CERTIFIED U.S. MAIL February 11, 2016
RETURN RECEIPT REQUESTED

David Small, Secretary
Delaware Department of Natural Resources
and Environmental Control
Richardson & Robbins Building
89 Kings Hwy
Dover, DE 19901

Delaware City Refining Company, LLC
4550 Wrangle Hill Road
Delaware City, DE 19706

PBF Energy Inc.
1 Sylvan Way, Second Floor
Parsippany, NJ 07054

RE: SIXTY-DAY NOTICE OF INTENT TO SUE FOR ENDANGERED SPECIES ACT SECTION 9 VIOLATIONS

Dear Sirs:

This letter provides notice, pursuant to Section 11(g) of the Endangered Species Act ("ESA" or "Act"), 16 U.S.C. § 1540 (g)(2)(A)(i), that the Delaware City Refining Company LLC ("DCRC") , PBF Energy Inc. ("PBF"), and Secretary David Small, in his official capacity as the Secretary of the Delaware Department of Natural Resources and Environmental Control ("DNREC" or "Department"), are in violation of the ESA. ESA Section 9 prohibits the "take" of

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endangered species,[1] and makes it "unlawful for any person…to…cause to be committed" any violation of the take prohibition.[2] Through their ownership and/or operation of the Delaware City Refinery ("Refinery"), the DCRC and PBF are taking, and will continue to take, two federally-listed endangered and threatened species: the shortnose sturgeon and the Atlantic sturgeon.

Additionally, through the Department and its National Pollutant Discharge Elimination System ("NPDES") program, Secretary Small causes the take of these species. Through the NPDES permitting program the Department is authorizing the Refinery operations that take members of the listed species, without complying with, nor requiring the Refinery to comply with, the ESA permitting and mitigation requirements for such takes. More specifically, the Department's NPDES permit has authorized the Refinery to operate a cooling water intake structure with antiquated controls despite the fact that doing so takes shortnose and Atlantic sturgeon.

Therefore, the Delaware Riverkeeper Network ("DRN") and the Delaware Riverkeeper intend to sue you to bring this facility into compliance with the ESA, thereby securing overdue protections for the endangered sturgeon.[3]

DRN is a nonprofit organization with over 16,000 members throughout the Delaware watershed. DRN members live and recreate throughout the State of Delaware and the watershed, including those areas adversely affected by the Refinery's activities. DRN members'

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[1] 16 U.S.C. § 1538 (a)(1)(B).
[2] 16 U.S.C. § 1538 (g).
[3] *See* 16 U.S.C. § 1540 (g)(1) (ESA citizen suit provision); *see also Ex Parte Young*, 209 U.S. 123, 159-60 (1908) (authorizing lawsuits for prospective relief against state officials acting in violation of federal law); *Citizens for Pennsylvania's Future v. Mallory*, 2002 U.S. Dist. LEXIS 24406, at *21 (E.D. Pa. 2002) (environmental laws that explicitly allow suit against states "to the extent permitted by Eleventh Amendment" clearly contemplate suits against state officials seeking prospective injunctive relief under *Ex Parte Young* doctrine).

conservation, aesthetic, recreational, and other concrete interests are injured by the unlawful take of endangered shortnose and Atlantic sturgeon resulting from the Refinery's operations and DNREC's failure to ensure the Refinery's compliance with the ESA. The Delaware Riverkeeper, Maya van Rossum, is the leader of the DRN and is a full-time privately-funded watchdog and advocate who is responsible for the protection of the waterways in the Delaware River Watershed.

I. THE ENDANGERED SPECIES ACT'S TAKE PROHIBITION

The ESA seeks to preserve endangered species and to protect the ecosystems upon which they depend.[4] The ESA does this in part though Section 9 which prohibits any person from taking endangered species.[5] The ESA also makes it "unlawful for any person" to "cause to be committed" any violation of the take prohibition;[6] and "person" includes "an individual, corporation…any officer, employee, agent, department, or instrumentality… of any State, municipality, or political subdivision of a State… [or] any State, municipality, or political subdivision of a State."[7] It is well-established that companies are liable when their actions result in or will result in the foreseeable take of listed species,[8] and that State regulatory officials are liable under the ESA when they license or otherwise authorize activity in "specifically the manner that is likely to result in violation of federal law" such as the ESA's take prohibition.[9]

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[4] 16 U.S.C. § 1531 (b).
[5] 16 U.S.C. § 1538 (a)(1)(B).
[6] 16 U.S.C. § 1538 (a)(1)(B) and § 1538 (g).
[7] 16 U.S.C. § 1532 (13).
[8] *See, for example*, *Animal Welfare Inst. v. Beech Ridge Energy LLC,* 675 F. Supp. 2d 540 (D. Md. 2009).
[9] *Strahan v. Coxe*, 127 F.3d 155, 163 (1st Cir. 1997), cert. denied, 525 U.S. 830 (1998); *see also Loggerhead Turtle v. County Council of Volusia County*, 148 F.3d 1231, 1251 (11th Cir. 1998), cert. denied, 526 U.S. 1081 (1999); *Defenders of Wildlife v. Administrator, EPA,* 882 F.2d 1294, 1300-1301 (8th Cir. 1989); *Animal Welfare Inst. v. Martin*, 588 F. Supp. 2d 70 (D. Me. 2008); *Animal Prot. Inst. v. Holsten*, 541 F. Supp. 2d 1073 (D. Minn. 2008).

"Take" is defined broadly to include "harass, harm, pursue, hunt, shoot, wound, trap, kill, capture, or collect, or attempt to engage in any such conduct".[10] "Harm" is further defined by the ESA implementing regulations as "an act which actually kills or injures wildlife" and includes "significant habitat modification or degradation" that "actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering."[11] "Harass" is further defined by the regulations as "an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering."[12] Most relevant to the issues presented here, the National Marine Fisheries Service ("NMFS"), the federal agency with principal responsibility for implementing the ESA with regard to the species presently at issue, has recently determined that any impingement or entrainment of a federally-listed species constitutes a "take."[13] Additionally, any action that is "reasonably certain" to harm, kill, wound, harass, or otherwise take any member of a listed species in the future is a prohibited "take" under the ESA.[14]

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[10] 16 U.S.C. § 1532 (19).
[11] 50 C.F.R. § 222.102.
[12] 50 C.F.R. § 17.3.
[13] *See* NMFS and FWS, *Endangered Species Act Section 7 Consultation Programmatic Biological Opinion on the U.S. Environmental Protection Agency's Issuance and Implementation of the Final Regulations Section 316(b) of the Clean Water Act* (May 2014) at 11 ("Because EPA defines impingement as entrapment and entrainment as entering or passing through a CWIS and into the cooling water system, and we interpret these as examples of "trap," "capture," and "harass," we have determined that any impingement or entrainment of federally-listed species constitutes take.")
[14] *Animal Welfare Inst. v. Beech Ridge Energy LLC,* 675 F. Supp. 2d 540 (D. Md. 2009) (finding a violation of section 9 where take had not yet occurred but was reasonably certain to occur in the future).

By virtue of listing the shortnose sturgeon (*Acipenser brevirostrum*) and Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) as endangered, NMFS has extended the take prohibition to these species everywhere within the U.S., including Delaware and the Delaware River. The shortnose sturgeon has been listed as an endangered species since 1967 and NMFS recognizes a distinct population segment in the Delaware and Hudson Rivers.[15] The Atlantic sturgeon New York Bight Distinct Population Segment (DPS) has been recognized as endangered since February 6, 2012. This population includes all Atlantic sturgeon spawned in the Delaware and Hudson Rivers. The Chesapeake Bay, South Atlantic, and Carolina DPSs of Atlantic sturgeon are also recognized as endangered, and may be present in the Delaware River and the area impacted by the Refinery. The Gulf of Maine DPS is listed as threatened and may be present in the area.

It is unlawful for any person to "take" or engage in any other activity prohibited by ESA Section 9 with respect to shortnose and Atlantic sturgeon unless said person has a valid incidental "take" permit issued by NMFS under Section 10 of the ESA.[16] Moreover, a "take" permit must be accompanied by a Habitat Conservation Plan that includes terms and conditions NMFS deems "necessary or appropriate" to minimize take, such as the installation of a Closed Cycle Cooling System.[17] A Habitat Conservation Plan also requires the take permit applicant to identify the steps the applicant will perform to minimize and mitigate the impacts that result

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[15] NMFS, Final Recovery Plan for the Shortnose sturgeon (*Acipenser brevirostrum*) (Dec. 1998) at vi, 2.
[16] Take that is incidental to federal agency action is prohibited unless it is the subject of an incidental take exemption provided through an ESA Section 7 Biological Opinion/Incidental Take Statement, 16 U.S.C. § 1536. All other incidental take is subject to Section 10 permitting. *See* 16 U.S.C. § 1539; 50 C.F.R. § 224.102; *see also* NMFS and FWS, Habitat Conservation Planning and Incidental Take Permit Processing Handbook (Nov. 1996); and NMFS and FWS, Addendum to the HCP Handbook, 5 Point Policy Initiative, 65 Fed. Reg. 35242 (June 1, 2002).
[17] 16 U.S.C. § 1539 (a)(2)(A)(iv).

from the taking.[18] Further, NMFS may only permit an incidental take if the Habitat Conservation Plan minimizes and mitigates the impacts of the taking "to the maximum extent practicable"[19] and the take "will not appreciably reduce the likelihood of the survival and recovery of the species in the wild."[20]

II. PRESENCE OF ENDANGERED SHORTNOSE AND ATLANTIC STURGEON IN THE DELAWARE RIVER AND THE AREA WHERE THE REFINERY OPERATES

The Delaware River, including the area affected by the Refinery[21] ("Action Area"), is home to endangered and threatened sturgeon populations that are critical to these species' long-term survival. Both species move between fresh water and salt water during their lifetimes; juvenile and adult shortnose sturgeon migrate through and forage and/or overwinter at River Mile (RM) 60, the location of the Refinery's operation. Likewise, Atlantic sturgeon from any of the five DPSs may be present in the Action Area.[22] Adult Atlantic sturgeon are present in the mainstem Delaware River from May to September, and subadult Atlantic sturgeon may be

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[18] 16 U.S.C. § 1539 (a)(2)(A)(i) and (ii).
[19] 16 U.S.C. § 1539 (a)(2)(B)(ii).
[20] 16 U.S.C. § 1539 (a)(2)(B)(iv).
[21] This includes the Delaware River by the facility (River Mile 60), Reybold's Cove, Cedar Creek, and Dragon Run Creek.
[22] NMFS letter to DNREC, March 18, 2015, p.3 ("NMFS March 18, 2015 Letter"). The sequence of the letters between NMFS, DNREC, and the Refinery are as follows: (a) NMFS crafted its initial correspondence to DNREC on March 18, 2015, expressing NMFS's concerns about Refinery's impacts (Letter is attached as Exhibit A); (b) the Refinery formulated its response to NMFS's initial correspondence in a letter to DNREC dated June 9, 2015 ("DCRC June 9, 2015 Letter") (attached as Exhibit B); and (c) NMFS disagreed with the Refinery's assertions for why take is not occurring in a subsequent letter to DNREC dated September 3, 2015 ("NMFS September 3, 2015 Letter") (attached as Exhibit C).

present year round.[23] Both Atlantic and shortnose sturgeon have low gene flow in their ranges, which undercuts their genetic diversity and thus their resilience.[24]

A. SHORTNOSE STURGEON IN THE VICINITY OF THE REFINERY

There is a long history of shortnose sturgeon in the Delaware portion of the Delaware River. NMFS noted in its most recent comprehensive study of shortnose sturgeon that adult shortnose sturgeon spend the summer and early fall foraging in the vicinity of Artificial Island (RM 50), approximately ten river miles south of the Refinery.[25] Juvenile shortnose sturgeon are present in the Wilmington (RM 70) to Marcus Hook (RM 76) reach of the lower tidal Delaware River year round, and may expand their range both up and down the river in winter.[26] Additionally, adult and juvenile shortnose sturgeon are likely to occur in the Action Area any time water temperatures are greater than 10ºC; which is typically between April and November.[27]

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[23] NMFS March 18, 2015 Letter, p. 3.

[24] *See* NMFS and FWS, *Endangered Species Act Section 7 Consultation Programmatic Biological Opinion on the U.S. Environmental Protection Agency's Issuance and Implementation of the Final Regulations Section 316(b) of the Clean Water Act* (May 2014), Appendix B, at 82 (shortnose sturgeon) ("The larger threat to shortnose sturgeon survival is the habitat fragmentation caused by extirpations throughout Florida, southern Georgia, all of North Carolina except for the Cape Fear River, all of Virginia, and all of Maryland [citations omitted]."), and 85 (Atlantic sturgeon); *see also* NMFS, Atlantic Sturgeon Status Review Team, Status Review of Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*) (February 23, 2007 updated with corrections on July 27, 2007), at 29 ("due to low gene flow among populations, the loss of one or more these five populations could negatively impact the species as a whole").

[25] NMFS, Shortnose Sturgeon Status Review Team, Biological Assessment of Shortnose Sturgeon (*Acipenser brevirostrum*) (Nov. 2010) at 192-94 (citations omitted).

[26] Brundage and O'Herron, *Investigations of juvenile shortnose and Atlantic sturgeons in the lower tidal Delaware River*, 52 Bulletin of the New Jersey Academy of Science 2 (June 22, 2009).

[27] NMFS, *Endangered Species Act Section 7 Consultation Biological Opinion, Continued Operation of Salem and Hope Creek Nuclear Generating Stations* (NER-2010-6581) (July 17, 2014), at 84 (hereinafter "2014 Incidental Take Statement for Salem").

NMFS's most recent correspondence with DNREC also confirms that shortnose sturgeon are present in the Action Area.[28]

B. SHORTNOSE STURGEON: CRITICAL IMPORTANCE OF POPULATIONS IN DELAWARE

No reproducing populations of shortnose sturgeon are known to occur south of Delaware and north of the state boundary between North and South Carolina.[29] NMFS found that this gap "negatively impacts the stability of the population, metapopulation, and species as a whole."[30] NMFS has stressed the importance of restoring the shortnose sturgeon's historically continuous range in order to re-establish gene flow, stating "[t]he loss of a single shortnose sturgeon population segment may risk the permanent loss of unique genetic information that is critical to the survival and recovery of the species."[31]

Restoration of this fish's historic range in Chesapeake rivers requires a robust population of Hudson and/or Delaware River shortnose sturgeon, with the Delaware River offering the greatest hope of restoration due to its geographic proximity to the Chesapeake.[32] However, the population size of the Delaware River shortnose sturgeon can hardly be described as robust; it did not grow at all between 1987 and 2006.[33] The outlook is similarly bleak for the more distant population in the Hudson, as the population there remains uncertain and is not well characterized. For these reasons, the shortnose sturgeon population in the Delaware River,

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[28] *See generally* NMFS March 18, 2015 Letter and NMFS September 3, 2015 Letter.
[29] NMFS, Shortnose Sturgeon Status Review Team, Biological Assessment of Shortnose Sturgeon (*Acipenser brevirostrum*) (Nov. 2010) at 23.
[30] *Id.* at 62.
[31] NMFS, Final Recovery Plan for the Shortnose sturgeon (*Acipenser brevirostrum*) (Dec. 1998) at 7.
[32] *See* NMFS, Shortnose Sturgeon Status Review Team, Biological Assessment of Shortnose Sturgeon (*Acipenser brevirostrum*) (Nov. 2010) at 194.
[33] *Id.* at 193.

including the Action Area around the Refinery, is critical to the species' genetic diversity and long-term survival.

C. ATLANTIC STURGEON IN THE VICINITY OF THE REFINERY

Juvenile Atlantic sturgeon occur in the lower tidal Delaware River primarily during summer and fall.[34] Adult Atlantic sturgeon are known to migrate through the Action Area to spawning sites upriver[35] and Atlantic sturgeon are likely to be present year-round in the Action Area, the majority of which would be sub-adults and adults.[36] Sub-adults and adults present in the action area could be from any of the previously discussed DPS. Young-of-year sub-adult Atlantic sturgeon in the Delaware River are most certain to be part of the endangered New York Bight DPS as this life stage is restricted to the natal river.[37]

Atlantic sturgeon's presence in the vicinity of the Refinery is further evidenced by recorded takes at PSEG's Salem plant, which is only ten river miles downstream from the Action Area. Salem recently reported eight takes of adult Atlantic sturgeon in just 26 days.[38] Further, NMFS's Biological Opinion for Salem includes a historical record of dozens of takes of both shortnose and Atlantic sturgeon since the 1970's.[39]

NMFS's most recent correspondence with DNREC also confirms that Atlantic sturgeon are present in the Action Area.[40]

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[34] Brundage and O'Herron *supra* fn. 26.
[35] Breece, *Coping with progress, Atlantic sturgeon spawning characteristics and locations in the Delaware River*. Presentation to Mid-Atlantic Chapter of the American Fisheries Society, November 18-19, 2011 Annual Meeting.
[36] 2014 Incidental Take Statement for Salem at 84.
[37] *Id.*
[38] January 10, 2014 email between NOAA employees Lynn Lankshear and Julie Crocker re: PSEG sturgeon takes since mid-December.
[39] *See generally*, 2014 Incidental Take Statement for Salem at 187-200.
[40] *See generally* NMFS March 18, 2015 Letter and NMFS September 3, 2015 Letter.

D. ATLANTIC STURGEON: CRITICAL IMPORTANCE OF POPULATIONS IN DELAWARE

The Hudson and Delaware Rivers provide the only two breeding locations for the endangered New York Bight DPS of Atlantic sturgeon[41] and the current Atlantic sturgeon population in the Delaware River is alarmingly small; while NMFS does not have a current population estimate for the Delaware River, NMFS believes that there are less than 300 adult Atlantic sturgeon spawning annually.[42] Compare this with historic levels of about 180,000 spawning individuals.[43] As with the shortnose sturgeon, the Delaware population of Atlantic sturgeon ensures gene flow between the genetically distinct southern and northern populations of Atlantic sturgeon on the East Coast,[44] and this population is therefore critical to the long-term survival of the species as a whole.[45]

III. TAKE OF LISTED SPECIES AT THE REFINERY

The Refinery's current operation results in, and will continue to result in, the take of Atlantic and shortnose sturgeon via impingement, entrainment, and through the facility's chemical and thermal discharge. Take of these species will also occur at the facility under the terms and conditions of the current Draft NPDES Permit. NMFS has expressed its grave concerns in recent letters urging the implementation of certain control measures to minimize the

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[41] *See* Endangered and Threatened Wildlife and Plants; Threatened and Endangered Status for Distinct Population Segments of Atlantic sturgeon in the Northeast Region, 77 Fed. Reg. 5880, 5883 (Feb. 6, 2012) ("2012 Atlantic Sturgeon Listing") (codified at 50 C.F.R. § 223.211).

[42] *See* National Marine Fisheries Service, Atlantic Sturgeon New York Bight Fact Sheet, *available at* *http://www.nmfs.noaa.gov/pr/pdfs/species/atlanticsturgeon_nybright_dps.pdf*.

[43] *Id*.

[44] *See* 50 C.F.R. § 224.101, *see also* 2012 Atlantic Sturgeon Listing, 77 Fed. Reg. 5880, 5883 (Feb. 6, 2012).

[45] *Id.*

impact associated with the incidental take of Atlantic and shortnose sturgeon.[46] The Refinery's current NPDES permit, which was issued nearly 20 years ago in 1997, allows for the continued use of one of the country's most antiquated intake structures in addition to the use of thirty three outfalls which release multiple stressors into sturgeon habitat. The Refinery's intake structure does little, if anything, to protect endangered and threatened sturgeon; it lacks adequate fish exclusion screens and other similar mechanisms, has trash bars located within the intake channel but not along the banks of the Delaware River, and has not been substantially modified or updated since its construction in the early 1950's.[47] Additionally, the terms and conditions in the Refinery's latest draft NPDES Permit fail to sufficiently protect Atlantic and shortnose sturgeon and will hence continue to result in the incidental take of these species.[48]

A. IMPINGEMENT AND ENTRAINMENT

As NMFS has concluded, juvenile and adult shortnose sturgeon and sub-adult and adult Atlantic sturgeon are impinged and entrained by the Refinery's current cooling water intake structure and will continue to be impinged and entrained by the Refinery's cooling water intake structure technology as contemplated in DNREC's draft NPDES permit conditions.[49] Impingement occurs when sturgeon become trapped against the Refinery's intake screens or trash racks, which occurs when their swimming speed is overtaken by the intake velocity. Fatigue and disorientation play a role in impingements, and most likely occur at the Refinery as sturgeon struggle against the intake velocity for the entire length of Cedar Creek, approximately

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[46] *See generally* NMFS March 18, 2015 Letter, DCRC June 9, 2015 Letter, and NMFS September 3, 2015 Letter.
[47] We recognize that the Refinery is replacing the existing traveling screens with Hydrolox screens, however, at this time only 1/3 of the outdated traveling screens have been replaced.
[48] *See generally* NMFS March 18, 2015 Letter and NMFS September 3, 2015 Letter.
[49] NMFS March 18, 2015 Letter, p.4-5; NMFS September 3, 2015 Letter, p. 2-3.

.82 miles. Juvenile shortnose sturgeon can be impinged at intake velocities of .7ft/second or more, and impingement of fish as large as approximately 28 inches has been known to occur at velocities of 1ft/second.[50] Impingement plainly constitutes "take" under the ESA, since it results in killing, wounding, and/or trapping members of the species, as well as harming and harassing them within the regulatory definitions of those terms.

Entrainment occurs when fish, larvae, or eggs are sucked into the facility's cooling water intake structure and are small enough to pass through the screen, or because the lack of a sufficient screen allows free passage into the facility. Like impingement, entrainment also occurs when a fish's swimming speed is overtaken by the intake velocity. NMFS has found that sub-adult and adult of each sturgeon species will be entrained when they are small enough to fit through the trash racks and intake screens.[51] When entrainment occurs, sturgeon are returned to Cedar Creek via the Refinery's fish return system, which is also significantly outdated.

The Refinery's intake volume and velocities, and its merciless "fish return" system combine to create an aquatic version of Dante's Inferno: fish that can fit through the trash bars and become entrained are not delivered back into the mainstem Delaware but instead are placed into the same intake channel from which they originally could not escape. Once there, sturgeon must try *again* to swim nearly a mile against the intake flow, which averages .5 to 1 feet per second but may reach up to 5 feet per second, while also battling against the stresses caused by the facility's discharges within the intake channel and those caused by the sturgeon's first capture and trip through the fish return system. Those fish that are unable to make it back to the mainstem will most likely be drawn back into the system ad nauseam until they inevitably perish.

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[50] *Id.*
[51] NMFS March 18, 2015 Letter, p.4.

Once again, this clearly constitutes textbook "take" for the purposes of the ESA insofar as it entails killing, wounding, trapping, harming, and harassing members of the species.

i. RECONSIDERATION OF CLOSED CYCLE COOLING

NMFS has requested that DNREC reconsider the implementation of a Closed Cycle Cooling System at the facility as the implementation of this technology would significantly reduce detrimental direct and indirect impacts, as well as the incidental take issues that occur at the facility.[52] In addition to the Agency's concerns with the Refinery, NMFS has written extensively on takes via cooling water intake structures, especially once-through cooling systems on the Delaware River, and the resultant required permitting and mitigation. The impacts of once-through cooling systems are amplified when young life stages are harmed, and when two or more such facilities are situated along sturgeons' migratory pathway,[53] as is the case in the Delaware River. The Refinery's intake structure has remained largely unchanged since the facility's construction in the early 1950's, and in 2011 DNREC recognized the importance of updating the facility to comply with the Best Technology Available (BTA), which the Department identified as a Closed Cycle Cooling System. Inexplicably, DNREC subsequently determined that the Refinery would not have to comply with a Closed Cycle Cooling BTA, despite the fact that it would likely reduce fish kills by 75 to 145 million fish per year,[54] and have associated benefits for the endangered shortnose and Atlantic sturgeon. As such, reconsideration

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[52] NMFS March 18, 2015 Letter, p.8; NMFS September 3, 2015 Letter, p. 1.
[53] NMFS and FWS, *Endangered Species Act Section 7 Consultation Programmatic Biological Opinion on the U.S. Environmental Protection Agency's Issuance and Implementation of the Final Regulations Section 316(b) of the Clean Water Act* (May 2014), Appendix B, at 81 (shortnose sturgeon) and 85 (Atlantic sturgeon), Appendix C at 54-55.
[54] DNREC Attachment A- BTA Determination *Draft* June 8, 2011 p.25.

of Closed Cycle Cooling coupled with its implementation is essential to remedying the incidental take of the protected endangered species that is occurring at the facility.

B. Chemical and Thermal Discharge

The Refinery's discharge can be as hot as 110ºF and may include oil and grease, Total Organic Carbon (TOC), pH, Total Suspended Solids (TSS), Iron, Nitrogen, Phosphorus, Total Residual Chlorine (TRC), bacteria, Biological Oxygen Demand (BOD5), Aluminum, Nitrates, Nitrites, Cyanide, Selenium, Vanadium, Phenolic Compounds, and Chromium (total and hexavalent). These constituents of the Refinery's effluent have the following impacts on the Atlantic and shortnose sturgeon: death, reduced growth rates, reduced resistance to disease, reduced ability to forage, general physiological stress, reduced endocrine function, negative effects on metabolism and reproduction, the prevention and/or hindrance of the development of fish eggs and larvae, and altered migration and movement patterns. Further, such effluent impairs the forage base and thus interferes with the essential feeding behaviors of both sturgeon species by limiting their food supply through entrainment, reduction of overall resources, and the bioaccumulation of the abovementioned compounds.[55]

The effects of the Refinery's chemical and thermal discharges are exacerbated during low flow/emergency situations, which are known to occur at the facility.[56] In addition to increasing intake velocities, low flow situations increase the potency of thermal and chemical discharges and reduce cool deep water areas preferred by sturgeon. Accordingly, such discharges constitute a distinct form of impermissible "take" through harm and harassment, as those terms are defined by the ESA regulations.

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[55] NMFS March 18, 2015 Letter, p.5-7.
[56] NMFS March 18, 2015 Letter, p.2.

C. NONE OF THE ATLANTIC AND SHORTNOSE STURGEON TAKE AT THE REFINERY IS COVERED BY AN INCIDENTAL TAKE PERMIT AS REQUIRED BY THE ESA

The Refinery does not possess any ESA section 10 incidental take permits, or any other form of authorization from NMFS for takes via the facility's antiquated cooling water intake structure and discharges. To the contrary, NMFS has made crystal-clear in repeated communications with DCRC and DNREC that the Refinery is adversely affecting the species in multiple ways that have never been authorized via any of the legal mechanisms provided by the ESA for permitting such take. Located a mere ten river miles away, and in recognition of the inevitability of takes, the Salem nuclear facility has recently sought and received take authorization by NMFS (subject to appropriate measures for minimizing and monitoring the take) through the Section 7 consultation process.[57]

IV. DNREC'S ESA VIOLATIONS: THE REFINERY'S NPDES PERMIT, AS AUTHORIZED BY SECRETARY SMALL, CAUSES TAKE OF ATLANTIC AND SHORTNOSE STURGEON

As discussed above, the ESA also makes it "unlawful for any person" to "cause to be committed" any violation of the take prohibition;[58] and "person" includes "any officer, employee, agent, department, or instrumentality… of any State, municipality, or political subdivision of a State… [or] any State, municipality, or political subdivision of a State."[59] Again, a state official violates the ESA when s/he authorizes a private action that causes the take of an endangered species.[60]

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[57] *See generally* 2014 Incidental Take Statement for Salem, *supra* fn. 27.
[58] 16 U.S.C. § 1538 (a)(1)(B) and § 1538 (g).
[59] 16 U.S.C. § 1532 (13).
[60] *Strahan v. Coxe*, 127 F.3d 155, 163 (1st Cir. 1997), cert. denied, 525 U.S. 830 (1998); *see also Loggerhead Turtle v. County Council of Volusia County*, 148 F.3d 1231, 1251 (11th Cir. 1998), cert. denied, 526 U.S. 1081 (1999); *Defenders of Wildlife v. Administrator, EPA*, 882 F.2d 1294, 1300-1301 (8th Cir. 1989); *Animal Welfare Inst. v. Martin*, 588 F. Supp. 2d 70 (D. Me. 2008); *Animal Prot. Inst. v. Holsten*, 541 F. Supp. 2d 1073 (D. Minn. 2008).

The Clean Water Act allows states to assume authority for administering the NPDES program within their borders[61] and the State of Delaware has done so.[62] The Refinery's NPDES permit, issued through Delaware's NPDES program, authorizes the Refinery's operation of antiquated cooling water intake structures, fish return system, and chemical and thermal discharges that take Atlantic and shortnose sturgeon. But for the NPDES permit issued by DNREC, the Refinery could not operate its cooling water intake structure and thirty three outfalls, and thus could not take endangered sturgeon through impingement, entrainment, and release of chemical and heated effluent.

In particular, DNREC controls the use of the specific technology and discharges that are causing take of endangered sturgeon. That is, as a part of its NPDES review, DNREC is required to ensure that the "location, design, construction, and capacity of cooling water intake structures [at the Refinery] reflect the best technology available for minimizing adverse environmental impact"[63] and DNREC regulates the discharge of pollutants into the state's surface waters.[64] Thus, but for the DNREC's determinations of the specific design and operation of the cooling water intake structure at the Refinery and DNREC's approval of the temperature and pollutant laden discharges at the facility, the Refinery could not engage in the activities that take sturgeon.

Therefore, Secretary Small, in his official capacity as Secretary of DNREC, is in violation of the ESA's take prohibition for the take of shortnose and Atlantic sturgeon at the Refinery, as such take has not been permitted by NMFS.

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[61] *See* 33 U.S.C. §1342(b).
[62] *See* 39 Fed. Reg. 26,061 (July 16, 1974).
[63] 33 U.S.C. §1326(b).
[64] *See* 7 Del. Code §6003 and 7 Del. Code Regs. §7201-6.0 *et seq*.

V. DCRC's and PBF's Violation of the ESA

As discussed above, the ESA also makes it "unlawful for any person" to "cause to be committed" any violation of the ESA's take prohibition;[65] and "person" includes a "corporation . . ."[66] Again, it is well-established that companies are liable when their actions result in the take of listed species.[67] Here, as outlined in Section III *infra*, take of endangered shortnose and Atlantic is occurring under the Refinery's current NPDES Permit and it will continue to occur under the terms of its latest draft renewal NPDES permit. Therefore, as the owners and/or operators of the Refinery, DCRC and PBF are in violation of the ESA's take prohibition for the take of shortnose and Atlantic sturgeon occurring at their facility, as such take has not been authorized by NMFS.

Conclusion

This letter provides formal notice of DRN's and the Delaware Riverkeeper's intent to sue Secretary Small, in his official capacity as Secretary of DNREC, DCRC, and PBF for their respective actions which violate the Endangered Species Act in distinct but related ways.

However, during the pendency of the sixty day notice period, DRN and the Delaware Riverkeeper are open to discussing an amicable resolution to this matter. Please note that any resolution that would avoid litigation would have to ensure that the mandates of the ESA would be achieved in a timely and enforceable fashion, and would need to include an agreement that DNREC would bring the Refinery's draft NPDES permit into full compliance with the ESA

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[65] 16 U.S.C. § 1538 (a)(1)(B) and § 1538 (g).
[66] 16 U.S.C. § 1532 (13).
[67] *See, for example, Animal Welfare Inst. v. Beech Ridge Energy LLC,* 675 F. Supp. 2d 540 (D. Md. 2009).

and/or that the DCRC and PBF would apply for an ESA section 10 incidental take permit and otherwise comply with ESA requirements. If you wish to pursue such discussions in lieu of litigation, please contact one of the undersigned below.

Sincerely,

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the Delaware Riverkeeper
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Bristol, PA 19007

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cc: Secretary Penny Pritzker
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Secretary Sally Jewell
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Eileen Sobeck, Assistant Administrator for Fisheries
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Delaware City Refining Corporation
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The Corporation Trust Company
Corporation Trust Center 1209 Orange St.
Wilmington, DE 19801
Registered Agent of the Delaware Refining Company LLC and
PBF Energy Inc. authorized to receive Service of Process

Eric Glitzenstein
Meyer Glitzenstein & Eubanks LLP
4115 Wisconsin Avenue, N.W. Suite 210
Washington, D.C. 20016

Exhibit A

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
GREATER ATLANTIC REGIONAL FISHERIES OFFICE
55 Great Republic Drive
Gloucester, MA 01930-2276

MAR 18 2015

John DeFriece
Environmental Engineer
Discharges Permits Program
Department of Natural Resources and Environmental Control
89 Kings Highway
Dover, Delaware 19901

Subject: NPDES Permit Application Technical Assistance, Delaware City Refinery (NPDES Permit No. DE0000256)

Dear Mr. DeFriece,

Thank you for the opportunity to review the National Pollutant Discharge Elimination System (NPDES) draft permit for The Delaware City Refinery (DCR), which we received on December 22, 2014. Our comments are provided as technical assistance and assess effects of the intake and discharge of water pursuant to the draft permit on endangered shortnose sturgeon, four endangered Distinct Population Segments (DPSs) of Atlantic sturgeon and one threatened DPS of Atlantic sturgeon, as described further below. Our comments are informed by the facility's application, which we requested from your staff, the draft permit, as well as other available information. Because we expect, as explained below, that the facility is likely to have more than minor detrimental effects on ESA-listed species, we are seeking input from the U.S. Environmental Protection Agency in keeping with technical assistance procedures.

<u>Project Description</u>

The Delaware City Refinery is located at Route 9 and Wrangle Hill in Delaware City, Delaware. The Delaware City Refinery (DCR), Delaware City Power Plant (DCPP), and oil terminal (truck and ship) facilities are co-located at this site. The facility is at approximately river mile 60 on the Delaware River. The facility is designed to process heavy, high sulfur crude oils, and the power plant generates steam and electricity for primary use at the Refinery. The DCPP consists of four gas-fired utility boilers and two gas-fired combined cycle turbines, producing approximately 295 MW of electricity. The plant's discharge consists of once-through non-contact cooling water that is at elevated temperatures of up to 110° Fahrenheit.

Thirty-three (33) outfalls and one cooling water intake structure (CWIS) have been identified in this permit. The design capacity water intake of the facility is 452 million gallons per day (MGD). Under the draft permit, the water intake volume will be reduced to 303 MGD, measured as a 12-month rolling average; however, peak intake volumes at design capacity may still be reached throughout the year, especially during high flow periods. Water comes from the Delaware River through an intake channel named Cedar Creek. The facility's intake structure has essentially not changed since the 1950's when the facility was built and, thus, no fish exclusion screening or other mechanisms are currently in place. Currently, there are trash bars in place, and these are not mounted at the bank of the Delaware River, but rather are located within the intake channel. There is currently a fish return system for fish that can fit through the trash bars. The system does not deliver fish back to the mainstem channel, but instead back into the intake channel. The CWIS is located within the 4,326 foot (0.82 mile) Cedar Creek channel, which is connected to the Delaware River. When fish are returned after intake into the facility, if alive and uninjured, they must swim against the intake flow (average of 0.5 to 1 feet per second) for the 0.82-mile length of Cedar Creek channel to reach the Delaware River again. Any individuals that do not make it back to the Delaware River will eventually be drawn back into the CWIS of the facility due to the velocity of the intake flow, and will likely perish. Most of the facility's other discharges occur directly into the Delaware River, with some discharges going into Cedar Creek, Dragon Run and Red Lion Creek.

The action area is defined as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 CFR § 402.02). The action area consists of all areas where NMFS listed species may be exposed to the effects of the action. For this project, the action area is the Delaware River, Cedar Creek, Dragon Run, and Red Lion Creek, where the zone of initial dilution is present from discharges, and to the point where the influence of the intake structure extends. Intake velocities vary from 0.5 to 1 foot per second under normal conditions, as stated, and may range up to 5 feet per second under low flow/emergency situations. In the past, the DCR has experienced an inability to draw in sufficient cooling water through the intake channel, and intake velocities have had to increase significantly under these situations.

The permittee has chosen to reduce flow volume from 452 MGD to 303 MGD measured as a 12-month rolling average as referenced above, to install modified traveling screens as the Best Technology Available (BTA),[1] and to conduct two years of impingement technology performance optimization studies. In 2011, you had recommended that the DCR install closed-cycle cooling systems (CCCS) to reduce the intake volume, and thus, vastly minimize the impingement and entrainment of aquatic life. However, in December 2014, a penalty settlement agreement between you and the DCR was established. The penalty agreement establishes an early implementation schedule for the installation of site-specific environmental technologies to minimize the impact to aquatic life in the cooling systems which is reflected in the draft permit. Under the agreement, the screens (9 in total) in the first three bays need to be operational on or before May 31, 2015, in the second bay on or before June 30, 2016, and in the third bay on or before June 30, 2017. The DCR must complete installation and operation of an improved fish return system no later than the completion of screens at the third bay.

<u>Species Present in Action Area</u>

The Delaware River Estuary supports a variety of species in the action area, including two sturgeon species listed under the ESA. Our evaluation of the effects of the facility's cooling water system and discharges will include consideration of effects to these listed species. There is currently no critical habitat under our jurisdiction in the action area; therefore, none will be affected by DCR at this time. However, based on a court ordered settlement agreement, we have agreed to send proposed rules designating critical habitat for the Atlantic sturgeon DPSs in the

[1] BTA is a term of art under the Clean Water Act, not the ESA. Generally speaking, even if a facility uses the BTA, incidental take of listed species can still occur.

Greater Atlantic and Southeast Regions by November 31, 2015. Given that the Delaware River contains a spawning population of Atlantic sturgeon, it is possible that critical habitat will be designated in the river. Consequently, we recommend that the permit for this facility include provisions that provide for adaptive management so that if critical habitat for Atlantic sturgeon is designated in the action area, recommended measures to reduce impacts to critical habitat can be implemented.

The Federally endangered shortnose sturgeon (*Acipenser brevirostrum*) occurs in the Delaware River from the lower bay upstream to at least Lambertville, New Jersey (river mile 148). In the Delaware River, the concentrated use of the Scudders Falls region (river mile 133) in the spring by large numbers of mature male and female shortnose sturgeon indicate that the area between Scudders Falls and the Trenton rapids (river mile 139) is a spawning area. Movement to the spawning grounds occurs in early spring, typically in late March, with spawning occurring through early May. After spawning, adult shortnose sturgeon migrate rapidly downstream to the Philadelphia area (river mile 100). After adult sturgeon migrate to the area around Philadelphia, many adults return upriver to between river mile 127 and 134 within a few weeks, while others gradually move to the same area over the course of the summer (O'Herron 1993). By the time water temperatures have reached 10°C, typically by mid-November, adult sturgeon have returned to the overwintering grounds in the Roebling (river mile 124), Bordentown (river mile 129), or Trenton reaches (river mile 133). In the study performed by O'Herron (1993), during the June through September study period, Atlantic and shortnose sturgeon were found to use the area on the west side of the shipping channel between Deep Water Point, New Jersey and the Delaware-Pennsylvania line (approximately river mile 70 to 89). The most frequently utilized areas within this section were off the northern and southern ends of Cherry Island Flats in the vicinity of the Marcus Hook Bar (approximately river mile 72 to river mile 80). The observed movements of acoustically tagged individuals suggest that juvenile shortnose sturgeon broaden their distribution in fall and winter, and may use the entire lower tidal Delaware River from Philadelphia (river mile 100) to below Artificial Island (approximately river mile 50) for overwintering (Brundage & O'Herron 2009). Brundage and O'Herron (2009) suggest that the juvenile shortnose sturgeon in the Delaware River overwinter in a dispersed fashion and not in the dense aggregations typical of adults (O'Herron *et al*., 1993). We do not expect eggs or larvae to be present in the action area because of high salinity levels. The action area is located at river mile 60, where brackish waters are present. We expect juvenile and adult shortnose sturgeon to be present in the Delaware River at river mile 60, while migrating, opportunistically foraging, or overwintering. They may be present in the action area in both the Delaware River and the intake channel, Cedar Creek, as well as in the other discharge channels while opportunistically foraging.

Five DPSs of Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) are listed under the ESA. The Gulf of Maine DPS is listed as threatened; the New York Bight, Chesapeake Bay, Carolina and South Atlantic DPSs are listed as endangered. Atlantic sturgeon originating from any of the five DPSs may be present in the action area. Due to the distance from the spawning grounds (>20 miles), Atlantic sturgeon eggs or larvae, whose occurrence is limited to the fresh waters near the spawning grounds, will not be present in the action area. As noted previously, the action area is located near river mile 60 of the Delaware River, where saline waters are present. Adult Atlantic sturgeon are present in the mainstem Delaware River between May and September; however, subadult Atlantic sturgeon may be present in the river year round. The action area includes not only the Delaware River, but several creeks where discharges occur and Cedar Creek, where the CWIS is located. Based on data (Dadswell *et al.* 1984) that indicate sturgeon will forage opportunistically and move into shallows while searching for prey, they may be present in all portions of the action area.

Potential Effects

Direct Effects

The re-authorization of the DRC NPDES permit is likely to produce more than a minor detrimental effect to both shortnose and Atlantic sturgeon in the Delaware River. In addition to harmful levels of chemicals in discharges from the facility, the CWIS at the facility is likely entraining and impinging various life stages of both sturgeon species, given strong intake velocities in the areas where they are likely foraging. Even with the proposed modifications to the current intake, which has not been altered since the construction of the facility in the 1950's and does not have any screens except for trash racks, there is still the likelihood of impingement, depending on the specifications of the CWIS that are authorized in the final permit. The action area supports shortnose sturgeon overwintering in this portion of the Delaware River, and Atlantic sturgeon are also expected to be present throughout the year.

Impingement occurs when organisms are trapped against cooling water intake screens, racks, or removal equipment by the force of moving water. Generally, fish are impinged when their swimming speed is overtaken by the intake velocity. Laboratory studies have shown that yearling or older shortnose sturgeon (>28 cm) are likely to avoid impingement when intake velocities are 1 ft/sec or less (Kynard et al. 2005). Under certain situations, juvenile shortnose sturgeon may be impinged at 0.7 ft/sec (Deslauriers and Kieffer 2012). The traveling Ristroph screens installed at the Indian Point facility on the Hudson River have near screen velocities of 1 ft/sec (Fletcher 1990), and the majority of fish impinged were between 32 to 71 cm, which is larger than those thought to be at risk of impingement at this velocity. Fatigue or disorientation plays a role in impingements. Because of the length of the intake channel at the DCR, we expect fatigue would play a role for fish that are caught in the intake suction as they try to swim against the flow back to the Delaware River (Deslauriers and Kieffer 2012).

Entrainment occurs when fish, larvae, or eggs are sucked into the CWIS and are small enough to pass by the screen, or the lack of screen allows free passage of individuals into the facility. This also occurs when the swimming speed of the organism is overtaken by the intake velocity. Given the presence in the action area of juvenile and adult shortnose sturgeon while overwintering, as well as the presence of sub-adult and adult Atlantic sturgeon throughout the year, the high intake velocities, the opportunity for fatigue and repeated exposures to the intake flow, and the lack of fish exclusion screening except trash racks, it is likely that juvenile, sub-adult and adult individuals of sturgeon species are being impinged on the trash racks and, in some cases, possibly entrained if they are small enough to fit through the trash racks. The current intake velocity ranges from 0.5 ft/sec to 1 ft/sec in high flow scenarios, and increases to 5 ft/sec in very low flow situations, which have occurred in the past in the action area. These intake velocities, coupled with the 4,326 foot (0.82 mile) intake channel, increase the potential for fish that do get caught in the intake suction to become fatigued if they try to swim back out of the channel. With fatigue, the risk of impingement and, in some cases, entrainment, increases, as shown in laboratory studies (Deslauriers and Kieffer 2012). Because traveling Hydrolox screens are proposed at the facility, a reduction in entrainment may occur because of the small mesh size of the screens, but sturgeon would be vulnerable to repeated exposure to intake flows, impingement against the trash racks, impingement against the traveling screens, and capture in the rotating buckets that collect fish washed off the screens and transfer them to the fish return system. However, we do not presently have sufficient data from the facility to estimate the level of take that has been occurring or any reductions that may be achieved with the installation of the screens. We do not expect eggs or larvae will be present in the action area given salinity levels are too high for it to be suitable habitat for them. As a result, we do not expect eggs or larvae would be impinged or entrained. However, we do expect juvenile and adult shortnose sturgeon and sub-adult and adult Atlantic sturgeon would be subject to various forms of take, such as capture, collection, harassment, injury, and mortality, as a result of repeated exposures to intake flows that disrupt foraging, cause fatigue and/or prevent escape; impingement on trash racks and/or Hydrolox screens; and capture and collection in the travelling screen buckets and fish return system.

The instatement of the Schedule of Compliance for BTA for the CWIS is also a condition of the draft permit. As a result, if Hydrolox screens are required, they will not be installed immediately. Furthermore, they would not address impingement on the trash racks. The longer it takes to reach compliance with the BTA for impingement and entrainment, the longer the period of time sturgeon would be subject to impingement and entrainment. Based on the location of the action area, the overlap with habitat suitable to support both sturgeon species, and our assessment of likely effects, this requirement in the draft permit for phasing in the BTA would enable more than minor detrimental effects to shortnose and Atlantic sturgeon to continue to occur. Again, because we do not have data to estimate the level of take occurring presently at the facility, we cannot estimate any potential reductions in take to be achieved by the installation of screens on the CWIS over the phased compliance period.

Additionally, discharge of heated cooling water and pollutants in effluent may also affect both shortnose and Atlantic sturgeon. Thermal discharges may cause lethal and sublethal effects, create barriers to movement, and/or create indirect effects to benthic food resources. At the DCR, effluent may be heated to 110°F. Sturgeon typically use bottom habitat in deep portions of rivers. However, the river and intake channel are less than 3 feet deep in the vicinity of the intake; thus, if heated effluent is discharged into the intake channel, it is likely making contact with any fish that are caught in the influence of the CWIS. The CWIS and the thermal discharges at Outfall 001 are co-located in the intake channel. Sturgeon may begin to experience physiological stress in waters that are warmer than 82° F, and temperature and dissolved oxygen availability are inversely correlated, which may stress the fish even further (Niklitchek 2001).

Chemical pollutants in the discharges may also affect listed sturgeon species that come into contact with the effluent from the DCR. Given sturgeon are present in the action area, we anticipate that sturgeon will come into contact with the discharges from the DCR. The DCR discharges a number of pollutants that have established effluent limitations in the draft permit including: oil and grease, Total Organic Carbon (TOC), pH, Total Suspended Solids (TSS), Iron, Nitrogen, Phosphorus, Total Residual Chlorine (TRC), bacteria, temperature, Biological Oxygen

Demand (BOD5), Aluminum, Ammonia, Nitrates, Nitrites, Cyanide, Selenium, Vanadium, Phenolic Compounds, and Chromium (total and hexavalent). The draft permit includes a new yearly monitoring requirement for polycyclic biphenols (PCB), furan, and dioxin congeners, and removes some requirements for several outfalls, including requirements for Zinc and Lead monitoring. The draft permit also alters some of the wet weather flows and limits discharge flow volumes.

A variety of effects may result from pollutants contained within the DCR's effluent. TSS may affect aquatic life by directly killing them, reducing growth rates, reducing resistance to disease, preventing the development of fish eggs and larvae, by altering natural migration and movement patterns, and by reducing their ability to forage or limiting the food supply (EPA, 1976). Studies of the effects of turbid waters on fish suggest that concentrations of suspended solids can reach thousands of milligrams per liter before an acute toxic reaction is expected (Burton, 1993). While there have been no directed studies on the effects of TSS on shortnose and Atlantic sturgeon, juveniles and adults of both species are often documented in turbid water and Dadswell *et al.* (1984) reports that shortnose sturgeon are more active under lowered light conditions, such as those in turbid waters. As such, shortnose and Atlantic sturgeon are assumed to be at least as tolerant to suspended sediment as other anadromous fish (up to 580 mg/L TSS). ELS are not expected to be present, but are typically less tolerant. Typically, a TSS discharge monthly average of 30.0 mg/L and a weekly average of 45.0 mg/L will be protective of aquatic life, including Atlantic and shortnose sturgeon.

Bacteria and BOD5 may affect the level of dissolved oxygen in a water body. As bacterial levels and BOD5 rise, dissolved oxygen may be reduced. For both shortnose and Atlantic sturgeon, dissolved oxygen levels less than 5 mg/L may create detrimental sublethal effects, such as effects to foraging, general physiological stress, metabolism, or reproduction (Secor and Niklitschek 2001, 2002; Campbell and Goodman 2004). As levels drop further, lethal effects may occur. Although direct studies on the effects of TRC on Atlantic sturgeon have not been completed, several studies have examined the effects of TRC on other aquatic organisms (Post, 1987; EPA, 1986). An analysis of 24 saltwater species indicated that acute effects, such as mortality, or effects to reproduction and growth, could be experienced anywhere between 0.026 mg/L and 1.418 mg/L. This represents the best available information regarding effects thresholds of aquatic life, including Atlantic and shortnose sturgeon, for TRC. The draft permit indicates a threshold of 0.2 mg/L daily is allowed. This is within the range where effects may be experienced. The level of potential effects would depend on dilution. Chlorination occurs at Outfall 001, which enters the intake channel canal. Because this area may draw sturgeon species into the intakes, and/or not allow escape, it is likely the dilution is not high and fish may be exposed to chlorinated effluents. However, because chlorine is highly reactive and dissipates quickly, levels might not be toxic to Atlantic or shortnose sturgeon.

Oil and grease and other petrochemicals, as well as pollutants such as heavy metals, phenolic compounds, PCBs, furans, and dioxins may adversely affect sturgeon species if present in areas where the fish aggregate or forage, such as in the action area. Toxic pollutants may inhibit growth, metabolism, endocrine function, as well as reproductive success. Limited studies have been performed on listed sturgeon species, but similar studies on salmonids have indicated a high probability for detrimental effects from levels currently set by EPA (NMFS 2014). Salmonids are one of the most sensitive species in riverine ecosystems, and are often used in toxicity studies. Although salmonids and sturgeon differ in some ways physiologically, data has indicated they do possess similar levels of sensitivity to pollutants (Raimondo *et al.* 2008).

Biomonitoring reports from the facility indicate that the effluent concentration at the edge of the regulatory mixing zones (acute, chronic, or both) have been in compliance. Because of this, the new draft permit removes the acute biomonitoring requirement, but instates quarterly chronic biomonitoring. We would encourage the continuation of acute monitoring since several additional monitoring requirements have been added (PCBs, furans, dioxins), to ensure that any adverse effects could be observed through testing and rectified.

Effects to the forage base of both sturgeon species may also produce effects to individual fish in the action area. Sturgeon food sources comprise mainly benthic invertebrates with limited mobility (i.e., mollusks, crustaceans, infaunal worms, etc.). Benthic invertebrates are small and could become entrained in the CWIS, potentially reducing the forage resources in the action area. Similarly, benthic invertebrates may be affected by thermal and/or chemical plumes from the facility. Consistent exposure to chemical plumes may bioaccumulate in filter feeding prey items over time, which may also affect sturgeon species that prey upon them in the long run. However, entrainment or exposure to the plumes are not likely to reduce the abundance of benthic invertebrates to a point where individual sturgeon may be affected because shortnose and Atlantic sturgeon are generalist feeders (Haley 1998; Miller 2004; Collins *et al.* 2008, Dumbauld *et al.* 2008), and may feed opportunistically on a wide range of prey items, over large expanses of available habitat. This may also reduce any risk of exposure to chemical plumes to which prey items in the vicinity of the facility have been exposed. Any loss of benthic invertebrates to entrainment or from thermal or chemical plumes may limit food supplies locally, and may reduce the ability for the action area to support sturgeon carrying capacity in the river near the DCR, but we do not expect that Atlantic or shortnose sturgeon populations will be limited by a local reduction in prey availability in the action area.

Synthesis of Effects

We expect that Atlantic and shortnose sturgeon in the action area are likely to experience more than a minor detrimental effect from the action. Stressors include impingement/entrainment of individuals, disruption of foraging behavior, capture/collection in the proposed travelling screens and fish return system, entrainment of prey items, and the exposure of both sturgeon individuals and prey to thermal and chemical plumes, which all may result in effects such as reduced fitness, reductions in reproductive capacity, physical injury, and mortality in some cases. At this time we do not have sufficient data (e.g. monitoring from the facility specific to ESA listed species, or appropriate proxy data from nearby facilities) to determine the level of adverse effects occurring at the facility or to estimate take resulting from operation of the DCR. As a result, it is not possible to estimate an amount or extent of incidental take resulting from the operation of the facility pursuant to the proposed draft permit reviewed herein. We do not have sufficient information, presently, to determine that the action is not likely to appreciably reduce the likelihood of both the survival and recovery of each of the affected species. In light of this, we do have recommendations to minimize the risk for and severity of effects to both species. We have compiled a number of recommended measures and suggested guidance for your review.

Recommended Measures to Minimize, Monitor and Report on Effects to Sturgeon

We believe that several measures described below are necessary to protect listed species from detrimental effects and to monitor and report on interactions. We have also included some additional suggestions and guidance to assist you in helping to ensure that the CWIS and discharges under the draft permit for the DCR will not create more than minor detrimental impacts and are not likely to jeopardize the continued existence of shortnose and Atlantic sturgeon. We recommend that these control measures and guidance be incorporated in the final permit. If the measures are not included in the final permit and we do not believe that alternative measures suffice to avoid more than minor detrimental effects to listed species, we will contact EPA following the procedures outlined in the 2001 MOA.

As discussed in 2011 in your discussions with DCR, a CCCS was proposed by you as the BTA for the site, and would provide the greatest reduction of volume intake, and thus impingement/entrainment. Less cooling water in the facility would also reduce the flow volume of cooling water out of the facility. Currently, the majority of discharges from the DCR are non-contact cooling water. We recommend the continued consideration of this type of retrofit for this facility because of the location, overlap with ESA listed species habitat and usage areas, as well as because of the very large intake of water and aquatic life. The implementation of this technology may not eliminate impacts altogether, but a significant reduction in intake volume and discharge could significantly reduce detrimental direct and indirect effects. An appropriate monitoring program for this type of retrofit should still be designed to determine if interactions are occurring and, if so, the number, location, type, and severity of interaction as well as the conditions under which they occurred. The facility should be required to report any data to us.

Although modified traveling Hydrolox screens will aid in reducing entrainment, especially since there are currently no screens at the facility, several considerations should be made if this BTA is authorized for the facility. Screen mesh size should be no greater than 2 mm to ensure that entrainment of most small organisms can be prevented, including benthic invertebrates that form the forage base for both shortnose and Atlantic sturgeon. Additionally, trash rack bars should be spaced approximately 3 inches apart. In conjunction with screens, diversion structures are recommended to keep juvenile, sub-adult and adult sturgeon from being impinged on the trash bars and the Hydrolox screens. The diversion structures can be placed near the intake canal to block sturgeon from entering the CWIS. Staff will need to clean and maintain the diversion structure on a daily basis, and diversion structures should be designed so that entrapment of fish does not occur. We also recommend reducing the intake velocity to below 1 ft/sec at all times (0.5 to 0.7 ft/sec is preferred). If this intake velocity is not possible during low flow periods, seasonal shutdowns should be considered to reduce the risk of impingement/entrainment due to very fast intake flows (which could be up to 5 ft/sec). If the diversion system is installed and operates efficiently, seasonal shutdowns may not be necessary during low flow periods. We recommend that plans to update the fish return system are maintained as well, in the event individuals get through the diversion system. The fish return system should allow monitoring of and safe return of fish to the Delaware River away from the intake channel. The monitoring plan, specifically for ESA listed species, should address impingement at the trash bars, and impingement at the screens, collection in the travelling screens' bucket system, transport via fish return system, and whether they are returned to the river safely in order to accurately account for the level of take that is occurring at the facility. The facility should be required to report this information to us on a pre-determined regular basis (i.e., quarterly, semi-annually, etc.).

Thermal and chemical impacts of effluent plumes will also need to be addressed, monitored and reported. If a diversion system is created, then the likelihood that sturgeon could be kept out of the intake channel is higher, and there would be less risk of exposure to heated effluent and pollutants that are released into the intake channel through the outfall located there. There are several additional outfalls throughout the action area that only discharge chemical effluents in accordance with water quality standards for the water body. The direct effects on sturgeon from discharges into the Delaware River may be reduced by the mixing of discharge water and high volumes of river water; however, we do not have sufficient information to conclude that effects will be reduced to no more than detrimental impacts. Efforts should be made to keep TSS, dissolved oxygen, and TRC at the appropriate levels, consistent with water quality standards and current research on pollutant effects to aquatic life, to avoid adverse effects to shortnose and Atlantic sturgeon as well. Any possible further removal of toxic pollutants in the effluent should be considered, as effluents containing toxins, such as hydrocarbons and heavy metals, may also impact listed sturgeon species in the action area, and these chemical constituents may be having more than a minor detrimental effect on shortnose and Atlantic sturgeon. We highly recommend that acute and chronic biomonitoring are continued at the facility, specifically tailored to ESA listed sturgeon species (or appropriate surrogate species). The facility should be required to report data received from this monitoring to us and the state on a regular basis.

Based on the details provided in the draft permit and the permit application, as well as information on ESA-listed species in the area, and our assessment of how they are likely affected by the facility's intakes and discharges under the draft permit, we conclude that the Delaware City Refinery's cooling water intake system and discharges are likely to result in more than minor detrimental effects to ESA listed species under our jurisdiction. We also expect incidental take of ESA listed species is likely under the renewed permit. Therefore, we have recommended measures to reduce impacts as well as to monitor and report interactions. As discussed above, incidental take that occurs at the facility is prohibited, unless it is the subject of an incidental take exemption provided through an ESA Section 7 Biological Opinion/Incidental Take Statement, or unless the facility obtains an ESA Section 10 permit and the level of incidental take is demonstrated to be not likely to jeopardize the continued existence of listed species. We would appreciate the opportunity to discuss with you which scenario would best apply to incidental take at the Delaware City Refinery.

We would appreciate hearing from you prior to your issuance of the final permit as to whether you will include the measures identified in this letter. If you wish to discuss the control measures or possible alternate control measures, or if you have any other questions, please contact Chris Vaccaro at 978-281-2167 or at Christine.vaccaro@noaa.gov. We look forward to our continued work with you on this project.

Sincerely,

John K. Bullard
Regional Administrator

CC: Mark Smith, EPA Region 3
Delaware City Refining Company, LLC
Harriet Nash, NMFS/OPR

Selected References

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Exhibit B

Delaware City
Refining Company

June 9, 2015

Via Electronic Mail and Overnight Mail
Surface Water Discharges Section
Division of Water
Department of Natural Resources and Environmental Control
89 Kings Highway
Dover, Delaware 19901

Re: Delaware City Refinery
Supplemental Comments to Draft NPDES Permit No. DE0000256

Dear Surface Water Discharges Section:

This letter provides supplemental comments on behalf of Delaware City Refining Company LLC ("DCRC") concerning the draft National Pollution Discharge Elimination System ("NPDES") Permit Number DE0000256 (the "Draft Permit") proposed for issuance to the Delaware City Refinery (the "Refinery"). The Delaware Department of Natural Resources and Environmental Control (the "Department") published notice of the Draft Permit on December 14, 2014. The deadline for submitting comments on the Draft Permit has been extended several times and is currently set for June 9, 2015.

DCRC submitted comments on the Draft Permit to the Department on February 12, 2015 (the "February Comments"). After submitting the February Comments, DCRC reviewed comments on the Draft Permit submitted to the Department by the National Marine Fisheries Service ("NMFS"), by letter dated March 18, 2015 (the "NMFS Comments"). DCRC has prepared this supplemental comment letter to address several issues raised by the NMFS Comments.

1. NMFS's Conclusions and Recommendations Regarding the Potential Effects of Impingement and Entrainment are Premature

The Draft Permit includes several proposed conditions applicable to the Refinery's cooling water intake structure. These conditions are intended to reflect the final Section 316(b) regulations. As described in the February Comments, DCRC generally supports the framework proposed by the Department to implement applicable provisions of the Section 316(b) Rule because, except as otherwise identified by DCRC, the conditions are consistent with the final Section 316(b) Rule.

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The NMFS Comments contain several comments relating to the potential presence of sturgeon within the vicinity of the Refinery's cooling water intake structure ("CWIS") and the potential impact that the CWIS may have on sturgeon. Significantly, NMFS does not cite to any site-specific or proxy data confirming the presence of sturgeon in the vicinity of the cooling water intake structure. In addition, NMFS states repeatedly in its comment letter that it has no information upon which it can determine the impact, if any, of the Refinery's CWIS and wastewater discharges on sturgeon species (assuming they are present). Notwithstanding NMFS's perception of a significant information gap, NMFS concludes that the Refinery's cooling water intake structure "is likely to have more than minor detrimental effects" on the identified sturgeon species. NMFS therefore recommends that the Department impose certain measures to minimize, monitor and report the Refinery's effects on sturgeon.

NMFS's conclusions and recommendations are premature in several important respects. First, NMFS's conclusions as to the effect of the Refinery's intake structure necessarily disregards the site-specific data that will be collected by the Refinery over the next several years. EPA designed its final Section 316(b) Rule to require the collection of relevant information to support decision-making regarding impingement and entrainment based on prescribed studies. Specifically, the final Section 316(b) Rule requires regulated facilities to submit detailed studies as part of the facility's permit application (for simplicity, these studies are referred to in this letter as the "Permit Application Studies").[1] Permitting authorities are then required to use the Permit Application Studies as the "information base" for determining appropriate permit conditions consistent with the requirements of Section 316(b). Similarly, EPA expected that the Services would use this "information base" (i.e., the Permit Application Studies) as the basis for fulfilling its technical consultation role. NMFS, however, did not base (and indeed could not have based) its comments on the Draft Permit on the Permit Application Studies, which will take years to develop.

EPA recognized in its final Section 316(b) Rule that the Permit Application Studies will require a long lead time to develop. At the same time, EPA recognized that many facilities, like the Refinery, have been operating pursuant to administratively continued permits for years. If EPA forced permitting authorities to await the results and subsequent review of the detailed Permit Application Studies, then the renewal of an administratively continued permit could be delayed by even more years. Therefore, to "avoid any unnecessary delay" in renewing administratively continued permits, EPA provided permitting authorities with the flexibility to establish interim BTA requirements and require the submission of the Permit Application Studies with the subsequent permit application.

The Draft Permit contains conditions that are consistent with this framework. The Department has proposed an "interim" BTA for the Refinery, which includes, among other things, the submission of the required Permit Application Studies. The Refinery's Permit

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Application Studies will then be submitted with the next permit application and the Department will base its final BTA determination on the information contained within the Studies. NMFS's technical assistance on the Draft Permit should similarly be guided by the same "information base," which at this time is not complete – which NMFS repeatedly acknowledges.[2] By allowing for issuance of the permit to the Refinery prior to commencement of the Permit Application Studies, the Department facilitates the earlier implementation of the Refinery's impingement and entrainment compliance efforts; indeed the actions authorized by the Draft permit are defined by the Section 316(b) Rule to constitute BTA for impingement. NMFS's Comments are therefore premature and should await the results of the impending Permit Application Studies.

Second, the NMFS Comments are premature because they appear to be based on past or current conditions and technology, rather than the technology addressed by the Draft Permit. Specifically, as the Draft Permit reflects, the Refinery is currently replacing the existing traveling screens with new, state-of-the-art Hydrolox traveling water screens. The new Hydrolox screens will undoubtedly result in a substantial improvement in impingement and will improve entrainment rates of any fish species at the Refinery, as compared to the older-generation traveling water screens.

NMFS's evaluation should reflect the implementation of the Hydrolox screens addressed by the Draft Permit. These future conditions will be subject to extensive evaluation through the Permit Application Study process. To the extent that the Permit Application Studies show that the intake structure has an impact on sturgeon (assuming they are even present), then the Department in consultation with NMFS can take action at that time. The NMFS Comments do not justify the imposition of any conditions within the Draft Permit concerning the protection of sturgeon due to the absence of any evidence in support of the projected concerns, disregard of the extensive studies that are about to be initiated (consistent with the Section 316(b) standards and objectives) and the focus on pre-existing equipment configurations rather than the new equipment addressed in the Draft Permit. Any imposition on the Refinery through the permit of requirements based on the NMFS Comments would therefore be overly burdensome, arbitrary and capricious, and inconsistent with the Section 316(b) Rule.

For these reasons, the NMFS Comments are premature and any considerations given to potential impacts to sturgeon should await completion of the site-specific Permit Application Studies.

2. <u>The Refinery is Not Likely to Have More than Minor Detrimental Effects on Sturgeon</u>

The importance of awaiting the results of the Permit Application Studies is highlighted by the fact that, contrary to NMFS's conclusions, there is strong, existing evidence indicating

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[2] 79 Fed. Reg. at 48,381.

that sturgeon species (and its critical habitat) are unlikely to be present in the vicinity of the Refinery's CWIS. DCRC requested that Normandeau Associates review NMFS's conclusions with respect to the presence of sturgeon and the Refinery's potential impact on any life stage of sturgeon or any critical habitat of sturgeon. Normandeau's analysis is attached hereto as "Attachment A." Briefly, Normandeau analysis resulted in the conclusion that the Refinery's CWIS will have no more than minor detrimental effects, if any, on Atlantic and Shortnose Sturgeon. Normandeau's conclusion was based on the following factors:

- No empirical evidence currently exists indicating that either Shortnose or Atlantic Sturgeon have ever encountered the intake at the Refinery.
- Eggs and larvae of sturgeon will not be present in the vicinity of the Refinery based on longitudinal position of these life stages in the tidal Delaware River and existing salinity levels near the Refinery.
- The known distribution of small Shortnose sturgeon is well upriver from the Refinery and freshwater preference for this life stage reinforces this distribution.
- Relatively few larger juvenile and adult Shortnose sturgeon are known to traverse the river reach occupied by the Refinery.
- Any juvenile or adult sturgeon present within the river reach of the Refinery are unlikely to enter the intake canal because of a strong affinity for water depth greater than 8.5 feet (and usually much greater).
- Intensive and extensive impingement studies at nearby Eddystone Generating Station corroborate the unlikeliness of impingement of juvenile or adult sturgeon.
- All life stages of sturgeon will not be impinged at the trash racks because the sturgeon are small enough in limiting dimensions (e.g., head width or depth) to fit through 12-inch trash racks.
- The Refinery's CWIS is unlikely to have a significant impact on sturgeon prey based on the life history characteristics (e.g., sessile, benthic, occurring outside the water column) of Shortnose and Atlantic sturgeon forage items.

3. <u>NMFS' Conclusions and Recommendations Are Based on Several Factual Inaccuracies</u>

The NMFS Comments include several factual inaccuracies that likely influence NMFS's analysis and recommendation. In the table below, DCRC identifies and clarifies some of the factual circumstances relating to the Refinery, including the cooling water intake structure, to assist the Department and NMFS with any future review. Note that DCRC's comments in this context are not intended to provide a sentence-by-sentence response to the NMFS Comments, and the exclusion from this letter of other factual corrections or clarifications should not be construed as DCRC's agreement with NMFS's assertion. DCRC does not believe that a sentence-by-sentence response would be productive at this time. Instead, the table below is focused on several more significant items that are more likely to bear upon NMFS's provision of technical assistance.

NMFS Comment	Response/Clarification
In several places throughout the comments, NMFS states that the Refinery does not have any fish exclusion mechanisms other than the trash rack bars. NMFS Comment Letter, p. 1, 4.	The Refinery does not deploy the trash rack bars as a fish exclusion mechanism. The Refinery's trash rack bars are designed to keep large debris from approaching the intake structure. The trash bars transect Cedar Creek approximately 200 feet in front of the intake structure, with the bars approximately 12 inches apart from each other, which provides plenty of space for any sturgeon present in the creek (if any) to pass through unimpeded. Historically, the Refinery has used nine conventional traveling water screens located in front of the circulating pumps to exclude fish from the intake structure. The wire mesh screens on these traveling water screens have openings ranging from three-eighths inch to three-sixteenths inch. In early 2015, the Refinery replaced three of the conventional traveling water screens with Hydrolox screens that conform in all respects to the standards for traveling screens identified as BTA for impingement in the Section 316(b) Rule. The Refinery will replace the other six conventional traveling water screens with Hydrolox screens and ensure the adequacy of the fish return system over the next two years.
NMFS states that the intake velocities vary from 0.5 to 1 foot per second under normal conditions. NMFS Comment Letter, p. 2.	In May 2001, Normandeau Associates calculated an average approach velocity to the screens of approximately 0.6 feet per second at full pumping rate, and at mean low tide. The approach velocities under normal operating conditions were therefore less than 0.6 feet per second. In addition, the Refinery has since reduced its average water intake volume from 452 million gallons per day ("MGD") to 303 MGD, further reducing corresponding intake velocities.
NMFS refers to low flow/emergency situations that have resulted in intake	Under prior ownership, the Refinery experienced several low flow events caused by the build-up of

velocities as high as 5 feet per second. NMFS Comment Letter, p. 2.	silt in Cedar Creek. DCRC has not experienced similar low flow conditions since the restart of the Refinery in 2011 and does not anticipate these conditions in the future because the Refinery has a dredging permit that requires bi-annual dredging of Cedar Creek to ensure maintenance of appropriate depths. The bi-annual dredging will ensure that velocities remain within normal ranges.
The NMFS Comments state that the Refinery's discharges include "harmful levels of chemicals" and include several recommendations for what concentrations would be protective of sturgeon. NMFS Comment Letter, p. 4-6.	The Department has proposed for inclusion in the Draft Permit effluent limitations or monitoring requirements for the parameters identified by NMFS as potentially harmful to sturgeon. In all cases, the effluent limitations or monitoring requirements were developed by the Department based on applicable effluent limitation guidelines, water quality standards, DRBC requirements, available data, or other state/federal requirements. Moreover, as with the NMFS Comments related to impingement and entrainment, NMFS does not identify a sufficient factual basis for considering the theoretical potential for the presence of sturgeon in establishing effluent limitations, prior to evaluation of relevant information, significantly including that which will be developed through the Permit Application Studies.
NMFS states that the Delaware River and intake channel are less than 3 feet deep in the vicinity of the intake structure. NMFS Comment Letter, p. 5.	DCRC is not aware of any location within the vicinity of the intake structure at which the depth of the intake channel measures 3 feet. The depth of the intake channel generally ranges between 5 feet and 16 feet, depending on the tide and the most recent dredging event.
The NMFS Comments characterize Outfall 001 as co-located with the CWIS in the intake channel. NMFS Comment Letter, p. 5-6.	Outfall 001 ins not co-located with the CWIS in the intake channel. Instead, Outfall 001 discharges to an unnamed creek that flows directly to the Delaware River.
NMFS states that the Refinery discharges heated effluent into the intake channel. NMFS Comment Letter, p. 5.	The Refinery only discharges heated effluent to the intake channel to prevent freezing of the intake structure during limited conditions in the winter. All thermal discharges from the Refinery are made in accordance applicable regulatory standards.
NMFS states that chlorination occurring at	As stated above, Outfall 001 does not discharge to

Outfall 001, which enters the intake channel. NMFS Comment Letter, p. 6.	the intake channel. In addition, all discharges from the Refinery are made in accordance with applicable regulatory standards, including standards for total residual chlorine.

DCRC appreciates the opportunity to provide these supplemental comments on the Draft Permit. We look forward to working with the Department as it pursues final publication of the permit. Should you have any questions on any of the foregoing comments, please contact me at 302-836-6812.

Very truly yours,

Thomas S Godlewski Jr

Thomas S. Godlewski, Jr.
Environmental Manager

Enclosure

Attachment A

APPENDIX A

Prevalence of Sturgeon Species and Habitat Near the Delaware City Refinery

Prepared for:

Delaware City Refinery Company LLC

Delaware City, DE

Prepared by:

Normandeau Associates, Inc.

Stowe, PA

Normandeau Project Number 23515.001

June, 2015

A. Introduction

Normandeau Associates, Inc. (Normandeau) reviewed the letter dated March 18, 2015 sent by Mr. John Bullard, Regional Administrator of the Greater Atlantic Regional Fisheries Office of the National Marine Fisheries Service (NMFS), to Mr. John DeFriece of the Delaware Department of Natural Resources and Environmental Control (NMFS 2015). The following discussion addresses statements made in the NMFS letter concerning the potential presence of sturgeon species in the vicinity of the Delaware City Refinery's (DCR) cooling water intake structure, and whether the intake structure is likely to have more than a minor detrimental impact on any sturgeon species present. The discussion begins by examining the existing evidence concerning the prevalence of each life stage of Atlantic and Shortnose Sturgeon in the vicinity of DCR's intake channel. The discussion also examines other existing information such as the sturgeon's depth preferences, and the depth and velocity characteristics of the intake canal and surrounding area to evaluate whether sturgeon are likely to encounter DCR's intake structure. Finally, the discussion examines existing information concerning the potential impact of the intake structure on sturgeon habitat. Taken together, the existing data and information and known preferences of sturgeon species suggest that the DCR's intake structure is unlikely to have more than a minor detrimental effect on sturgeon.

B. Evaluation of the Potential Presence of Sturgeon Species in the Vicinity of the DCR

1. Eggs and Larvae

Normandeau agrees with the following NMFS conclusion (NMFS 2015, page 3, paragraph 1, lines 24-25), referring to Shortnose Sturgeon "We do not expect eggs or larvae will be present in the action area because of high salinity levels."

In addition to the consideration of salinity, the accuracy of this expectation is bolstered by the known early life stage (ELS) distribution of Shortnose Sturgeon. The Shortnose Sturgeon Status Review Team (2010) reviewed the locations of field collection of eggs and larvae of Shortnose Sturgeon in the Delaware River as well as observations from impingement/entrainment studies and confirmed the presence of shortnose sturgeon larvae and/or eggs between Scudders Falls and Trenton. They note that larvae collected at a Fairless Hills, PA Generation Plant at River Mile (RM) 126 well south of the spawning/rearing area at RM 133-140 may have been carried there during a one day flood event. These locations are all more than 65 river miles upriver from DCR.

With regard to Atlantic Sturgeon, Normandeau agrees with NMFS's conclusion that "Due to the distance from the spawning grounds (>20 miles), Atlantic Sturgeon eggs or larvae, whose occurrence is limited to the fresh waters near the spawning grounds, will not be present in the action area." (NMFS 2015, page 3, paragraph 2, lines 4-6). NMFS's conclusions with respect to the absence of eggs or larvae of both species near the DCR cooling water intake structure are also supported by the following NMFS statements referring to both sturgeon species: "We do not expect eggs or larvae will be present in the action area given salinity levels are too high for it to be suitable habitat for them. As a result, we do not expect eggs or larvae would be impinged or entrained." (NMFS 2015, page 5, paragraph 1, lines 9-11).

2. Juveniles and Adults

The following discussion addresses the presence or potential presence of juvenile and adult Atlantic and Shortnose Sturgeon in the section of the Delaware River that includes DCR. Although there may be some juvenile and adult Atlantic and Shortnose Sturgeon present from time to time within the reach of the Delaware River near DCR, based upon a number of factors, we do not expect that the sturgeon will enter the DCR intake channel where they could be subject to impingement. The first factor is existing empirical data, which indicates that juvenile and adult sturgeon may not be present within the intake channel at DCR. The second factor is the relatively infrequent occurrence of juvenile Shortnose Sturgeon in the reach of river containing DCR. The third factor is the great affinity of both sturgeon species for extremely deep water compared to the presence of the relative shallow area along the river shoreline near DCR and the entrance of the intake canal. Other additional factors limiting the probability of impingement of sturgeon on DCR's intake structure include greater depth of water and consequently lower velocity of water within the intake canal at DCR than has been ascribed to it by NMFS (2015).

a. Empirical Evidence

Empirical data directly from DCR supports the lack of exposure of juvenile and adult Atlantic and Shortnose Sturgeon impingement at DCR. Normandeau (2001) reported on impingement sampling conducted over a two-year period at the DCR. Impingement sampling was performed over one 24-hr period each week from May through October, and one 24-hr period every 2 weeks during November through April, over the 2-year period April 1998 – March 2000. This effort encompassed a total of 1,975 hours of impingement sampling over the course of 79 days of sampling during the 104-week long period.

Each sampling event began by running the screens for about 0.3 hr (or at least two screen rotations) to clean them of previously impinged fish and delineate the start of the 24-hr collection period. The screens were then operated every 6 hrs during the 24-hr sampling period for a minimum of 0.3 hr to clear them of impinged organisms and debris. Impinged fish removed during the sampling event were collected in a basket device that was positioned in the sluiceway immediately after the last traveling screen. The mesh size of the collection device was 1/8-in, which is smaller than the size of the smallest mesh on the intake screens, in order to minimize the risk of an impinged organism passing through the sampling gear. No juvenile or adult sturgeon of either species was collected by impingement sampling, leading to the conclusion that there is less than minor detrimental effect of the CWIS intake operations on sturgeon species.[1]

Examination of impingement data from Eddystone Generating Station (EGS), which is located at River Mile 83, approximately 23 miles upriver from DCR, revealed that, for a period of 6 years (1987-1992), a fish impingement census was conducted for major portions of each year at EGS as part of an interim program of fish monitoring prescribed by agreement between Pennsylvania Department of Environmental Resources (PADER) and Philadelphia Electric Company (PECo, now Exelon) (Waterfield et al. 2008; Kinnell et al. 2008). A sampling schedule was originally constructed to determine if and when "periods of high impingement" occurred, but shortly after the beginning of the study, the study design was changed to sample all impinged fish, thus making the surveys a census of impinged fish. Surveyed days totaled 658 during 1987 through 1989, when the intakes at all four units were in operation. A total of 244 days were surveyed during 1990 when Units 1, 3 and 4 intakes were operational. A total of 243 days were surveyed in 1991, of which 93 occurred when Units 1, 3 and 4 were operational and 150 surveyed days occurred when only the intakes at Units 3 and 4 were operational. During 1992 a total of 363 surveyed days occurred when only Units 3 and 4 intakes were operational. Over the course of 1,508 surveyed days during these six years, no sturgeon were collected by impingement.

In addition to the intensive impingement sampling conducted at EGS from 1987 to 1992, there were two other periods of impingement sampling (Waterfield et al. 2008). During 1976 to 1978, impingement sampling occurred for a period of 20 months. During this period, a total of 162 collections extending for 24 hours each produced a total of 3,888 sampled hours. During this study, an estimated 3,680,350 fish were impinged but no sturgeon were collected. Impingement sampling also was conducted at EGS from April 2005 to March 2006 (Waterfield et al. 2008). By this time, the conventional intakes at Units 1 and 2 had been replaced with wedgewire screens, so only Units 3 and 4 were sampled. During this period, a total of 86 12-hr impingement samples (1,032 hr) yielded an estimated total of 182,000 impinged fish, but no impinged sturgeon were collected.

Data from EGS also corroborates the low potential for the entrainment of early life stages of sturgeon in this portion of the tidal Delaware River, consistent with the discussion in the section above. Entrainment sampling was conducted at EGS weekly from April 18 through August 26, 2005, monthly from September through December 2005, and biweekly from January through March 2006, for a total of 33 sampling dates (Waterfield et al. 2008). Despite the location of the intakes nearer to the channel at EGS relative to those at DCR, no sturgeon eggs or larvae were collected in this study. Because EGS is closer to, or slightly overlaps, the potential spawning

[1] Normandeau (2001) was based on conservative assumptions that likely overestimated impingement levels. Further, the Normandeau (2001) study was conducted under less favorable conditions than exist today (e.g., higher intake flow volumes). Yet even under these less favorable conditions, it is notable that the study did not result in the collection of any sturgeon.

locations of Atlantic Sturgeon, the lack of entrainment reinforces the conclusion that early life stages of sturgeon would not be entrained at DCR.

b. Shortnose Sturgeon – Occurrence in Action Area and Depth Preferences

Shortnose Sturgeon likely have limited occurrence in the action area based upon temporal and spatial distribution as well as depth preference. O'Herron et al. (1995) presented a generalized pattern of Shortnose Sturgeon movement and activities in which all life stages of Shortnose Sturgeon are established more than 35 miles upriver of DCR. The established summer and winter ranges of juvenile and adult Shortnose Sturgeon have since been extended as far downriver as Deepwater, NJ (RM 65) by collection and by acoustical tracking of four individuals (O'Herron et al., 1993; Brundage and O'Herron 2009). The exceptions to this extended generalized distribution appear to be a few adults that migrate downriver as far as Salem Nuclear Generating Station (NMFS 2014) and as far as the mouth of Delaware Bay and beyond and a few juveniles that may utilize the river between river mile 50 and river mile 100 during the late fall and winter based upon one acoustically tracked individual (Brundage and O'Herron 2009).

As stated in (NMFS 2015):

In the study performed by O'Herron (1993), during the June through September study period, Atlantic and shortnose sturgeon were found to use the area on the west side of the shipping channel between Deep Water Point, New Jersey and the Delaware-Pennsylvania line (approximately river mile 70 to 89). The most frequently utilized areas within this section were off the northern and southern ends of Cherry Island Flats in the vicinity of the Marcus Hook Bar (approximately river mile 72 to river mile 80). The observed movements of acoustically tagged individuals suggest that juvenile shortnose sturgeon broaden their distribution in fall and winter, and may use the entire lower tidal Delaware River from Philadelphia (river mile 100) to below Artificial Island (approximately river mile 50) for overwintering (Brundage & O'Herron 2009).

The discussion above suggests the possibility of limited movement of juvenile Shortnose Sturgeon in the vicinity of DCR area for overwintering, but the suggestion is highly speculative. The extension of the fall and winter range to the area downriver from river mile 65 (Deepwater, New Jersey) to Artificial Island (approximately river mile 50) postulated by Brundage and O'Herron (2009) is based upon one acoustically tagged Shortnose Sturgeon. In that study, four Shortnose Sturgeon were acoustically tagged and the other three individuals remained above River Mile 65 and, in fact, spent most of the recorded time in areas well upriver from river mile 65.

Even if a limited number of juvenile Shortnose Sturgeon might be near the action area during late fall and winter, reduced foraging by sturgeon and thus reduced movement should be occurring. In mid-Atlantic areas, including the Chesapeake Bay, and the Delaware River, foraging is believed to occur year-round, though Shortnose Sturgeon are believed to feed less in the winter (J. O'Herron, Amitrone O'Herron, Inc., pers. comm. 2008, as cited in Shortnose Sturgeon Status Review Team, 2010).

More importantly, however, depth selection by both juvenile sturgeon and adult sturgeon likely exclude them from the intake in the DCR action area. The portion of the river immediately adjacent to DCR is shallow and the area at the creek mouth has historically required dredging to allow flow of water into the intake canal. Even with this dredging, the relatively shallow depths near the intersection of the intake canal with the river and just inside the intake canal is likely to greatly discourage movement of adult and juvenile Shortnose Sturgeon into the intake canal.

DCR provided a series of depth soundings from the intake canal and immediately adjacent river that reflect typical annual depth conditions (Attached as five figures in Appendix 1). Dredging of these areas is performed twice annually, usually in late April into May and then again mid-September into October. A set of four stations (Stations 52, 53, 54 and 55) located several hundred feet inside the intersection of the canal intake and the river (adjacent to the Rebar "Rock") where depth was measured following dredging in October 2014 displayed depths of between slightly less than -10.0 feet and -11.0 feet below mean low water. Most of the measured river depths adjacent to the facility but outside the dredged channel of the intake canal could generally be characterized as "less than three feet deep." This relative shallowness of this entire area should therefore tend to discourage depth-seeking Shortnose Sturgeon from moving closer to the intake.

Note that the depths within these four stations near the intersection of the intake canal and the Delaware River (encompassing about 600 linear feet of channel) are not typical of the entire intake canal. Instead, inside and outside of the four stations discussed above, the channel depths at Stations 46 to 68 are relatively uniformly -12.0 to -13.0 feet or more below mean low water across the entire channel up to -16.0 feet below mean low water 200 feet in front of the intake. The greater depths throughout much of the intake channel should reduce current velocity in the intake canal channel, particularly directly in front of the intake structure.

In a prior study, Normandeau Associates (2001) calculated an average approach velocity to the screens of approximately 0.6 feet per second (fps) at full pumping rate at mean low tide. The approach velocities under normal operating conditions were therefore less than 0.6 feet per second. In addition, DCR has since reduced its average water intake volume from 452 million gallons per day (MGD) to 303 MGD, further reducing corresponding intake velocities.

O'Herron et al. (1995) list the range of suitable depths for Shortnose Sturgeon throughout their distribution along the east coast of the United States. The range of suitable depths for juveniles is 15 to 46 feet. The range of suitable depths for adults is 1.6 to 46 feet. However, a distinct difference exists between habitat that might be suitable for some sturgeon in some river systems and the habitats that they regularly occupy in the Delaware River. Relatively little depth collection/preference information is readily available for juvenile or adult Shortnose Sturgeon within the tidal Delaware River. However, O'Herron et al. (1995) state that "Delaware Estuary Shortnose Sturgeon occur virtually always within the deepest water available, typically the navigation channel or near-comparable depths."

Haley et al. (1996) reported the distribution of Shortnose and Atlantic Sturgeon collected from multiple regions of the Hudson River that encompassed a variety of habitats. Juvenile Shortnose Sturgeon were collected at a mean depth of 56.5 feet and, despite sampling of a number of shallow habitats, none were collected in water less than 34.7 feet.

It is of significant importance to note that the single juvenile Shortnose Sturgeon tracked in the Delaware River downriver of RM 65 and as far downriver as approximately RM 44 (which included the reach occupied by DCR at river mile 60) in the study by Brundage and O'Herron (2009) was tagged with a depth-sensing transmitter. A total of 1,979 measurements made over 185 days did not produce a single measurement during which this fish was in water less than 8.5 feet and the mean depth occupied was 35.4 feet.

NMFS's assertion that "the CWIS at the facility (DCR) is likely entraining and impinging various life stages of both sturgeon species" is particularly unlikely for juvenile Shortnose Sturgeon that are small in size, i.e. ≤12 inches (305 mm) in total length (TL). Both longitudinal distribution and preference for greater channel depth for this size and species of sturgeon appear to nearly eliminate the possibility of impingement at DCR. Due to their affinity for deep water, only an extremely limited number of Shortnose Sturgeon of this size have ever been collected from the tidal Delaware River/Estuary since efforts have been made to identify the abundance and spatial distribution of this species in the Delaware River/Estuary over the last 40+ years.

The number of collected small juveniles is so limited that individual catches are notable. A single individual in the range of 8-12" (203-305 mm) TL, was collected in November-December, 1985 in the navigation channel abreast the Burlington Generating Station (J. O'Herron, Amitrone O'Herron, Inc., pers. comm. 2014). In addition, O'Herron referred to unpublished records during the past ten years of a few juvenile Shortnose Sturgeon ≤8" (203 mm) TL from Trenton inside the mouth of Crosswicks Creek to below the Commodore Barry Bridge caught by gillnet, seine and in a crab pot. The individual sturgeon caught by seine, which represented the only individual collected by this type of gear as well as the most down-estuary collection, was collected by the New Jersey Department of Environmental Protection (NJDEP) during their annual seine survey in August of 2004 (NJDEP 2014). This Shortnose Sturgeon, 4.6 inches (117 mm) in length, was collected during a seine haul at the Oldman's Point Station just down-river from the Commodore Barry Bridge. This location is approximately 21 miles upriver from DCR. The sturgeon collected in 2009 was reported by NJDEP to be the only sturgeon ever collected during these seine surveys, which as of 2014 had been occurring annually since 1980. The fact that only one sturgeon has ever been collected in the NJDEP seine surveys strongly affirms the avoidance of shallow water by juvenile sturgeon of both species. Thirty-four years of seine collections from near the Delaware Memorial Bridges (approximately nine miles upriver from

DCR) to Trenton, NJ produced 7,193 seine hauls, collected 1,392,486 fish and yielded just the one Shortnose Sturgeon and no Atlantic Sturgeon.

Juvenile Shortnose Sturgeon of small size and even larger juveniles may be selecting freshwater (well upriver from DCR). Jarvis et al. (2001) demonstrated that 16-month old juveniles grew best at zero salinity and poorest at salinity of 20 parts per thousand. Dadswell (1979) reported Shortnose Sturgeon juveniles prefer freshwater habitats until they reach about 45cm TL or age eight, and juvenile Shortnose Sturgeon are found near spawning and nursery areas upstream in freshwater in the Hudson River (Bain 1997; Dovel et al. 1992; Geoghegan et al. 1992).

c. Atlantic Sturgeon – Occurrence in Action Area and Depth Preferences

Although juvenile Atlantic Sturgeon, unlike Shortnose Sturgeon of small size, inhabit the river reach surrounding DCR, as documented by distributional and tracking studies (Shirey, 1994; Simpson and Fox, 2007) and impingement on the trash racks at Salem Nuclear Generating Station (NMFS 2014), their preference for water of great depth also likely serves to deter them from entering the intake canal at DCR.

As noted above, Haley et al. (1996) reported the distribution of Shortnose and Atlantic Sturgeon collected from multiple regions of the Hudson River that encompassed a variety of habitats. Wild juvenile Atlantic Sturgeon were collected at a mean depth of 74.8 ft and stocked Atlantic Sturgeon were collected at a mean depth of 54.5 ft. Despite sampling of a number of shallow habitats, no wild juvenile Atlantic Sturgeon were collected in water less than 23.0 ft in depth, and no stocked Atlantic Sturgeon were collected in water less than 39.4 ft in depth. The affinity of juvenile Atlantic sturgeon for deeper water is consistent with earlier reports for the Delaware River (Lazzari et al., 1986; Shirey, 1996) and other rivers (Pottle and Dadswell, 1979; Bain, 1997). Moser and Ross (1995) reported that juvenile Atlantic sturgeon in the lower Cape Fear River, NC typically preferred water >98.4 ft deep.

In a recent collection effort in the Delaware River, Brundage and O'Herron (2009) collected seven juvenile Atlantic Sturgeon between Wilmington, DE (RM 74) and the Marcus Hook Anchorage (RM 81). The depths of collection ranged between 15.1 and 47.6 feet with a mean depth of 39.1 feet. One of the Atlantic Sturgeon was tagged with a depth-sensing transmitter and was successfully tracked for 46 days. Depths recorded for this sturgeon (n=589 measurements) ranged from 8.5-52.5 ft and averaged 38.5 ft.

In a study that tracked acoustically tagged juvenile and adult Atlantic Sturgeon within the tidal Delaware River including the reach near DCR, a dramatic selection for depth over substrate occurred (Simpson and Fox, 2007). These Atlantic Sturgeon selected depths exceeding 26.3 ft approximately 86% of the time and depths exceeding 46 ft approximately 25% of the time. Relative frequency occupying water less than 6.6 ft in depth was less than 1 percent.

The depth and velocity characteristics of the intake canal and surrounding area discussed in the above section concerning Shortnose Sturgeon is equally applicable to discouraging movement of juvenile and adult Atlantic Sturgeon into the intake canal, as well as the availability of refuge for the sturgeon should it nonetheless venture into the canal by virtue of greater depth and reduced velocity.

d. Comparison to Salem Nuclear Generating Station

Salem Nuclear Generating Station (SNGS) provides a contrast to DCR in terms of an intake that is located in relatively deep water compared to the intake located within the intake canal at DCR. It also provides additional information about occurrence and lifestage of sturgeon in the portion of the river near DCR. SNGS is located on the southern end of Artificial Island, NJ, on the eastern shore of the Delaware River Estuary and approximately 6 miles downriver from DCR. Artificial Island is a peninsula created from a natural sand bar in the early 1900's by the US Army Corps of Engineers. Most of the river in this area is less than 18 feet deep, however, the navigation channel has depths of up to 40 feet near Artificial Island. There is a long history of impingement of adult Shortnose Sturgeon at SNGS (1978-2013) and a much shorter history of juvenile Atlantic Sturgeon (2011-2013) (NMFS 2014).

NOAA (2015) Chart 12311 shows the depths in front of the intakes at SNGS are between 10 and 18 ft mean low water, with adjacent depths exceeding 25 feet. However, a bathymetric survey performed on August 20, 2010 recorded elevations which were as extreme as -42 feet (or 42 feet below mean sea level) NAVD88 directly in front of the intake (Normandeau Associates, 2010, unpublished data). These depths are in contrast to the general shallowness of the river at entrance to the intake canal at DCR.

At SNGS, impingement of Shortnose Sturgeon has occurred sporadically since 1978 (NMFS 2014). A total of 25 Shortnose Sturgeon has been collected from the trash racks over a period of 35 years. No Shortnose Sturgeon have been collected from the travelling screens, indicating that even with the deep water present near the SNGS juvenile Shortnose Sturgeon are either not often present in the area or capable of resisting the intake velocities. According to criteria set by Dadswell et al. (1984), Shortnose Sturgeon smaller than a fork length of 510 mm can be considered juveniles, so by this criteria all individuals listed in Table 10 (NMFS 2014) can be considered adults. This designation is corroborated by Bain (1997) who utilizes a fork length of >500 mm as the criteria for adults. NMFS (2014) concluded that "the only impingement at the trash racks that we would anticipate is adult or large juvenile shortnose sturgeon that are dead or stressed and, therefore, unable to avoid the current caused by the facility's water intake and swim away from the trash racks." The stated intake velocity at the trash racks of approximately 1 fps is marginally greater than the normal intake velocities at DCR.

The infrequent impingement of adult Shortnose Sturgeon (less than one impinged per year) speaks to the infrequent occurrence of the species this far downriver. In addition, impinged adult Shortnose Sturgeon were judged to be dead or stressed and therefore unable to avoid the current caused by the facility's water intake. As previously discussed, all Shortnose Sturgeon collected from the trash racks were adult, as determined by criteria set forth by Dadswell et al. (1984) and Bain (1997), reinforcing the concept that juvenile Shortnose Sturgeon are unlikely to frequent the river reach below RM 65. DCR is located at approximately RM 60.

Impingement of Atlantic Sturgeon at the travelling screens at SNGS has been documented to have occurred on just four occasions, with one sturgeon impinged in each of the years, 2006, 2007, 2011 and 2013 (NMFS 2015). In addition, 23 Atlantic Sturgeon were collected from the trash racks over a three year period, 2011-2013. According to the criteria set by Dovel and Berggren (1983), Atlantic Sturgeon less than or equal to 1200 mm fork length can be considered juveniles. According to this criteria, all the sturgeon collected from the trash racks would be considered juveniles. Utilizing the criteria set by Bain (1997), >1350 mm for non-spawning adults, 100% of these individuals would also be considered juveniles. Therefore, some discussion above included potential encounters of adult Atlantic Sturgeon with the intake at DCR. However, based upon the information provided by studies at SNGS where no adult Atlantic Sturgeon have been encountered, it is extremely unlikely that adult Atlantic Sturgeon would either encounter the intake at DCR. If they did, however, encounter the area near the intake intake, they would be of sufficient size and power to swim away.

There may be unique characteristics of the trash racks and the associated cleaning system (trash rake) at SNGS in conjunction with a deepwater intake that results in impingement of Atlantic Sturgeon at the trash racks. The following description of the condition and possible mechanism for impingement of Atlantic Sturgeon at the trash racks at SNGS is presented in NMFS (2014):

Sixteen of the 23 Atlantic sturgeon removed from the Salem intakes were alive (approximately 70%). With the exception of one live fish that had a significant laceration, the other live fish exhibited minor injuries (abrasions), these did not likely affect the fishes swimming ability. Given the size of these fish and the minor injuries exhibited, we expect that these fish were not actually stuck on the racks but were close enough to be captured by the trash rake as it moved down the rack.

Approximately 30% of these sturgeon appeared to have suffered substantial injuries or been dead prior to being impinged on the trash racks. However, because approximately 70% of these sturgeon were considered to not have suffered injuries sufficient to impair their ability to swim away from the trash racks prior to impingement, and intake velocities were not high enough to cause direct impingement, it seems that some unique characteristic of the intake may be causing impingement, possibly as suggested by NMFS, movement of the trash rake. A trash rack cleaning system of the size at SNGS is not present at DCR.

e. Other Factors Limiting Potential Impact on Juvenile and Adult Sturgeon

(NMFS 2015, page 4, paragraph 1, lines 3-5), concludes "the CWIS at the facility is likely entraining and impinging various life stages of both sturgeon species, given strong intake velocities in the areas where they are likely foraging." This statement assumes both high intake velocities in the canal and near the intake structure, and that sturgeon are present adjacent to the intake. The available evidence does not support either assumption. The NMFS letter states that intake velocities vary from 0.5 to 1 fps under normal conditions, and may range up to 5 fps under low flow/emergency situations. Under the flow rate identified by NMFS for "normal conditions," fish would not be subjected to high velocities. Furthermore, as discussed extensively above, recent depth sounding information does not appear to indicate that extreme shallow depths that would create high flow velocities occur within the intake canal. Calculated approach velocity in 2001 was approximately 0.6 fps and should be less now due to the reduced volume of cooling water withdrawal. The 5 fps value cited by NMFS is not reflective of current conditions in the intake canal. In addition, for the reasons addressed above, available data does not support the assumption that sturgeon are likely to be present within the intake canal during either normal or low flow conditions.

C. Habitat

According to NMFS (2015) (page 7, paragraph 2, lines 1-4) "Effects to the forage base of both sturgeon species may also produce effects to individual fish in the action area. Sturgeon food sources comprise mainly benthic invertebrates with limited mobility (i.e., mollusks, crustaceans, infaunal worms, etc.). Benthic invertebrates are small and could become entrained in the CWIS, potentially reducing the forage resources in the action area." This statement is inconsistent with several lines of evidence.

Sturgeon prey species are found on the bottom and are generally immobile or have limited mobility and are not within the water column. Therefore, they are less vulnerable to potential impingement or entrainment because they do not generally occur within the water column. The exceptions to this characterization are the larval stages of bivalve mollusks, commonly known as clams, which are discussed below.

The benthic macroinvertebrate community in the Delaware River near the DCR is diverse, with densities exceeding 5,000 macroinvertebrates per meter^2 at some locations sampled in 2001 and 2002 (Hall et al. 2005). Bivalves, which are reported to be a significant component of the diet of Shortnose Sturgeon, were represented by five species. *Rangia cuneata* by far was the dominant bivalve species collected in terms of numbers and biomass, with densities exceeding 500 individuals per meter^2 at some locations. However, it is uncertain how many *Rangia cuneata* are nutritionally available to sturgeon because these clams can grow to approximately 70 millimeters shell length and the shells are very strong (Ebersole and Kennedy 1994). In addition, when given a choice of dietary items, it appears that clams constitute a very small percentage of the diet of Atlantic Sturgeon. Although *Rangia* are not present off the central coast of New Jersey (based on salinity tolerance), a very similar mollusk, *Mercenaria mercenaria* is present. This clam comprised only 5.9% and *Tellina agilis* comprised < 0.1% of the stomach contents of Atlantic Sturgeon during the fall along the central coast of New Jersey (Johnson et al. 1997). During the other three seasons of the year, no clams were present in the stomach contents. Shortnose Sturgeon are much more likely to include clams as a substantial portion of their diet; however, as discussed above, both adult and juvenile Shortnose Sturgeon are unlikely to traverse the area in the vicinity of DCR.

There is some potential for entrainment of several of the bivalve species in the Delaware River near the DCR intake because they have planktonic early life stages, but there is no reasonable potential for impact on the populations. These species are: *Macoma balthica, Mytilopsis leucophaeta,* and *Rangia cuneata. Rangia cuneata* would be of greatest interest because it is the most abundant bivalve, based on 2001 and 2002 macroinvertebrate sampling (Hall et al. 2005). Eggs and sperm are broadcast into the water column, fertilization occurs in the water column, and the resultant larvae are presumed to be in the water column for several days before settling to the bottom. However, these larvae are likely present in the area in quantity of several trillions and quickly leave the water column. Two periods of spawning of *Rangia cuneata* were observed in the James River in Virginia, one in early through mid-summer and a second longer period in late fall and early winter (Cain 1975). It is assumed that spawning would occur during the same periods in the Delaware River at the DCR. Since spawning of clams is protracted and occurs in more than one season and larvae occur in immense quantities and quickly leave the water column, loss of a small percentage of larvae would be of no consequence.

The Endangered Species Act Section 7 Consultation regarding the Salem and Hope Creek Nuclear Generating Station (NMFS 2014) concludes that "any loss of potential shortnose sturgeon prey due to impingement or entrainment is insignificant." The consultation further concluded that "Based on the determination that the past and continued operation of Salem is likely to have only insignificant impacts on species chosen to represent the macroinvertebrate community, and given the life history characteristics (sessile, benthic, occurring outside of the water column) of shortnose and Atlantic sturgeon forage items which make impingement and entrainment unlikely, any loss of potential shortnose sturgeon prey due to impingement or entrainment is insignificant".

This determination would certainly also apply to DCR where a substantially smaller volume of cooling water is utilized. Given the life history characteristics (sessile, benthic, occurring outside of the water column) of Shortnose and Atlantic Sturgeon forage items which make impingement and entrainment unlikely, any loss of potential sturgeon prey due to impingement or entrainment would therefore be insignificant.

D. Conclusions

Based upon available data concerning sturgeon in the Delaware River and Estuary, as well as other information known about these species, we conclude that there will be no more than a minor detrimental impact upon sturgeon due to interaction with the DCR intake.

There exists no empirical evidence that any life stage of either Shortnose or Atlantic Sturgeon have ever encountered the intake at DCR. Longitudinal position of eggs and larvae in the tidal Delaware River and existing salinities in the vicinity of DCR lead to the conclusion reached by both NMFS and Normandeau that these life stages will not be present at DCR.

The known distribution of small (< 12 inch, 305 mm) Shortnose Sturgeon is well upriver from DCR and freshwater preference of this life stage reinforces this distribution. Relatively few larger juvenile and adult Shortnose Sturgeon are known to traverse the river reach occupied by DCR. The affinity of juvenile and adult Shortnose and Atlantic Sturgeon for water depth greater than 8.5 ft, and usually <u>much</u> greater, will tend to isolate these life stages from impingement at DCR where surrounding depths are shallow. Intensive and extensive impingement studies at nearby Eddystone Generating Station corroborate the unlikeliness of impingement of juvenile or adult sturgeon.

An average approach velocity to the screens of approximately 0.6 fps at full pumping rate at mean low tide was calculated in 2001. The approach velocities under normal operating conditions were therefore less than 0.6 feet per second. In addition, DCR has since reduced its average water intake volume from 452 million gallons per day (MGD) to 303 MGD, further reducing corresponding intake velocities. Therefore, should sturgeon venture into the intake canal, both the depth and velocity characteristics of the intake canal should provide refuge for the sturgeon.

All life stages of both species of sturgeon will not be impinged at the trash racks, because they are small enough in limiting dimensions (e.g., head width or depth) to fit through 12-inch trash racks.

Given the life history characteristics (sessile, benthic, occurring outside of the water column) of Shortnose and Atlantic sturgeon forage items which make impingement and entrainment unlikely, any loss of potential shortnose sturgeon prey due to impingement or entrainment is insignificant.

These factors together lead to a conclusion there likely will be no more than minor detrimental, if any, effect of the DCR cooling water intake operations upon Atlantic and Shortnose Sturgeon.

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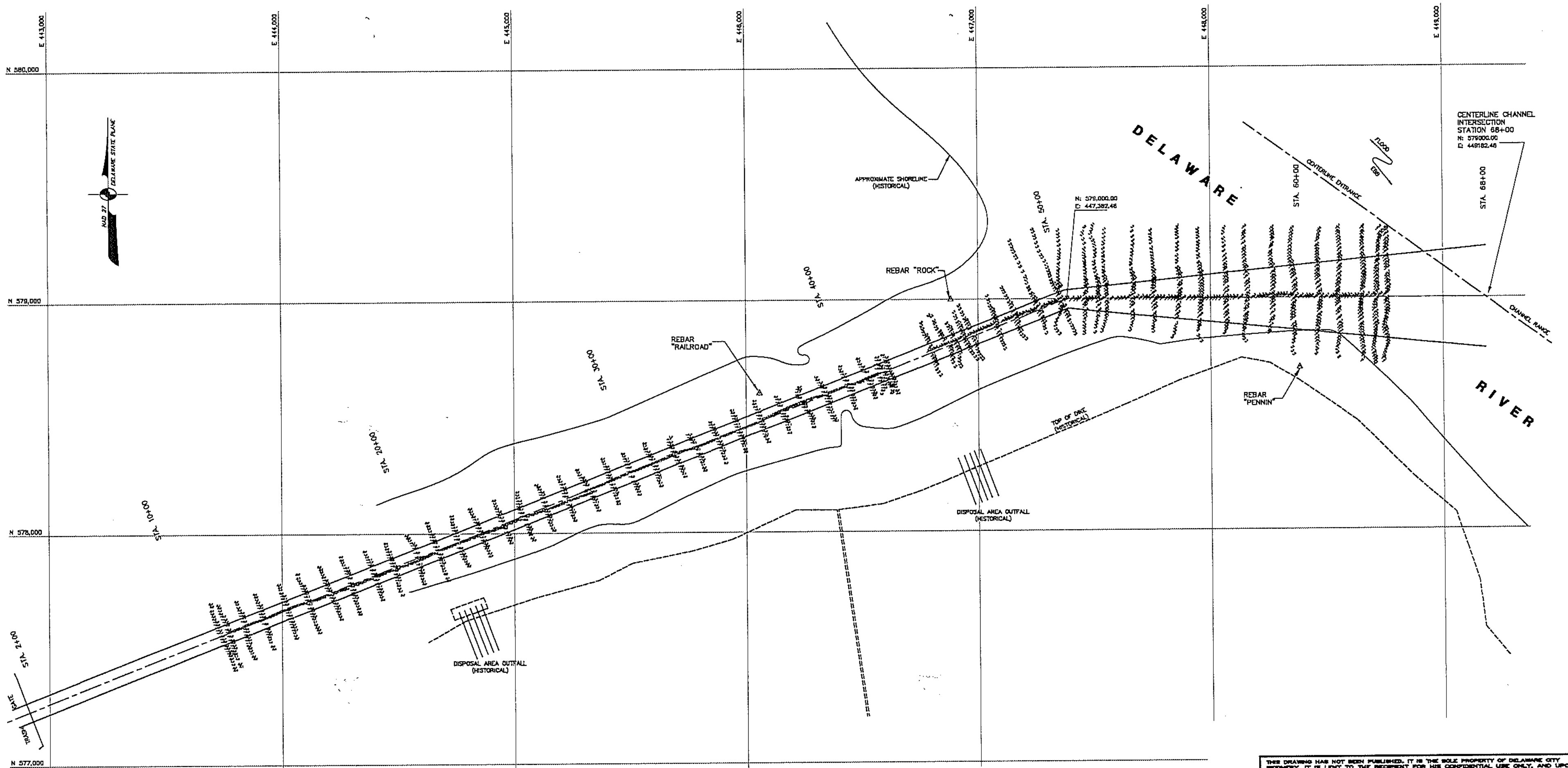

LEGEND:

Spot elevation in feet

NOTES:

1. Pre-Dredge soundings were surveyed on September 24, 2014 from Station 2+00 to Station 68+00. Post-Dredge Soundings were surveyed on November 11, 2014 from Station 62+70 to Station 45+80, and November 21, 2014 from, Station 41+40 to Station 11+20.
2. All measurements are in U.S. Survey feet.
3. Horizontal Datum: Delaware State Plane, NAD27.
4. Vertical Datum: Refinery Mean Low Water = 0.00'
5. All elevations were derived from tide corrected soundings and reduced to Refinery Mean Low Water Datum.

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ENGINEERS – PLANNERS – SURVEYORS

FILE NAME	REVISION	SHEET
21923.13–HYDRO–03		1 of 5
PERMANENT FILE	APPROVED BY	

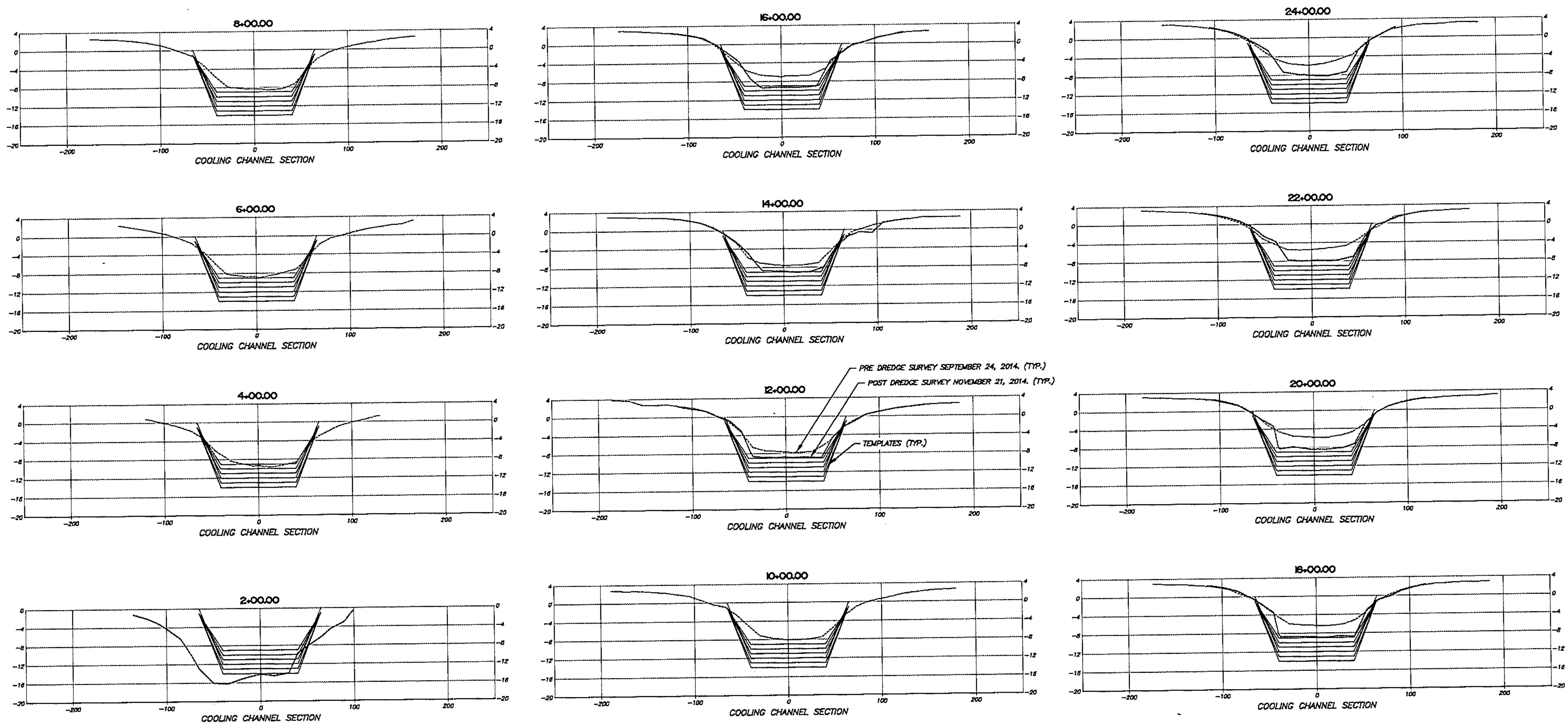
UNIT #15 – WATER TERMINAL AREA COOLING WATER INTAKE CANAL PRE–DREDGE SOUNDINGS

Delaware City Refining Company

WA#	
MOC#	M
PROCESS	
OPERATIONS	
PROCESS CONTROL	
ENGINEERING	
ORIGINAL ISSUE	APPROVED/DATE

WORK ORDER#	AUTOCAD FILE	ENGINEER	DESIGNER	DRAFTSPERSON
21923.13	HYDRO–03	XXX	XXX	JCW
SCALE 1"=200'	DRAWING NUMBER			REVISION
DATE 11/21/2014	XXXX – XXXX – XD – XXXX			

REV.	DATE	DESCRIPTION	BY	REV'WD	APPR'D	REV.	DATE	DESCRIPTION	BY	REV'WD	APPR'D	REFERENCE DWG NUMBER	REFERENCE DWG TITLE



LEGEND:

- - - - PRE DREDGE SURVEY SEPTEMBER 24, 2014.
—— -9'-10'-11'-12'-13'-14' TEMPLATE
—— POST DREDGE NOVEMBER 21, 2014

NOTE: POST-DREDGE SOUNDINGS WERE SURVEYED ON NOVEMBER 11, 2014 FROM STA. 82+70 TO STA. 45+80, AND NOVEMBER 21, 2014 FROM STA. 41+40 TO 11+20.

SCALES: HOR. 1" = 50'
VERT. 1" = 10'

VANDEMARK & LYNCH, INC.
ENGINEERS – PLANNERS – SURVEYORS

FILE NAME: 21923.13-HYDRO-03
SHEET 2 of 5

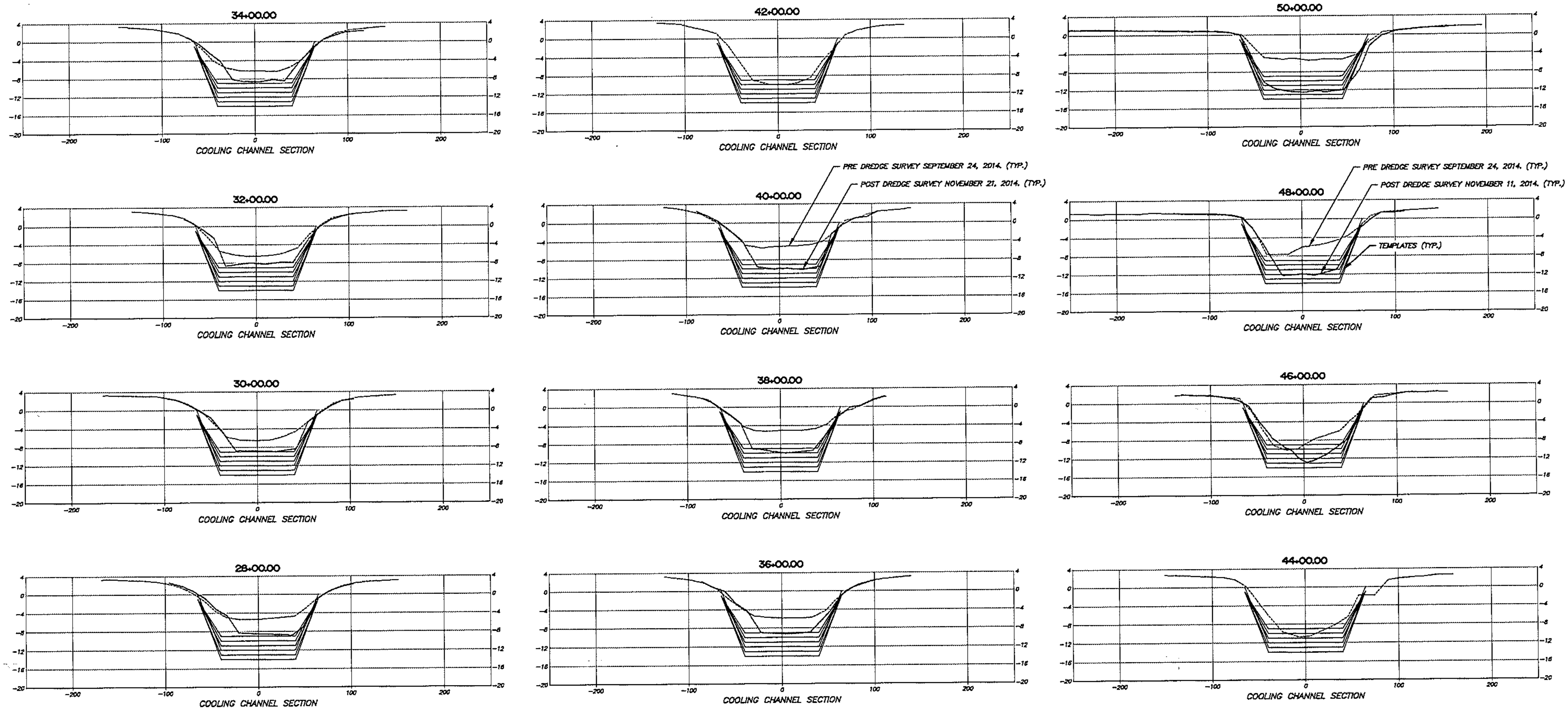
UNIT #15 – WATER TERMINAL
AREA COOLING WATER INTAKE CANAL
CROSS SECTIONS STA. 2+00 STA. 24+00

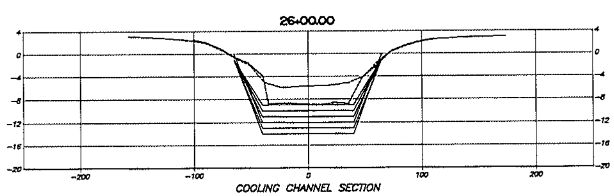
Delaware City
Refining Company

WA#
MOC# M

WORK ORDER#	AUTOCAD FILE	ENGINEER	DESIGNER	DRAFTSPERSON
21923.13	HYDRO-03	XXX	XXX	JCW

SCALE: AS NOTED
DATE: 11/21/2014
DRAWING NUMBER: XXXX – XXXX – XD – XXXX
REVISION





LEGEND:

- PRE DREDGE SURVEY SEPTEMBER 24, 2014.
- -8'-10'-11'-12'-13'-14' TEMPLATE
- POST DREDGE NOVEMBER 11, 2014
- POST DREDGE NOVEMBER 21, 2014

NOTE: POST-DREDGE SOUNDINGS WERE SURVEYED ON NOVEMBER 11, 2014 FROM STA. 62+70 TO STA. 45+80, AND NOVEMBER 21, 2014 FROM STA. 41+40 TO 11+20.

SCALES: HOR. 1" = 50'
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UNIT #15 – WATER TERMINAL
AREA COOLING WATER INTAKE CANAL
CROSS SECTIONS STA. 26+00 STA. 50+00

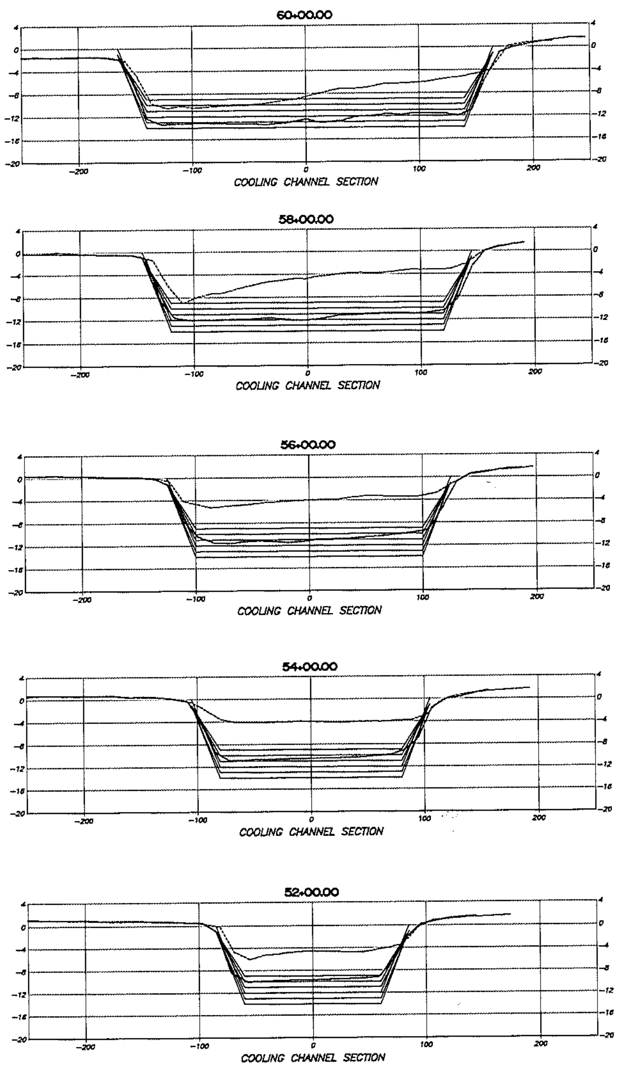
Delaware City
Refining Company

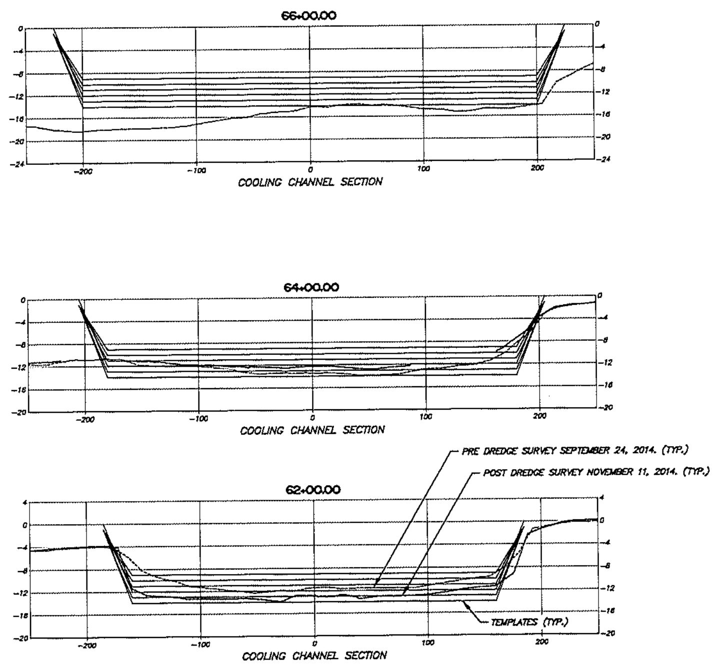
WA#	
MOC#	M
PROCESS	
OPERATIONS	
PROCESS CONTROL	
ENGINEERING	
ORIGINAL ISSUE	APPROVED/DATE

WORK ORDER#	AUTOCAD FILE	ENGINEER	DESIGNER	DRAFTSPERSON
21923.13	HYDRO–03	XXX	XXX	JCW

SCALE	DRAWING NUMBER	REVISION
AS NOTED	XXXX – XXXX – XD – XXXX	
DATE 11/21/2014		

REV.	DATE	DESCRIPTION	BY	REV'WD	APPR'D	REV.	DATE	DESCRIPTION	BY	REV'WD	APPR'D	REFERENCE DWG NUMBER	REFERENCE DWG TITLE





LEGEND:

- - - - - - PRE DREDGE SURVEY SEPTEMBER 24, 2014.
——— -8'-10'-11'-12'-13'-14' TEMPLATE
——— POST DREDGE NOVEMBER 11, 2014

NOTE: POST-DREDGE SOUNDINGS WERE SURVEYED ON NOVEMBER 11, 2014 FROM STA. 82+70 TO STA. 45+80, AND NOVEMBER 21, 2014 FROM STA. 41+40 TO 11+20.

SCALES: HOR. 1" = 50'
VERT. 1" = 10'

VANDEMARK & LYNCH, INC.
ENGINEERS – PLANNERS – SURVEYORS
4305 MILLER ROAD
WILMINGTON, DE 19802/(302) 764-7635
WWW.VANDEMARKLYNCH.COM

FILE NAME	REVISION	SHEET
21923.13-HYDRO-03		4 of 5

PERMANENT FILE	APPROVED BY

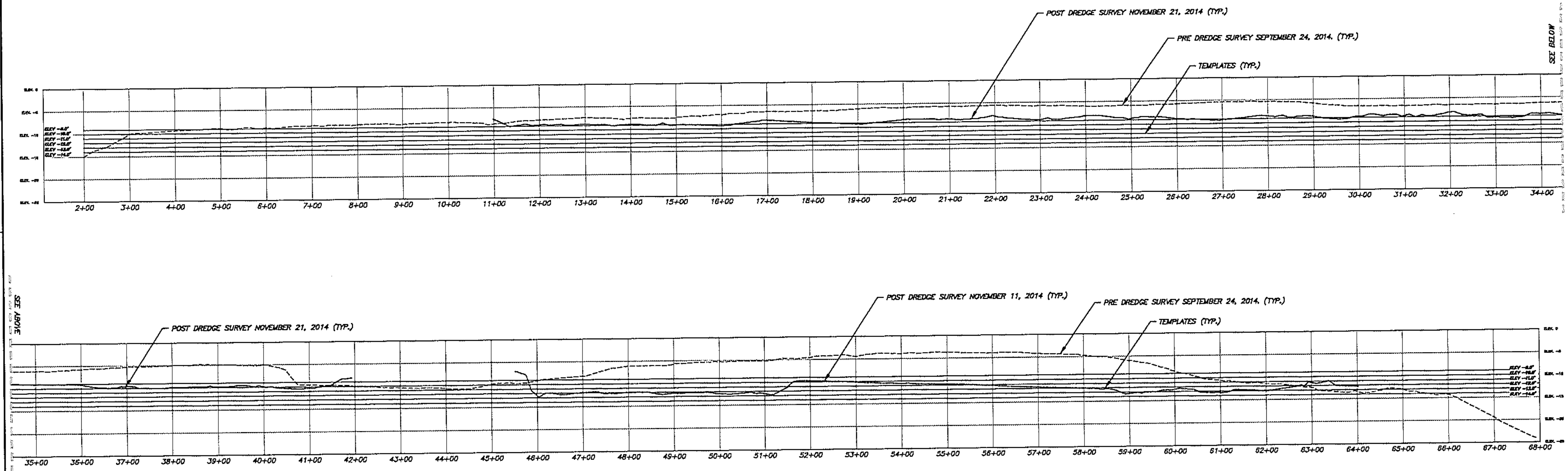
UNIT #15 – WATER TERMINAL AREA COOLING WATER INTAKE CANAL CROSS SECTIONS STA. 52+00 STA. 66+00

Delaware City
Refining Company

WA#	
MOC#	M
PROCESS	
OPERATIONS	
PROCESS CONTROL	
ENGINEERING	
ORIGINAL ISSUE	APPROVED/DATE

WORK ORDER#	AUTOCAD FILE	ENGINEER	DESIGNER	DRAFTSPERSON
21923.13	HYDRO-03	XXX	XXX	JCW
SCALE AS NOTED	DRAWING NUMBER			REVISION
DATE 11/21/2014	XXXX – XXXX – XD – XXXX			

REV.	DATE	DESCRIPTION	BY	REV'WD	APPR'D	REV.	DATE	DESCRIPTION	BY	REV'WD	APPR'D	REFERENCE DWG NUMBER	REFERENCE DWG TITLE



SCALES: HOR. 1" = 100'
VERT. 1" = 10'

NOTE: POST-DREDGE SOUNDINGS WERE SURVEYED ON NOVEMBER 11, 2014 FROM STA. 62+70 TO STA. 45+80, AND NOVEMBER 21, 2014 FROM STA. 41+40 TO 11+20.

LEGEND:
- PRE DREDGE SURVEY SEPTEMBER 24, 2014.
- -8'-10'-11'-12'-13'-14' TEMPLATE
- POST DREDGE NOVEMBER 11, 2014
- POST DREDGE NOVEMBER 21, 2014

VANDEMARK & LYNCH, INC.
ENGINEERS – PLANNERS – SURVEYORS

FILE NAME: 21923.13–HYDRO–03
SHEET 5 of 5

UNIT #15 – WATER TERMINAL
AREA COOLING WATER INTAKE CANAL
CL PROFILE STA. 2+00–STA. 68+00

Delaware City
Refining Company

WA#	
MOC#	M
PROCESS	
OPERATIONS	
PROCESS CONTROL	
ENGINEERING	
ORIGINAL ISSUE	APPROVED/DATE

WORK ORDER#	AUTOCAD FILE	ENGINEER	DESIGNER	DRAFTSPERSON
21923.13	HYDRO–03	XXX	XXX	JCW
SCALE AS NOTED	DRAWING NUMBER			REVISION
DATE 11/21/2014	XXXX – XXXX – XD – XXXX			

REV.	DATE	DESCRIPTION	BY	REV'WD	APPR'D	REV.	DATE	DESCRIPTION	BY	REV'WD	APPR'D	REFERENCE DWG NUMBER	REFERENCE DWG TITLE

Exhibit C

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
GREATER ATLANTIC REGIONAL FISHERIES OFFICE
55 Great Republic Drive
Gloucester, MA 01930-2276

SEP - 3 2015

John DeFriece
Environmental Engineer
Discharges Permits Program
Department of Natural Resources and Environmental Control
89 Kings Highway
Dover, Delaware 19901

Subject: NPDES Permit Application Technical Assistance, Delaware City Refinery (NPDES Permit No. DE0000256)

Dear Mr. DeFriece,

As a follow up to the conference call on July 23, 2015, between the National Marine Fisheries Service (NMFS), Delaware Department of Natural Resources and Environmental Control (DNREC), and the Environmental Protection Agency (EPA), this letter summarizes important aspects of the call, confirms a change in the recommended measures we agreed to on the call, and provides additional guidance to assist you in your draft permit process for the Delaware City Refinery (DCR), in Delaware City, Delaware.

Previously, in our March 18, 2015 technical guidance letter, we recommended a number of control, monitoring, and reporting measures for your consideration with regard to your draft permit for the DCR. Those measures are summarized again, below, and are designed to ensure the facilities' impacts on species, protected by the Endangered Species Act (ESA), amount to no more than minor detrimental impacts. While we are not requiring that you include those measures in the permit, it is our understanding that including them in their entirety in the permit will allow the facility to be eligible for incidental take coverage under the May 19, 2004, Biological Opinion and Incidental Take Statement (ITS) NMFS Headquarters issued to the EPA for its Clean Water Act 316(b) rule. Pursuant to ESA section 7(o)(2), coverage under the ITS for a specified amount of take would provide an exemption from the ESA's prohibition against take[1] in the event species listed by us under the ESA are impinged, entrained, or otherwise taken at the DCR. As mentioned on our July 23 call, if all of our recommended measures are not included in the permit, then take coverage may be available through the ESA Section 10(a)(1)(B) permitting process.

Our suggested control measures were detailed in our March 18, 2015 letter as follows:

1) Continued consideration of cooling tower retrofit with appropriate monitoring.
2) If modified traveling Hydrolox screens are used then the following should be followed:
    a. No greater than 2 mm mesh be used,
    b. Trash bars spaced 2 inches apart,

[1] "Take" defined in ESA section 3(19) means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct.

c. Diversion structures recommended to block sturgeon's entrance into intake channel,
d. Intake velocity of less than 1 foot per second (fps) (maximum) at all times (preferred intake velocity of between 0.5 and 0.7 fps), and
e. If intake flows are not possible at this velocity, seasonal shutdowns should be considered. If effective diversion structures are installed, seasonal shutdowns may not be necessary if intake velocities are above 1 fps.

3) Update fish return system so that any fish taken into the facility will be returned safely to the Delaware River.
4) Monitoring plan must address the following:
   a. Impingement at trash bars,
   b. Impingement on screens,
   c. Collection of fish in traveling screen buckets,
   d. Transport via fish return system,
   e. Thermal plume monitoring, and
   f. Chemical plume monitoring.
5) All discharges must be consistent with Delaware Water Quality Standards (WQS),
6) Additional measures to remove toxins before discharge into the Delaware River to be investigated by the facility, and
7) Continuation of chronic and acute biomonitoring (Whole Effluent Toxicity (WET)).

On the July 23 call, we discussed, among other things, our recommendation for the continuation of chronic and acute biomonitoring with WET tests. You indicated that the draft permit would likely require chronic testing and that results from chronic testing would address our interest in being aware of acutely toxic levels of pollutants. As a result, you indicated that you thought our recommendation for both acute and chronic testing would not be necessary. Based on our discussion, we agree that chronic biomonitoring would be sufficient. As a result, by this letter, we modify our technical assistance to remove the recommendation for acute biomonitoring, but we maintain the recommendation for the continuation of chronic testing.

We received DCR's response on June 9, 2015 to our March 18, 2015 technical guidance letter and recommended measures. Nothing in the DCR letter causes us to change our recommended measures. While we understand the facility is putting in screens, it is important that they have an appropriate screen mesh size and through screen intake velocity. If, as the DCR letter states, the intake velocities at the facility do average around 0.6 feet/second and do not exceed one foot/second, then it appears our recommendations on intake velocity should be achievable. We also understand that the trash racks are not specifically to exclude fish. However, the spacing of 3 inches between the bars is recommended as it will exclude sturgeon expected to be in the area. While we understand that some of the information on the facility reflected in our letter may have needed updating, we based our analysis on what was presented to us. That said, even if the intake channel is between 5-16 feet deep, it is reasonable to expect sturgeon to enter the channel while opportunistically foraging, given that sturgeon will forage wherever conditions are suitable, they are found in water depths in the 5-16 foot-range, and they are not restricted just to the deep channels in large rivers such as the Delaware. We have evidence that sturgeon are found in shallow areas away from mainstem rivers. For example, sturgeon were recently found in the small and narrow Marshyhope Creek, which leads into the Nanticoke River which is a tributary to the Chesapeake Bay. The sturgeon in Marshyhope Creek were far upstream in 12-15 feet of water (Chuck Stence pers. comm. 2015). Furthermore, water depths around the Salem intake, which is known to take sturgeon, are approximately 10-18 feet, according to the DCR's Normandeau report. Those depths overlap with the reported depths at the DCR intake channel; therefore, it is reasonable to expect that sturgeon would be there as well.

We are glad to read in the DCR letter that the Cooling Water Intake System (CWIS) and outfall are not co-located. However, our comments remain the same—monitoring should occur for discharge plumes, and the CWIS should have the recommended minimization, monitoring, and reporting measures. The Normandeau report accompanying DCR's letter concentrates heavily on shortnose sturgeon as opposed to Atlantic sturgeon, which are very active in this portion of the river and move in and out of the river system. Using infrequency of take at Salem/Hope Creek is not a valid reason why there is no reasonable expectation of impingement or other forms of take at DCR. We recognize that we do not have empirical data from the facility regarding sturgeon interactions with the CWIS and discharges; however, there has been no requirement to monitor and report such information. Nevertheless, based on the best available scientific information, it is our judgment that sturgeon are likely in the intake canal as well as in the river, that detrimental effects (including incidental take) caused by the operation of the facility are likely occurring, and that reasonable measures are available to minimize, monitor and report on such effects.

We continue to encourage you to require implementation of our recommended measures, as modified by this letter with regard to chronic and acute biomonitoring, as part of the issuance of your draft permit for DCR. As noted earlier, if these measures (except for the inclusion of acute monitoring) are not adopted into the draft permit, then the facility will not be eligible for coverage under the existing NMFS 316(b) Biological Opinion and ITS issued under Section 7 of the ESA. In this case, the DCR has the option to seek coverage under a separate ESA Section 10 permit, which could provide coverage for incidental take under the ESA. The facility will need to contact us for more information on this process.

We would appreciate you notifying us of your decision regarding inclusion of all of our recommended measures in your draft permit and sharing the draft permit with us. If you choose to proceed with incorporating all of our recommended measures, we will review the draft permit again before it is finalized and estimate an anticipated level of incidental take that would be eligible for coverage under the 316(b) Biological Opinion and ITS. If you have any questions, please contact Chris Vaccaro at 978-281-2167 or at Christine.vaccaro@noaa.gov. We look forward to our continued work with you on this project.

Sincerely,

Kimberly B. Damon-Randall
Assistant Regional Administrator for
Protected Resources

EC: Mark Smith, EPA Region 3
Delaware City Refining Company, LLC
Harriet Nash, NMFS/OPR
Vaccaro, GARFO