this study, they are not known to be abundant in impingement samples from other power plants (Galveston Bay National Estuary Program [GBNEP], 1993; TCEQ, 2003). It is believed that sheepshead and pinfish were collected because they were feeding on the community of oysters, mussels, and algae living on and encrusting the bar screens or because they may have actually swam into the collection pipe. Once power plant operation is resumed, the NBPS will maintain the bar screen and keep

oysters and other organisms from creating fouling communities on the bar screen. This is expected to reduce the numbers of pinfish and sheepshead in the vicinity of the bar screen.

Twenty-seven organisms were collected from the Nueces Bay station and included brown shrimp (*Farfantepenaeus aztecus*), pink shrimp (*F. duorarum*), grass shrimp (*Palaemonetes* sp.), blue catfish (*Ictalurus furcatus*), tidewater silverside (*Menidia beryllina*), sheepshead, pinfish, spot (*Leiostomus xanthurus*), striped blenny (*Chasmodes bosquianus*), skilletfish (*Gobiesox strumosus*), and one each of an unidentified jellyfish, shrimp, crab, and four unidentified fish.

5.2 ENTRAINMENT

Broad spatial and temporal differences in entrainable organisms were observed over the course of the study. Table 3 presents the mean entrainment rates (number/million gallons) by taxa collected for each of the sample locations. These organisms were small and passed through a ⅜-inch-square mesh screen. The overwhelming majority of entrained organisms consisted of early life stages (e.g., larvae and post-larvae) that occur at high densities shortly after spawning. The periodicity and concentration of organisms generally corresponds to the spawning behavior and fecundity of each taxa.

The large majority of entrained representative species among all sample locations consisted of shellfish, with an average entrainment rate among all sample locations over the course of the study of approximately 5,700/mg. The average entrainment rate among all sample locations and of all finfish representative species combined was approximately 2,450/mg. Of these, the majority entrained were naked goby (*Gobiosoma bosc*) with an average entrainment rate among all sample locations of approximately 2,350/mg. This was followed by silver perch (*Bairdiella chrysoura*) with an average entrainment rate of approximately 40/mg.

Considering representative species combined over the course of the study, the highest entrainment rate by location was from the Nueces Bay station, with an annual mean of approximately 27,000/mg (see Table 3). The most pronounced difference between the Nueces Bay station and the Inner Harbor locations was among the shellfish community. The largest proportion of penaeid shrimp was collected from the Nueces Bay station making up 59% of the sample total, whereas the proportion of this taxa at the Inner Harbor stations ranged from 36 to 50% of the sample totals. Conversely, *Callinectes* spp. were relatively abundant at the Inner Harbor locations, making up 27 to 47% of the sample totals, whereas, at the Nueces Bay station, these crabs made up 8% of the sample total.

Table 3. Average Annual Entrainment Rates Per Million Gallons of Representative Species Collected at Each Sampling Site at NBPS

		Inner Harbor Surface		Inner Harbor Bottom		Inner Harbor Offshore		Nueces Bay	
Common Name	Scientific Name	Entrainment Rate (No./mg)	% of Total	Entrainment Rate (No./mg)	% of Total	Entrainment Rate (No./mg)	% of Total	Entrainment Rate (No./mg)	% of Total
Penaeid shrimp	Penaeidae family	1,412.9	45.2	608.9	36.5	403.1	50.7	15,952.9	59.3
Callinectes sp.	*Callinectes* (swimming crab)	1,460.8	46.7	450.0	26.9	335.6	42.2	2,071.6	7.7
Silver perch	*Bairdiella chrysoura*	77.0	2.5	88.3	5.3	0	0	7.6	0.0
Spotted seatrout	*Cynoscion nebulosus*	2.1	0.1	4.4	0.3	0.6	0.1	1.8	0.0
Atlantic croaker	*Micropogonias undulatus*	3.4	0.1	57.1	3.4	12.9	1.6	91.8	0.3
Red drum	*Sciaenops ocellatus*	0.6	0.0	0.3	0.0	2.0	0.2	13.7	0.1
Naked goby	*Gobiosoma bosc*	169.1	5.4	461.0	27.6	40.2	5.1	8,754.8	32.6
Naked goby, juvenile	*G. bosc,* juveniles	0	0	0	0	0	0	0.9	0.0
	Finfish Total	252.1		611.1		55.6		8,870.5	
	Total	3,125.8		1,670.0		794.4		26,895.1	

5.2.1 Inner Harbor and Nueces Bay Comparisons

Considering all representative species combined over the course of the study, the highest entrainment rate by location was from the Nueces Bay station, with a mean of approximately 27,000/mg (see Table 3). The most pronounced difference between the Inner Harbor locations and the Nueces Bay station was among the *Callinectes* spp. community. *Callinectes* spp. made up a higher proportion of entrained organisms from the Inner Harbor locations, making up from 27 to 48% of the total, whereas the proportion of this taxa at the Nueces Bay station represented only 8% of the sample total. The highest proportion of penaeid shrimp and finfish were collected at the Nueces Bay station, making up 59% and 33%, respectively. Approximately 33% of the finfish collected from the Nueces Bay station were naked goby.

5.2.2 Comparison of Inner Harbor Surface and Bottom Locations

Penaeid shrimp and *Callinectes* spp. were the dominant taxa in the Inner Harbor surface and bottom samples (see Table 3). Concentrations near the surface were more than two times higher than near the bottom for penaeid shrimp and more than three times for *Callinectes* spp. The average density of penaeid shrimp at the Inner Harbor surface location was approximately 1,400/mg and at the bottom location was approximately 600/mg. The average density of *Callinectes* spp. at the Inner Harbor surface location was approximately 1,500/mg and at the bottom location was approximately 450/mg.

Concentrations of finfish were greatest in the Inner Harbor bottom sample with approximately 600/mg. Naked goby was the dominant finfish taxa in the Inner Harbor surface and bottom samples, with the greatest concentration collected in the bottom samples. The high numbers of naked goby probably resulted from the oyster/algae community on the bar screens and the oyster community that developed on the Inner Harbor sampling apparatus during the course of the study (Figure 7). This species is associated with oyster reef habitats, feeding, reproducing, and using the reef as protection (South Carolina Department of Natural Resources, 2008). Facility maintenance in the past maintained the bar screen free of oysters and macroalgae that provide habitat for organisms like naked goby or other species that use this type of structure or substrate. Numbers of naked goby will probably be significantly reduced near the intake structure once the facility is in operation and the bar screen is kept clean.

5.2.3 Comparison of Inner Harbor Surface and Offshore Locations

In order to make an accurate comparison of the Inner Harbor samples, the Inner Harbor surface samples were compared to the offshore samples for only those dates during which both these locations were sampled, from August 28, 2007 through February 5, 2008.

Figure 7. Fouling by Oysters of the Head Box of the Inner Harbor Intake Pipe

Penaeid shrimp and *Callinectes* spp. were the dominant taxa in the Inner Harbor surface and offshore samples (Table 4). The average density of penaeid shrimp at the Inner Harbor surface location was approximately 380/mg and at the offshore location was approximately 400/mg. The average density of *Callinectes* spp. at the Inner Harbor surface location was approximately 230/mg and at the offshore location was approximately 340/mg. Concentrations of finfish were similar at both locations with approximately 58/mg in the Inner Harbor surface sample and 56/mg in the Inner Harbor offshore sample. Naked goby again was the dominant finfish taxa at both locations.

Table 4. Average Annual Entrainment Rates Per Million Gallons of Representative Species Collected at Each Inner Harbor Sampling Site at NBPS, August 28, 2007 through February 5, 2008 (Nelson et al., 2004)

		Inner Harbor Surface		Inner Harbor Offshore	
Common Name	Scientific Name	Entrainment Rate (No./mg)	% of Total	Entrainment Rate (No./mg)	% of Total
Penaeid shrimp	Penaeidae family	378.6	56.6	403.1	50.7
Callinectes spp.	*Callinectes* (swimming crab)	233.1	34.8	335.6	42.2
Silver perch	*Bairdiella chrysoura*	0.70	0.1	0	0
Spotted seatrout	*Cynoscion nebulosus*	0	0	0.6	0.1
Atlantic croaker	*Micropogonias undulatus*	7.6	1.1	12.9	1.6
Red drum	*Sciaenops ocellatus*	1.4	0.2	2.0	0.2
Naked goby	*Gobiosoma bosc*	48.2	7.2	40.2	5.1
	Finfish Total	57.9		55.6	
	Total	669.5		794.4	

5.2.4 Inner Harbor Surface and Inner Harbor Mid-Channel Locations

An ichthyoplankton tow from the middle of the Inner Harbor channel at a depth of 5 ft was collected on June 19, 2007, about the same time the day sample was collected from the Inner Harbor surface site (Table 5). Of the representative species, only *Callinectes* spp. megalops were collected at both locations. Concentrations of *Callinectes* spp. megalops were almost two times greater in the Inner Harbor mid-channel location when compared to the Inner Harbor surface sample.

Table 5. Comparison of Representative Species and Concentrations (#/mg) between the Inner Harbor Mid-Channel and the Inner Harbor Surface June 19, 2007

Species	Inner Harbor Surface	Inner Harbor Mid-channel
Callinectes spp. megalops	156.3	288.5
Callinectes spp.	49.7	0
Penaeid shrimp	490.3	0
Naked goby larvae	149.2	0
Spotted sea trout	14.2	0
Silver perch	120.8	0
Total	980.7	288.5

This comparison shows the difference in how the abundance of organisms changes with the sampling location. There are more organisms living on the edge of the Inner Harbor versus in the channel. While the original sampling design included a characterization of the Inner Harbor, this was unable to be completed beyond this one time due to security concerns in the Inner Harbor.

5.2.5 Changes in Concentration Over Season

Seasonal trends of representative species were considered. Entrainment estimates were calculated using 343 mgd and extrapolated over a 2-week period surrounding the sample date to obtain an estimate of entrainment for the 2-week period. The sum of all 2-week periods was used to estimate potential annual entrainment in millions of organisms. Seasons were considered as follows: spring (March 20–June 20), summer (June 21–September 22), fall (September 23–December 20), and winter (December 21–March 19). Entrainment was higher at the Inner Harbor locations during the summer sampling events, followed by the spring, fall, and winter (Table 6). At the Nueces Bay Station, entrainment was slightly higher during the fall sampling than during the summer and spring, whereas the winter sampling events had substantially lower entrainment rates.

At the Inner Harbor locations, penaeid shrimp accounted for the majority of organisms collected during the spring and winter (Table 7, Figure 8). *Callinectes* spp. also accounted for a large portion of organisms collected, especially during the summer and fall (see Table 7, Figure 9). Finfish (mainly naked goby)

Table 6. Biweekly Entrainment Estimate of Representative Species Over Season at Each Sample Location (343 mgd), NBPS

Sample Date	Inner Harbor Surface	Inner Harbor Bottom	Inner Harbor Offshore	Nueces Bay
Winter 2007				
2/13/07	378,159	450,892		7,859,914
2/27/07	146,368	602,503		126,326
3/13/07	3,294,401	9,552,515		7,531,081
Season Total	3,818,929	10,605,910		15,517,321
Spring 2007				
3/27/07	8,003,144	4,350,771		33,733,865
4/10/07	22,494,124	8,504,753		7,107,785
4/24/07	3,952,263	5,917,842		29,314,194
5/8/07	11,832,063	12,992,936		84,349,179
5/22/07	5,535,639	2,306,551		7,360,443
6/5/07	13,404,106	6,703,136		26,764,320
6/19/07	4,709,193	8,299,443		71,312,180
Season Total	69,930,532	49,075,431		259,941,965
Summer 2007				
7/2/07	22,827,396	7,651,106		91,067,469
7/17/07	102,137,201	13,832,533		48,073,137
7/31/07	146,634,449	44,499,818		5,611,523
8/14/07	13,907,924	14,335,648		34,087,635
8/28/07	23,279,929	23,608,232	15,918,417	27,307,476
9/11/07	2,802,013	3,884,067	6,374,949	912,530,376
Season Total	311,588,911	107,811,403	22,293,367	1,118,677,617
Fall 2007				
9/25/07	1,442,957	6,338,121	2,875,535	946,092,001
10/9/07	4,111,115	9,921,639	3,731,773	87,301,708
10/23/07	1,764,169	6,823,374	6,526,926	88,905,282
11/6/07	1,115,465	3,879,758	3,164,738	52,459,253
11/19/07	1,665,385	5,750,223	3,498,874	5,105,751
12/4/07	997,275	3,699,158	2,319,422	39,544,331
12/18/07	761,272	3,237,805	576,395	620,479
Season Total	11,857,638	39,650,079	22,693,662	1,220,028,806
Winter 2008				
1/8/08	236,141	290,058	209,220	4,559,455
1/22/08	228,626	172,350	360,150	117,698
2/5/08	177,601	201,853	255,933	647,955
Season Total	642,367	664,260	825,304	5,325,107
Annual Totals	397,838,378	207,807,083	45,812,332	2,619,490,815

Table 7. Representative Species Annual Entrainment Estimates
by Season (343 mgd), NBPS

Species	Inner Harbor Surface		Inner Harbor Bottom		Inner Harbor Offshore		Nueces Bay	
	Entrainment Estimate	Percent of Total	Entrainment Estimate	Percent of Total	Entrainment Estimate	Percent of Total	Entrainment Estimate	Percent of Total
Spring								
Penaeid shrimp	33,246,317	47.5	20,727,203	42.2			173,284,756	66.7
Callinectes spp.	24,619,017	35.2	6,028,103	12.3			9,117,921	3.5
Silver perch	2,735,311	3.9	3,267,622	6.7			986,042	0.4
Spotted seatrout	106,878	0.2	81,367	0.2			39,361	0.0
Naked goby	9,223,010	13.2	18,971,136	38.7			76,396,753	29.4
Naked goby, juvenile	0	0	0	0			117,131	0.0
Summer								
Penaeid shrimp	140,691,490	45.2	38,161,184	35.4	13,848,476	62.1	906,423,717	81.0
Callinectes spp.	159,738,447	51.3	36,702,828	34.0	7,924,985	35.5	72,334,898	6.5
Silver perch	979,659	0.3	579,588	0.5	0	0	0	0
Spotted seatrout	160,864	0.1	219,918	0.2	0	0	85,458	0.0
Atlantic croaker	0	0	0	0	0	0	79,461	0.01
Naked goby	10,018,452	3.2	32,147,884	29.8	519,906	2.3	139,754,083	12.5
Fall								
Penaeid shrimp	5,279,614	44.5	9,961,056	25.1	9,162,478	40.4	106,157,876	8.7
Callinectes spp.	4,396,942	37.1	13,664,407	34.5	11,162,129	49.3	182,255,845	14.9
Atlantic croaker	436,855	3.7	7,252,882	18.3	525,762	2.3	11,575,036	0.9
Spotted seatrout	0	0	271,912	0.7	36,866	0.2	105,600	0.0
Red drum	80,164	0.7	43,116	0.1	113,902	0.5	1,775,249	0.1
Naked goby	1,664,063	14.0	8,456,706	21.3	1,655,659	7.3	918,159,200	75.3
Winter								
Penaeid shrimp	3,108,482	69.7	8,987,827	79.7	218,277	26.4	15,531,064	74.5
Callinectes spp.	643,382	14.4	1,947,511	17.3	252,601	30.6	4,517,366	21.7
Atlantic croaker	0	0	144,847	1.3	214,945	26.0	168,156	0.8
Naked goby	709,432	15.9	189,986	1.7	139,480	16.9	625,842	3.0

Figure 8. Concentration (#/mg) of Penaeid Shrimp on Each Sample Date at Each Sample Location, NBPS

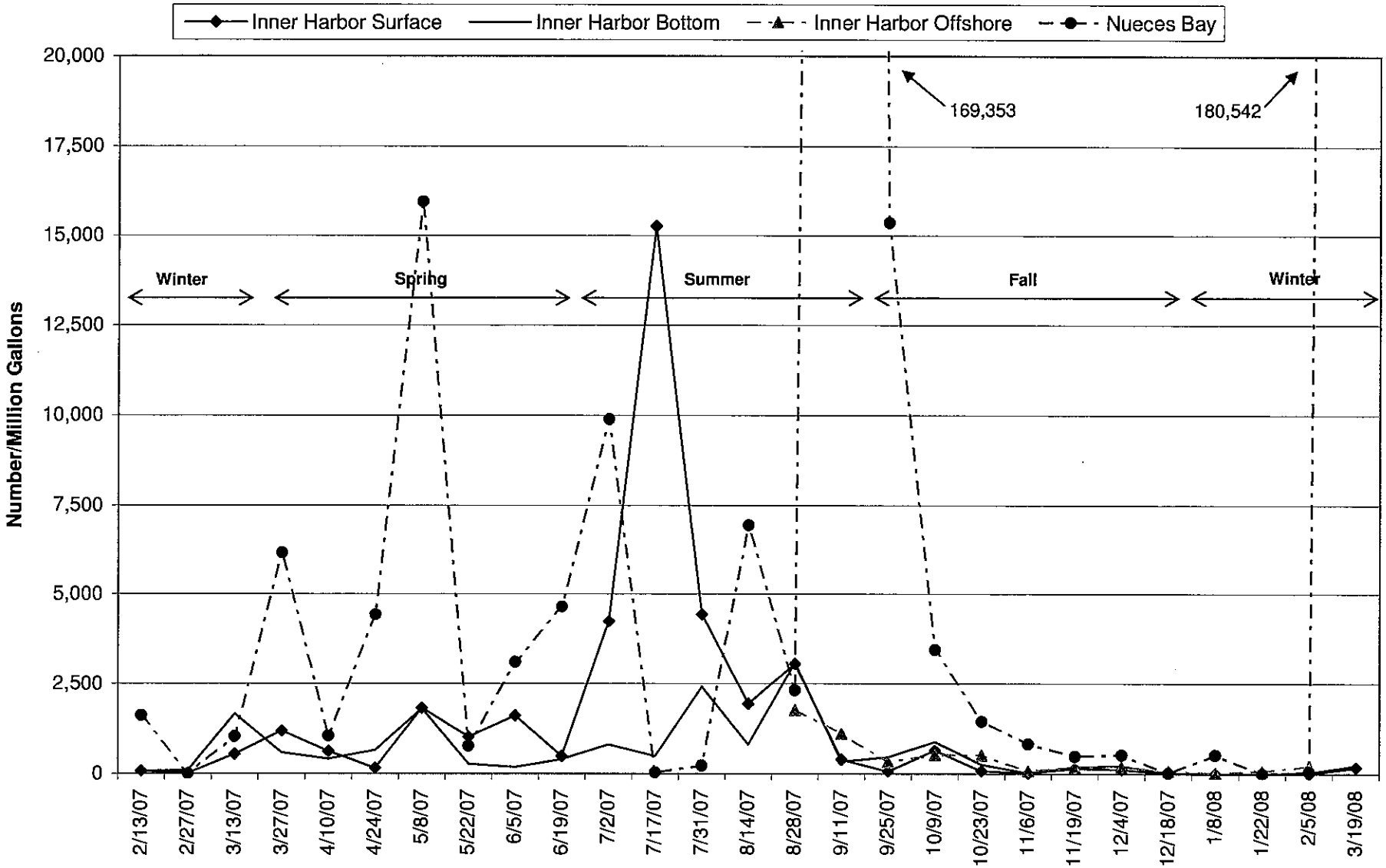


Figure 9. Concentration (#/mg) of *Callinectes* spp. on Each Sample Date at Each Sample Location, NBPS

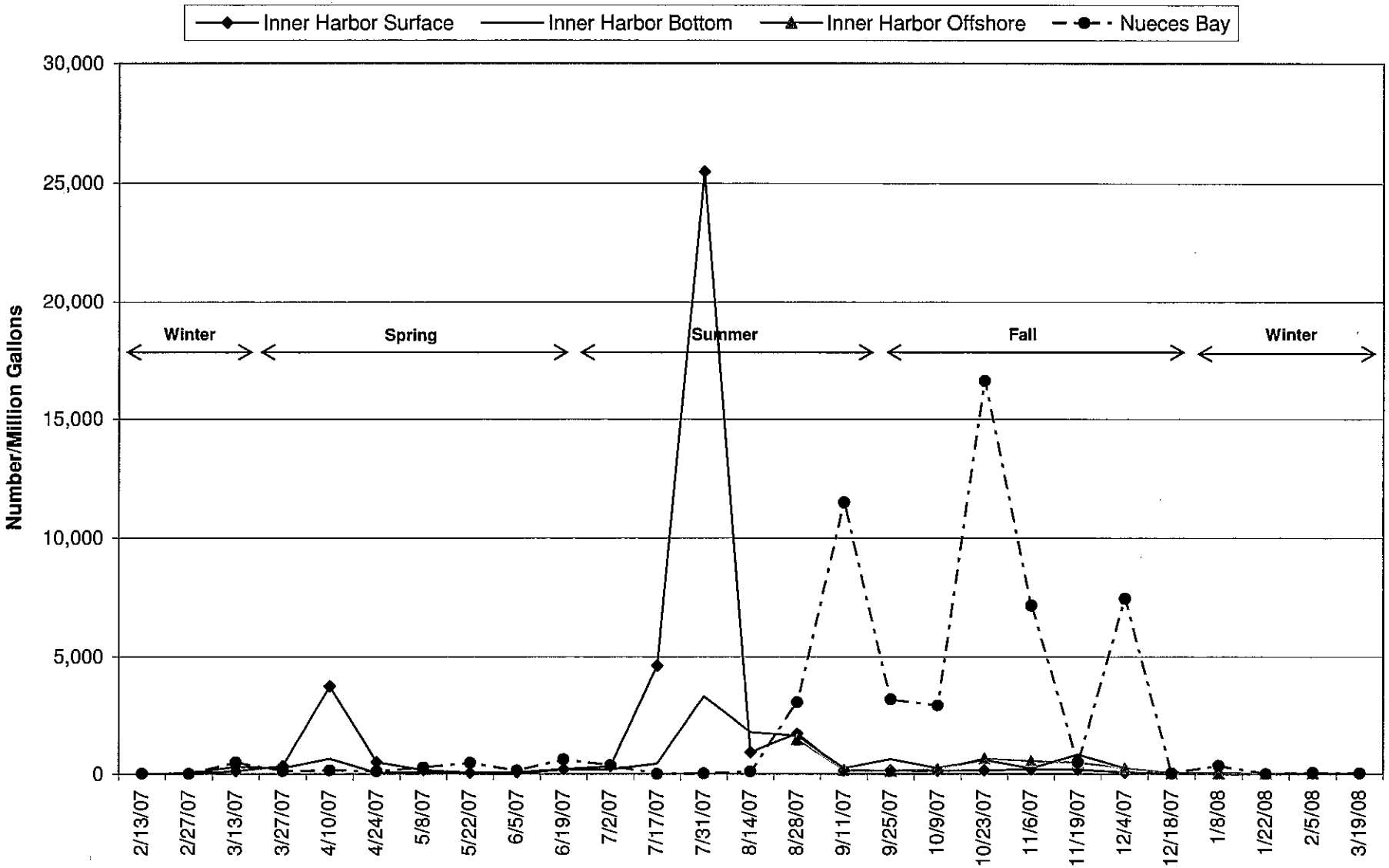
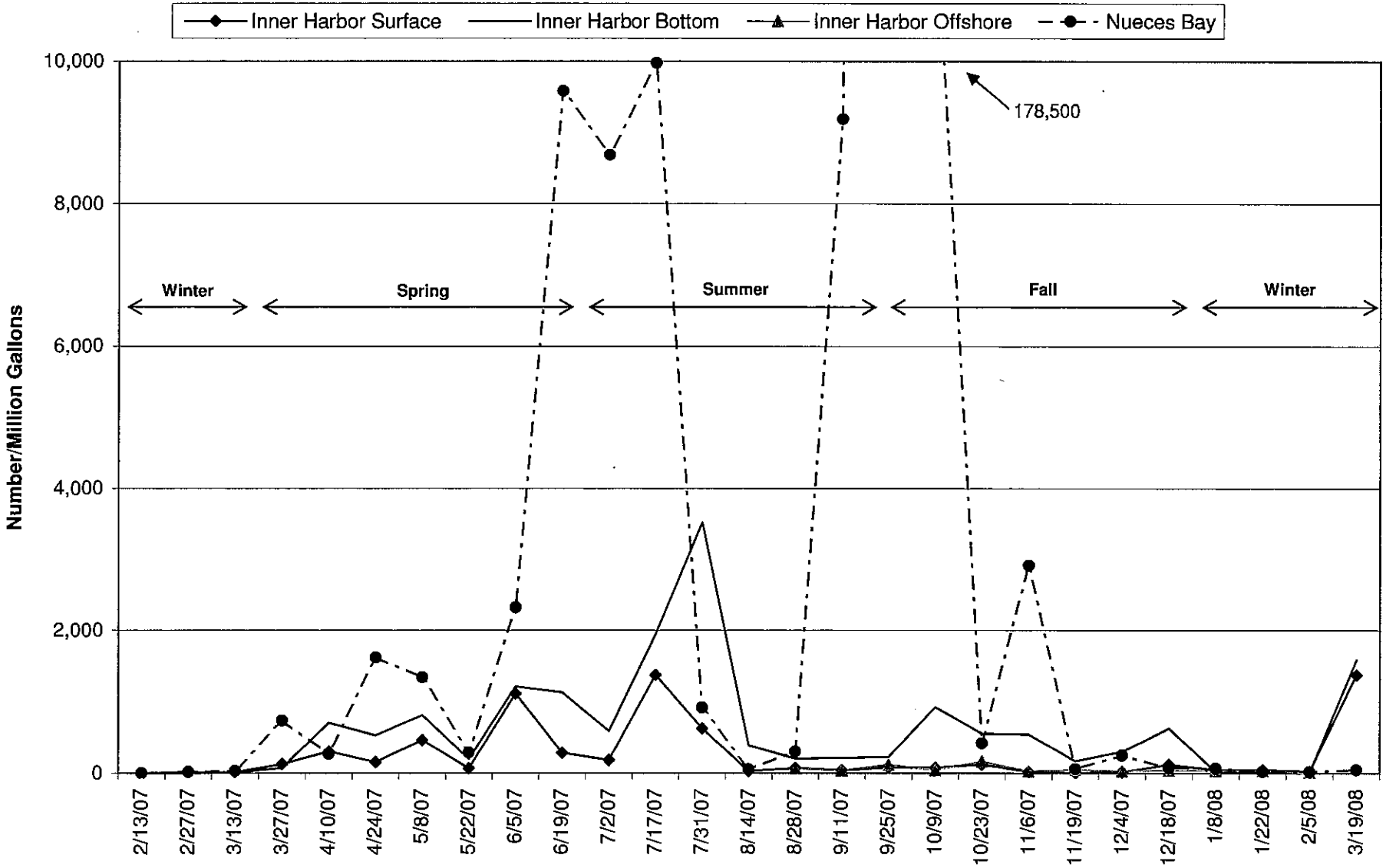


Figure 10. Concentration (#/mg) of Finfish on Each Sample Date at Each Sample Location, NBPS



accounted for a large portion of organisms collected during the spring and summer at the Inner Harbor bottom location (see Table 7, Figure 10). At the Nueces Bay site, penaeid shrimp accounted for the majority of organisms collected during the spring, summer, and winter; whereas, during the fall, finfish (mostly naked goby) accounted for the majority of organisms (see Table 7, Figures 8–10).

5.2.6 Diurnal Differences in Entrainment

There were diurnal differences in entrainment rates where the representative species were collected in higher concentrations in the night samples than during the day at both the Inner Harbor locations and the Nueces Bay site (Table 8). Penaeid shrimp were over three to four times more abundant during the night samples than day at all sample locations; *Callinectes* spp. were from about two to almost five times greater; and finfish were one to four times greater at night.

Table 8. Representative Species Diurnal Differences in Average Entrainment Rate (#/mg) for the Study Period, NBPS

Penaeid Shrimp		Callinectes spp.		Finfish	
Day	Night	Day	Night	Day	Night
		Inner Harbor Surface			
829	2,495	2,162	5,446	296	314
		Inner Harbor Bottom			
269	1,072	465	1,633	336	940
		Nueces Bay			
8,459	27,820	794	4,319	4,139	33,335

5.3 ENVIRONMENTAL VARIABLES

5.3.1 Dissolved Oxygen

Dissolved oxygen concentrations were generally within expected ranges during the study period (Figure 11). The lowest daily average dissolved oxygen observed at the Inner Harbor was 1.5 mg/L on September 11, 2007, at the Inner Harbor bottom, and the highest was 11.2 mg/L on January 22, 2008. At the Nueces Bay site, daily average dissolved oxygen observed ranged from a low of 3.7 mg/L on February 27, 2007 to a high of 12.4 mg/L on January 22, 2008.

Mean dissolved oxygen levels were generally above 5 mg/L at all sample sites. Concentrations in the Inner Harbor surface waters dropped below 5 mg/L during mid-May, mid-July, and early September sample events. At the Inner Harbor bottom site, concentrations dropped below 5 mg/L during mid-May, July, late August, and early September sample events. Daily mean dissolved oxygen levels in Nueces Bay exceeded 6 mg/L except during the late February and mid-May sample events.

The relationship between mean dissolved oxygen and entrainment rates observed during each sample event is shown on Figure 11. There was no relationship between dissolved oxygen and entrainment rate at the Inner Harbor ($p=0.06$; $r^2=0.14$) or the Nueces Bay site ($p=0.64$; $r^2=0.01$).

5.3.2 pH

Daily mean pH in the Inner Harbor ranged from a low of 7.6 on April 10, 2007 to a high near 8.2 on November 19, 2007 (Figure 12). In Nueces Bay, pH ranged from 7.3 on March 27, 2007 to near 8.6 on July 31, 2007. Daily mean pH values were most variable and highest at the Nueces Bay site suggesting increased vegetative productivity occurring at the bay sampling location. While pH was generally higher during times of higher entrainment, the relationship between pH and entrainment rate was not significant in the Inner Harbor ($p=0.65$; $r^2=0.01$) or the Nueces Bay site ($p=0.55$; $r^2=0.02$) (see Figure 12).

5.3.3 Salinity

Daily average salinity in the Inner Harbor ranged from a low of 14.1 ppt on July 31, 2007 to a high of 30.3 ppt on March 19, 2008 (Figure 13). In Nueces Bay, daily mean salinity ranged from a low 1.2 ppt on July 31, 2007 to a high of 29.5 ppt on February 13, 2007. Salinity data show vertical stratification in the Inner Harbor occurring during the July through mid-September sample events. This vertical stratification contributed to low dissolved oxygen levels at the same time in the Inner Harbor bottom water. Salinity data also reflects the influence of the elevated amounts of freshwater inflow during the relatively wet summer in this region of Texas. Salinity levels in the Inner Harbor at the surface more than doubled from a daily average of 14.1 ppt at the end of July to a peak of 30.3 ppt in the mid-March 2008 sample. The daily average salinity at the Nueces Bay location dropped from a peak daily average of 29.5 ppt in mid-February to a low of 1.2 ppt during the late July sample. During relatively wet periods, Nueces River inflow can drop salinities throughout Nueces Bay to 0 ppt.

The relationship between mean salinity and entrainment rates observed during each sample event is shown on Figure 13. There was no relationship between mean salinity and entrainment rate at the Inner Harbor ($p=0.45$; $r^2=0.00$) or the Nueces Bay site ($p=0.09$; $r^2=0.15$).

5.3.4 Temperature

Mean water temperature in the Inner Harbor ranged from a low of 12.7°C (54.8°F) on January 22, 2008 to a high of 30.1°C (86.2°F) on August 28, 2007 (Figure 14). In Nueces Bay, mean water temperature ranged from a low of 14.1°C (57.2°F) on January 22, 2008 to a high of 30.7°C (87.3°F) on July 31, 2007. Water temperatures at all locations reflected the changes in season with daily average temperatures at all sites below 20.0°C (68.0°F) at the beginning and end of the study, and reaching near 30.0°C (86.0°F) during July and August sample dates. Temperatures at the Nueces Bay location were more variable reflecting the shallow, exposed nature of this location that loses and gains heat more rapidly than the substantially deeper, less exposed Inner Harbor locations.

Figure 11. Mean Dissolved Oxygen and Entrainment Rate of Organisms Collected in the Inner Harbor and Nueces Bay, Nueces Bay Power Plant

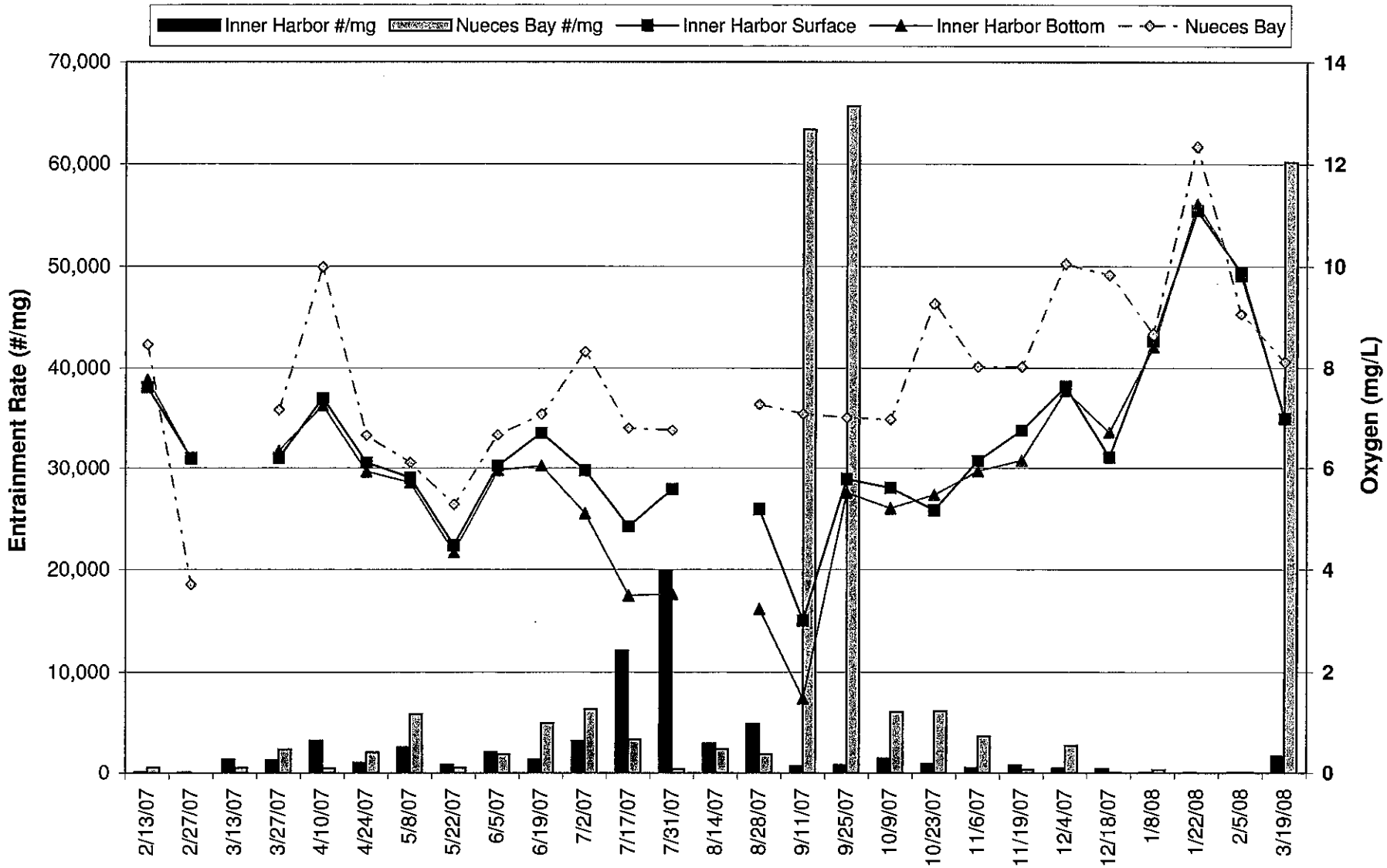


Figure 12. Mean pH and Entrainment Rate of Organisms Collected in the Inner Harbor and Nueces Bay, Nueces Bay Power Plant

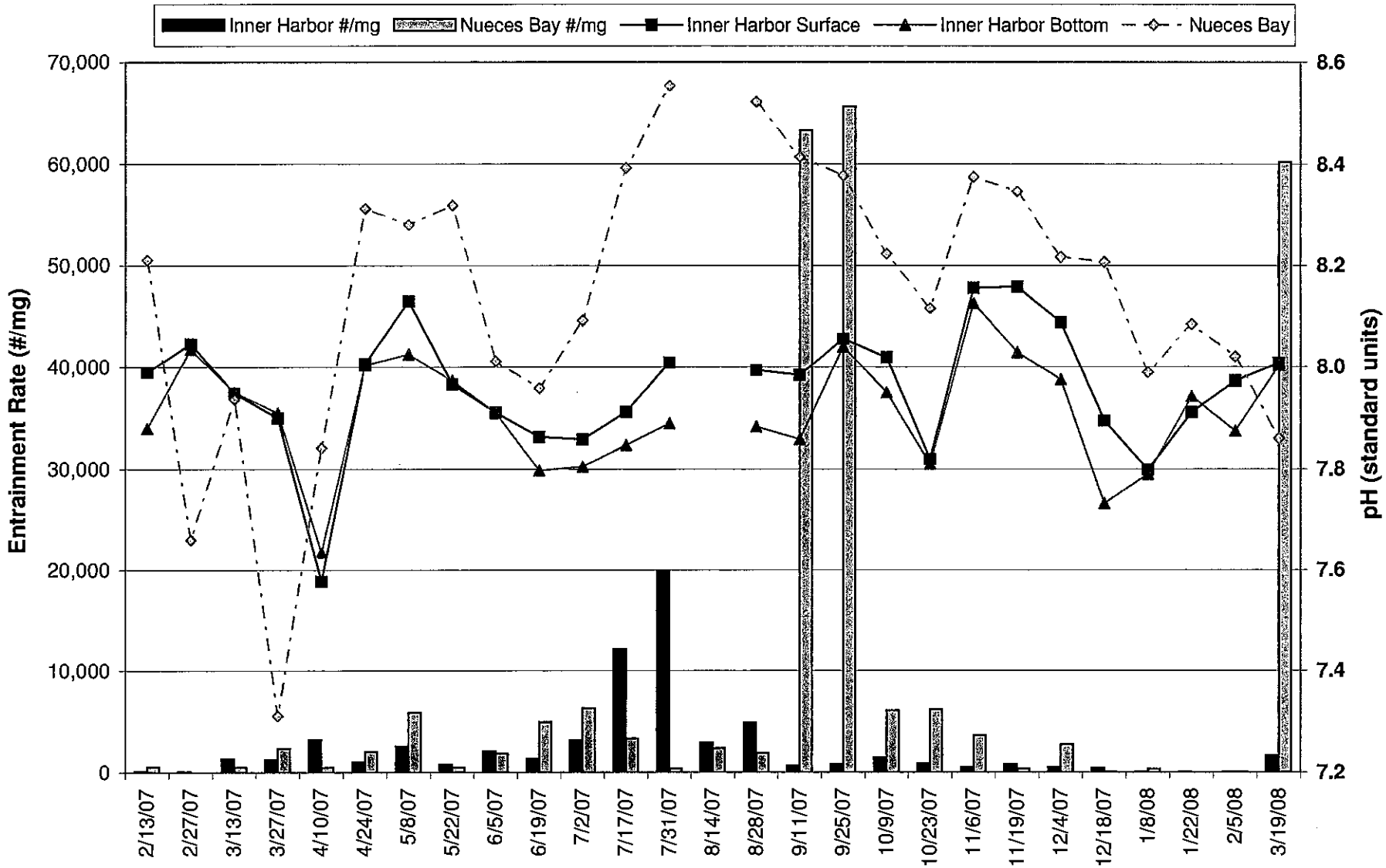
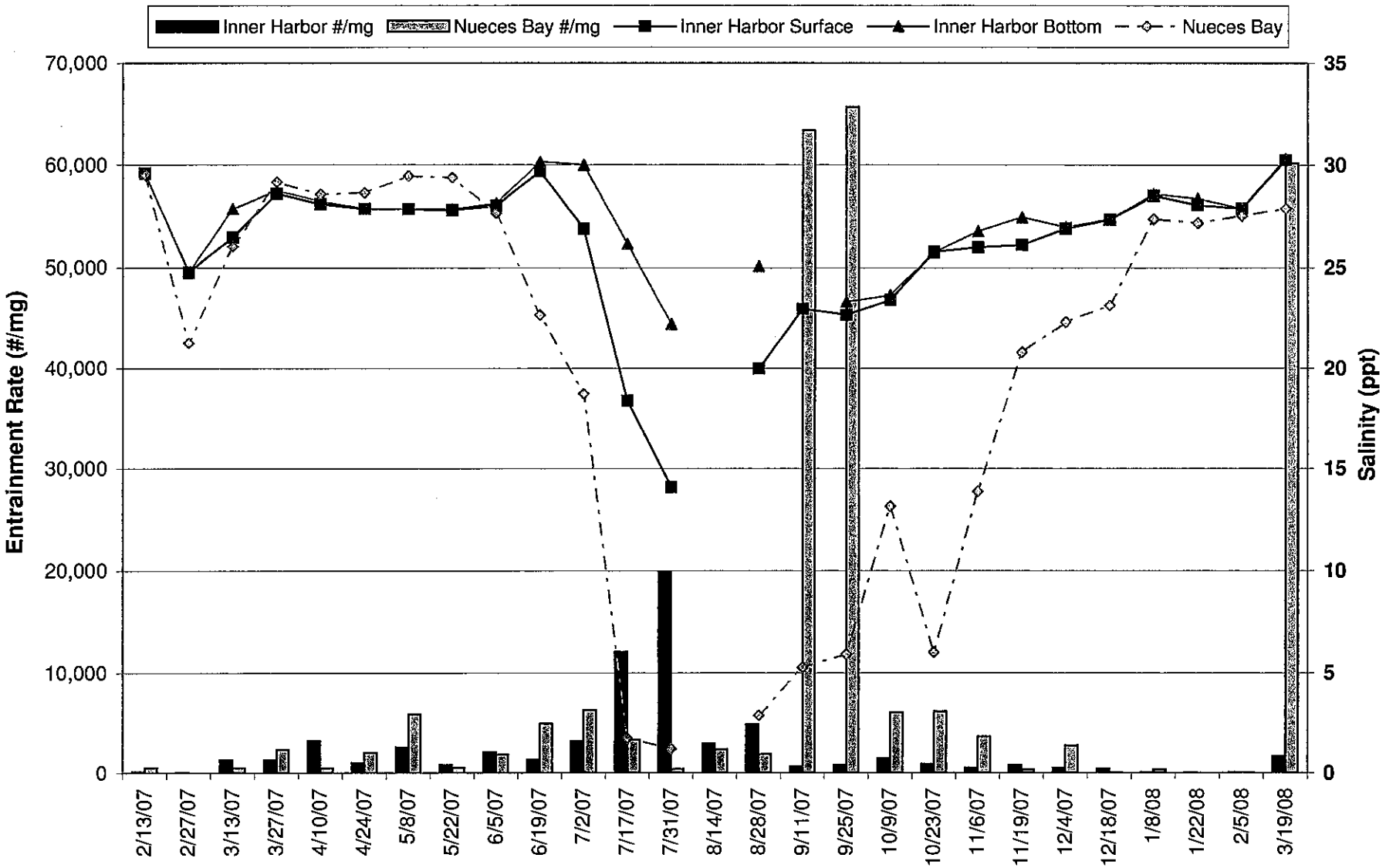


Figure 13. Mean Salinity and Entrainment Rate of Organisms Collected in the Inner Harbor and Nueces Bay, Nueces Bay Power Plant



The relationship between mean water temperature and entrainment rates observed during each sample event is shown on Figure 14. There was a possible significant relationship between mean water temperature and entrainment rate at the Inner Harbor ($p=0.02$; $r^2=0.20$). However, there was no relationship between mean water temperature and entrainment rate at the Nueces Bay site ($p=0.60$; $r^2=0.01$).

5.3.5 Secchi Disk Transparency

Secchi disk transparency (water clarity) in the Inner Harbor ranged from 1.5 ft on July 17, 2007 to 8.5 ft on January 22, 2008 (Figure 15). In Nueces Bay, Secchi disk transparency ranged from a low on March 19, 2008 of 0.3 ft to a high on February 5, 2008 of 2.3 ft. Transparency at the shallow, more exposed sampling location at Nueces Bay was lower than transparency in the Inner Harbor during every sample event. The greater depth and sheltered nature, along with the Inner Harbor's very small watershed, which contributed little rainfall runoff directly into the Inner Harbor, are factors that probably contribute to the higher transparency there.

The relationship between water clarity and entrainment rates observed during each sample event is shown on Figure 15. There was no relationship between Secchi disk transparency and entrainment rate at the Inner Harbor ($p=0.17$; $r^2=0.08$) or the Nueces Bay site ($p=0.20$; $r^2=0.12$).

5.3.6 Precipitation

Precipitation totals for NBPS were obtained from the NOAA weather station at the Corpus Christi Airport (NOAA, 2008). The 30-year mean annual precipitation total was 32.3 inches. The precipitation total during the study period was 4.8 inches above normal at 37.1 inches. Rainfall totals for July were considerably higher than the long-term mean (Figure 16). Relating precipitation to entrainment rates on the date in which samples were taken was not possible since there were only a few instances when precipitation occurred during a sample event. However, the total weekly precipitation totals for the week preceding each sample event were compared to entrainment. There was a possible significant relationship between precipitation and entrainment rate at the Inner Harbor ($p=0.02$; $r^2=0.19$); however, there appeared to be no relationship at the Nueces Bay site ($p=0.50$; $r^2=0.02$) (Figure 17).

Figure 14. Mean Water Temperature and Entrainment Rate of Organisms Collected in the Inner Harbor and Nueces Bay, Nueces Bay Power Plant

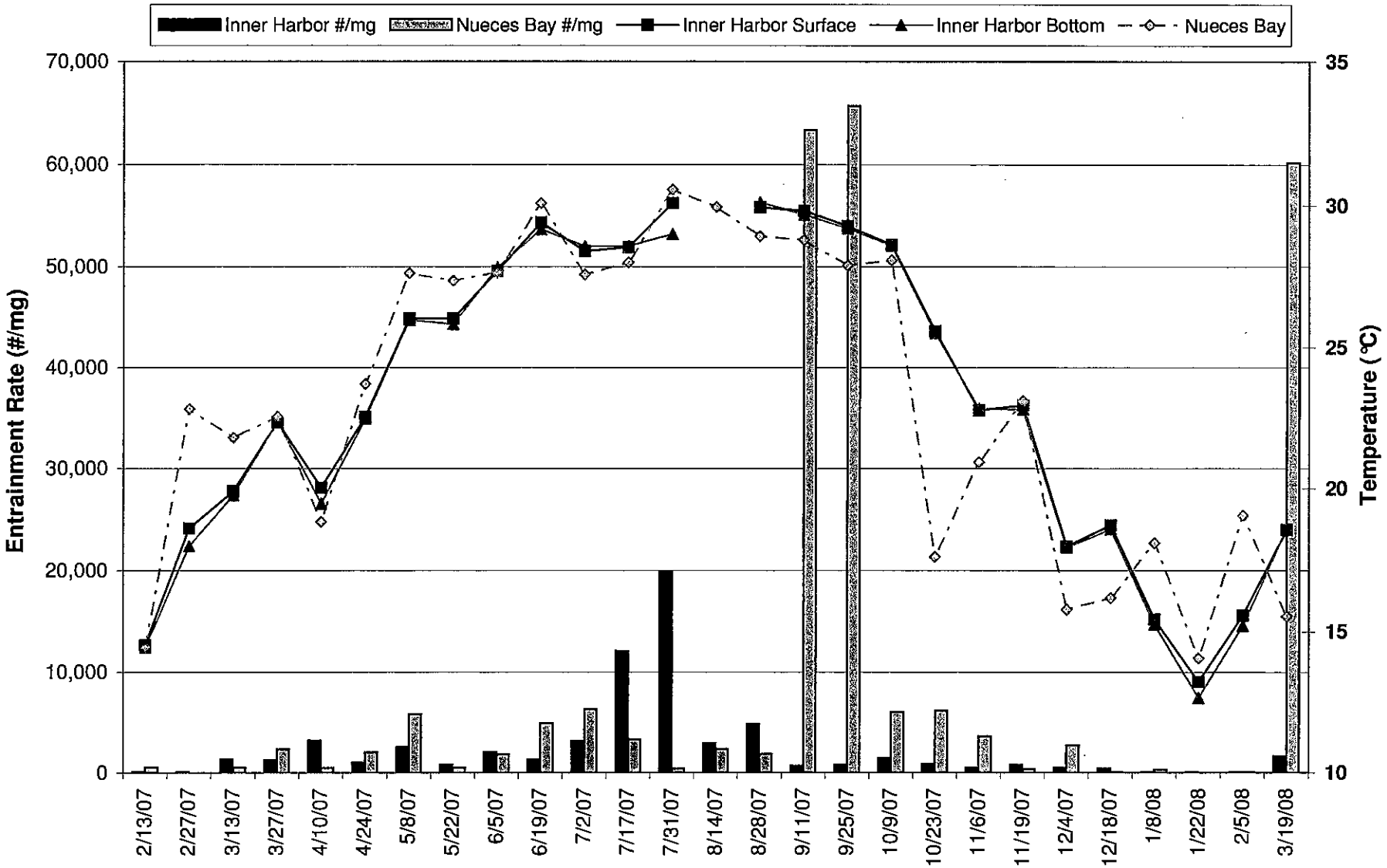


Figure 15. Secchi Disk Transparency and Entrainment Rate of Organisms Collected in the Inner Harbor and Nueces Bay, Nueces Bay Power Plant

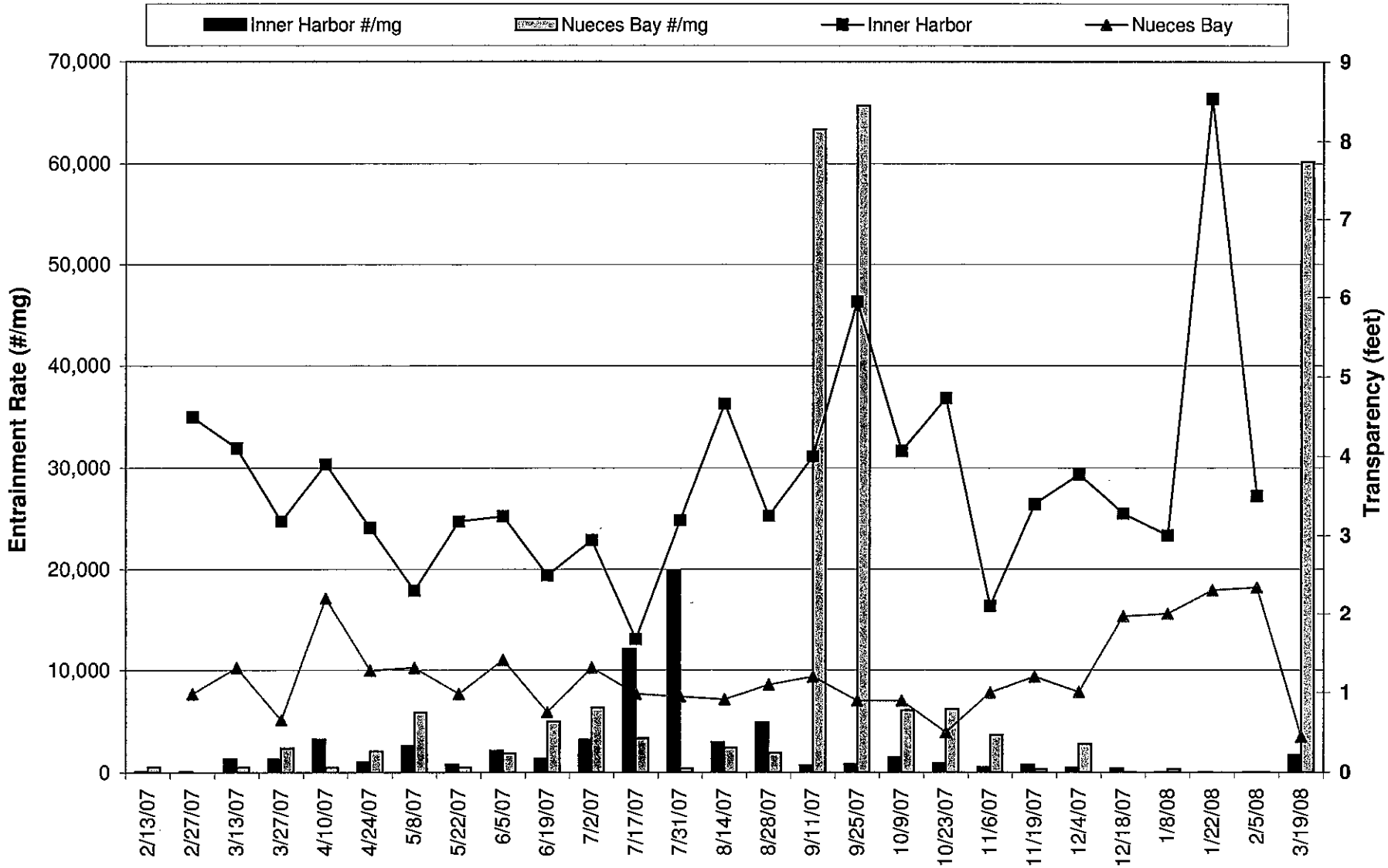


Figure 16. Study Period and 30-year Mean Rainfall Totals, Corpus Christi, Texas (NOAA, 2008)

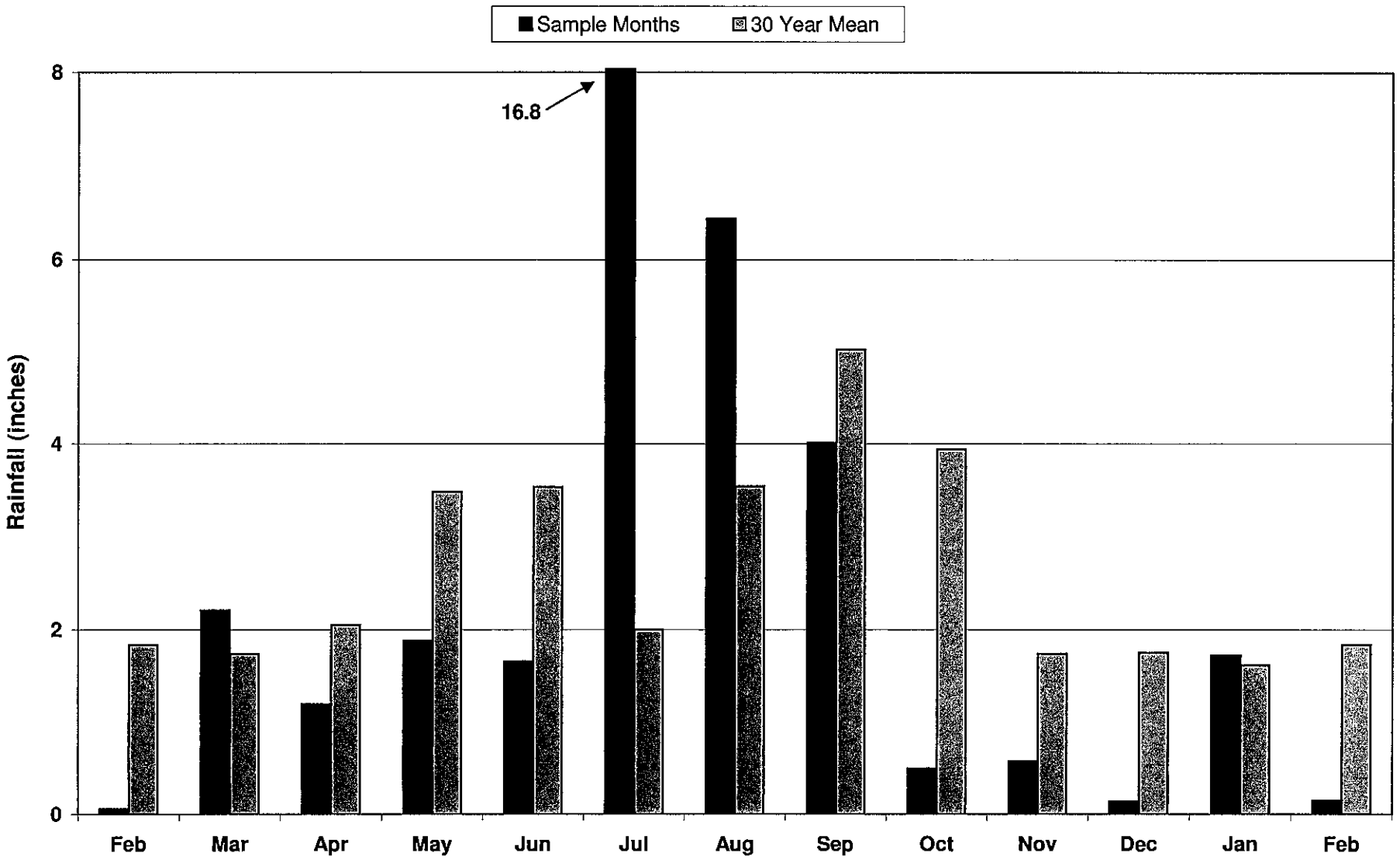
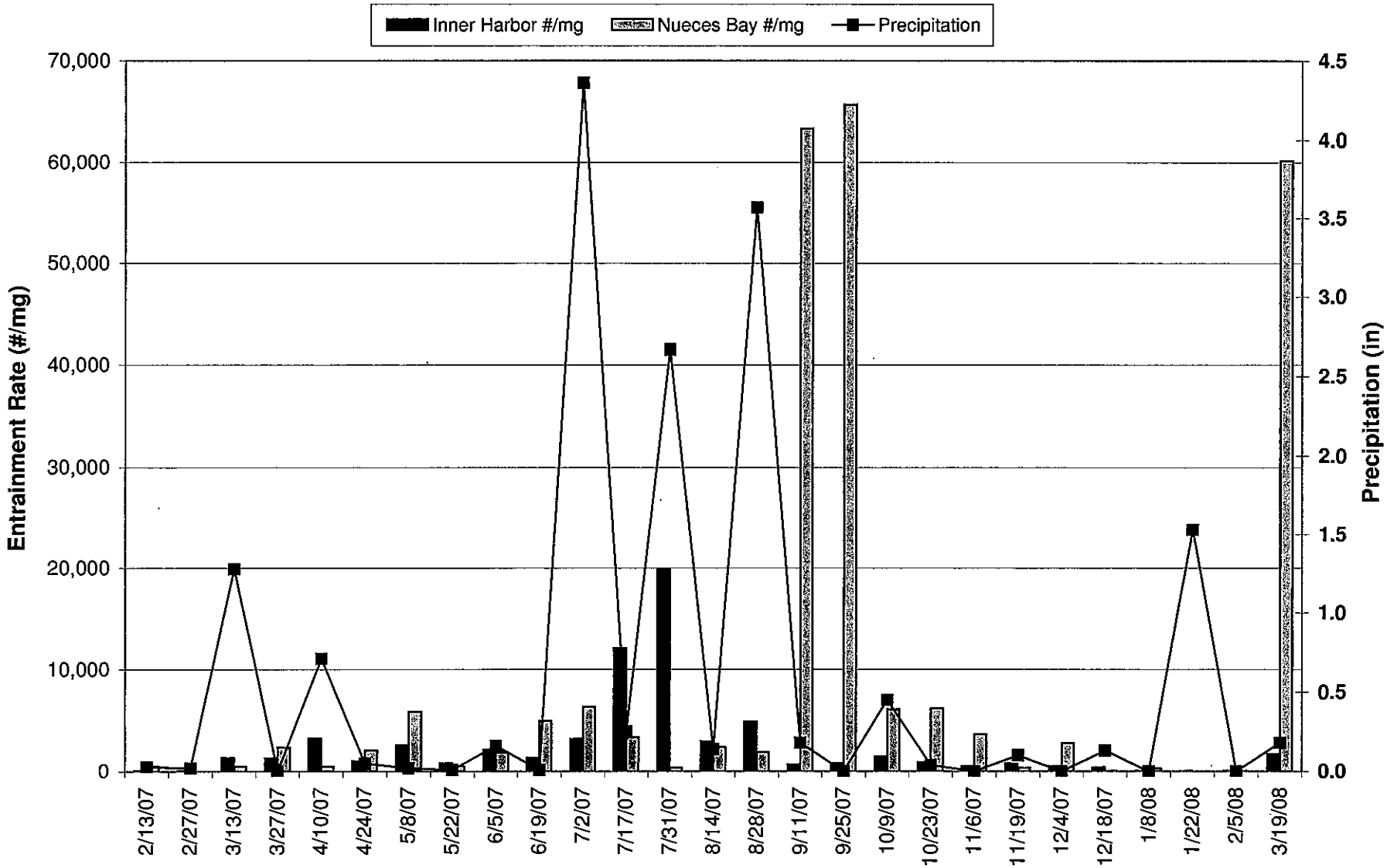


Figure 17. Precipitation Totals One Week Prior to Sample Date and Entrainment Rate of Organisms Collected in the Inner Harbor and Nueces Bay, Nueces Bay Power Plant



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ATTACHMENT C

EPA DRAFT FACT SHEET

DEVELOPMENT OF BPJ-BASED SECTION 316(b)

NPDES PERMIT CONDITIONS 1 (DECEMBER 2007)

United States
Environmental Protection Agency

DECEMBER 2007

DRAFT Fact Sheet

Development of BPJ-Based Section 316(b) NPDES Permit Conditions[1]

A National Pollutant Discharge Elimination System (NPDES) permit for any new or existing facility (see special definitions at 40 C.F.R. §§ 125.83 and 125.133) operating a cooling water intake structure (CWIS) must contain permit conditions meeting the requirements applicable to CWISs under section 316(b) of the Clean Water Act (CWA). Section 316(b) of the CWA requires that the location, design, construction, and capacity of CWISs reflect the best technology available (BTA) for minimizing adverse environmental impact (AEI). Under current regulations, existing facilities are subject to section 316(b) conditions that reflect BTA for minimizing AEI on a case-by-case, best professional judgment (BPJ) basis. 40 C.F.R. §§ 125.90(b) and 401.14. In addition, the fact sheet for the permit needs to reflect the rationale for the determination that CWISs reflect the BTA for minimizing AEI.

EPA's Phase II Section 316(b) Existing Facilities Rule was remanded to the Agency in *Riverkeeper, Inc, et al. v. EPA*, 475 F.3d 83 (2d Cir. 2007). EPA has begun work to address the remand. Until EPA has issued the final rule, EPA has not definitively spoken to what controls represent BTA for minimizing AEI for those facilities. The rulemaking record for the Phase II Rule is, however, a useful source of information concerning potential technologies for minimizing AEI at CWISs that the permitting authority may wish to evaluate in order to establish controls that represent BTA for minimizing AEI at a particular facility. This fact sheet discusses information in the Phase II record that permit writers may consider when establishing BPJ 316(b) permit conditions or when reviewing 316(b) conditions for reissued permits to ensure that they continue to reflect BTA for minimizing AEI.

Examples of Information From the Phase II Record That May Be Useful to Consider When Developing BPJ Permit Requirements Reflecting BTA for Minimizing AEI

Information on intake flows

Information in the record for EPA's Phase II Section 316(b) Existing Facilities Rule showed that closed-cycle recirculating cooling systems can reduce cooling water flow by up to 98 percent and can correspondingly reduce mortality from impingement and entrainment by up to 98 percent when compared with conventional once-through systems.

One approach for the permit writer would be to determine that BTA for minimizing AEI at a particular facility represents some prescribed flow level. This might mean that the permit writer would develop permit conditions requiring achievement of the BTA flow level or achievement of BTA impingement mortality and entrainment (IM&E) reduction standards associated with the BTA flow level. Under this approach, the permit writer would need information from the facility demonstrating that it has reduced (or will reduce) the volume of its intake flow to a level that is commensurate with the BTA flow level. The permit writer should consider including conditions in the permit that require proper operation and maintenance of the system in order to meet the BTA intake flow.

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1 The discussion in this document is intended solely as a tool. The statutory provisions and EPA regulations described in this document contain legally binding requirements. This document is not a regulation itself, nor does not it change or substitute for those provisions and regulations. Thus, it does not impose legally binding requirements on EPA, States, or the regulated community. This tool does not confer legal rights or impose legal obligations upon any member of the public. While EPA has made every effort to ensure the accuracy of the discussion in this tool, the obligations of the regulated community are determined by statutes, regulations, or other legally binding requirements. In the event of a conflict between the discussion in this document and any statute or regulation, this document would not be controlling.

Information on performance ranges

The record for the Phase II rule also included information on the performance ranges of technology other than closed-cycle recirculating systems. The data showed that current technologies other than closed-cycle cooling can meet a performance standard range of 80-95% reduction in impingement mortality and 60-90% reduction in entrainment. These ranges were representative of the efficacies that can be expected from the use of intake technologies at most facilities.

Another approach for the permit writer would be to determine that an IM&E performance level represents BTA for minimizing AEI for a particular facility. Under this approach, the permitting authority may consider requiring the facility to submit data to demonstrate the IM&E performance level that the technology or suite of technologies they currently employ (or will install) will achieve. Data collection may include, among other things, engineering data, operational information, source waterbody information, and IM&E characterization studies. Historical data may also be useful where the conditions at the facility and in the waterbody from which the facility withdraws have not changed substantially over time.

The permit writer may consider requiring the facility to characterize adverse environmental impact (AEI), e.g., impingement and entrainment, describe its expected CWIS operation, and to develop a technological or operational response to reduce AEI based on the site-specific details of the facility to minimize impacts.

Under this approach, the permit writer would include a condition in the permit requiring achievement of the IM&E performance level that the permit writer determines is BTA for minimizing AEI for the facility as well as conditions requiring operation and maintenance of the facility in a manner consistent with the information submitted to establish the BTA performance for the facility.

What If the Permit Writer Determines that the Facility's Current Technology is BTA for Minimizing AEI?

In circumstances where the permit writer determines that technology or a suite of technologies in-place at the CWIS currently reflect BTA for minimizing AEI, the permit writer may base the section 316(b) permit conditions on the current technologies at the CWIS. Under this approach, the permitting authority should explain why other available technologies do not represent BTA for minimizing AEI. Examples of why technologies are not available could include considerations such as costs or energy penalty and would support the determination that the current technology represents BTA for minimizing AEI.

For a facility where current technology is BTA for minimizing AEI, permit conditions could include, for example, operation and maintenance conditions or the achievement of a required flow or IM&E performance level as BTA for minimizing AEI.

In addition, the permitting authority may want to include a permit reopener provision and the requirement for the facility to submit additional data. This data would allow the permit writer to compare AEI associated with the existing technology with that identified for other technologies. Data submission requirements may address engineering data, operational information, source waterbody information, and IM&E characterization studies. As noted above, in certain circumstances, historical data may be useful.

The permitting authority could also consider requiring the facility to evaluate AEI, e.g., impingement and entrainment, resulting from its current CWIS operation and develop additional technological or operational solutions if necessary based on the site-specific details of the facility. If studies indicate the current CWIS configuration is not representative of BTA for minimizing AEI, the permitting authority should consider modifying its determination of BTA either by reopening the permit under the reopener provision or during the next permit cycle .

Useful Resources

The materials in the 316(b) Phase I, II, and III rulemaking records offer a substantial amount of information on intake technology performance. EPA has identified the following documents as especially helpful:

American Society of Civil Engineers (ASCE). *Design of Water Intake Structures for Fish Protection*. 1982. DCN 6-5057 and OW-2002-0049-2769 in the 316(b) Phase II record.

Electric Power Research Institute (EPRI). *Fish Protection at Cooling Water Intakes: Status Report*. 1999. DCN 4-4002B in the 316(b) Phase II record.

U.S. EPA. *Technical Development Document for the Proposed Section 316(b) Phase II Existing Facilities Rule* (EPA 821-R-02-003). Chapter 3. April 2002. DCN 4-0004 in the 316(b) record. http://www.epa.gov/waterscience/316b/phase2/devdoc/

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U.S. EPA. *U.S. EPA NPDES Permit Writers' Manual.* Chapter 5.1.4. December 1996. EPA-833-B-96-003 http://www.epa.gov/npdes/pubs/owm0243.pdf

For More Information

Contact Jamie Hurley at the EPA Office of Water; Office of Wastewater Management (4203M), 1200 Pennsylvania Avenue, NW Washington, D.C. 20460 (e-mail: hurley.jamie@epa.gov).

40 CFR 122.21(r)(8)
OPERATIONAL STATUS

40 CFR 122.21(r)(8) - OPERATIONAL STATUS

BACKGROUND

Nueces Bay, LLC owns and operates Nueces Bay Power Station (NBPS), a 633-megawatt (MW) electric power generating facility, located at 2002 Navigation Boulevard in Corpus Christi, Nueces County, Texas. The facility is physically located on approximately 63 acres on the north shore of the Corpus Christi Inner Harbor (CCIH) (Figures 1 and 2). NBPS was initially constructed in the mid-1930s to provide electrical power to the power grid. A Repowering Project was completed at the facility in 2010. The Repowering Project replaced the Unit 7 Boiler with two (2) new combustion turbines and associated duct-fired heat recovery steam generators (HRSGs) which, in combination with the reuse of the existing steam turbine-generator, comprise a combined cycle power plant. NBPS currently consists of the cooling water intake structure (CWIS) and screens, two (2) natural gas-fired combustion turbines (Units 8 and 9), two (2) Heat Recovery Steam Generators (HRSGs), one (1) steam turbine (STG7), a Power Distribution Center, Firewater Pump House, Continuous Emission Monitoring (CEM) Buildings, and a warehouse. As part of the repowering, Units 1-7 (natural gas-fired boilers) were demolished and removed from NBPS.

NBPS is authorized to divert up to 680,000 acre feet per year of water (equivalent to approximately 607 million gallons per day [MGD]) from the CCIH/Corpus Christi Ship Channel for industrial (cooling) purposes pursuant to Certificate of Adjudication No. 22-4505. Water withdrawn from the Corpus Christi Ship Channel is used for once through cooling. NBPS is authorized to discharge 605 million gallons per day (MGD) of once through cooling water to Nueces Bay pursuant to Texas Pollutant Discharge Elimination System (TPDES) Permit No. WQ0001244000.

The following paragraphs provide the information required pursuant to §122.21(r)(8).

(i)(1) Age of each unit.

Unit ID	Date of Commercial Operation	Age of Unit (Years)[1]
Unit 8	11/17/2009	8
Unit 9	11/20/2009	8

[1] Age of unit as of January 1, 2018.

(i)(2) Capacity utilization rate (or equivalent) for the previous 5 years.

Year	Unit 8	Unit 9
2015	40.8%	40.2%
2016	30.8%	30.9%
2017	29.5%	28.9%
2018	59.1%	54.2%
2019	40.7%	44.0%

Capacity utilization rates were calculated based on each unit's nameplate capacity (megawatts) and annual gross generation data (reported in megawatt hours) retrieved from the Environmental Protection Agency's Air Markets Program database. There were no extended or unusual outages that significantly affected data for flow, impingement, entrainment, or other factors during the previous five (5) year period.

(i)(3) Major upgrades completed within the last 15 years.

The following major upgrades were completed within the last 15 years:

- 2004 – Unit 7 Boiler permanently removed from service;
- 2006 - Fuel oil removed from the site and demolition of the fuel oil storage tanks;
- 2008 through 2010 – Repowering Project, including:
  - Partial demolition of the existing facility;
  - The construction of Units 8 and 9;
  - Performance gas fuel heating installed;
  - Modifications to the Unit 7 steam condenser (i.e., added 650 tubes to each waterbox, added tubing to protect tube sheets, replaced/repaired debris filters); and
- 2010 – Units 8 and 9 commence operation.

(i)(4) Plans or schedules for decommissioning or replacement of process units or production processes and product lines.

Currently there are no plans or schedules for decommissioning or replacement of the existing EGUs.

(ii) Descriptions of completed, approved, or scheduled uprates and Nuclear Regulatory Commission relicensing status of each unit at nuclear facilities.

NBPS is not a nuclear facility; therefore, the information required pursuant to §122.21(r)(8)(ii) is not applicable.

(iii) For process units at your facility that use cooling water other than for power production or steam generation, if you intend to use reductions in flow or changes in operations to meet the requirements of 40 CFR 125.94(c), descriptions of individual production processes and product lines.

There are no process units at NBPS that use cooling water other than for power production or steam generation; therefore, the information required pursuant to §122.21(r)(8)(ii) is not applicable.

(iv) For all manufacturing facilities, descriptions of current and future production schedules.

NBPS is not a manufacturing facility; therefore, the information required pursuant to §122.21(r)(8)(iv) is not applicable.

(v) Descriptions of plans or schedules for any new units planned within the next 5 years.

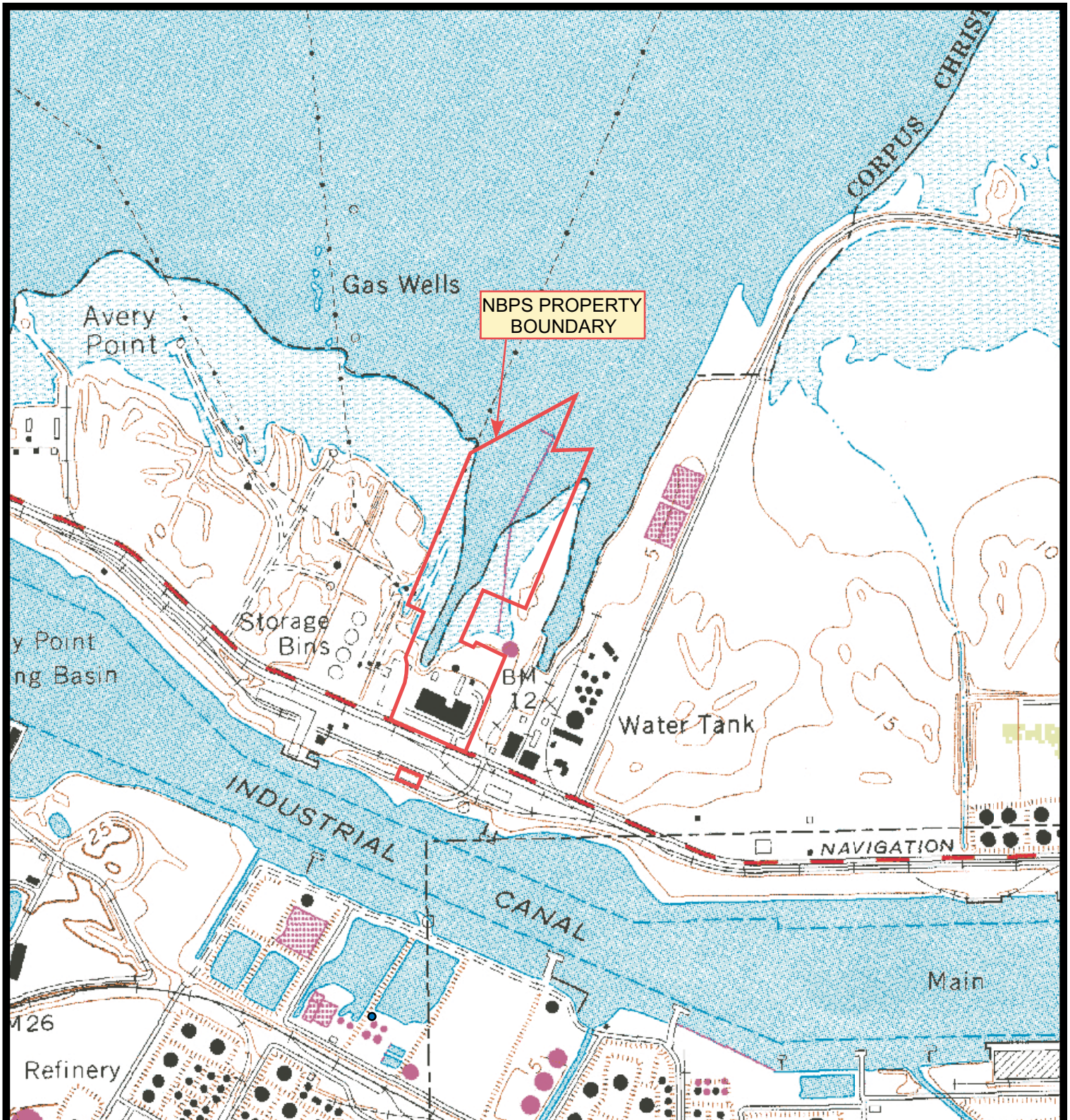
There are no new units planned within the next five (5) years.

ENVIRONMENTAL PROFESSIONALS
WCM
The WCM Group, Inc.
P. O. Box 3247
Humble, TX 77347-3247
(281) 446-7070 Fax (281) 446-3348

Facility Location
NUECES BAY, LLC
Nueces Bay Power Station
Corpus Christi, Nueces County, Texas

FIGURE
1

DRAWN BY:	**HJC**
DATE:	**07/15/2017**
REV. DATE:	
DRAWING ID:	Y:\NUE\CC\316B19_22111\1584525372\r8



SITE TOPOGRAPHIC MAP

NUECES BAY, LLC; Nueces Bay Power Station
2002 E. Navigation Blvd.
Corpus Christi, Texas

FIGURE 2

Location on 7.5 Minute USGS Topo Quads: Corpus Christi, Texas; Zone 14

DRAWN BY:	AKD/hjc
DATE:	1/19/2010
REV. DATE:	7/15/2017
DRAWING ID:	Y:\NUE\CC\316B19_22111\1584525372\r8

SCALE 1:12,000
Scale in Feet
0 500 1000

N

ENVIRONMENTAL PROFESSIONALS
WCM
The WCM Group, Inc.
P. O. Box 3247
Humble, TX 77347-3247
(281) 446-7070 Fax (281) 446-3348

40 CFR 122.21(r)(9)
ENTRAINMENT CHARACTERIZATION STUDY

40 CFR 122.21(r)(9) - ENTRAINMENT CHARACTERIZATION STUDY

40 CFR §122.21(r)(9) states:

"The owner or operator of an existing facility that withdraws greater than 125 mgd AIF, where the withdrawal of cooling water is measured at a location within the cooling water intake structure that the Director deems appropriate, must develop for submission to the Director an *Entrainment Characterization Study* that includes a minimum of two years of entrainment data collection. The Entrainment Characterization Study must include the following components:

(i) *Entrainment Data Collection Method.* The study should identify and document the data collection period and frequency. The study should identify and document organisms collected to the lowest taxon possible of all life stages of fish and shellfish that are in the vicinity of the cooling water intake structure(s) and are susceptible to entrainment, including any organisms identified by the Director, and any species protected under Federal, State, or Tribal law, including threatened or endangered species with a habitat range that includes waters in the vicinity of the cooling water intake structure. Biological data collection must be representative of the entrainment at the intakes subject to this provision. The owner or operator of the facility must identify and document how the location of the cooling water intake structure in the waterbody and the water column are accounted for by the data collection locations;

(ii) *Biological Entrainment Characterization.* Characterization of all life stages of fish, shellfish, and any species protected under Federal, State, or Tribal law (including threatened or endangered species), including a description of their abundance and their temporal and spatial characteristics in the vicinity of the cooling water intake structure(s), based on sufficient data to characterize annual, seasonal, and diel variations in entrainment, including but not limited to variations related to climate and weather differences, spawning, feeding, and water column migration. This characterization may include historical data that are representative of the current operation of the facility and of biological conditions at the site. Identification of all life stages of fish and shellfish must include identification of any surrogate species used, and identification of data representing both motile and non-motile life-stages of organisms;

(iii) *Analysis and Supporting Documentation.* Documentation of the current entrainment of all life stages of fish, shellfish, and any species protected under Federal, State, or Tribal law (including threatened or endangered species). The documentation may include historical data that are representative of the current operation of the facility and of biological conditions at the site. Entrainment data to support the facility's calculations must be

collected during periods of representative operational flows for the cooling water intake structure, and the flows associated with the data collection must be documented. The method used to determine latent mortality along with data for specific organism mortality or survival that is applied to other life-stages or species must be identified. The owner or operator of the facility must identify and document all assumptions and calculations used to determine the total entrainment for that facility together with all methods and quality assurance/quality control procedures for data collection and data analysis. The proposed data collection and data analysis methods must be appropriate for a quantitative survey."

STATUS OF 40 CFR 122.21(r)(9) REPORT

Other Requirement No. 13 of NBPS' TPDES Permit No. WQ0001244000, issued on April 11, 2017, includes requirements for the development of studies and/or reports identified in 40 CFR §122.21(r).

Other Requirement No. 13 states:

> "The permittee shall prepare all application materials required by 40 CFR §122.21(r) for all provisions that apply to the facility. The deadline submission of these materials is to be determined by the TCEQ upon the subsequent application for renewal of this permit. The permittee shall provide all completed application materials required by 40 CFR §121.21(r) upon the subsequent application for renewal, along with a proposed schedule, which must include a proposed deadline and a reasonable timeline for the completion of the remaining application materials. Completion of the application materials is to occur as soon as is practicable, but in no case may the proposed deadline exceed 54 months after the date of issuance of a subsequent renewal of this permit action."

In accordance with this provision, development of the required information is ongoing and will be complete prior to the deadline of "54 months after the date of issuance of a subsequent renewal of this permit action." A subsequent renewal of the permit has not yet been issued, therefore a deadline date cannot be established. Although an absolute deadline cannot be established for completion of all materials, NBPS anticipates the completion of §122.21(r)(9) by December 31, 2020, which is in compliance with Other Requirement No. 13.

40 CFR 122.21(r)(10)
COMPREHENSIVE TECHNICAL FEASIBILITY AND COST EVALUATION STUDY

40 CFR 122.21(r)(10) - COMPREHENSIVE TECHNICAL FEASIBILITY AND COST EVALUATION STUDY

40 CFR §122.21(r)(10) states:

"The owner or operator of an existing facility that withdraws greater than 125 MGD AIF must develop for submission to the Director an engineering study of the technical feasibility and incremental costs of candidate entrainment control technologies. In addition, the study must include the following:

(i) *Technical feasibility.* An evaluation of the technical feasibility of closed-cycle recirculating systems as defined at 40 CFR §125.92(c), fine mesh screens with a mesh size of 2 millimeters or smaller, and water reuse or alternate sources of cooling water. In addition, this study must include:

(A) A description of all technologies and operational measures considered (including alternative designs of closed-cycle recirculating systems such as natural draft cooling towers, mechanical draft cooling towers, hybrid designs, and compact or multi-cell arrangements);

(B) A discussion of land availability, including an evaluation of adjacent land and acres potentially available due to generating unit retirements, production unit retirements, other buildings and equipment retirements, and potential for repurposing of areas devoted to ponds, coal piles, rail yards, transmission yards, and parking lots;

(C) A discussion of available sources of process water, grey water, waste water, reclaimed water, or other waters of appropriate quantity and quality for use as some or all of the cooling water needs of the facility; and

(D) Documentation of factors other than cost that may make a candidate technology impractical or infeasible for further evaluation.

(ii) *Other entrainment control technologies.* An evaluation of additional technologies for reducing entrainment may be required by the Director.

(iii) *Cost evaluations.* The study must include engineering cost estimates of all technologies considered in paragraphs (r)(10)(i) and (ii) of this section. Facility costs must also be adjusted to estimate social costs. All costs must be presented as the net present value (NPV) and the corresponding annual value. Costs must be clearly labeled as compliance costs or social costs. The applicant must separately discuss facility level compliance costs and social costs, and provide documentation as follows:

(A) Compliance costs are calculated as after-tax, while social costs are calculated as pre-tax. Compliance costs include the facility's administrative costs, including costs of permit application, while the social cost adjustment includes the Director's administrative costs. Any outages, downtime, or other impacts to facility net revenue, are included in compliance costs, while only that portion of lost net revenue that does not accrue to other producers can be included in social costs. Social costs must also be discounted using social discount rates of 3 percent and 7 percent. Assumptions regarding depreciation schedules, tax rates, interest rates, discount rates and related assumptions must be identified;

(B) Costs and explanation of any additional facility modifications necessary to support construction and operation of technologies considered in paragraphs (r)(10)(i) and (ii) of this section, including but not limited to relocation of existing buildings or equipment, reinforcement or upgrading of existing equipment, and additional construction and operating permits. Assumptions regarding depreciation schedules, interest rates, discount rates, useful life of the technology considered, and any related assumptions must be identified; and

(C) Costs and explanation for addressing any non-water quality environmental and other impacts identified in paragraph (r)(12) of this section. The cost evaluation must include a discussion of all reasonable attempts to mitigate each of these impacts."

STATUS OF 40 CFR 122.21(r)(10) REPORT

Other Requirement No. 13 of NBPS' TPDES Permit No. WQ0001244000, issued on April 11, 2017, includes requirements for the development of studies and/or reports identified in 40 CFR §122.21(r).

Other Requirement No. 13 states:

"The permittee shall prepare all application materials required by 40 CFR §122.21(r) for all provisions that apply to the facility. The deadline submission of these materials is to be determined by the TCEQ upon the subsequent application for renewal of this permit. The permittee shall provide all completed application materials required by 40 CFR §121.21(r) upon the subsequent application for renewal, along with a proposed schedule, which must include a proposed deadline and a reasonable timeline for the completion of the remaining application materials. Completion of the application materials is to occur as soon as is practicable, but in no case may the proposed deadline exceed 54 months after the date of issuance of a subsequent renewal of this permit action."

In accordance with this provision, development of the required information is ongoing and will be complete prior to the deadline of "54 months after the date of issuance of a subsequent renewal of this permit action." A subsequent renewal of the permit has not yet been issued, therefore a deadline date cannot be established. Although an absolute deadline cannot be established for completion of all materials, NBPS anticipates the completion of §122.21(r)(10) by March 31, 2021, which is in compliance with Other Requirement No. 13.

40 CFR 122.21(r)(11)
BENEFITS VALUATION STUDY

40 CFR 122.21(r)(11) - BENEFITS VALUATION STUDY

40 CFR §122.21(r)(11) states:

"The owner or operator of an existing facility that withdraws greater than 125 MGD AIF must develop for submission to the Director an evaluation of the benefits of the candidate entrainment reduction technologies and operational measures evaluated in paragraph (r)(10) of this section including using the Entrainment Characterization Study completed in paragraph (r)(9) of this section. Each category of benefits must be described narratively, and when possible, benefits should be quantified in physical or biological units and monetized using appropriate economic valuation methods. The benefits valuation study must include, but is not limited to, the following elements:

(i) Incremental changes in the numbers of individual fish and shellfish lost due to impingement mortality and entrainment as defined in 40 CFR §125.92, for all life stages of each exposed species;

(ii) Description of basis for any estimates of changes in the stock sizes or harvest levels of commercial and recreational fish or shellfish species or forage fish species;

(iii) Description of basis for any monetized values assigned to changes in the stock size or harvest levels of commercial and recreational fish or shellfish species, forage fish, and to any other ecosystem or non use benefits;

(iv) A discussion of mitigation efforts completed prior to October 14, 2014 including how long they have been in effect and how effective they have been;

(v) Discussion, with quantification and monetization, where possible, of any other benefits expected to accrue to the environment and local communities, including but not limited to improvements for mammals, birds, and other organisms and aquatic habitats;

(vi) Discussion, with quantification and monetization, where possible, of any benefits expected to result from any reductions in thermal discharges from entrainment technologies."

STATUS OF 40 CFR 122.21(r)(11) REPORT

Other Requirement No. 13 of NBPS' TPDES Permit No. WQ0001244000, issued on April 11, 2017, includes requirements for the development of studies and/or reports identified in 40 CFR §122.21(r).

Other Requirement No. 13 states:

> "The permittee shall prepare all application materials required by 40 CFR §122.21(r) for all provisions that apply to the facility. The deadline submission of these materials is to be determined by the TCEQ upon the subsequent application for renewal of this permit. The permittee shall provide all completed application materials required by 40 CFR §121.21(r) upon the subsequent application for renewal, along with a proposed schedule, which must include a proposed deadline and a reasonable timeline for the completion of the remaining application materials. Completion of the application materials is to occur as soon as is practicable, but in no case may the proposed deadline exceed 54 months after the date of issuance of a subsequent renewal of this permit action."

In accordance with this provision, development of the required information is ongoing and will be complete prior to the deadline of "54 months after the date of issuance of a subsequent renewal of this permit action." A subsequent renewal of the permit has not yet been issued, therefore a deadline date cannot be established. Although an absolute deadline cannot be established for completion of all materials, NBPS anticipates the completion of §122.21(r)(11) by March 31, 2021, which is in compliance with Other Requirement No. 13.

40 CFR 122.21(r)(12)
NON-WATER QUALITY ENVIRONMENTAL AND OTHER IMPACTS STUDY

40 CFR 122.21(r)(12) - NON-WATER QUALITY ENVIRONMENTAL AND OTHER IMPACTS STUDY

40 CFR §122.21(r)(12) states:

"The owner or operator of an existing facility that withdraws greater than 125 MGD AIF must develop for submission to the Director a detailed facility-specific discussion of the changes in non-water quality environmental and other impacts attributed to each technology and operational measure considered in paragraph (r)(10) of this section, including both impacts increased and impacts decreased. The study must include the following:

(i) Estimates of changes to energy consumption, including but not limited to auxiliary power consumption and turbine backpressure energy penalty;

(ii) Estimates of air pollutant emissions and of the human health and environmental impacts associated with such emissions;

(iii) Estimates of changes in noise;

(iv) A discussion of impacts to safety, including documentation of the potential for plumes, icing, and availability of emergency cooling water;

(v) A discussion of facility reliability, including but not limited to facility availability, production of steam, impacts to production based on process unit heating or cooling, and reliability due to cooling water availability;

(vi) Significant changes in consumption of water, including a facility-specific comparison of the evaporative losses of both once-through cooling and closed-cycle recirculating systems, and documentation of impacts attributable to changes in water consumption; and

(vii)A discussion of all reasonable attempts to mitigate each of these factors."

STATUS OF 40 CFR 122.21(r)(12) REPORT

Other Requirement No. 13 of NBPS' TPDES Permit No. WQ0001244000, issued on April 11, 2017, includes requirements for the development of studies and/or reports identified in 40 CFR §122.21(r).

Other Requirement No. 13 states:

> "The permittee shall prepare all application materials required by 40 CFR §122.21(r) for all provisions that apply to the facility. The deadline submission of these materials is to be determined by the TCEQ upon the subsequent application for renewal of this permit. The permittee shall provide all completed application materials required by 40 CFR §121.21(r) upon the subsequent application for renewal, along with a proposed schedule, which must include a proposed deadline and a reasonable timeline for the completion of the remaining application materials. Completion of the application materials is to occur as soon as is practicable, but in no case may the proposed deadline exceed 54 months after the date of issuance of a subsequent renewal of this permit action."

In accordance with this provision, development of the required information is ongoing and will be complete prior to the deadline of "54 months after the date of issuance of a subsequent renewal of this permit action." A subsequent renewal of the permit has not yet been issued, therefore a deadline date cannot be established. Although an absolute deadline cannot be established for completion of all materials, NBPS anticipates the completion of §122.21(r)(12) by March 31, 2021, which is in compliance with Other Requirement No. 13.

40 CFR 122.21(r)(13)
PEER REVIEW NOTIFICATION

40 CFR 122.21(r)(13) - PEER REVIEW NOTIFICATION

40 CFR §122.21(r)(13) states:

"If the applicant is required to submit studies under paragraphs (r)(10) through (12) of this section, the applicant must conduct an external peer review of each report to be submitted with the permit application. The applicant must select peer reviewers and notify the Director in advance of the peer review. The Director may disapprove of a peer reviewer or require additional peer reviewers. The Director may confer with EPA, Federal, State and Tribal fish and wildlife management agencies with responsibility for fish and wildlife potentially affected by the cooling water intake structure, independent system operators, and state public utility regulatory agencies, to determine which peer review comments must be addressed. The applicant must provide an explanation for any significant reviewer comments not accepted. Peer reviewers must have appropriate qualifications and their names and credentials must be included in the peer review report."

STATUS OF 40 CFR 122.21(r)(13) REPORT

Other Requirement No. 13 of NBPS' TPDES Permit No. WQ0001244000, issued on April 11, 2017, includes requirements for the development of studies and/or reports identified in 40 CFR §122.21(r).

Other Requirement No. 13 states:

> "The permittee shall prepare all application materials required by 40 CFR §122.21(r) for all provisions that apply to the facility. The deadline submission of these materials is to be determined by the TCEQ upon the subsequent application for renewal of this permit. The permittee shall provide all completed application materials required by 40 CFR §121.21(r) upon the subsequent application for renewal, along with a proposed schedule, which must include a proposed deadline and a reasonable timeline for the completion of the remaining application materials. Completion of the application materials is to occur as soon as is practicable, but in no case may the proposed deadline exceed 54 months after the date of issuance of a subsequent renewal of this permit action."

In accordance with this provision, development of the required information is ongoing and will be complete prior to the deadline of "54 months after the date of issuance of a subsequent renewal of this permit action." A subsequent renewal of the permit has not yet been issued, therefore a deadline date cannot be established. Although an absolute deadline cannot be established for completion of all materials, NBPS anticipates submittal of notification to TCEQ of selected peer reviewers as required by §122.21(r)(13) by April 30, 2020, which is in compliance with Other

Requirement No. 13. NBPS anticipates peer review of the studies required under paragraphs (r)(10) through (12) will be conducted during the 2nd Quarter of 2021, which is in compliance with Other Requirement No. 13.

THE WCM GROUP, INC.
110 S. Bender Ave.
Humble, TX 77338

May 13, 2020

Ms. Velma Fuller
Texas Commission on Environmental Quality
Applications Review and Processing Team (MC-148)
12100 Park 35 Circle
Austin, Texas 78753

UPS NUMBER
1Z07479R0399995444

REFERENCE: Administrative Response Letter for TPDES Permit No. WQ0001244000
Nueces Bay, LLC; Nueces Bay Power Station
Corpus Christi, Nueces County, Texas
CN605698612; RN100552181

Dear Ms. Fuller,

On behalf of Nueces Bay, LLC (Nueces Bay), The WCM Group, Inc. (WCM) is providing this response to your email dated April 13, 2020 indicating administrative incompleteness regarding the application to renew the above referenced permit. For a copy of this email please see Attachment A. Each item from the email is identified and followed by a response.

Item 1:
Section 1.c on page 2 of the administrative report: Renewal with changes was selected as the type of application; however, the requested change was not provided. Please submit a revised page with the requested change noted.

Response:
Section 1.c on page 2 of the administrative report has been revised to include the requested change. The revised page is included as Attachment B.

Item 2:
Core Data Form, Section 2.c on page 3 of the administrative report: For item 17, please provide an email address for Mr. Dale Lebsack. An email address is required for the applicant. Furthermore, the mailing address provided for item 15, 2002 East Navigation Boulevard, Corpus Christi, Texas 78402, is not recognized by the US Postal Service (USPS). The USPS lists an alternative address for this location, 2742 Joe Fulton International Trade Corridor, Corpus Christi, Texas 78402. This address is recognized by the USPS. Please confirm that the correct mailing address for the applicant. The address will be used on the permit and for receiving permit correspondence.

Response:
The e-mail address on the Core Data Form, included by reference in Section 2.c on page 3 of the administrative report, has been revised. The e-mail address for Ms. Cecilia Garcia-Rios, Texas Compliance Manager has been removed and the email address for Mr. Dale Lebsack, President has been included.

Nueces Bay confirmed that both addresses identified in your email are correct for the facility. However, to meet the requirements of US Postal Service (USPS) verification, the Core Data Form has been updated to 2742 Joe Fulton International Trade Corridor.

The updated page of the Core Data Form (page 1) is included as Attachment C.

Item 3:
Section 7.d on page 5 of the administrative report: According to the website, Janet F. Harte Public Library is temporarily closed due to COVID-19. The public viewing location must be available at the time the notice is published in the paper. If the library is not available, a new public viewing location in the county is required. Note: Due to COVID-19, if a publicly owned building cannot be found, the new location may consist of any reasonable location within the county that is accessible to the public where the application can be reviewed and copied (or where extra copies are made available by the applicant for public distribution) during reasonable hours during the day. The location does not need to be a publicly owned building; however, it must be accessible to the public. If a publicly-accessible physical viewing location cannot be found in the county, the complete application can be posted online for public viewing. A direct weblink to the documents must be provided and included in the public notice. Also, a written statement certifying that a diligent search to locate a publicly-accessible physical viewing location was made and the required application documents will be posted online at the time the notice is published is required.

Response:
WCM contacted the Janet F. Harte Public Library via telephone on April 29, 2020 and received confirmation that the library will be open to the public, at a reduced capacity, beginning May 4, 2020.

In addition to placing a physical copy of the application at the library, an electronic copy of the application and supporting documents is available via the below weblink:

http://www.wcmgroup.com/files/public_notices/Nueces%20Bay%20WQ0001244000%20TPDES%20Permit%20Renewal%20Application.pdf

Item 4:

Section 9.d on page 7 of the administrative report: The application indicates the point of discharge and discharge route in the existing permit are correct; however, the topographic map submitted indicates the treatment plant boundary is approximately 2,000 feet from the outfall location. Please provide an accurate description of the discharge route of the effluent from the treatment facility to the outfall location. An example of the flow of effluent to the point of discharge is: from the plant site via pipe directly to Nueces Bay.

Response:

The description of the discharge route in the application and previous permit are correct. The discharge is piped to the discharge canal, which directly discharges to Nueces Bay. No revisions to the discharge route are required.

Item 5:

The following is a portion of the Notice of Receipt of Application and Intent to Obtain a Water Quality Permit which contains information relevant to your application. Please read it carefully and indicate if it contains any errors or omissions. The complete notice will be sent to you once the application is declared administratively complete.

APPLICATION. Nueces Bay, LLC, (address pending response), which owns a natural gas-fired, steam-electric generating facility, has applied to the Texas Commission on Environmental Quality (TCEQ) to renew Texas Pollutant Discharge Elimination System (TPDES) Permit No. WQ0001244000 (EPA I.D. No. TX0003581) to authorize the discharge of treated wastewater at a volume not to exceed a daily average flow of 500,000,000 gallons per day. The facility is located at 2002 East Navigation Boulevard, Corpus Christi, Texas 78402. The discharge route is from the plant site via pipe directly to Nueces Bay. TCEQ received this application on April 1, 2020. The permit application is available for viewing and copying at (pending response). This link to an electronic map of the site or facility's general location is provided as a public courtesy and not part of the application or notice. For the exact location, refer to the application.
https://tceq.maps.arcgis.com/apps/webappviewer/index.html?id=db5bac44afbc468bbddd360f8168250f&marker=-97.419444%2C27.819166&level=12

Response:

The notice language provided has been revised to include the verified mailing address for Nueces Bay. Additionally, the application was hand delivered to TCEQ on March 31, 2020. Please see Attachment D for verification of the date the application was received by TCEQ.

Please see the revised notice language below:

APPLICATION. Nueces Bay, LLC, 2742 Joe Fulton International Trade Corridor, which owns a natural gas-fired, steam-electric generating facility, has applied to the Texas Commission on Environmental Quality (TCEQ) to renew Texas Pollutant Discharge Elimination System (TPDES) Permit No. WQ0001244000 (EPA I.D. No. TX0003581) to authorize the discharge of treated wastewater at a volume not to exceed a daily average flow of 500,000,000 gallons per day. The facility is located at 2002 East Navigation Boulevard, Corpus Christi, Texas 78402. The discharge route is from the plant site directly to Nueces Bay. TCEQ received this application on March 31, 2020. The permit application is available for viewing and copying at Janet F. Harte Public Library, 2629 Waldron Road, Corpus Christi, Texas and viewing at http://www.wcmgroup.com/files/public_notices/Nueces%20Bay%20WQ0001244000%20TPDES%20Permit%20Renewal%20Application.pdf. This link to an electronic map of the site or facility's general location is provided as a public courtesy and not part of the application or notice. For the exact location, refer to the application.
https://tceq.maps.arcgis.com/apps/webappviewer/index.html?id=db5bac44afbc468bbddd360f8168250f&marker=-97.419444%2C27.819166&level=12

Should you have any questions in this regard, please do not hesitate to contact me at (281) 446-7070.

Sincerely,

Alison K. Davis
Senior Director, Technical Services
adavis@wcmgroup.com

AKD/tnk
ENCLOSURE

cc: C. Garcia-Rios, Talen Energy
File: NBP.180.45.30

ATTACHMENT A
TCEQ ADMINISTRATIVE REQUEST FOR ADDITIONAL INFORMATION EMAIL DATED APRIL 13, 2020

Hailey V. Cofty

From: Alison Davis
Sent: Monday, April 13, 2020 12:16 PM
To: Hailey V. Cofty
Subject: FW: Application to Renew Permit No. WQ0001244000 - Request for Additional Information (w/corrected location link)

From: Velma Fuller [mailto:Velma.Fuller@Tceq.Texas.Gov]
Sent: Monday, April 13, 2020 12:16 PM
To: cecilia.garcia-rios@talenenergy.com; Alison Davis <adavis@wcmgroup.com>
Subject: Application to Renew Permit No. WQ0001244000 - Request for Additional Information (w/corrected location link)

Application to Renew Permit No. WQ0001244000
Nueces Bay, LLC
CN605698612, RN100552181

We have received the application for the above referenced permit and it is currently under review. Your attention to the following items is requested before we can declare the application administratively complete. Please submit one original and two copies (including a cover letter) of the complete response.

1. Section 1.c on page 2 of the administrative report: Renewal with changes was selected as the type of application; however, the requested change was not provided. Please submit a revised page with the requested change noted.

2. Core Data Form, Section 2.c on page 3 of the administrative report: For item 17, please provide an email address for Mr. Dale Lebsack. An email address is required for the applicant. Furthermore, the mailing address provided for item 15, 2002 East Navigation Boulevard, Corpus Christi, Texas 78402, is not recognized by the US Postal Service (USPS). The USPS lists an alternative address for this location, 2742 Joe Fulton International Trade Corridor, Corpus Christi, Texas 78402. This address is recognized by the USPS. Please confirm that the correct mailing address for the applicant. The address will be used on the permit and for receiving permit correspondence

3. Section 7.d on page 5 of the administrative report: According to the website, Janet F. Harte Public Library is temporarily closed due to COVID-19. The public viewing location must be available at the time the notice is published in the paper. If the library is not available, a new public viewing location in the county is required. Note: Due to COVID-19, if a publicly owned building cannot be found, the new location may consist of any reasonable location within the county that is accessible to the public where the application can be reviewed and copied (or where extra copies are made available by the applicant for public distribution) during reasonable hours during the day. The location does not need to be a publicly owned building; however, it must be accessible to the public. If a publicly-accessible physical viewing location cannot be found in the county, the complete application can be posted online for public viewing. A direct weblink to the documents must be provided and included in the public notice. Also, a written statement certifying that a diligent search to locate a publicly-accessible physical viewing location was made and the required application documents will be posted online at the time the notice is published is required.

4. Section 9.d on page 7 of the administrative report: The application indicates the point of discharge and discharge route in the existing permit are correct; however, the topographic map submitted indicates the treatment plant boundary is approximately 2,000 feet from the outfall location. Please provide an accurate description of the discharge route of the effluent from the treatment facility to the outfall location. An example of the flow of effluent to the point of discharge is: from the plant site via pipe directly to Nueces Bay.

5. The following is a portion of the Notice of Receipt of Application and Intent to Obtain a Water Quality Permit which contains information relevant to your application. Please read it carefully and indicate if it contains any errors or omissions. The complete notice will be sent to you once the application is declared administratively complete.

APPLICATION. Nueces Bay, LLC, *(address pending response)*, which owns a natural gas-fired, steam-electric generating facility, has applied to the Texas Commission on Environmental Quality (TCEQ) to renew Texas Pollutant Discharge Elimination System (TPDES) Permit No. WQ0001244000 (EPA I.D. No. TX0003581) to authorize the discharge of treated wastewater at a volume not to exceed a daily average flow of 500,000,000 gallons per day. The facility is located at 2002 East Navigation Boulevard, Corpus Christi, Texas 78402. The discharge route is from the plant site via pipe directly to Nueces Bay. TCEQ received this application on April 1, 2020. The permit application is available for viewing and copying at *(pending response)*. This link to an electronic map of the site or facility's general location is provided as a public courtesy and not part of the application or notice. For the exact location, refer to the application. https://tceq.maps.arcgis.com/apps/webappviewer/index.html?id=db5bac44afbc468bbddd360f8168250f&marker=-97.419444%2C27.819166&level=12

Further information may also be obtained from Nueces Bay, LLC at the address stated above or by calling Ms. Cecilia Garcia-Rios, Talen Energy, at 956-763-3510.

Please submit the complete response, addressed to my attention, by May 13, 2020. If the requested information is not received by the given deadline, pursuant to 30 TAC Chapter 281, the application may be removed from our list of pending applications. If you should have any questions, please do not hesitate to call me at (512) 239-3321.

Sincerely,

Velma Fuller

Applications Review & Processing Team
Water Quality Division, MC 148
Texas Commission on Environmental Quality
PO Box 13087
Austin, Texas 78711-3087
512-239-3321

www.texq.texas.gov/customersurvey

THE WCM GROUP, INC.
110 S. Bender Ave.
Humble, TX 77338

ATTACHMENT B
ADMINISTRATIVE REPORT
SECTION 1.C, PAGE 2

INDUSTRIAL ADMINISTRATIVE REPORT 1.0

The following information **is required** for **all** applications for TPDES permits and TLAPs.

1. TYPE OF APPLICATION AND FEES (Instructions, Page 21)

a. Permit No.: WQ0001244000 Expiration Date: April 1, 2020

EPA ID No.: TX0003581

b. Check the box next to the appropriate application type.

☐	New TPDES permit	☐	New TLAP permit
☐	Major amendment with renewal	☐	Major amendment without renewal
☒	Renewal with changes	☐	Renewal without changes
☐	Minor amendment without renewal	☐	Minor modification without renewal
☐	Stormwater only discharge		

c. If applying for an **amendment** or **modification** of a permit, describe the request in detail: NBPS is requesting a revision to the biomonitoring language to clarify the requirements for invalid tests/ failures based on pre-existing toxicity in the intake water prior to any use or treatment by the facility. Please see the Executive Summary for further information.

d. Application Fee

Check the box next to the amount submitted for the application fee:

EPA Classification	New	Major Amendment (With or Without Renewal)	Renewal (With or Without Changes)	Minor Amendment/ Minor Modification (Without Renewal)
Minor facility not subject to EPA categorical effluent guidelines (*40 CFR Parts 400-471*)	☐ $350	☐ $350	☐ $315	☐ $150
Minor facility subject to EPA categorical effluent guidelines (*40 CFR Parts 400-471*)	☐ $1,250	☐ $1,250	☐ $1,215	☐ $150
Major facility	N/A *	☐ $2,050	☒ $2,015	☐ $450

* All facilities are designated as minors until formally classified as a major by EPA.

e. Payment Information:

Mailed Check or money order number: 39965

Check or money order amount: $2,015.00

Named printed on check or money order: The WCM Group, Inc.

ePAY Voucher number: Click to enter text

Copy of voucher attached? ☐ Yes

Attachment: A

ATTACHMENT C
CORE DATA FORM
SECTION 2.C, PAGE 3

TCEQ Core Data Form

TCEQ Use Only

For detailed instructions regarding completion of this form, please read the Core Data Form Instructions or call 512-239-5175.

SECTION I: General Information

1. Reason for Submission *(If other is checked please describe in space provided.)*

☐ New Permit, Registration or Authorization (*Core Data Form should be submitted with the program application.)*

☒ Renewal *(Core Data Form should be submitted with the renewal form)* ☐ Other

2. Customer Reference Number *(if issued)*	Follow this link to search for CN or RN numbers in Central Registry**	3. Regulated Entity Reference Number *(if issued)*
CN **605689612**		RN **100552181**

SECTION II: Customer Information

4. General Customer Information | 5. Effective Date for Customer Information Updates (mm/dd/yyyy)

☐ New Customer ☒ Update to Customer Information ☐ Change in Regulated Entity Ownership

☐ Change in Legal Name (Verifiable with the Texas Secretary of State or Texas Comptroller of Public Accounts)

The Customer Name submitted here may be updated automatically based on what is current and active with the Texas Secretary of State (SOS) or Texas Comptroller of Public Accounts (CPA).

6. Customer Legal Name *(If an individual, print last name first: eg: Doe, John)* | *If new Customer, enter previous Customer below:*

Nueces Bay, LLC

7. TX SOS/CPA Filing Number	8. TX State Tax ID (11 digits)	9. Federal Tax ID (9 digits)	10. DUNS Number *(if applicable)*
0803410579	12010456452	20-1045645	

11. Type of Customer: ☒ Corporation ☐ Individual Partnership: ☐ General ☐ Limited

Government: ☐ City ☐ County ☐ Federal ☐ State ☐ Other ☐ Sole Proprietorship ☐ Other:

12. Number of Employees

☐ 0-20 ☒ 21-100 ☐ 101-250 ☐ 251-500 ☐ 501 and higher

13. Independently Owned and Operated?

☒ Yes ☐ No

14. Customer Role (Proposed or Actual) – *as it relates to the Regulated Entity listed on this form. Please check one of the following:*

☐ Owner ☐ Operator ☒ Owner & Operator

☐ Occupational Licensee ☐ Responsible Party ☐ Voluntary Cleanup Applicant ☐ Other:

15. Mailing Address:							
	2742 Joe Fulton International Trade Corridor						
	City	Corpus Christi	State	TX	ZIP	78402	ZIP + 4

16. Country Mailing Information *(if outside USA)*	17. E-Mail Address *(if applicable)*
	Dale.Lebsack@talenenergy.com

18. Telephone Number	19. Extension or Code	20. Fax Number *(if applicable)*
(956) 763-3510		( ) -

SECTION III: Regulated Entity Information

21. General Regulated Entity Information *(If 'New Regulated Entity" is selected below this form should be accompanied by a permit application)*

☐ New Regulated Entity ☐ Update to Regulated Entity Name ☐ Update to Regulated Entity Information

The Regulated Entity Name submitted may be updated in order to meet TCEQ Agency Data Standards (removal of organizational endings such as Inc, LP, or LLC.)

22. Regulated Entity Name *(Enter name of the site where the regulated action is taking place.)*

Nueces Bay Power Station

ATTACHMENT D
COPY OF TCEQ'S RECEIPT OF
TPDES APPLICATION - MARCH 31, 2020

ORIGINAL

THE WCM GROUP, INC.
110 S. Bender Ave.
Humble, TX 77338

RECEIVED
MAR 3 1 2020
TCEQ MAIL CENTER
DA

March 30, 2020

HAND DELIVERED

Executive Director
Applications Review and Processing Team, MC-148
Texas Commission on Environmental Quality
12100 Park 35 Circle
Austin, Texas 78753

REFERENCE: Industrial Wastewater Permit Renewal With Changes Application
TPDES Permit No. WQ0001244000; NPDES Permit No. TX0003581
Nueces Bay, LLC; Nueces Bay Power Station
Corpus Christi, Nueces County, Texas
CN605698612; RN100552181

Dear Sir or Madam,

On behalf of Nueces Bay, LLC, Nueces Bay Power Station, The WCM Group Inc. is submitting this application for the renewal of Texas Commission on Environmental Equality (TCEQ) TPDES Permit No. WQ0001244000.

A check in the amount of $2,015.00 (copy attached) has been forwarded to the TCEQ Financial Administration Division under separate letter for the application fee.

Should you have any questions, or require additional information regarding this matter, please feel free to contact me at (281) 446-7070.

Sincerely,

Alison K. Davis
Director, Technical Services
adavis@wcmgroup.com

AKD/tnk
ENCLOSURE

cc: C. Garcia-Rios

TABLE OF CONTENTS
ADMINISTRATIVE REPORT 1.0
SUPPLEMENTAL PERMIT INFORMATION FORM (SPIF)