

MEMORANDUM FOR RECORD**SUBJECT: Supplemental Department of the Army Public Interest Review for the Port of Wilmington Expansion at Edgemoor, NAP-2019-00278-86**

1. This document constitutes a supplemental public interest review evaluating the impact of the proposed turning basin and dredging activities on navigation and safety, associated with Diamond State Port Corporation's (DSPC) proposal to construct a new containerized cargo port along the Delaware River in Edgemoor, Delaware. The Memorandum For Record containing the Environmental Assessment and Statement of Findings for the above-referenced permit, approved on 4 August 2022, is incorporated by reference (2022 Permit Decision). Reference is also made to the new name for the proposed port, Delaware Container Terminal (DCT).

2. On 4 August 2022, USACE Philadelphia District issued a Department of the Army permit under Section 404 of the Clean Water Act (Section 404) and Section 10 of the Rivers and Harbors Act of 1899 (Section 10, collectively Section 404/10) authorizing (1) the removal and relocation of existing in-water structures; (2) construction of a pile-supported wharf; (3) construction of a steel sheet pile bulkhead along the landward side of the wharf; (4) the discharge of fill material into 5.5 acres of the Delaware River landward of the bulkhead; (5) the dredging of 3,525,000 cubic yards of material between the bulkhead and the federal navigation channel; (6) the discharge of dredged material as return water from multiple upland confined disposal facilities; and (7) the work and discharge of dredged material associated with the construction of compensatory mitigation sites at Fox Point State Park and Brandywine Creek Dam No. 2. USACE North Atlantic Division also granted permission under Section 14 of the Rivers and Harbors Act of 1899 (Section 408) for a subset of those activities.

a. In the 2022 Permit Decision, USACE Philadelphia District Regulatory Branch (now Division) determined that the regulated activities will have a neutral (mitigated) effect on the navigation public interest factor, as USACE North Atlantic Division found that the regulated activities would not adversely affect the Philadelphia to the Sea project, would not be injurious to the public interest, and would not impair the usefulness of the Philadelphia to the Sea project. USACE Philadelphia Regulatory Division concurred with the findings in the Section 408 decision document.

b. Also, in the 2022 Permit Decision, USACE Philadelphia District Regulatory Division determined that the safety public interest factor was not applicable, as the safety public interest factor refers specifically to the safety of impoundment structures, i.e., dams, which were neither proposed nor authorized in the 2022 Permit Decision (see 33 CFR 320.4(k)). Safety is also mentioned under 33 CFR 320.4(g)(2) (consideration of property ownership concerning the adverse effects that erosion protection structures may have on safety) and 33 CFR 320.4(l)(2) (floodplain

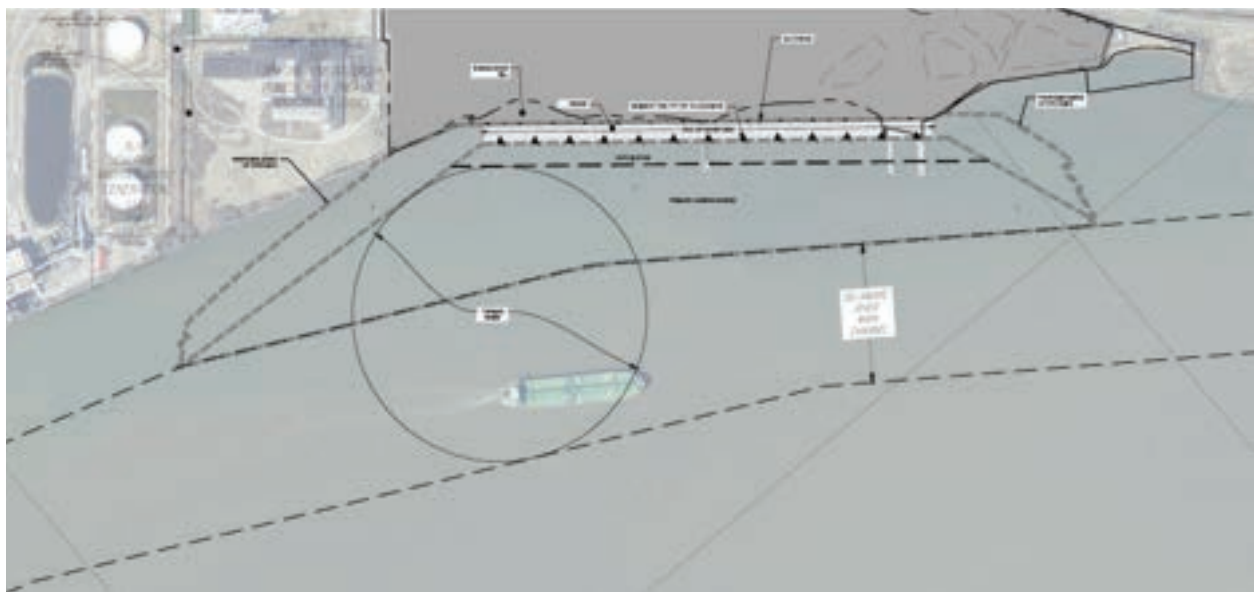
management concerning the impacts of potential flooding on safety), but neither of these citations are related to navigation safety. Navigation safety was analyzed under the navigation public interest factor.

3. On 3 November 2023, Greenwich Terminals LLC and Gloucester Terminals LLC (Terminals) filed a lawsuit against USACE challenging the Section 404/10 Permit and Section 408 Permission under the Administrative Procedures Act. The Terminals claimed that USACE failed to adequately consider navigation, safety, general welfare of the public, and economics in the decision-making process.

4. On 8 March 2024, the Philadelphia Regional Port Authority (PhilaPort) filed a lawsuit against USACE challenging the Section 408 Permission, Section 404/10 Permit, and Section 204(f) approval under the Administrative Procedures Act. PhilaPort is the non-federal sponsor of the Delaware River Main Channel Deepening project. PhilaPort claimed that USACE (1) failed to ensure that DSPC obtained a Statement of No Objection (SONO) from PhilaPort and (2) failed to adequately consider navigation, safety, general welfare of the public, and economics.

5. The two lawsuits were consolidated, and oral arguments were held before the United States District Court for the Eastern District of Pennsylvania on 8 October 2024. The Court ruled on 28 October 2024, vacating the Section 404/10 permit and Section 408 permission. The Court found that USACE failed to engage in reasoned decision-making for the Section 404/10 permit by not fully considering the impacts of the proposed turning basin and dredging activities on navigation and safety (see Figure 1 below). Additionally, the Court ruled that USACE acted arbitrarily and capriciously in granting Section 408 permission by not requiring the DSPC to obtain a SONO from PhilaPort.

FIGURE 1: Depiction of circular turning basin within the federal navigation channel (lower portion of figure) and access channel (upper portion of figure)



a. With respect to the public notice comments, the Court noted that USACE did not consult with the United States Coast Guard (USCG) to assess the impact the turning basin would have on ship traffic and safety and that USACE did not fully consider tide, wind, emergencies, vessel size/type, and future maintenance dredging in future ship simulations.

b. With respect to USACE's evaluation of public notice comments, the Court noted that USACE did not address how the removal of proposed sedimentation fans will not increase the anticipated maintenance dredging and that USACE did not address where maintenance dredged material from the berth will be placed.

c. With respect to USACE's analysis of the navigation public interest factor, the Court noted that (1) USACE dismissed navigation concerns raised by commenters and relied on traffic data submitted by DSPC without independent verification; (2) USACE did not discuss if ship turning will slow or halt vessel traffic in the federal navigation channel; (3) USACE did not discuss if ship turning will lead to vessel collisions; (4) a feasibility study failed to evaluate effects to navigation from the turning basin; (5) a feasibility study relied on old studies using data for large vessels only; (6) USACE did not evaluate the number of passing ships, along with river conditions; and (7) USACE did not evaluate the effect of maintenance dredging on passing ships, along with pipelines crossing the channel.

d. With respect to USACE's analysis of the safety public interest factor, the Court noted that (1) a feasibility study did not evaluate night transits, sudden squalls, and restricted visibility; (2) a feasibility study did not address pilots' concerns related to specific safety issues; and (3) USACE did not address navigation safety concerns.

e. USACE was directed by the Court to reevaluate the Section 404/10 Permit application in accordance with its decision.

6. By letter dated 4 December 2024, DSPC requested that USACE initiate the process to reevaluate the Section 404/10 permit application and Section 408 request and agreed to provide additional information to USACE to address the issues raised in the Court's decision.

7. On 11 December 2024, DSPC submitted a letter to PhilaPort requesting a SONO for the DCT. PhilaPort responded to DSPC on 10 January 2025, requesting: (1) a comprehensive traffic study evaluating the potential impacts of the proposed DCT turning basin and maintenance dredging on ship traffic; (2) a navigation study addressing concerns raised in a report, entitled "Comments on Navigational Safety Concerns for Edgemoor Terminal", prepared by KSEAS LLC, on behalf of the Terminals, and dated 1 October 2020 (2020 Kichner Report), including the full impacts resulting from Panamax and Post-Panamax ships utilizing the main channel as a turning basin under a variety of weather and tide conditions; (3) development of a communications and scheduling plan requiring access to the main channel; (4) establishment of emergency procedures to handle incidents involving ships calling on

the proposed DCT that may impact or block the main channel; and (5) development of a maintenance dredging plan to minimize disruptions to ships using the main channel.

8. To assist with the reevaluation of DSPC's Section 404/10 Permit application in accordance with the Court's decision, on 31 January 2025, USACE Philadelphia District requested the USACE Engineer Research and Development Center (USACE ERDC) to review the 2020 Kichner Report and provide comments with respect to navigation and safety.

a. The 2020 Kichner Report was prepared to evaluate and respond to the "Full Mission Ship Simulation for Edgemoor Navigation Feasibility Study," prepared by the Maritime Institute of Technology and Graduate Studies (MITAGS) and dated 22-24 August 2018 (2018 MITAGS Report). The 2018 MITAGS Report was prepared for DSPC by MITAGS, with additional participation from members of The Pilots' Association for the Bay and River Delaware (Pilots)¹ and USACE ERDC. The 2018 MITAGS Report was part of DSPC's Section 404/10 Permit Application submittal. The 2020 Kichner Report was provided to USACE by the Terminals during the public comment period.

b. The 2018 MITAGS Report concluded that the DCT would have minimal impact on ships transiting the federal navigation channel with the following recommendations: (1) wind speeds of 20 knots or less; (2) use of high tide for inbound transits; (3) expanding the turning basin to provide additional maneuvering (hence the neutral or mitigation finding for navigation in our initial public interest review); and (4) develop berthing procedures, tug power requirements, and emergency procedures in future simulation studies.

c. The 2020 Kichner Report concluded that additional ship simulations and analysis should be completed to incorporate (1) recommendations from the Permanent International Association of Navigation Congress (PIANC)²; (2) a probabilistic Monte Carlo simulation; (3) further consideration of vessel collisions, groundings or allisions due to environmental factors and/or tugboat unavailability; (3) the effect of vessels calling at the DCT on other vessels using the federal navigation channel for commerce; and (4) the development of a navigation transit plan.

9. After determining that additional studies were needed to address navigation and safety in accordance with the Court's decision, USACE Philadelphia District sent an information request letter to DSPC on 23 April 2025, requiring a response within 30 days. In the letter, USACE Philadelphia District directed DSPC to confer with maritime agencies and organizations and to provide a written response addressing the navigation and safety issues raised by the Court in its decision. USACE Philadelphia District also

¹ The Pilots Association of the Bay & River Delaware is a historic, state-licensed maritime organization founded in 1896 that ensures safe navigation for commercial vessels in the Delaware Bay, River, and tributaries.

² PIANC is an international, non-profit organization that provides guidance and technical advice for a sustainable waterborne transport infrastructure to ports and waterways.

directed DSPC to provide a comprehensive response to the five items in PhilaPort's 10 January 2025 letter to DSPC.

10. On 23 May 2025, DSPC informed USACE that they retained Jacobs Engineering Group, Inc. (Jacobs) to address the Court's concerns noted above and to provide USACE with additional information responsive to PhilaPort's 10 January 2025 letter to DSPC, including the preparation of updated ship simulation reports and other required information. This effort was expected to take 10 weeks.

11. On 12 June 2025, USACE ERDC submitted its comments on the 2020 Kichner Report and 2018 MITAGS Report to USACE Philadelphia District.

a. USACE ERDC concluded that (1) the 2018 MITAGS Report was a feasibility level study that considered a limited range of navigation conditions and that a pre-construction engineering design (PED) level study that would have addressed many of the comments raised by Captain Kichner; (2) the Pilots would establish standard operating procedures to address vessel turning, traffic timing, and communication and would address ship movements past the DCT to accommodate turning maneuvers; (3) the PIANC Guidelines are the best practice but that there are other examples of turning basins in navigation channels; (4) issues like visibility concerns and inbound ebb simulated transits could be analyzed in a PED-level simulation and that an issue like high flow simulations should have been simulated; (5) follow-up letters from Wilmington Tug and the Pilots are appropriate; and (6) further considerations that analysis be performed that addresses potential economic impacts associated with turning maneuvers and that additional analysis should look at the potential impacts to transit times past Edgemoor, including higher river flow rates.

b. These findings were shared with DSPC at a meeting on 26 June 2025, and all findings were addressed in a follow-up report prepared by Jacobs (see below), except for the development of a PED-level study and an economic analysis.

c. PED-level studies are required for USACE Civil Works Water Resources projects with funds appropriated by Congress, along with an executed design agreement with, and secured funding from, a non-federal sponsor. Since this is a project proposed by a state agency with state funding, a PED-level study is not required. That being written, many of the ship simulations that would have been a component of a PED-level study, e.g. poor visibility, high winds, extreme currents, etc., were simulated in a follow-up report.

d. The Court found that USACE's consideration of the economic public interest review factor was supported by the record. As such, further economic analysis is not required.

e. The ERDC comments are included in Enclosure 1.

12. On 25 June 2025, USACE Philadelphia District informed DSPC of an updated timeline for completing its Section 404/10 and Section 408 decisions, reflecting the 10-week period for DSPC to provide additional information.

13. On 31 July 2025, DSPC responded to PhilaPort's 10 January 2025 letter, noting that they retained Jacobs to compile vessel traffic data, to initiate additional simulations with MITAGS, and to undertake technical studies with particular focus on concerns about potential and safety impacts of the proposed turning basin and dredging, as well as the vessel traffic impacts. Jacobs would also consult with the Pilots', USCG, and the Mariner's Advisory Committee for the Bay and River Delaware (MAC) on scheduling plans for ships requiring access to the main channel and emergency procedures. At this time, DSPC made a second request for a SONO.

14. On 8 August 2025, PhilaPort asked to meet with DSPC to discuss the proposed MITAGS ship simulations and review the model parameters. PhilaPort noted that DSPC's 31 July 2025 letter did not include proposed scopes of work or proposed descriptions of work that PhilaPort could use to make a SONO decision and offered two examples of requests for SONOs that PhilaPort granted. PhilaPort suggested an in-person meeting between PhilaPort management and DSPC management to discuss further information needed to issue a SONO. Finally, PhilaPort welcomed USACE's participation to assist in facilitating and/or providing technical guidance.

15. On 11 September 2025, DSPC met with PhilaPort (without USACE) to discuss the scope and methodology of the ship simulation studies being conducted by MITAGS. On 30 September 2025, DSPC submitted a third request to PhilaPort for a SONO, which included a summary of the in-person discussion between PhilaPort and DSPC regarding trail run matrix development and evaluation criteria for simulation trails. On 9 October 2025, PhilaPort responded that they were reviewing DSPC's request and would respond expeditiously.

16. On 15 October 2025, DSPC submitted a report to USACE Philadelphia District Regulatory Division, entitled "Delaware Container Terminal U.S. Army Corps Permit Additional Technical Support", Version 0, prepared by Jacobs for DSPC and Enstructure, and dated 14 October 2025 (Jacobs Report). The Jacobs Report was prepared in response to the Court decision and PhilaPort's responses to DSPC's requests for a SONO and in coordination with PhilaPort, Urban Engineers, Pilots, MAC, several dredging contractors, and tugboat/towing companies. The Jacobs Report provided a comprehensive analysis of vessel traffic, navigation, safety, communication, emergency procedures, and maintenance dredging, summarized as follows:

a. Traffic Study

i. **Vessel Traffic:** Jacobs evaluated ship reporting data collected and reported by the MAC from 2000 to 2024, which included all vessels by total number and draft depth operating in the Delaware River and Bay, and found that the total number of vessels decreased from 3,437 in 2000 to 2,745 in 2024 due to declines caused by the

2008 financial crises and decommissioning of crude oil refineries. Even with the projected increase in vessel traffic from the DCT, traffic levels will remain below historical peaks observed in 2000. The federal navigation channel has adequate capacity to accommodate the additional vessel traffic from the DCT.

ii. **Vessel Spacing:** The Pilots schedule vessel traffic with the tides to prioritize upriver terminals first. Further, the Pilots noted that ship traffic congestion in the federal navigation channel is not an issue and that minor ship delays at terminals are normal and accounted for in scheduling. While berthing maneuvers at DCT are conservatively anticipated to take approximately 30 minutes in a worst-case scenario, even with an increase of 118 vessels per year for the DCT (or a 4.3% increase in total vessel traffic) Jacobs found that the federal navigation channel can support up to three times the volume of traffic as the river does in 2024. Jacobs found that vessel spacing and transit times are sufficient to avoid congestion or delays, with most flood-tide windows underutilized.

iii. **Monte Carlo Analysis:** A Monte Carlo Analysis is a computational technique that models uncertainty in maritime engineering by running thousands of simulations using random sampling. The analysis demonstrated that the federal navigation channel can handle DCT's deep-draft traffic with a greater than 95% probability, even under multiple risk scenarios. The analysis concluded that the river could support 4,637 deep-draft vessels per year (six vessels per tide) and that the baseline traffic will be about 557 deep-draft vessels per year (one vessel per tide).

b. Navigation and Safety Study

i. **Regulations:** Navigation is regulated under 33 CFR 83 and 33 CFR 164, which is primarily enforced by the USCG. USACE regulates structures and work in or affecting navigable waters of the United States under 33 CFR 322. In this decision, USACE Philadelphia District Regulatory Division is evaluating the effects that dredging adjacent to the federal navigation channel will have on navigation and safety, given that such dredging will allow for ship maneuvering in and adjacent to the federal navigation channel.

ii. **Simulations:** Jacobs conducted 24 fast-time and 35 real-time simulations with and without passing vessels in a variety of environmental conditions to address the issues raised in the 2020 Kichner Report. The Pilots noted that the four-knot current from the 2020 Kichner Report was an unrealistic sailing condition, as there is no observation of these currents in the federal navigation channel and as the Pilots would not operate in these conditions. Real-time simulations 8 and 28 were unsuccessful due to extreme currents and high winds, and the Jacobs Report further states "Run numbers 28, 29, and 34 were successfully completed but the Delaware River Pilots noted them as 'unsafe.'" Jacobs notes that these situations represented vessels meeting on the river adjacent to DCT and are independent of DCT's development. The Conditions for these runs were outside the MAC's Transit Advisory, and the Delaware River Pilots noted that they would likely not have transited vessels in these conditions. Jacobs

further notes, and as noted elsewhere in the Report, construction of DCT's turning basin effectively widens the Federal Channel, making transits safer in the area of DCT." Jacobs found the 2018 MITAGS Report to be consistent with current operating procedures and navigation maneuvering scenarios using local Pilots. In their additional real-time simulations, Jacobs simulated interactions with other vessel types and/or in adverse conditions without incident (except for unrealistic conditions). Jacobs confirmed that ultra-large container vessels (ULCVs), tankers, car carriers, and cruise ships can safely navigate, turn, and/or berth at the DCT under various environmental conditions.

iii. **Proposed Access Channel and Existing Anchorages:** The DCT access channel and nearby anchorage areas allow for safer passage of passing ships. The Pilots noted that the DCT access channel provides more room for passing ships than other access channels on the river. Existing anchorages are located both upstream and downstream of the proposed DCT. This allows Pilots of both inbound and outbound traffic a margin of safety that is not present at other ports on the Delaware River, e.g., the existing Packer Avenue Marine Terminal. These existing anchorages near the DCT give vessels a place to slow down or even stop and wait if there were some type of unforeseen problem (see Figure 2 below).

FIGURE 2: Depiction of Marcus Hook Anchorage and Deepwater Point Anchorage along the federal navigation channel upriver and downriver of the DCT (located on the Wilmington side of the river near the "30" in the center of the figure).



iv. **Turning Basin:** Many of the terminals on the Delaware River utilize the federal navigation channel to turn ships, and USACE policy allows for turning basins in federal navigation channels. See *Engineering Manual 1110-2-1623, Hydraulic Design of Deep-Draft Navigation Projects* ("Where traffic conditions permit, the turning basin should use the navigation channel as part of the basin area"). The Pilots noted that the DCT turning basin is larger than other turning basins on the river. This provides enhanced safety compared to other terminals on the Delaware River.

v. **Passing Vessels:** Analysis of Automatic Identification System (AIS) data and pilot interviews confirmed that ULCVs routinely pass other large vessels safely. The report also states that, compared to crude oil tankers that historically utilized the channel, today's vessels are far more responsive in their handling characteristics.

vi. **Additional Input from the Pilots:** The Pilots reported that transits, arrivals, and departures are scheduled among ship agents, tugboat companies, and marine terminals. Delays are normally a result of unavailability at marine terminals, weather conditions, or other causes – not ship traffic. Pilots follow the MAC Transit Advisories and recommend updating the MAC Transit Advisories for the DCT. Vessels transiting to other ports on the river do so in a safe and efficient manner, and there is no expectation that this will change with the addition of the DCT.

c. Communication and Scheduling Plan

i. **Existing Communication Protocols:** The Pilots and tugboat captains primarily use very high frequency (VHF) and ultra-high frequency (UHF) radios, along with cell phones, to communicate with one another. They also use MAC Transit Advisories, AIS, GPS, and the Vessel Reporting System (VRS) to navigate the river. The VRS requires reporting of important phone numbers, specific VHF channels for communication, sailing plans, check-in and check-out points, position and anchorage reports, instructions for anchorage, navigation rules, final reports, and specific instructions for dredge and floating plants. The Pilots and tugboat captains coordinate communication efforts with the USCG, vessel captains, Docking Pilots, other terminals, and the MAC. These communication protocols help ensure safe navigation and will continue to ensure safe navigation after the addition of the DCT.

ii. **Existing Scheduling Protocols:** For draft-restricted vessels that require high tides for transit, the Pilots schedule inbound traffic based on destination, delays prior to arrival, occupied berths, and incoming high tides. Changes are made to the schedule as necessary. Vessel trips are sequenced such that ships calling on the farthest-upriver port go first, followed by the next farthest-upriver port, and so on, unless there is sufficient time for berthing maneuvers making such sequencing unnecessary. Ship turning can be completed upon arrival or departure, which is considered during scheduling with the factors noted above, and ship turning for departing ships in their berths can be delayed allowing other ships to pass or allowing the departing ship to enter downriver traffic safely. The Jacobs Report emphasizes that the Pilots have been successfully scheduling ship traffic with similarly sized vessels for decades under heavier traffic loads, and that this is not a new or novel approach for them.

iii. **Transit Advisory Updates:** The MAC will likely update its Transit Advisory to incorporate DCT-specific requirements, such as tug pickup locations and timing.

d. Emergency Procedures

i. **Existing Emergency Procedures:** In addition to the safeguards noted above, all vessels are required to have “Salvage and Marine Firefighting” plans for professional services and trained personnel to respond to maritime emergencies. Emergency response plans, training, and procedures are already in place and will not be adversely affected by DCT’s development.

ii. **USCG PAWSA Findings:** USCG prepared a Ports and Waterways Safety Assessment (PAWSA) in 2018, which evaluated risks and mitigation measures regarding deep-draft vessels, commercial traffic volume, traffic mix, congestion, hazards, etc., and identified that risks are balanced by existing mitigations, and the addition of the DCT does not introduce new high-risk factors. Further, the PAWSA noted that there are robust emergency procedures in place and that broad communication occurs. USCG is in the process of updating its PAWSA.

e. Maintenance Dredging Plan

i. **Capital Dredging:** DSPC’s initial dredging of the access channel and berthing area will occur outside the federal navigation channel, and DSPC plans to place dredged material in uplands on the western side of the river. There is no proposed dredged material pipeline crossing of the federal navigation channel.

ii. **Maintenance Dredging:** Under Section 204(f), USACE will assume maintenance dredging responsibilities of the DCT access channel and will place dredged material at the USACE Pedricktown complex in New Jersey. Dredge pipeline crossings can be installed or removed in less than two hours in normal conditions and in less than four hours in adverse conditions. The federal navigation channel will be closed during dredge pipeline installation and removal, and ship schedules will adjust accordingly. Dredges are present in the river up to 191 days per year with minimal interference to ship traffic, and the DCT will add up to 20 days per year, with expected similar results. Routine maintenance dredging will follow established procedures and is expected to have minimal impact on vessel traffic. DCT’s dredging requirements are comparable to existing operations at other Delaware River terminals.

f. **Conclusion:** Jacobs concluded that the development of the DCT would not result in traffic, navigational, safety, or emergency procedure-related concerns. The federal navigation channel has adequate capacity and existing protocols to ensure safe and efficient vessel navigation. Additionally, the turning basin and access channel will enhance safety by effectively widening the federal navigation channel adjacent to the terminal. This report provides a thorough technical basis for addressing concerns raised during the permitting process and supports the feasibility of the DCT. The Jacobs Report is included in Enclosure 2.

17. On 31 October 2025 USACE Philadelphia District provided a copy of the Jacobs Report to Captain David K. Cuff, President of the Pilots' Association for the Bay and

River Delaware. While the Pilot's Association was involved in performing the additional ship simulations in the Jacobs Report, USACE Philadelphia District asked the Pilot's Association to provide an independent statement of their view of the Jacobs Report. This was done to ensure the views of the Pilot's Association represented in the report were truly reflective of the opinions of the Pilot's Association.

18. On 3 November 2025, USACE Philadelphia District provided a copy of the Jacobs Report to the USCG Sector Delaware Bay and asked them to provide any comments on the Jacobs Report with respect to navigation and safety.

19. On 20 November 2025, Captain Drew J. Hodgens of the Pilots' Association provided a memo to USACE Philadelphia District, entitled "Alleged Vessel Navigation Issues Pertaining to the Proposed Delaware Container Terminal" and dated 18 November 2025.

a. Captain Hodgens is the Vice President of the Pilots' Association and Chairman of the MAC and has 27 years of experience piloting thousands of various types and sizes of ships in the Delaware River and Bay in all types of conditions.

b. Captain Hodgens concurred with the findings of the Jacobs Report and disagreed with the conclusions of the 2020 Kichner Report. He also expressed strong support for the DCT project, emphasizing that the proposed terminal and turning basin design are both safe and feasible.

c. Captain Hodgens highlighted the expertise of the Pilots' Association, the effectiveness of existing navigation systems, and the adequacy of anchorages and scheduling protocols to ensure safe vessel operations. Furthermore, Captain Hodgens dismissed the concerns raised by Captain Kichner as unfounded and lacking credibility.

d. Captain Hodgens wrote that he himself participated in the ship simulations in the Jacobs Report, and the report accurately represented the findings. Additionally, Captain Hodges states in the letter:

"Mr. Kichner fails to mention in his report the fact that ULCVs have been calling at the Packer Avenue Marine Terminal [(PAMT)] in Philadelphia for several years now without incident. Those ships need to be turned in the adjacent turning basin which essentially spans the entire navigable channel just down-river from the Walt Whitman Bridge. The PAMT is located in what might be called the central Philadelphia Harbor which is the busiest portion of the river traffic-wise. Given the level of skill of the tug operators, docking pilots and river pilots and the careful scheduling of ship transits, there have been no traffic delays, obstruction problems, collision incidents or near-miss incidents when ULCVs have been turned adjacent to the PAMT."

e. Captain Hodgens' memo is included in Enclosure 3.

20. On 15 January 2026, Captain K. Higgins-Bloom, Captain of the Port for the USCG Sector Delaware Bay, regarding the Jacobs Report.

a. In the letter, Captain Higgins-Bloom wrote:

“We have reviewed the report titled ‘Delaware Container Terminal U.S. Army Corps Permit Additional Technical Support,’ dated October 14, 2025. The report determined that the development of the Delaware Container Terminal would not result in concerns related to vessel traffic, navigation, safety, communication, scheduling, or emergency response. Coast Guard Sector Delaware Bay met with the state pilots' association and federal pilots' agency to discuss the report and to identify any safety concerns with the development of Delaware Container Terminal.

In regard to safe use of the local waterway, we find the proposed development of Delaware Container Terminal consistent with existing safe use of the waterway and offer no additional comments on the findings from the report.”

b. Captain Higgins-Bloom’s memo is included in Enclosure 4.

21. On 26 January 2026, DSPC submitted a revised report to USACE Philadelphia District, entitled “Delaware Container Terminal U.S. Army Corps Permit Additional Technical Support”, Version A, prepared by Jacobs for DSPC and Enstructure, and dated 19 December 2025 (Jacobs Report).

a. Section 2.4 of the Jacobs Report was revised to include the number of vessels restricted to floodtide transits each year and to clarify that the MAC Transit Advisories were updated continuously to reflect current channel conditions with respect to the federal navigation channel. Further, Section 2.4 includes new figures, which show the number of vessels per year by vessel type; a comparison of terminals called upon in 2006 and 2024; and a comparison of flood-restricted vessel types in 2006 and 2024.

b. Table 2-4 in Section 2.8.5 of the Jacobs Report was revised to include the existing conditions without DCT-related vessel traffic and events, with DCT-related vessel traffic and events for the DCT, and both non-DCT- and DCT-related traffic events for the DCT.

c. The MITAGS Report in Appendix C of the Jacobs Report was finalized on 1 December 2025 (2025 MITAGS Report) and revised to include a note for Run 25 in the Pilots and Tug Captains Evaluations and updated figures for the Run Track Plots, including new figures for Runs 31 and 35.

d. This revised information provided additional clarity to the 2025 MITAGS Report but did not significantly change the findings or conclusions.

22. On 24 March 2026, Manko, Gold, Katcher, and Fox (MGKF) submitted comments, on behalf of the Terminals, on the Jacobs Report, which they obtained from Philaport.³ The comments were prepared by Captain Jerzy J. Kichner, USCG (ret). USACE asked DSPC to review Captain Kichner's comments and provide responses. DSPC provided responses, which were prepared in large part by Jacobs, on April 1, 2026. USACE carefully reviewed Jacobs' responses to Captain Kichner's comments and found them to be thorough, substantive, and persuasive. USACE is satisfied that the additional information provided by DSPC is sufficient to support the Section 404/10 decision. As such, USACE is adopting those responses, and they are incorporated into this document and included in enclosures.

a. Regarding Captain Kichner's recommendation to condition USACE authorizations to require a 30-minute travel distance between ships, an updated MAC Transit Advisory, and a requirement that pilots adhere to an updated MAC Transit Advisory, this condition would not be reasonably enforceable, as DSPC does not have the authority or means to ensure that a 30-minute travel distance between ships is followed, to require the MAC to update their travel advisory, or to require pilots to follow an updated travel advisory. Given the policies and procedures of the MAC and Pilots' Association provided in the Jacobs Report, we believe that such a condition (even if it was enforceable) is not needed to ensure that the regulated work is not contrary to the public interest.

b. Regarding Captain Kichner's recommendation for USACE to ask USCG to update the PAWSA for the DCT, on 3 April 2026 USACE forwarded Captain Kichner's 2026 comments and Jacobs' 2026 responses to USCG for their consideration.

c. MGKF's and Captain Kichner's comments on the Jacobs Report are included in Enclosures 5 and 6. DSPC's responses to MGKF's and Captain's Kichner's comment on the Jacobs Report are included in Enclosure 7.

23. The Court previously determined that USACE did not fully address the impacts on navigation and safety associated with the proposed turning basin and dredging activities during the Section 404/10 permitting process. Since the vacatur of the Section 404/10 permit for the proposed DCT, USACE has worked with DSPC, ERDC, the Pilots' Association, and USCG to reevaluate the permit application in accordance with the opinion. Based on the comprehensive analyses, extensive ship simulations, and expert feedback, USACE is confident that the proposed DCT and turning basin as designed poses no additional navigation safety concerns to ship traffic in the federal navigation channel and will not cause delays to that traffic. Consequently, USACE considers the reissuance of the permit to be a well-founded and reasonable course of action, supported by the expertise of stakeholders and the findings of detailed studies on Delaware River navigation.

³ Since the scope of the Section 404/10 permit application and Section 408 request did not change, a supplemental public notice was not issued. Although not required to respond to the comments prepared by Captain Kichner, USACE opted to request responses from DSPC given the prior litigation.

a. USACE provided a copy of the 15 October 2025 copy of the Jacobs Report to the USCG, who reviewed the report and found that the proposed DCT is “consistent with existing safe use of the waterway....” After reviewing the 19 December 2025 copy of the Jacobs Report, USACE did not feel it was necessary to request a second review from the USCG, as the changes between versions were minor and as the conclusions were the same. Prior to requesting USCG’s comments, USACE also recommended to DSPC that they run several new ship simulations for various vessel types and sizes to include all sorts of adverse conditions, which DSPC did in their Jacobs Report. The Pilots were able to complete most of the ship simulation runs without incident, except for unrealistic extreme current and very high wind scenarios, situations that the Pilots would not operate in real life.

b. The initial annual maintenance dredge volume estimate of 500,000 cubic yards per year without sedimentation fans was extrapolated based on an initial hydrodynamic model that was included in the initial Section 404/10 permit application. This model was performed over a limited period, and the information was conservatively extrapolated over 12 months. To address comments in our initial Section 408 review, DSPC provided a revised hydrodynamic evaluation that further refined the annual maintenance dredge volume estimate of 275,000 cubic yards per year in the access channel and berthing areas without sedimentation fans by calibrating the model to the established sedimentation rates of the local area. Maintenance dredge material from the berthing areas would be placed in the Wilmington Harbor North Disposal Area, pending USACE approval.

c. USACE presented DSPC with concerns raised by the Court and asked DSPC to address those concerns. After considering the Jacobs Report and with input from the Pilots, USACE concludes that ships transiting to and from DCT would not slow or halt vessel traffic in the federal navigation channel or lead to vessel collisions, as the Pilots take great care to schedule ship transit with multiple stakeholders. The Jacobs Report built upon the 2018 MITAGS Report by further evaluating the effects to navigation from the turning basin and provided updated data to support that the turning basin would not have a detrimental effect on ship traffic and/or safety. While neither 2025 nor 2026 data was available to Jacobs in the development of the report, even with conservative increases in ship traffic, there is still more than enough capacity in the river to support future safe vessel trips. The Jacobs Report demonstrated that ships could pass each other safely in the Delaware River and that the effect of maintenance dredging on passing ships is negligible. To summarize the Pilots’ conclusion, delays are normally a result of unavailability at marine terminals, weather conditions, or other causes – not ship traffic. The initial public interest factor determination of neutral (mitigated) remains valid, as the size of the turning basin was expanded in response to comments by the Pilots during the ship simulations in 2018 to ensure safe vessel maneuvering at the DCT; the widened federal navigation channel at the DCT allows for safer vessel passing; and the nearby anchorages allow for ship traffic to pause, if necessary, to avoid conflicts with vessel passing.

d. USACE is required to conduct a public interest review of the proposed activity by considering enumerated public interest review factors and weighing the benefits against the detriments. 33 CFR 320.4(a) states that all factors which may be relevant to the proposal must be considered including the cumulative effects thereof: among those are conservation, economics, aesthetics, general environmental concerns, wetlands, historic properties, fish and wildlife values, flood hazards, floodplain values, land use, navigation, shore erosion and accretion, recreation, water supply and conservation, water quality, energy needs, safety, food and fiber production, mineral needs, considerations of property ownership and, in general, the needs and welfare of the people. As mentioned in Paragraph 2.b. above, the safety public interest factor is not applicable to navigation safety. Navigation safety is weighed under the navigation public interest factor. As such, the initial public interest factor determination of not applicable remains valid. Nevertheless, the Jacobs Report addressed adverse environmental conditions in the 2025 MITAGS Report, as well as Pilots' concerns to specific safety issues.

24. The permit project description and Special Conditions 18 to 20 were updated to reflect permissions granted pursuant to Section 217(b) and 204(f) of the Water Resources Development Act.

25. Having reviewed and considered the information above, I find that the proposed project is not contrary to the public interest. The benefits of the proposed alteration – economic benefits and more efficient transportation of goods and commerce and – are not outweighed by any minor delays associated with vessels calling on the new port facility. All the findings in the previous Memorandum For Record for the Department of the Army Environmental Assessment and Statement of Findings for the Above-Referenced Standard Individual Permit Application, approved on 4 August 2022, including the public interest review, remain valid, with allowances for changes to individual's and company's names and projected scheduled construction time frames. The permit will be reissued with appropriate conditions included to ensure minimal effects, ensure the authorized activity is not contrary to the public interest, and/or ensure compliance of the activity with any of the authorities identified in the 2022 Permit Decision.

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ENCLOSURE 1

Review of KSeas Comments on Edgemoor Navigation Feasibility Study

The following is a review by the Engineer Research and Development Center (ERDC) ship simulation SME of a document developed by KSeas LLC. The KSeas document was developed as a commentary on the Maritime Institute of Technology and Graduate Studies (MITAGS) ship simulation study entitled “*Full Mission Ship Simulation for Edgemoor Navigation Feasibility Study*”

Feasibility vs PED-level Study Comments

The MITAGS study appears to be a feasibility level study. The purpose of such a study is to assess the feasibility of a navigation channel design feature(s) across a limited range of navigation conditions that occur in the study area. The range of conditions should certainly include what is considered the maximum, adverse navigable conditions including environment conditions such as wind, tide, currents, visibility and the vessel type(s) that regularly transit the study area. However, a feasibility study is not intended to be a robust treatment of the design, but a vetting tool that allows for down selecting of design features analyzing feasibility for navigation by the design vessels selected for the project. The testing of the design features identified in feasibility are rigorously tested and refined in the Pre-Construction Engineering Design (PED) ship simulations. PED-level ship simulations are performed as in addition to feasibility level simulations. Feasibility simulations are not meant to be standalone or all-inclusive, but rather simplified often with fewer simulated transits performed.

Some of the comments in the KSeas document appear to approach the MITAGS report at a PED level investigation; however, the report as stated in the title is intended to address the project at the feasibility level.

Section 3 – Turning Basin Location

Turning Basin Location – In the first two paragraphs of Section 3, regarding the turning basin location, the KSeas author is correct in asserting that the channel would be blocked during turning maneuvers. This would indeed halt vessel traffic past Edgemoor. However, this is a timing issue. Ship pilots in ports routinely communicate their sailing and arriving transits to other vessels transiting in the same areas to coordinate and arrange the optimum time/location for passing maneuvers or to delay or accelerate a ship movement to avoid potentially adverse situations. It is believed that the Delaware Pilots would establish standard operating procedures to address such issues and adjust their ship movements past Edgemoor to accommodate turning maneuvers in the Edgemoor turning basin.

PIANC Guidelines – While PIANC guidelines are considered best practice, in some cases the layout of the navigation channels do not allow for construction of a turning basin that does not intrude on the navigation channel. The Choctaw Pass Turning Basin in Mobile Harbor is one such example.

Section 4 – MITAGS Study Specific Comments

Limited Vessel types – The KSeas author indicated that the ships models used in the simulation study were too limited, using only a 9,300 twenty equivalent unit (TEU) and 12,000 TEU ship model. The MITAGS report acknowledged that 14,000 TEU container ships and Suezmax ships transit the

study area. Ship model selection process, at a minimum should include consultation with the Delaware Pilots, basic research of ships that routinely transit past the proposed Edgemoor location, and include considerations for vessels that are larger and/or less maneuverable. AIS data for the study area is available to aide in assessing the class and size of ships that transit past Edgemoor.

The number of vessel models utilized in the study does not directly impact the validity of the findings. The issue lies in proper identification and selection of ships that meet the criteria mentioned in the previous paragraph. ERDC has not reviewed any analysis of ship traffic past Edgemoor and therefore cannot comment on the appropriateness of the vessel model selections.

The stated purpose of the study was to analyze the proposed Edgemoor Terminal and corresponding turning basin. Therefore, it is appropriate that only ships proposed to call on the new terminal were used in simulations. It is ERDC's assertion that if ships like the 14,000 TEU container ships and Suezmax tankers currently transit the reach in front of Edgemoor there is little benefit in replicating them in simulation unless the addition of the turning basin impacts the magnitude and/or direction of the currents in the reach.

Turning Basin Impacts on Other Vessel Transits – This is a similar point to the one that was brought up in Section 3 of the KSeas document. As was stated above, this is a routine timing and communication issue that the Delaware Pilots are well-equipped to handle.

Visibility Concerns – KSeas noted the lack of low visibility maneuvers in the ship simulation study. Based on the US Coast Guard (USCG) PAWSA report the author references, fog is an issue in the study area. Unless ship movements are halted for fog, simulations including fog should be conducted. The same comment applies for night operations. These low visibility simulations are appropriate for PED-level simulations due to the increased rigor and evaluation.

Inbound Ebb Simulated Transits – The MITAGS study indicated that no inbound runs were performed under maximum ebb. KSeas concern over this omission is valid as the current will set the ship towards the upstream bound of the proposed turning basin during turning maneuvers. This should have been examined. It will need to be analyzed in PED-level simulations.

High Flow Simulations – KSeas referenced the USCG PAWSA report which stated that the rainfall and snow melt runoff can magnify the currents in the Delaware River significantly. ERDC concurs that these conditions should have been simulated as they represent maximum adverse, navigable conditions.

Tugmaster and Pilot Letters – The Wilmington Tug letter addresses tug requirements. A follow-up letter from Wilmington Tug with some clarification would be appropriate.

Regarding the letter from The Pilots Association for the Bay & River Delaware, pilots are very qualified in assessing what the guidelines should be for moving ships. The letter is somewhat general. A follow-up letter that addresses KSeas concerns would be appropriate.

KSeas Conclusions and Recommendations

The Monte Carlo analysis and a full navigational safety analysis recommended by KSeas are not simulator-related. They are navigation-related and likely are outside the scope of the analysis MITAGS was tasked to perform. These additional analyses are suited for a PED phase conducted by the port.

Further Considerations:

- Analysis be performed that addresses potential economic impacts associated with turning maneuvers.
- Any additional analysis should look at the potential impacts to transit times past Edgemoor, specifically the increased time associated with halting or slowing vessel traffic during turning maneuvers performed in the proposed Edgemoor Turning Basin. This additional analysis is helpful in waterways like this that depend heavily on transit efficiency. Any follow-up study to address the concerns from the KSeas document should be significantly more rigorous than the present study addressing visibility, higher river flow rates, and the impacts on vessel transit times past the proposed Edgemoor facility.

Respectfully submitted,

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ENCLOSURE 2



Delaware Container Terminal U.S. Army Corps Permit Additional Technical Support

Version: A

Diamond State Port Corporation and Enstructure DCT LLC
ATTORNEY CLIENT PRIVILEGE

Delaware Container Terminal

December 19, 2025



Delaware Container Terminal
U.S. Army Corps Permit
Additional Technical Support

Client Name: Diamond State Port Corporation and Enstructure DCT LLC
Project Name: Delaware Container Terminal
Client Reference: ATTORNEY CLIENT PRIVILEGE Project No.: T2484304
Document No.: 250814140326_03c6e0fa Project Manager: Duncan Kopp
Version: A Prepared By: Jacobs Team
Date: December 19, 2025 File Name: US Army Corps Permit Analysis Report

Document history and status

Version	Date	Description	Author	Checked	Reviewed	Approved
0	10/14/2025	Version 0	DRK, SR, MN	AH, CAL	FW	DRK
A	12/19/2025	Revision A - Minor Updates	DRK, SR, MN	AH, CAL	FW	DRK

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Acronyms and Abbreviations

Acronym	Definition
3D	three-dimensional
AIS	Automatic Identification System
ATON	aid(s) to navigation
CDF	confined disposal facility
CFR	<i>Code of Federal Regulations</i>
DBOFS	Delaware Bay Operational Forecast System
DCT	Delaware Container Terminal
DEM	digital elevation model
DSPC	Diamond State Port Corporation
ECDIS	electronic chart display information system
ERDC	USACE Engineer Research and Development Center
ETA	estimated time of arrival
ETD	estimated time of departure
FTTW	flood-tide transit window
GLDD	Great Lakes Dredge & Dock Company, LLC
IQR	interquartile range
MAC	Mariners Advisory Committee for the Bay and Delaware River
MEX	Maritime Exchange for the Delaware River
MITAGS	Maritime Institute of Technology and Graduate Studies
MLLW	mean lower low water
nm	nautical mile(s)
NOAA	National Oceanic and Atmospheric Administration
PAMT	Packer Avenue Marine Terminal
PAWSA	Ports and Waterways Safety Assessment
PCC	pure car carrier
PIANC	Permanent International Association of Navigation Congresses

PORTS	Physical Oceanographic Real-Time System
RADAR	radio detection and ranging
TEU	twenty-foot equivalent unit
UHF	ultra-high frequency (radio)
ULCV	ultra large container vessel
U.S.	United States
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
VHF	very high frequency (radio)
VRS	Vessel Reporting System
WGS84	World Geodetic System 1984

Executive Summary

On August 4, 2022, the U.S. Army Corps of Engineers (USACE) issued an Individual Permit and Section 408 Permission (permit number CENAP-OPR-2019-00278-86) for a proposal from the Diamond State Port Corporation (DSPC) to construct a new containerized cargo port, now called the Delaware Container Terminal (DCT), in the unincorporated Edgemoor section of New Castle County, Delaware. The permit and permission authorized (1) construction of a new wharf and bulkhead, (2) undertaking capital dredging, and (3) creating a new berthing area and access channel adjacent to, but outside, the Federal Navigation Channel (Federal Channel).

On October 28, 2024, the U.S. District Court for the Eastern District of Pennsylvania vacated the previously issued permits, finding that USACE did not “engage in reasoned decision making” as it relates to the Section 404/10 permit and “departed from their own procedures” in issuing the Section 408 permit.

DSPC and its partner, Enstructure DCT LLC, which are codeveloping DCT, have engaged Jacobs Engineering Group, Inc. (Jacobs), to provide additional technical input to address items raised in the court ruling, items requested by USACE in subsequent follow-up, and comments made by public commenters.

This report includes the following sections, for which Jacobs undertook analyses, performed outreach to key stakeholders, and reviewed and documented existing procedures and policies to assess the potential impact of DCT’s development and operation on the Federal Channel:

1. Introduction
2. Traffic Study
3. Navigation and Safety Study
4. Communication and Scheduling Plan
5. Emergency Procedures
6. Maintenance Dredging Plan
7. Conclusion and Summary

Jacobs’ findings are as follows:

- **Traffic Study:** The additional vessel traffic related to DCT will have minimal impact on both draft-restricted and non-draft-restricted vessels because there is adequate capacity to support the additional vessel calls. Further, even with the additional DCT traffic, the number of ships transiting the River is less than the peak observed in 2000, in which no capacity or congestion issues were noted. Jacobs performed a Monte Carlo Analysis of the channel traffic and capacity, which shows that even with multiple risk events considered, the Federal Channel has adequate capacity to accommodate DCT’s deep-draft traffic at a greater than 95% probability.
- **Navigation and Safety Study:** The size and types of ships expected to call on DCT are already navigating the River to Packer Avenue Marine Terminal (PAMT) and doing so in a safe, coordinated, and effective manner. Jacobs performed simulations that confirmed prior studies showing that vessels can safely turn and enter/depart DCT in a variety of weather and wind conditions. Further, interviews with and statements by the Delaware River Pilots, supported by simulations, demonstrate that DCT provides more favorable conditions for turning and berthing large vessels that currently exist at PAMT and other terminals on the River. The relative absence of obstruction (for example, bridges), the width of the channel, and the availability of bail-outs (that is, anchorages upriver of the facility) that would not be similarly available at other terminals provide more opportunities for navigation safety mitigation.

- **Kichner Report Comments:** To address comments in the Kichner Report (KSEAS 2020), Jacobs reviewed the proposed turning basin location and its potential impact on transiting vessels and determined that using the Federal Channel for turning and berthing maneuvers is required for large vessels calling at all the existing terminals on the Delaware River. This requirement or practice was confirmed for other major U.S. seaports, and it was confirmed that this arrangement is consistent with the USACE's Engineer Manual.
- **Simulations:** Jacobs performed simulations that confirmed prior studies showing that container, oil, car carrier, and cruise vessels can safely pass each other on the Delaware River in the area of DCT. Jacobs' desktop analysis of Automatic Identification System data demonstrated, and confirmed statements, analysis and conclusions obtained from the Delaware River Pilots, that ultra large container vessels (ULCVs) routinely pass Suezmax tankers, car carriers, and other ULCVs without issue or safety concerns within the Delaware River Pilots' standard operating procedures. Not only can vessels safely transit today, but development of DCT's Access Channel would effectively widen the Federal Channel adjacent to DCT; this would enhance safety for all vessels transiting the River in front of DCT.
- **Maritime Institute of Technology and Graduate Studies (MITAGS) Study (2018):** Jacobs reviewed the 2018 MITAGS Study and found it to be adequately scoped and performed to a reasonable standard. However, to address further comments in the Kichner Report, Jacobs and MITAGS undertook additional simulations under conditions identified in the Kichner Report and found that vessels can safely pass near, and call, DCT.
- **Communications and Scheduling Plan:** The Delaware River Pilots, U.S. Coast Guard (USCG), tug companies, and other organizations and stakeholders have well-established communications and scheduling plans and protocols developed to ensure the safe navigation of vessels. These plans and protocols are not expected to change with the addition of DCT, except that the Mariners Advisory Committee for the Bay and Delaware River (MAC) Transit Advisory will be updated to incorporate ULCVs calling on DCT, specifically the timing and location for picking up their tugs. Modification of the Transit Advisory would not adversely impact other vessel traffic on the River but would serve to maintain and improve safety of all vessels on the River.
- **Emergency Procedures:** The Delaware River Pilots, USCG, tug companies, vessels, terminals, first responders, and other stakeholders have well-defined emergency procedures, training, and plans in place today. These plans will remain in place and would not be adversely affected by the development of DCT and the addition of its vessel traffic. The USCG's current Ports and Waterways Safety Assessment (PAWSA) notes that many risks are "balanced by existing mitigations," which will not change.
- **Dredging:** Both capital and maintenance dredging have occurred on the River in recent years, with maintenance dredging happening annually. DCT-related dredging will follow the same requirements, procedures, and plans for dredge plants and pipeline channel crossings and would require similar approvals. DCT's capital dredging will occur outside the Federal Channel and will not impact navigation. Maintenance dredging of DCT's approach channel would also occur outside the Federal Channel, in contrast to the USACE's current regular (and ongoing) maintenance dredging, meaning there would be minimal impacts on vessel traffic.

In summary, Jacobs finds that development of DCT would not result in traffic, navigational, communications, scheduling, or emergency procedure-related concerns. The Federal Channel has adequate capacity to accommodate DCT's deep-draft traffic, and the Delaware River Pilots are safely handling ULCVs on the River today with no concerns. Dredging associated with DCT will not impede navigation. Well-established safety, communications, scheduling, and emergency plans, which are

Delaware Container Terminal
U.S. Army Corps Permit
Additional Technical Support

approved by multiple parties and agencies, will remain in place to provide safe and efficient vessel navigation for all users.

1. Introduction

1.1 Background

On August 4, 2022, the U.S. Army Corps of Engineers (USACE) issued an Individual Permit and Section 408 Permission (permit number CENAP-OPR-2019-00278-86) for a proposal from the Diamond State Port Corporation (DSPC) to construct a new containerized cargo port in the unincorporated Edgemoor section of New Castle County, Delaware. The permits authorized, (1) construction of a new wharf and bulkhead, (2) undertaking capital dredging, and (3) creating a new berthing area and access channel adjacent to, but outside, the Federal Channel.

The project, the Delaware Container Terminal (DCT), was previously named the Edgemoor Container Terminal.

On October 28, 2024, the U.S. District Court for the Eastern District of Pennsylvania vacated the previously issued permits, finding that USACE did not “engage in reasoned decision making” as it relates to the Section 404/10 permit and “departed from their own procedures” in issuing the Section 408 permit.

On April 23, 2025, USACE requested written responses from DSPC to specific items it viewed as central to addressing the deficiencies identified by the federal court, which include, without limitation, the following:

- Section 404/10 – Confer with relevant agencies on the River (pilots, U.S. Coast Guard [USCG], and so forth) and document how navigation and safety concerns will be addressed or avoided with the construction and subsequent operation of a new turning basin in the channel and during future maintenance dredging activities.
- Section 408 – USACE has requested that DSPC address the federal court’s concerns regarding vessel traffic, navigation studies, communication and scheduling, emergency procedures, and maintenance dredging impacts.

The U.S. District Court also cited a report titled *Comments on Navigational Safety Concerns for Edgemoor Terminal* prepared by KSEAS LLC (2020) and authored by Captain Jerzy J. Kichner, a retired USCG Captain (hereinafter, the “Kichner Report”), which includes comments on and objections to aspects of the in-water elements of the DCT development. Other ports on the Delaware River and interested parties have also provided written commentary on the DCT project.

DSPC and its partner, Enstructure DCT LLC (Enstructure), which are codeveloping DCT, have engaged Jacobs Engineering Group, Inc. (Jacobs), to provide additional technical input to address the items raised in the court ruling, items requested by USACE in subsequent follow-up, and items in the Kichner Report.

1.2 Scope of Work

This report aims to provide additional information to USACE in response to the items listed in Section 1.1 and additional technical information concerning Section 408 issues raised by the Court, as well as responses to some related comments submitted by other ports on the River and interested parties. This report includes the following sections:

1. Introduction
2. Traffic Study
3. Navigation and Safety Study

4. Communication and Scheduling Plan
5. Emergency Procedures
6. Maintenance Dredging Plan
7. Conclusion and Summary

Jacobs and DSPC met with PhilaPort on September 11, 2025, to discuss Jacobs' scope of work and proposed methodology and to obtain PhilaPort concurrence on both. PhilaPort's Director of Engineering and their consultant, Urban Engineers, provided feedback on the proposed scope of work and methodology, and did not object to DCPS's opinion that the scope would be sufficient to evaluate or address any potential concerns and resulting mitigations.

In preparing this report, Jacobs reviewed historical information provided by DSPC and Enstructure, including the 2019 permit application and supporting materials, the 2024 findings of the U.S. District Court, documents submitted to the U.S. District Court, and publicly available data. Jacobs also interviewed various third party stakeholders, including members of the Pilots' Association for the Bay and River Delaware (hereinafter, the "Delaware River Pilots") and members of the dredging and tug industries to identify current operations on the Delaware River and how the proposed DCT may impact operations.

It should be noted that the Delaware River Pilots are members of the Mariners Advisory Committee for the Bay and Delaware River (MAC),¹ which is a committee formed *"to primarily concern itself with the safety of navigation with particular regard to large ocean going vessels. In this regard, it will recommend safe drafts on the basis of experience in navigation and in the light of current channel information as published by competent authorities."*

1.3 About Jacobs

Jacobs leads the global professional services sector delivering solutions for a more connected, sustainable world. With approximately \$12 billion in annual revenue and a team of approximately 45,000, Jacobs provides end-to-end services in advanced manufacturing, cities and places, energy, environmental, life sciences, water, and transportation. From advisory and consulting, feasibility, planning, design, program and life cycle management, Jacobs is creating a more connected and sustainable world.

The Jacobs Ports & Maritime Group consists of more than 700 professionals dedicated solely to delivering projects in the marine environment and is ranked No. 2 by *Engineering News Record*. Jacobs provides value-added advisory, planning, design, and program and construction management services to the container, bulk, general cargo, energy, and cruise industries and to port authorities, governments, and some of the world's leading naval forces. Jacobs has a long history of working on the Delaware River for a wide variety of clients.

1.4 Entities Consulted

This section provides background information on the parties Jacobs consulted in preparation of this report.

Maritime Exchange for the Delaware River and Bay² is a nonprofit trade association and *"the leading advocate and information provider for port and related businesses in the tristate region. First established in*

¹ <https://macdelriv.org/>

² <https://www.maritimedelriv.com/>

1875, the Maritime Exchange has grown into a modern, highly respected, organization recognized as an essential maritime partner and an integral part of the fabric of the regional port community.” Exchange members benefit from a wide array of programs designed to help them meet daily operational and long-term planning needs, stay on top of industry news and policy changes, and learn from and with their colleagues and government partners.

Diamond State Port Corporation³ (DSPC) is a public instrumentality of the State of Delaware that promotes the State’s economic vitality by sustaining and promoting the Port of Wilmington, Delaware as a competitive and viable full service, multi-modal operation through its ownership of the port terminal facilities.

Enstructure⁴ is a leading U.S. marine terminal and logistics company, the port operator at the Port of Wilmington, and codeveloper and future operator of the DCT facility. Enstructure operates the facilities through a long-term concession agreement with DSPC.

Individual Delaware River Pilots with extensive experience on the Delaware River and who are members of the **Pilots' Association for the Bay and River Delaware**⁵ (the official maritime pilot group for the Delaware Bay and Delaware River) was founded in 1896. The association is one of the oldest state pilot organizations in the nation. Delaware River Pilots are licensed maritime pilots for the Delaware River and Bay.

Great Lakes Dredge and Dock Company⁶ (GLDD) is the largest American company providing construction services in dredging and land reclamation. GLDD operates primarily in the United States (U.S.) but conducts one-quarter of its business overseas. GLDD has a long history of performing significant dredging projects, including prior dredging on the Delaware River.

Norfolk Dredging⁷ has been engaged in hydraulic and clamshell dredging since 1899. The company operates in all coastal areas performing both maintenance and new work dredging, with specialties in projects involving sub-aqueous trench and tunnel excavation, backfill and hydraulic landfill. Major area of operations spans the Atlantic Coast and the Gulf of Mexico. Norfolk Dredging Company has a long history of successfully undertaking dredging projects on the Delaware River.

Cottrell Contracting, Inc.⁸ was established in 1928 and has a long history of infrastructure dredging along the U.S. East Coast. Cottrell has a long history of performing significant dredging projects, including prior dredging on the Delaware River.

Maritime Institute of Technology and Graduate Studies⁹ is a nonprofit vocational training center for individuals seeking to enter the maritime profession and for professional mariners seeking to advance their careers. In 2018, MITAGS undertook a simulation in support of DSPC’s application to the USACE for Federal assumption of operation and maintenance of DCT’s dredging under Section 204(f) of the Water Resources Development Act, titled *Full Mission Ship Simulation for Edgemoor Navigation Feasibility Study* (MITAGS Study).

³ <https://port.delaware.gov/>

⁴ <https://enstructure.com/>

⁵ <https://www.delpilots.org/>

⁶ <https://gldd.com/>

⁷ <https://www.norfolkdredging.com/>

⁸ <https://www.cottrellcontracting.com/>

⁹ <https://www.mitags.org/>

Wilmington Tug ¹⁰ *“is a family owned and operated company that has been providing superior harbor assist towage and services on the Delaware River since 1965.”* Wilmington Tug *“built the first Z-drive tug in North America in 1977, and [has] a fleet of 6 modern Z-drive ship docking tugs that service our customers on the Delaware River.”* Wilmington Tug is the proposed tug company supporting vessels calling DCT.

McAllister Towing ¹¹ *“operate[s] a fleet of more than 60 tugboats, crew boats, and barges in 13 locations along the U.S. East Coast from Eastport, ME to San Juan, PR. The fleet includes 38 Z-Drive/tractor tugs and 20-plus vessels...McAllister is engaged in ship docking..., general harbor towing, coastal towing, windfarm support, and bulk transportation.”* McAllister currently serves the ULCVs calling on the River today.

Moran Towing ¹² is a leading provider of marine towing and transportation services with a long-standing reputation for safe, efficient service, operating for over 160 years. They have a fleet of 111 tug boats on the East and Gulf Coasts. Moran serves a variety of ships on the River, including ULCVs.

1.5 About DCT

DCT will be a state-of-the-art port that will feature a deepwater container terminal with all-electric container yard operations and a modern, efficient truck gate. The new facility aims to meet increasing international waterborne trade demand, accommodate larger and deeper vessels, and contribute to the economic vitality of Delaware and the region.

DCT is located at the former DuPont Edgemoor facility, located along the Delaware River, east of Wilmington, as shown on Figure 1-1.

¹⁰ <https://wilmingtontug.com/>

¹¹ <https://www.mcallistertowing.com/>

¹² <https://www.morantug.com/>



Figure 1-1. DCT Location

2. Traffic Study

2.1 Objective

Jacobs undertook a comprehensive traffic study to evaluate the potential impact from development of DCT to vessel traffic in the Delaware River and Bay. This section focuses on the review and cataloging of data to identify the probability of conflicting movements. Section 3 address vessel navigation, Section 4 addresses communication and scheduling, Section 5 addresses emergency procedures, and Section 6 addresses dredging activities on the River.

2.2 Approach

To assess the current capacity of the Delaware River Channel and the impact from DCT's development, Jacobs undertook a comprehensive traffic study of vessels navigating the Delaware River using publicly available historical vessel traffic information. The analysis reviewed quantified statistics such as time between vessels, number of vessels using the flood-tide transit window, and proportion of flood-transit restricted vessels. Key operational details provided by the Delaware River & Bay Pilots regarding the organization of vessel traffic are also incorporated into this discussion.

Given the numerous variables that affect vessel traffic patterns on the Delaware River, a multifaceted approach was undertaken, as summarized below. The steps taken for the analysis are discussed in detail in the following sections.

- **Vessel Traffic Guidance** – Vessel traffic on the River adheres to Transit Advisories published by the MAC. These advisories outline safe transit conditions, practices to mitigate risks, and are actively updated to consider the present condition of the navigation channel. Jacobs reviewed these advisories, and used them to set the baseline rules considered in the traffic analysis.
- **Vessel Traffic Summary** – Jacobs quantified the historical vessel traffic on the River, including reported vessel draft, to assess the use of the Federal Navigation Channel. The historical vessel traffic statistics provide the baseline information needed to assess impacts of additional DCT-related traffic.
- **Vessel Draft Analysis** – Larger vessels have historically arrived with drafts approaching the available channel depth. These vessels generally transit the channel during an appropriate tide window. Therefore, the times at which they can transit the channel are limited. Vessel traffic data was further assessed to segregate out larger vessels (for example, requiring flood-tide transit) from other vessels without similar restrictions.
- **Pilot Coordination** – Queuing and subsequent transit of vessels depend on several factors related to the discretion of Delaware River Pilots. For instance, the destination and draft of the vessels are key considerations in staging and sequencing vessels in transit. Delaware River Pilots were interviewed to understand the constraints, particularly related to tides and vessel draft, to be incorporated into the traffic analysis.
- **Vessel Transit Analysis** – With the availability of the previously described data, an in-depth analysis was performed to provide quantified statistics such as time between vessels, number of vessels using the flood-tide transit window, and the proportion of flood-transit restricted vessels relative to all vessel transits.

2.3 Vessel Traffic Summary

This section discusses data sources and the evaluation of historical traffic on the Delaware River's Federal Channel and provides a detailed summary of the traffic.

2.3.1 Data Source

The Maritime Exchange for the Delaware River and Bay has a Maritime Online¹³ site and database. The Reporting Module included in that database provides current and advance vessel arrival, shifting, and departure information that is critical to the business community, federal government agencies, law enforcement, emergency responders, and a host of other maritime stakeholders. In addition, the Module provides historical ship movement data and on-demand custom reports. Data is available from 1998 to present. The historical ship movement data includes vessel characteristics, including name, type, and dimensions, and timestamps of when the vessel arrives and departs from port and when crossing into or out of the basin through the mouth of the Delaware Bay or the Chesapeake & Delaware Canal. The historical vessel traffic data from the Maritime Exchange was used to classify individual ship visits, to quantify ship traffic in the basin, and to provide an overview of traffic trends.

2.3.2 Maritime Exchange Ship Reporting Data Processing

Ship reporting data from the Maritime Exchange for the Delaware River and Bay were downloaded for the years 2000 through 2024. This data set consists of a continuous log of dated events for all vessels operating within the Delaware River and Bay, including entries into the basin, stops at piers and anchorages, passages through Marcus Hook, and exits from the basin. Vessel characteristics such as length, beam, and draft were also recorded.

The data set was filtered to include only vessels classified as cargo or tanker ships that must use the deep-draft Federal Channel. This excluded smaller vessels not considered relevant to the analysis (for example, excursion boats, and so forth), because they have shallow drafts and can safely transit outside of the Federal Channel without impacting traffic in the Federal Channel.

The data were grouped into individual visits, defined as instances when a vessel entered and subsequently exited the basin through either the mouth of the Delaware Bay or the Chesapeake & Delaware Canal. As such, only complete transits into and out of the system were included.

This data set was used primarily to analyze annual traffic trends, including:

1. Total number of visits per year
2. Visits per month
3. Total number of visits each year by vessel draft
4. Proportion of visits restricted to flood-tide transit

2.3.3 Overview of Vessel Traffic Trends

The volume of ship traffic in the Delaware River and Bay is variable year over year and has fluctuated considerably over the last 25 years. Figure 2-1 illustrates the total number of ship visits from the years 2000 through 2024, broken down by the entrance location of the visiting vessel. In 2024 there were 2,745

¹³ <https://www.maritimedelriv.com/mol/>

visits. This is well below (more than 20%) the peak levels observed during the 2000s, which included 3,437 visits in 2000 and 3,383 visits in 2006.

The increased vessel traffic observed in the early 2000s can be attributed to peak operations of crude oil refineries in the Delaware River and Bay. There were distinct drops in vessel traffic associated with the 2008 financial crisis. With the idling and subsequent decommissioning/repurposing of the Marcus Hook and Eagle Point Refineries circa 2011 and the subsequent decommissioning of the Philadelphia Energy Solutions refineries at Girard Point starting in 2019, it is unlikely that vessel traffic associated with crude oil will return to the volumes seen during these peak periods. However, these data provide overall context concerning the traffic capacity of the channel, as discussed further herein.

Distinct drops in vessel traffic were again observed in 2020 associated with the coronavirus (COVID-19) pandemic. However, vessel traffic has generally increased over the past 5 years, returning to volumes experienced in 2015.

Figure 2-2 shows the total number of vessel visits by month for each year, demonstrating that traffic is relatively evenly distributed throughout the year. This is an important consideration when evaluating the channel's capacity, as it suggests that ship traffic in the Delaware River and Bay does not exhibit strong seasonal variation.

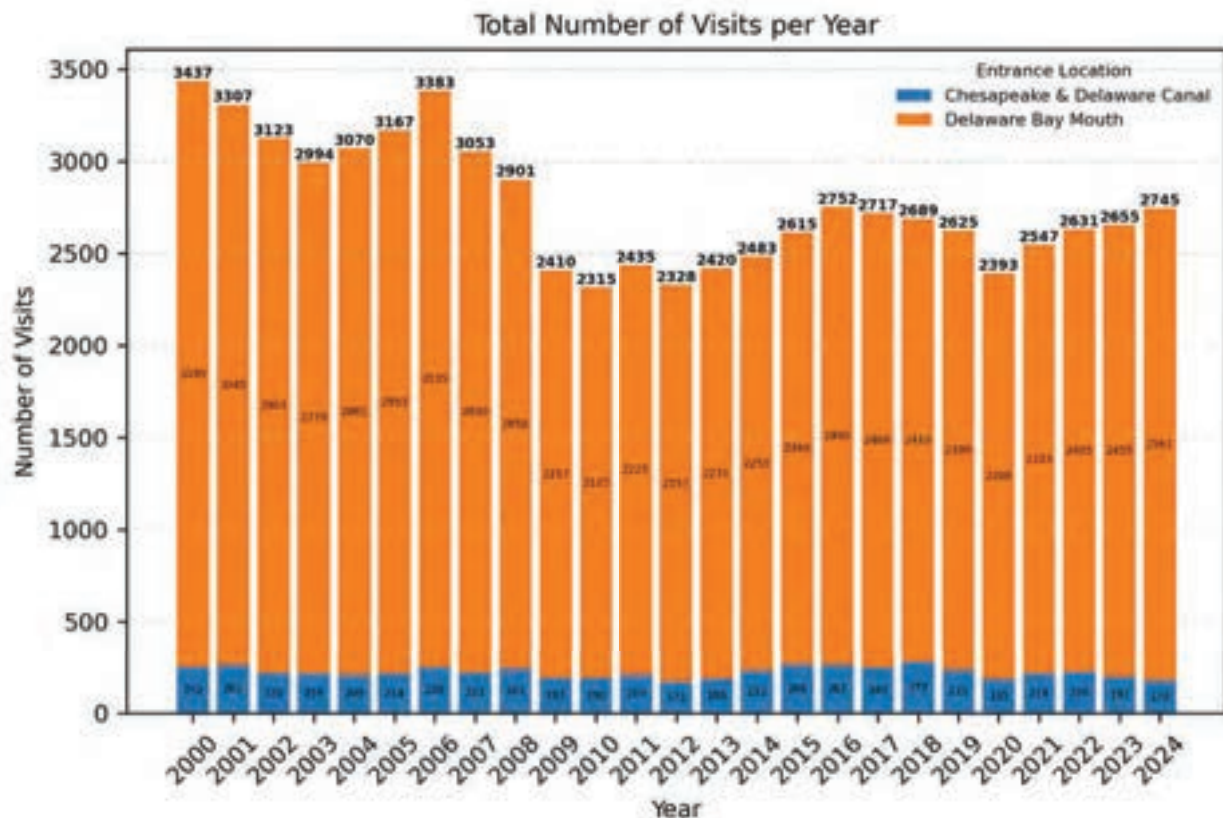


Figure 2-1. Total Annual Visits to Delaware River and Bay by Entrance Location

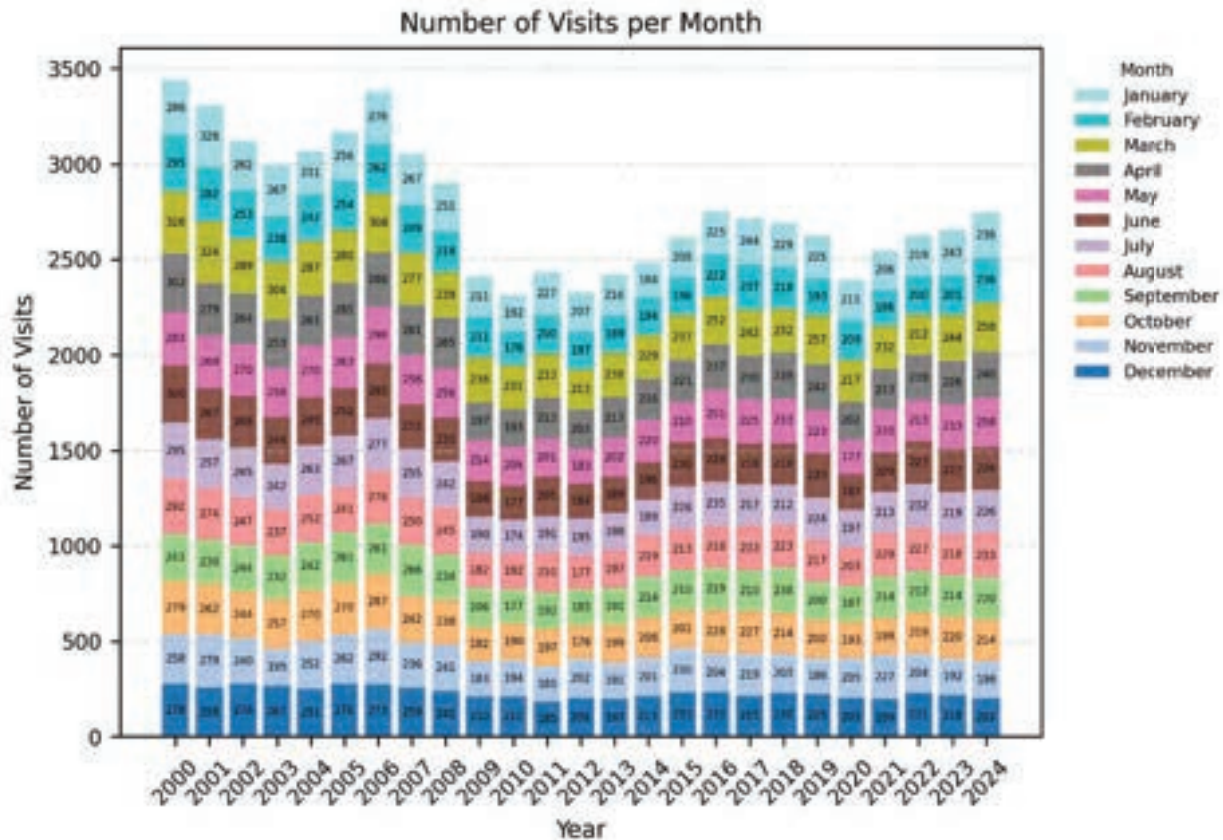


Figure 2-2. Total Annual Visits to Delaware River and Bay by Month

2.4 Vessel Draft Analysis

The Maritime Exchange for the Delaware River (MEX) and Bay Maritime Online data can be distilled to provide vessel counts by draft ranges as filtered by the user.

Figure 2-3 presents the number of vessel visits categorized by reported draft in 5-foot increments. The proportion of visits within each draft range remains relatively consistent from year to year. This analysis excludes vessels that only visited Big Stone Beach Anchorage or Breakwater Anchorage before departing the Bay because these ships likely arrived solely to conduct ship-to-ship oil transfers before leaving the region. Some inbound vessels reported drafts greater than 40 feet. MEX noted that drafts for vessels inbound to Delaware River Terminals, specifically in the 2000s when the Federal Channel was shallower than it is today, were often not updated after lightering,¹⁴ and some had erroneous drafts.¹⁵ Lightered vessels typically offload an amount of product to reduce their draft to allow safe navigation but sometimes offload all of their product in the Bay through lightering vessels and do not call terminals.

¹⁴ Tankers typically arrived at the mouth of the Bay and offloaded some of their crude onto a lightering vessel to reduce the tanker’s draft to less than 40 feet. Both vessels would then proceed up the River to oil terminals. MEX explained that draft measurements were often taken only once, prior to lightering, so the post-lightering draft was not updated in vessel data reports.

¹⁵ There were some instances of misreported vessel dimensions in the MEX ship reporting data, such as a draft recorded greater than 70 feet.

For this analysis, Jacobs did not alter or reclassify the reported drafts because these erroneous drafts would not have any downstream impacts on the traffic study. Therefore, it was assumed that drafts greater than the 40-foot pre-channel deepening would be vessels in the 30- to 35-foot and 35- to 40-foot draft categories and were, therefore, included in Jacobs' analyses.

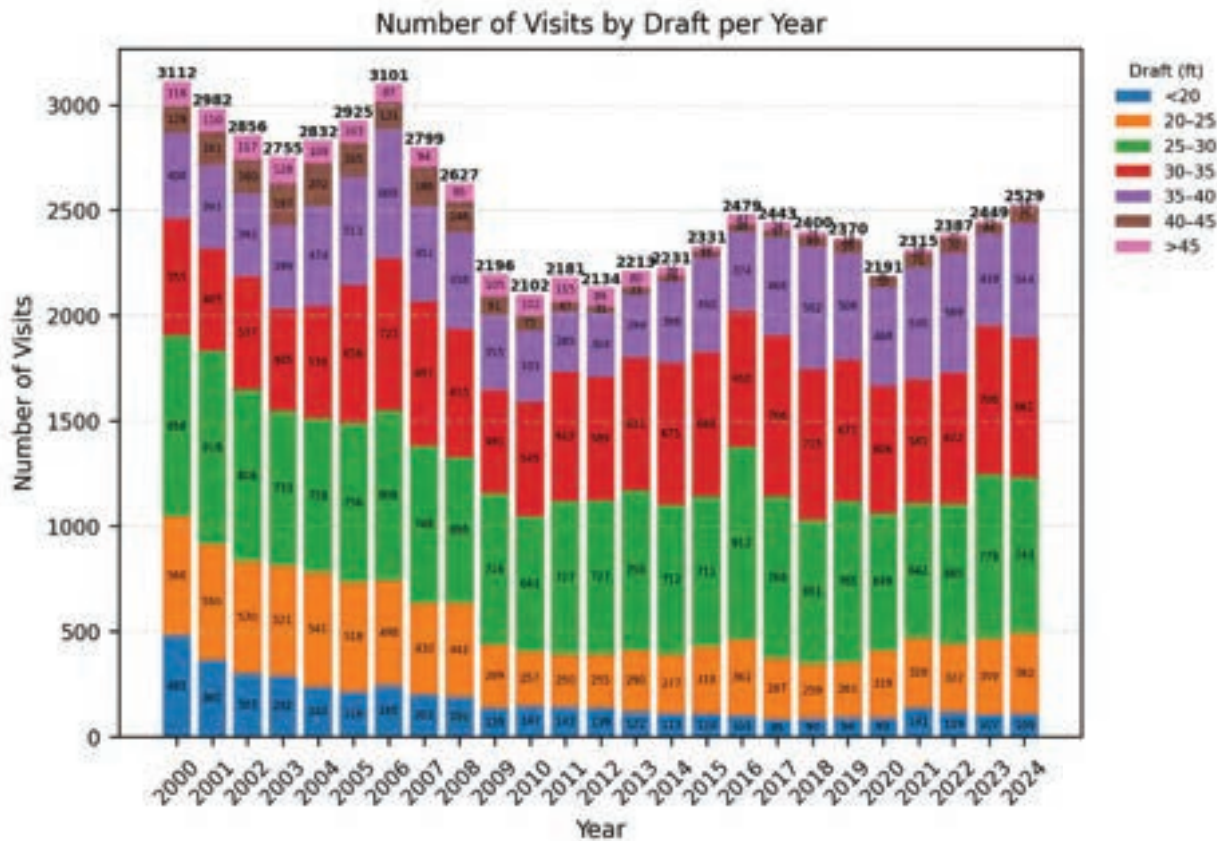


Figure 2-3. Total Annual Visits to Delaware River and Bay by Reported Draft

Vessel traffic was reviewed with respect to the active and archived MAC Transit Advisories¹⁶ to determine the number and proportion of vessels restricted to flood-tide transit each year. The Transit Advisories were continuously updated to reflect the current channel conditions with respect to the 45 foot Federal Channel Deepening project. These Advisories delineate which vessels are restricted to flood-tide transit based on their draft and beam. Figure 2-4 shows an example of the restrictions in the 2024 MAC Transit Advisory. For vessels that underwent lightering at Big Stone Beach Anchorage or Breakwater Anchorage, their updated post-lightering draft was used in the assessment. In this assessment, the term “deep-draft vessels” refers to ships that are required to transit during flood tides.

¹⁶ https://macdelriv.org/files/transit_advisory.pdf

> Inbound

The maximum inbound freshwater draft for river transit from sea to Beckett Street is 44 feet.

<u>Container Vessel</u>	
• Flood:	44' max draft
• Ebb:	37'-06" (Beam 40m or greater) 38'-06" (Beam less than 40m)
<u>Tanker/Bulker/Other</u>	
• Flood:	44' max draft
• Ebb:	37'-06" (Beam 32.2m or greater) 38'-06" (Beam less than 32.2m)

Figure 2-4. Excerpt from MAC Transit Advisory ¹⁷

Figure 2-5 shows the total number of deep-draft vessel transits from 2000 to 2024, categorized by vessel type: tankers, containerships, bulk carriers, and other. The "other" category includes all vessels that are not tankers, containerships, or bulk carriers. Deep-draft vessel traffic has evolved significantly since the 2000s, with a steady decline in tankers paired with an increase in containerships. The decline in tankers is driven by the closure of and the reduction in capacity of major refineries in the region. For example, between 2006 and 2024, there were significant reductions in deep-draft vessel traffic going to Delaware City (-75%), Monroe (-47%), Marcus Hook Terminal (-64%), Eagle Point (-88%), and Paulsboro Refining (-49%). The closure of Fort Mifflin resulted in a reduction of over 100 deep-draft ships. Changes in visiting vessels and updated restrictions associated with the Channel Deepening may have also negatively impacted the number of deep-draft vessel visits.

Figure 2-6 ¹⁸ lists the top 7 destinations, excluding anchorages, for deep-draft vessels in 2006 and 2024. If the vessel went to more than one terminal, then only the first terminal called was used in this analysis. When a vessel stopped at an anchorage before calling a terminal, the first terminal visited after the anchorage was considered. The list includes the number of deep-draft vessel visits relative to the total number of visits to each port. In addition, deep-draft vessel visits have become increasingly concentrated at fewer ports over time. For example, in 2006, only three times as many deep-draft vessels went to the terminal with the most calls (Paulsboro Refining) as compared to the terminal with the seventh most calls (Buckeye Energy). In 2024, over 13 times as many ships called the top terminal (Packer Avenue) as compared to the seventh (Paulsboro Marine Terminal). Not only are there fewer deep-draft vessel visits in 2024 than in 2006, but these visits are also concentrated at a smaller number of ports. Therefore, to fully realize the benefits of the 45-foot Channel Deepening project, it is essential to expand the capacity of existing ports and develop new facilities, such as DCT, that are capable of accommodating deep-draft vessels.

¹⁷ https://macdelriv.org/files/transit_advisory.pdf

¹⁸ Jacobs-prepared graphic, based on Maritime Exchange Data

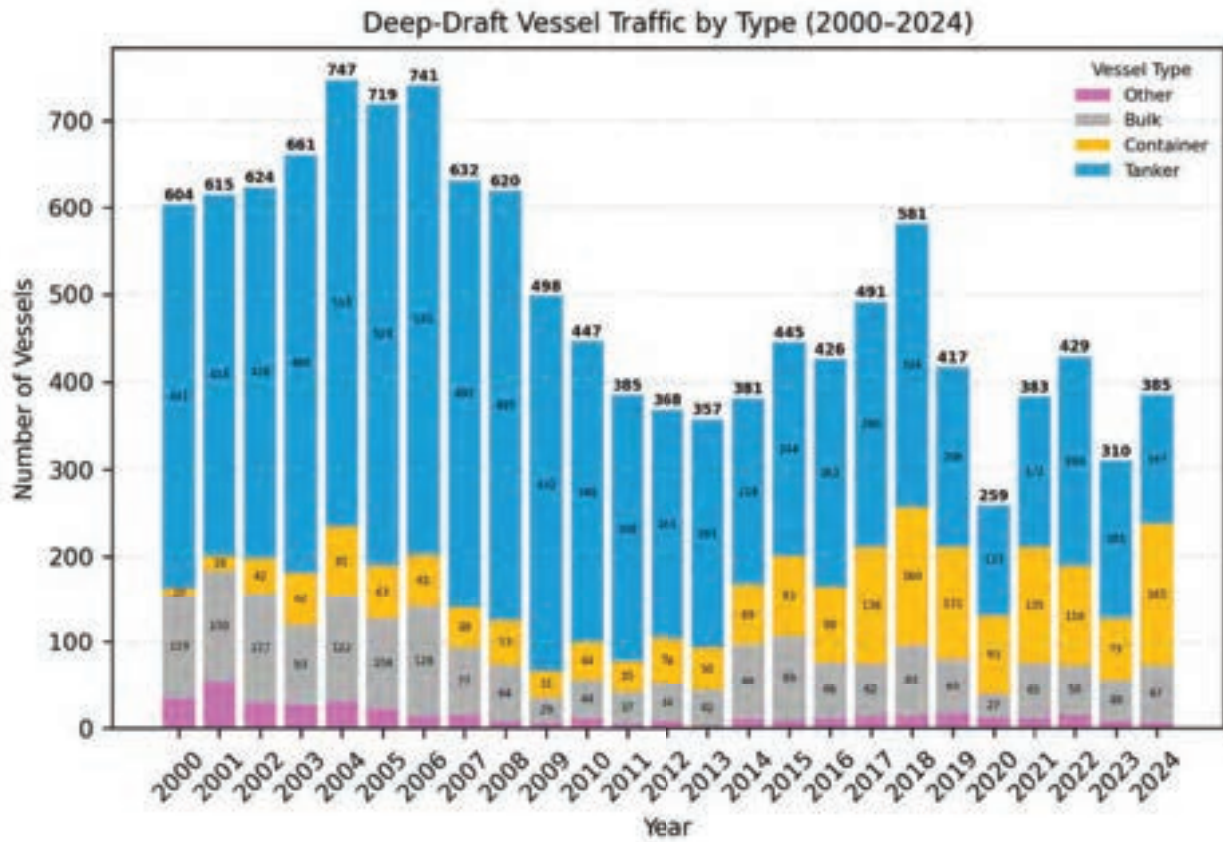


Figure 2-5. Deep-Draft Vessel Traffic by Type



Figure 2-6. Top Seven Terminals for Deep-Draft Vessel Visits in 2006 and 2024

Fewer vessels were restricted to flood-tide transit in 2024 than in 2006, both in terms of the number of ships and their percentage of total traffic. Figure 2-7 and Figure 2-8 show the proportion of flood-tide restricted vessels and the breakdown of the vessels by type for 2006 and 2024. In 2006, there was a total of 741 deep-draft vessel visits, which constituted 22% of all vessel traffic that year. In 2024, there were only 385 deep-draft vessel visits, which made up 14% of all vessel traffic that year.

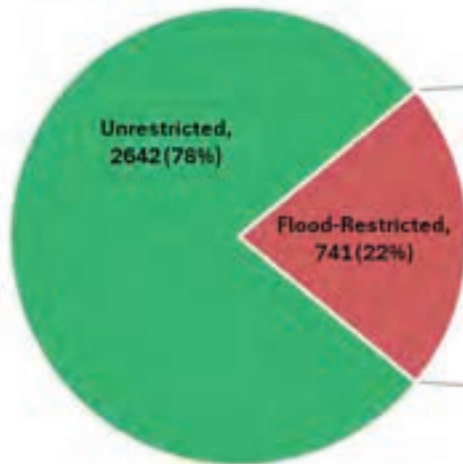
This information is significant, as it suggests that deep-draft ship traffic restricted to flood-tide-only transit constitutes a relatively small portion of the overall ship traffic in the basin. Additionally, the large volume of flood-restricted vessel traffic in the 2000s shows that the Federal Channel has the capacity to safely support almost double the amount of deep-draft vessel traffic observed today. Even with the addition of 118 DCT-related vessels¹⁹ to 2024, the total volume of deep-draft vessel traffic would remain below the historical peak levels.

¹⁹ Reference Section 2.7.2

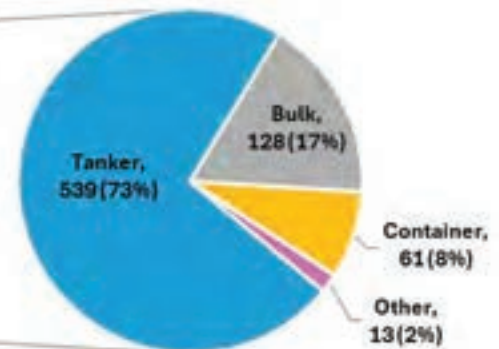
Legend:
 Category,
 # of Vessels, % of Total

2006 Vessel Visits to the Delaware Bay & River

Transit Restrictions for Vessel Visits*



Flood-Restricted Vessel Types



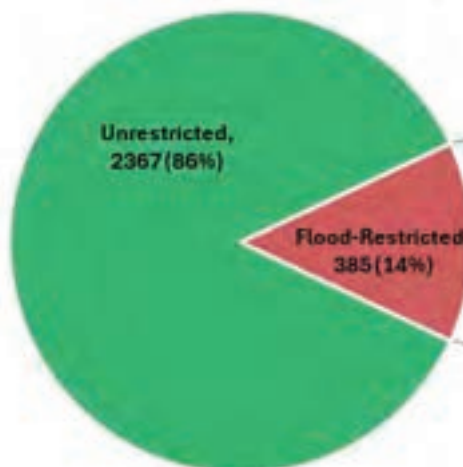
*According to the Mariners' Advisory Committee's Transit Advisory effective in 2006

Figure 2-7. Proportion of Flood-Tide Transit Restricted Vessels in 2006

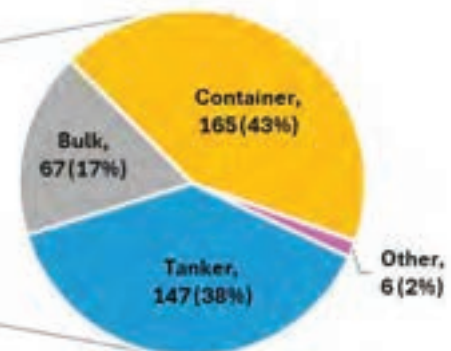
Legend:
 Category,
 # of Vessels, % of Total

2024 Vessel Visits to the Delaware Bay & River

Transit Restrictions for Vessel Visits*



Flood-Restricted Vessel Types



*According to the Mariners' Advisory Committee's Transit Advisory effective in 2024

Figure 2-8. Proportion of Flood-Tide Transit Restricted Vessels in 2024

2.5 Pilot Coordination

Jacobs held a series of discussions with the Delaware River Pilots to understand and document current procedures and requirements for transiting vessels. More detail related to these discussions is provided in Section 3.6; however, key information provided by the Delaware River Pilots and the data considered in the traffic analysis is summarized as follows:

- The Delaware River Pilots noted that it is not uncommon to have several deep-draft ships inbound on the same tide cycle; but there is adequate time to embark within the tide window to ride the tide.
- According to the Delaware River Pilots, vessel traffic in the Delaware River and Bay is organized in a way that makes it unlikely for deep-draft vessels transiting upriver beyond DCT to be delayed by DCT-bound ships. During flood tides, vessels are typically sequenced such that those with destinations further upriver are placed ahead of those with downriver destinations. Sequencing the ships structurally prevents vessels from being delayed by the berthing maneuvers of preceding ships. Additionally, vessels with far-upriver destinations are constrained to narrower departure windows and must begin their transit earlier in the flood tide. For example, ships destined for Packer Avenue Marine Terminal (PAMT) only have a 1- to 2-hour window on the flood tide when they can begin their upriver transit to safely reach their destination, while ships bound for DCT would typically have 4 to 5 hours. These timing constraints naturally favor earlier departures for vessels traveling further upriver, which reduces the likelihood of delay due to DCT-bound traffic.
- The discussion with the Delaware River Pilots made clear and reinforced that ship traffic congestion is not presently an issue for meaningful transit delays. Sequencing of deep-draft vessels on a tide largely prevents delays due to a vessel's berthing maneuvers because vessels needing time to maneuver during berthing are not sequenced in front of vessels bound for terminals upstream of their maneuver.
- Through their daily involvement of piloting ships on the River, the Delaware River Pilots are very familiar with ship traffic in the Bay and its constraints. The Delaware River Pilots conveyed that they have not seen congestion of ships sharing the Federal Channel become a source of meaningful delays in transit times. The Delaware River Pilots identified the primary causes of delay for vessel traffic in the Federal Channel, which include the following:
 - Occupied berths (that is, berths to which the inbound vessels were destined, and waiting until the ship in the berth was underway outbound to free up the berth for the inbound ship)
 - Unsafe wind or fog conditions
 - Lower-than-expected tides
 - Ship mechanical issues
 - Deep-draft vessels arriving during ebb tide must wait for the next flood tide to transit
 - Delays during vessel transit in the Atlantic Ocean prior to arrival at the Bay
- The Delaware River Pilots noted that slowing down transit speeds to allow berthing and slow maneuvering speeds near occupied berths or to meet passing vessels at optimal reaches of the River is a normal part of operations. The time consumed by these types of delays is inconsequential compared to the vessel's total Federal Channel journey time and the delays during ocean transit.

- There are fewer large vessels now than during the years with peak traffic (prior to closure of several refineries on the River), and even during those peak years, traffic congestion was not a common issue that caused meaningful delays.
- The Delaware River Pilots also noted that the occurrence of vessels staging to overtake, slow for navigation maneuvers, or slow for safe transit past certain segments of the River are dependent on a variety of factors, including the type of vessels under way and location on the River, and are not solely a function of the vessel length or draft.

2.6 Vessel Transit Analysis

Data available from the MEX ship reporting described overall traffic behavior on the River, but it did not provide precise location information throughout a given vessel's transit. More specifically, an accurate assessment of vessel spacing could not be derived from the MEX data. Transit times, vessel spacing, and temporal relation to tide cycle are key for evaluating traffic and potential congestion, given that deeper-draft vessels may be restricted to transiting during a flood tide.

Therefore, additional analysis was conducted by supplementing the MEX data with data available from the Marine Cadastre to account for vessel spacing.²⁰

2.6.1 Data Source

The Marine Cadastre is an initiative established in 2007 by the National Oceanic and Atmospheric Administration (NOAA) and the Bureau of Ocean Energy Management in response to the growing need for spatial data and tools to support offshore infrastructure. It is considered a premier source for authoritative and trusted ocean geospatial data.

The Marine Cadastre provides historical vessel traffic data within the waters of the U.S. from Automatic Identification System (AIS) data collected by USCG. The data comes from an onboard navigation safety device that transmits and monitors the location and characteristics of vessels in U.S. and international waters in real time (including draft). The precise location data at a high temporal resolution were used to quantify the time between vessels and to analyze ship traffic with respect to the tides.

As with data derived from MEX, AIS data were filtered to include only vessels classified as cargo or tanker ships.

2.6.2 Marine Cadastre AIS Data Processing

AIS data from the Marine Cadastre was downloaded for the years 2019 through 2024 for the regions surrounding DCT and Brandywine Shoal Lighthouse. The data set contains time-stamped vessel positions, headings, speeds, and characteristics, recorded at 1-minute intervals. Vessel track lines were reconstructed from these AIS points, with distinct transits by the same vessel separated into individual tracks.

The data near DCT were used to characterize traffic patterns near the proposed terminal. Traffic patterns near the Brandywine Shoal Lighthouse were considered as they represented the broader traffic (all River traffic) using the Federal Channel. The Brandywine Shoal Lighthouse is located near the beginning of the navigation channel in the lower Delaware Bay.

²⁰ <https://hub.marinecadastre.gov/>

The time at which each vessel passed a set location at DCT or Brandywine Shoal Lighthouse was estimated (that is, all time stamps reconciled to a consistent location), using linear interpolation between AIS points. Linear interpolation was used to estimate values between two known data points by assuming a straight-line change between them. Accordingly, in this application, the line spans between the AIS points located immediately before and after the set location. These time stamps were used to analyze:

- Number of vessels transiting each flood-tide window at Brandywine
- Time between vessels at Brandywine Shoal Lighthouse
- Time between vessels at DCT
- Proportion of inbound and outbound flood-tide restricted vessels at DCT

2.7 Results

This section presents the findings of the ship traffic analysis, focusing on vessel patterns, transit timing, and the potential impacts of additional traffic from the proposed DCT.

2.7.1 Existing Conditions

Stakeholders (namely competitor ports and their representatives) expressed concern that the introduction of additional vessel traffic associated with DCT could result in transit delays, particularly for vessels navigating upstream of DCT along the Delaware River Channel. This section addresses two key aspects of that concern:

- **Delays caused by vessels slowing to berth at DCT** – to evaluate this possibility, the time between vessels passing DCT from both the upstream and downstream directions was analyzed to assess if the berthing maneuver would disrupt the typical traffic patterns.
- **The possibility of congestion resulting from increased traffic within the system** – to evaluate this concern, the number of vessels using each Flood-Tide Transit Window (FTTW) was compiled to evaluate whether the system currently operates near capacity and to what extent it could accommodate additional traffic.

The analysis was performed to evaluate whether congestion is an issue in the Delaware Bay and if berthing maneuvers at DCT will materially disrupt traffic in the event an upstream-destined vessel is behind a DCT-destined vessel. For the following discussion, it is assumed that the berthing maneuver at DCT will take approximately 30 minutes, which is a conservative (worst-case scenario) estimate based on discussions with the Delaware River Pilots (refer to Section 4.2) and Jacobs' analysis of vessel traffic (refer to figures in Section 2.33.5.1).

Boxplots were prepared to visualize the time between vessels as they passed a defined threshold location. Boxplots are a simple picture of how much time usually passes between vessels. The box marks where the middle range of values fall, the line inside shows the median, and the lines on either side reach the outer limits of the data. Any points beyond those limits highlight rare situations where vessels came much closer together or much farther apart than usual.

Figure 2-6 presents a labeled diagram of the boxplots included in this section. In the figure, "time interval" refers to the time between vessels. Boxplots are characterized by a box and two whiskers extending from the box. The main box ranges from the 25th percentile (Q1) to the 75th percentile (Q3) of the data set, and the difference between these values is the interquartile range (IQR). The IQR is used to determine outliers of the data set and the distance of the extension lines. The top line extends to either the maximum

of the data sets or $Q3 + 1.5 \times IQR$, whichever is smaller. The bottom line extends to either the minimum of the data set or $Q1 - 1.5 \times IQR$, whichever is greater.

In the context of this analysis, for all scenarios, the bottom line extends to the minimum of the data set rather than $1.5 \times IQR$ below $Q1$. The value is close to zero, suggesting that vessels are sometimes as little as 30 seconds to 1 minute apart. Under normal operating procedures, the minimum time between vessels would typically be in the range of 7.5 to 15 minutes for vessels going 14 to 7 knots, respectively. This is based on the minimum 2-mile standard safe following distance described by the Delaware River Pilots. Therefore, the short time intervals can be attributed to vessels making passing maneuvers, which would create situations where the safe following distance is breached. An interval of only 1 or 2 minutes between vessels would require unrealistic speeds to maintain the safe distance. However, these short intervals were not excluded from the analysis because this would have introduced a bias toward the longer intervals or require artificially manipulating the data to replace the short intervals with more appropriate ones. Therefore, the results are likely skewed toward shorter intervals, which is acceptable for this analysis because it provides a more conservative assessment of the time between vessels. In reality, the median times between vessels depicted in the boxplots are longer.

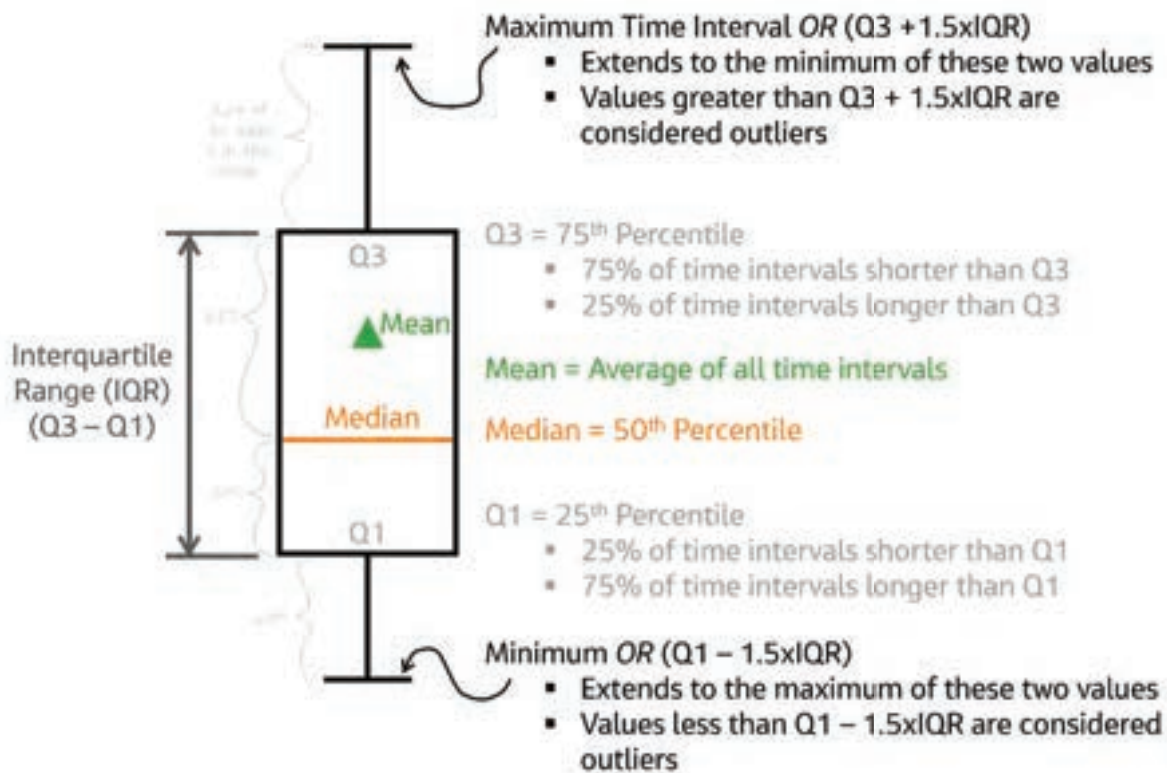


Figure 2-9. Labeled Boxplot Diagram for Interpreting Time Between Vessels Boxplots

Figure 2-7 presents boxplots showing the time between vessels transiting past DCT during the FTTW. This includes both upstream and downstream vessels and excludes FTTW with no vessels. To account for unused time in the FTTW, the time between the opening of the window to the first vessel and between the last vessel and the closing of the window was included in the analysis if the time was longer than an hour.

Focusing on the presentation of the data for 2024, 75% of passing vessels had 33 minutes or more between them, and 50% of passing vessels had 74 minutes or more between them. This shows that the berthing maneuver could be performed without disrupting upstream or downstream traffic within a large proportion of windows. The wide IQR across all years is indicative that congestion is not an issue because there is substantial variation in the time between vessels.

Figure 2-8 shows a similar set of boxplots but for all vessel transits, not just those occurring within the FTTW. Note that the percentiles all increase compared to those on Figure 2-7. For the remaining discussion, similar analyses of the time between vessels will only focus on the FTTWs. The FTTW spans from 4 hours before to 2 hours after peak high tide. These windows represent the most constrained and operationally critical scenarios. An operationally critical scenario refers to a situation where navigation and scheduling decisions matter the most, such as deep-draft vessel transits.

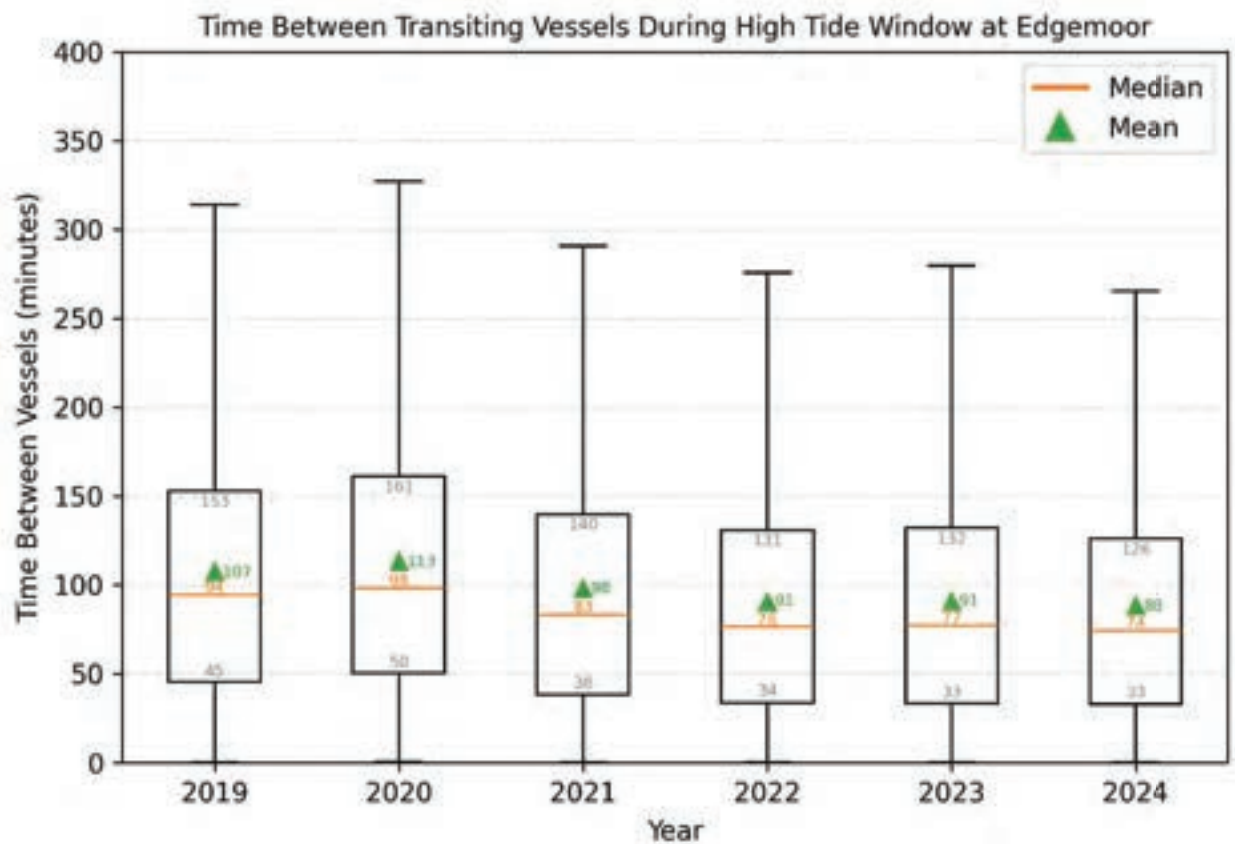


Figure 2-10. Boxplots of Time Between Transiting Vessels During FTTW at DCT

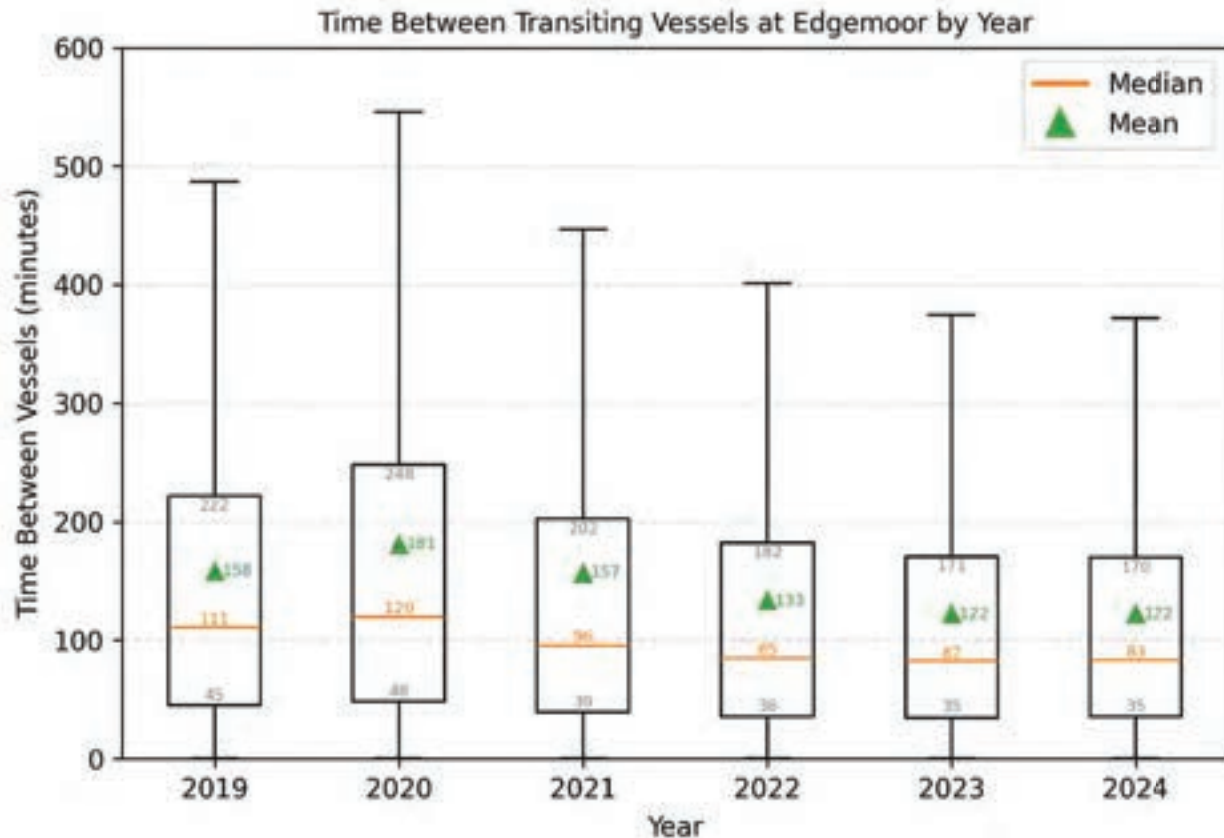


Figure 2-11. Boxplots of Time Between Transiting Vessels at DCT

Figure 2-9 shows similar boxplots but only for upstream transiting vessels at DCT. In 2024, 75% of passing vessels had 69 minutes or more between them. This indicates a substantial buffer between most upstream transits. In the rare event that an upriver-destined vessel is behind a DCT-destined vessel, it would be an unusual scenario since the Delaware River Pilots sequence the upriver-bound vessels first. If the sequencing were to be out of typical order, it would only be done when an adequate following distance between the two can be arranged such that the upstream vessel would not need to slow in transit to allow the DCT vessel to complete its berthing maneuver before overtaking. According to the Delaware River Pilots, a vessel would be able to pass the DCT-bound vessel once the DCT-bound vessel is out of the Federal Channel. Clearing the channel would take approximately 15 minutes, and the voyage from the mouth of the Delaware Bay to PAMT is approximately 7 hours, exclusive of berthing time. Therefore, the a delay of 15 minutes under this unusual scenario represents only a 3.5% increase in transit time. Further, passing-vessel speeds would be adjusted far downriver (while staying at safe maneuvering speeds) and are accounted for in transit time planning. Finally, it should be noted that this possible delay is even more insignificant when considering overall trans-ocean transit times.

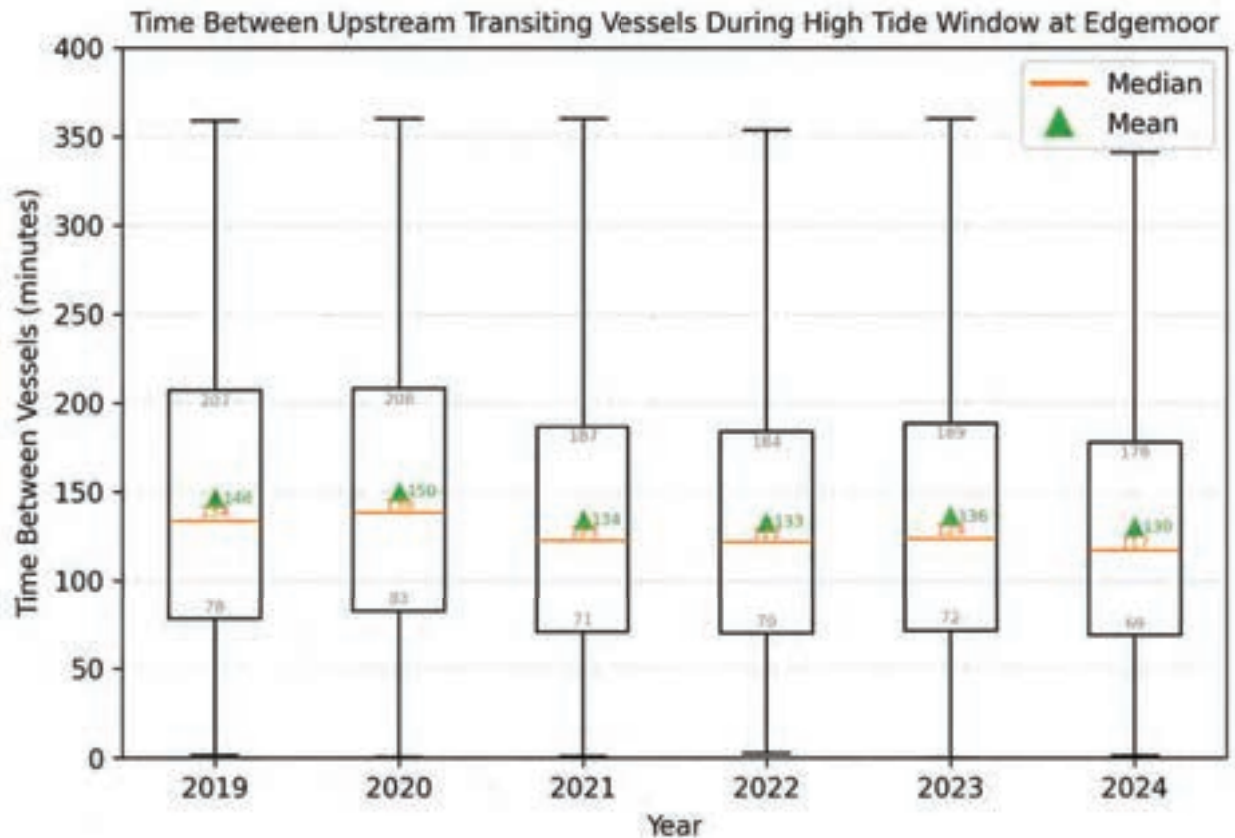


Figure 2-12. Boxplots of Time Between Upstream Transiting Vessels During FTTW at DCT

2.7.2 Projected Conditions with DCT

To assess the impacts of vessels arriving at or departing from DCT, Jacobs considered an additional 118 vessels per year at DCT. This is the estimated number of vessel calls identified in the USACE-endorsed *Biological Assessment of Potential Impacts of the Edgemoor Container Terminal Port Project to Species Listed Under the Endangered Species Act Application*, CENAP-OP-R-2019-278, prepared by Duffield Associated, LLC on July 26, 2019, and revised on October 20, 2021 (Biological Assessment), and subsequent Biological Opinion.

The additional 118 additional vessels from the proposed DCT equates to a 4.3% increase over the total number of visits recorded in 2024 (refer to Section 2.3.3). This level of growth does not constitute a significant shift in traffic patterns and is consistent with historical year-over-year increases, such as those observed between 2005-2006, 2010-2011, and 2015-2016, while still falling short of the peak observed in 2000.

2.7.2.1 Additional DCT Vessel Traffic

As noted previously, the full buildout of the proposed DCT is projected to generate an additional 118 vessel calls to the Delaware River and Bay. To assess the impact of this increase on regional ship traffic, these additional calls were added to the 2024 vessel traffic record. The AIS data was available from 2009 to 2024. Over this timespan, 2015 and 2024 had the peak volumes of vessel traffic. 2024 was selected

because it was representative of the highest vessel traffic case in the record, captured present-day vessel traffic patterns, and the data were of a higher quality compared to the 2015 data. Therefore, 2024 was the critical case to simulate, considering other years would show fewer vessels per tide and greater time intervals between vessels. For both upstream and downstream transits, all vessels were assumed to be deep draft and, therefore, restricted to traveling during flood tides.

A logic-based methodology was developed to assign upstream and downstream transit windows. This method ensured that the additional vessels would not conflict with existing traffic, adhere to flood-tide transit restrictions, and account for berth occupancy at DCT. The upstream-directed traffic at Brandywine Shoal Lighthouse was used to determine conflicts for the upstream transit window, and the downstream-directed traffic at DCT was used to determine conflicts for the departure transit window. The following logic guided the simulation of each vessel, and was based on information from the Delaware River Pilots, traffic data, and estimates of vessel transit time and time at berth:

1. Upstream Transit Criteria:

- a. The FTTW are the periods in the tidal cycle during which water depths are deep enough to support deep-draft vessels and defined as 4 hours before to 2 hours after high tide at Brandywine Shoal Lighthouse.
- b. Vessel Transits were scheduled to occur at least 1 hour after FTTW opens and 1 hour before it closes to be conservative and account for variations in safe transiting conditions and water levels of FTTWs.
- c. Vessels are separated by a 30-minute following time to avoid causing delays due to the upriver vessel completing berthing operations.
- d. Only 1 or 2 vessels are on the FTTW to focus on less-congested FTTWs.
- e. The destination berth for each vessel is available at DCT upon arrival.

2. Berthing Details:

- a. The transit time to DCT was assumed to be approximately 4.5 hours.
- b. Berthed vessels remain at berth for a minimum of 67 hours, based on the projected average time a vessel will stay at berth at DCT to tie up, transfer cargo, and prepare for departure.
- c. There are two berths available, and each berth is considered unavailable if occupied.

3. Downstream Transit Criteria:

- a. A vessel can depart after 67 hours at berth.
- b. No downstream traffic will occur within the next 30 minutes.
- c. Vessels will depart within the flood-tide exit window, which ranges from 2.5 hours after and 1 hour before the predicted low and high tides at DCT, respectively (the flood-tide exit window is discussed further in Section 2.7.2.3).
- d. Wind speed must be less than 25 knots for the 6 hours following departure from DCT.

This simulation loop repeated until all 118 vessels were added to the traffic record. The time between vessels during the FTTW and the number of vessels using each FTTW were recalculated to quantify the impact of the additional vessel traffic.

2.7.2.2 Transit Analysis Including DCT Traffic

The total number of vessels using each FTTW was determined by using the peak high-tide times at NOAA Station 8555889 Brandywine Shoal Light, DE. The FTTW occurs between 4 hours before and 2 hours after peak high-tide water levels. The Brandywine Shoal Light location was selected for the analysis because it is

situated near the beginning of the Federal Channel and is at the location where all the vessel traffic entering the basin is sequenced for transit up the River. Figure 2-10 shows the number of vessels using each FTTW by year, including 2024 with the estimated additional DCT vessel traffic added. The intent of this analysis is to assess whether additional deep-draft vessel traffic can be smoothly integrated into current traffic patterns such that other vessel movements would not be significantly altered to accommodate the new traffic. Therefore, this analysis includes all vessels using the FTTW, regardless of draft restriction. Due to the relatively low quantity of deep-draft vessel transits compared to the number of tides, analyzing only deep-draft vessels would not yield meaningful results. By analyzing all vessels, the results instead capture the sporadic nature of vessel arrivals, general traffic patterns, and safety practices related to maintaining safe following distances.

Across all years, only a small proportion of the total flood tides have four or more vessels on them, indicating that most tides remain underutilized.

Table 2-1 details the mean and maximum number of vessels on each flood tide by year. Each year in recent history (2019-2024), a maximum of seven or eight ships on a single tide was observed, confirming the Delaware River Pilots' determination (or assessment) that the Federal Channel has significant capacity to support additional deep-draft traffic. Thus, the increasing trend of more vessels on each flood tide is not a present concern.

Delaware River Pilots noted that because ships are sequenced so that vessels bound for terminals are ahead of vessels bound for downstream terminals, vessels are spaced as close as 2-5 minutes apart. However, a spacing closer to 30 minutes is required when the leading vessel turns for a terminal and the vessel following behind continues past the terminal. This 30-minute spacing allows the leading vessel to turn and clear the Federal Channel, and for the following vessel to maintain safe maneuvering speeds. A scenario where ships bound for downriver terminals are sequenced first (which would require a 30-minute spacing between the vessels) on a FTTW would be extremely rare and avoided by Delaware River Pilots. However, even when modeling the most conservative case of 30 minutes between all vessels, upwards of 12 ships could safely be fit on a single 6-hour FTTW with a gap of 30 minutes between vessels.

The 2024 traffic data showed that the maximum observed number of vessels at eligible FTTW was 8 vessels, which is significantly fewer than the 12-vessel capacity based on conservative 30-minute spacing. Assuming the current maximum 8-vessel capacity is implemented on all FTTWs in a year, it is therefore feasible to have up to 4,992 deep-draft vessel inbound transits annually. Figure 2-11 shows the FTTW with eight vessels in 2024, with the moment the vessel passed Brandywine Shoal Light superimposed onto the hourly water levels measured at that location.

In 2024, only 1,512 vessels used the FTTWs, with less than a third of those vessels restricted to flood-tide transit based on their draft. Therefore, the channel can safely support more than triple the present-day flood-tide transit traffic. These results highlight that the primary constraint on ship traffic is not the capacity of the Federal Channel but, rather, the number of berths and the limited port infrastructure available in the Delaware Bay region, which DCT would improve upon.

The additional traffic associated with DCT was deliberately allocated to FTTWs with only one or two vessels to illustrate that it is feasible to seamlessly integrate the new traffic into the least-congested tides. Additional traffic due to DCT was deliberately *not* added to FTTWs with zero ships, because some of these (although a small fraction) may not have been navigable due to low water level conditions discussed further in Section 4.2. Even with this allocation, many flood tides remain lightly used. To provide a rough estimate of overall capacity, Jacobs assumed 624 valid FTTW opportunities [events] in 2024, which corresponds to the number of the FTTWs with at least one vessel transit in 2024. Conservatively, DCT vessels were not incorporated into "zero-vessel" tides (FTTWs with no vessels transiting) because some of

these 2024 “zero-vessel” tides may have been restricted due to weather conditions making them ineligible for transit. For the zero-vessel tides, the difference could not be discerned between the tides with safe transit conditions that happen to have no vessel transits and tides where transit was not permitted due to environmental factors. The number of zero-vessel tides where transit was not permitted is likely a small fraction of the total zero-vessel tides recorded in 2024. However, the exact number could not be quantified, so this conservative approach was taken in that all zero-vessel tides were excluded.

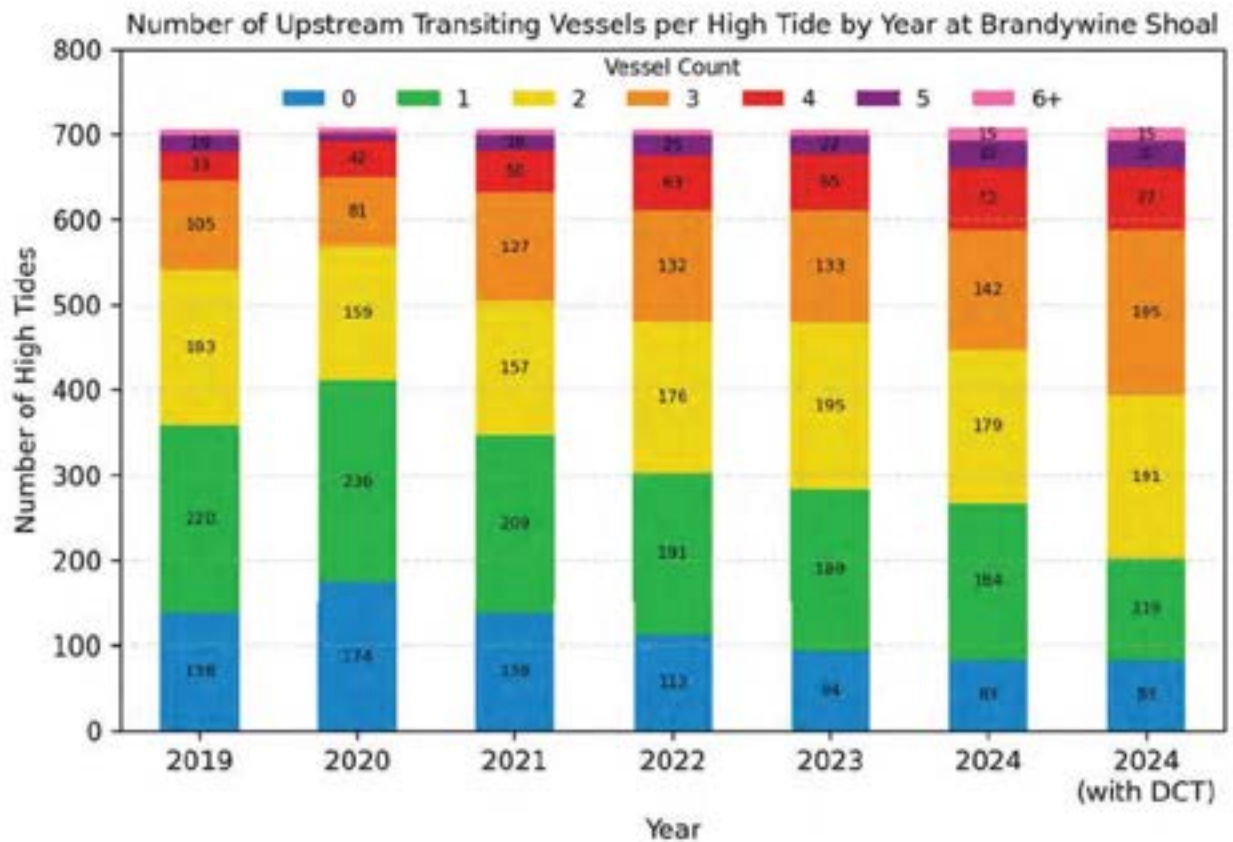


Figure 2-13. Number of Upstream Transiting Vessels per FTTW at Brandywine Shoal with DCT Traffic

Table 2-1. Mean and Maximum Number of Upstream Transiting Vessels per FTTW per Year

Year	Mean	Maximum
2019	1.66	7
2020	1.48	7
2021	1.75	7
2022	1.92	7
2023	1.97	7
2024	2.14	8
2024 (with DCT)	2.31	8

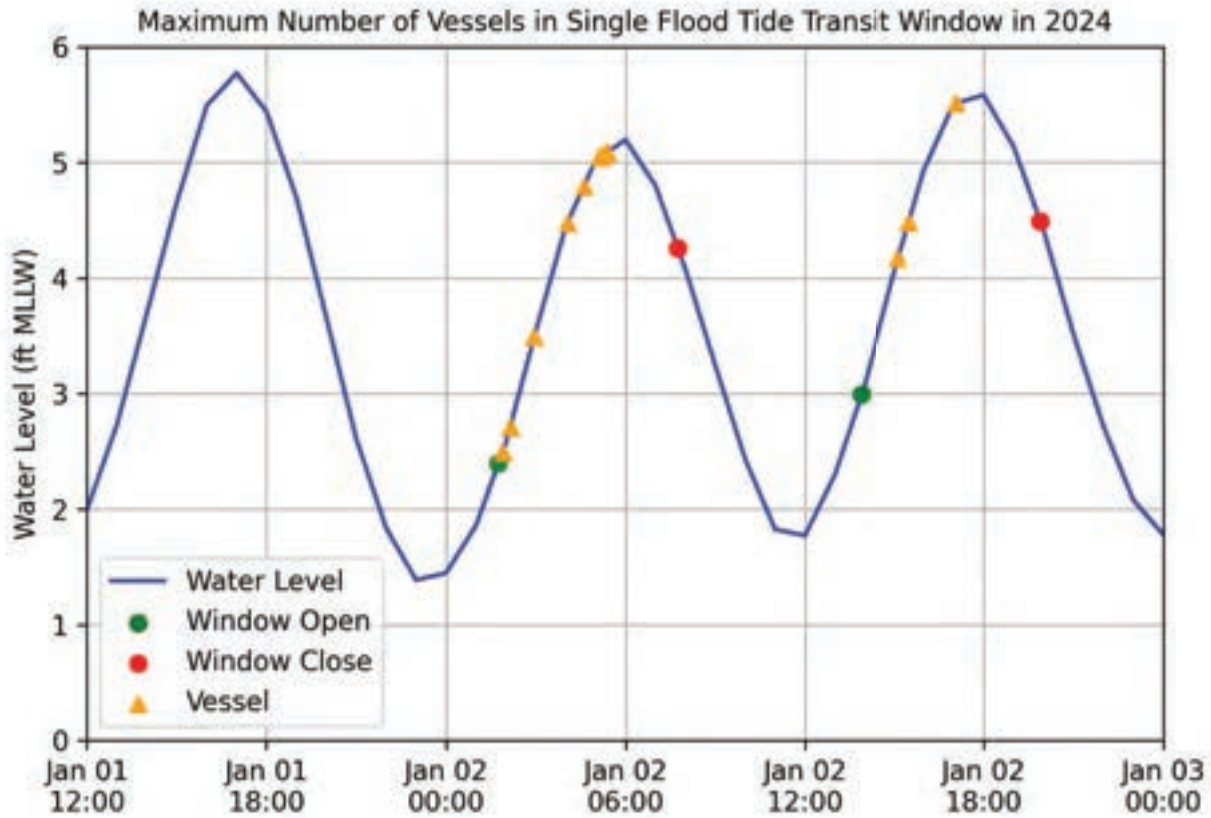


Figure 2-14. Maximum Number of Vessels in a FTTW in 2024

Figure 2-12 displays boxplots of the time between upstream transiting vessels passing Brandywine Shoal Light from 2019 to 2024, including the 2024 scenario with simulated DCT traffic. The additional 118 DCT vessel calls slightly decreased all percentiles for the time between vessels. In 2024, 50% of vessels passing Brandywine Shoal had 106 or more minutes between them, while with the simulated additional traffic, 50% of vessels had only 97 or more minutes. This slight decrease does not represent a baseline shift in ship traffic. Rather, the relatively small decrease reinforces that the system remains well below capacity and that additional traffic can be accommodated without congestion.

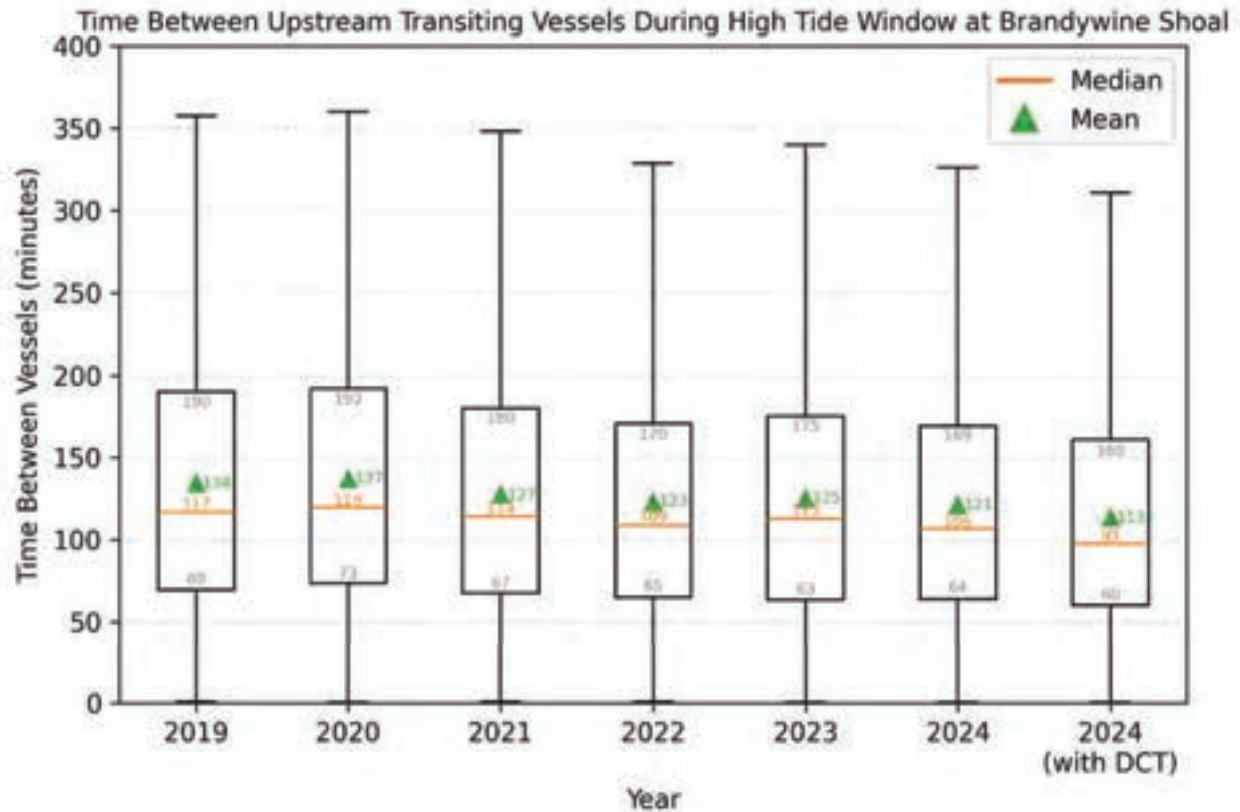


Figure 2-15. Boxplots of Time Between Upstream Transiting Vessels During FTTW at Brandywine with DCT Traffic

2.7.2.3 Outbound Traffic Considerations

The analysis and discussion in the previous section largely focused on the inbound traffic and the traffic capacity on the inbound FTTW. This section discusses the outbound deep-draft traffic patterns and capacity.

The June 2024 MAC Transit Advisory only delineates specific deep-draft vessel departure windows for the areas around PAMT, Eagle Point, Paulsboro, and Marcus Hook. For DCT, the departure window defined for Marcus Hook was applied using predicted high and low tides at Edgemoor, DE. This exit window extends from 2.5 hours after low water until 1 hour before high water. Departure during this window guarantees that the outbound vessel will safely exit the Delaware Bay. This exit restriction was applied to vessel traffic departing DCT during the analysis.

Data revealed that deep-draft vessels departing from terminals upriver of DCT did not necessarily pass during the exit window. Specifically, of the 201 outbound deep-draft vessels passing Edgemoor in 2024, only 41% did so within the defined window. In practice, outbound vessels passed at all stages of the tide, with 60 percent during flood tide and 40 percent during ebb tide. Safe transit conditions can exist outside of the departure windows defined in the MAC Transit Advisory as River discharge events and weather can cause higher than anticipated water levels, and thus safer transit conditions with greater bottom clearance. Delaware River Pilots are responsible for each transit and make informed decisions based on weather, vessel characteristics, and channel conditions about the safety of a departure outside the recommended window.

The outbound traffic data shows that vessels from Edgemoor have many more safe departure opportunities outside the recommended window since 59% of passing vessels did not pass during the outbound window in 2024. However, it is still important to measure the capacity of this window to understand the potential effect of additional DCT traffic. For a conservative estimate, the exit window will be assumed to be a 2-hour window occurring each flood tide. With a vessel spacing of 30 minutes, 5 deep-draft vessels could use an individual exit window. Similar to the inbound analysis, it is assumed that only 624 of the 707 tides per year will be valid for safe transit. This equates to a total maximum annual outbound deep-draft vessel capacity of 3,120 vessels. With respect to the 2024 traffic, only 6.4% of that capacity was used. Adding in the 118 deep-draft ships from DCT raises it to 10.2%.

In conclusion, there is ample capacity to accommodate the additional outbound deep-draft vessel traffic from DCT. Some vessels will depart outside the defined window, and many will not be draft restricted, so the available capacity is understated. In 2024, the volume of outbound draft-restricted traffic was about 28% lower than the volume of inbound draft-restricted traffic. Figure 2-13 presents pie charts depicting the proportion of inbound and outbound flood-tide transit restricted vessel traffic passing DCT in 2024.

Flood-Tide Transit Restriction Class for Vessels Passing Edgemoor in 2024 Based on June 2024 MAC Advisory

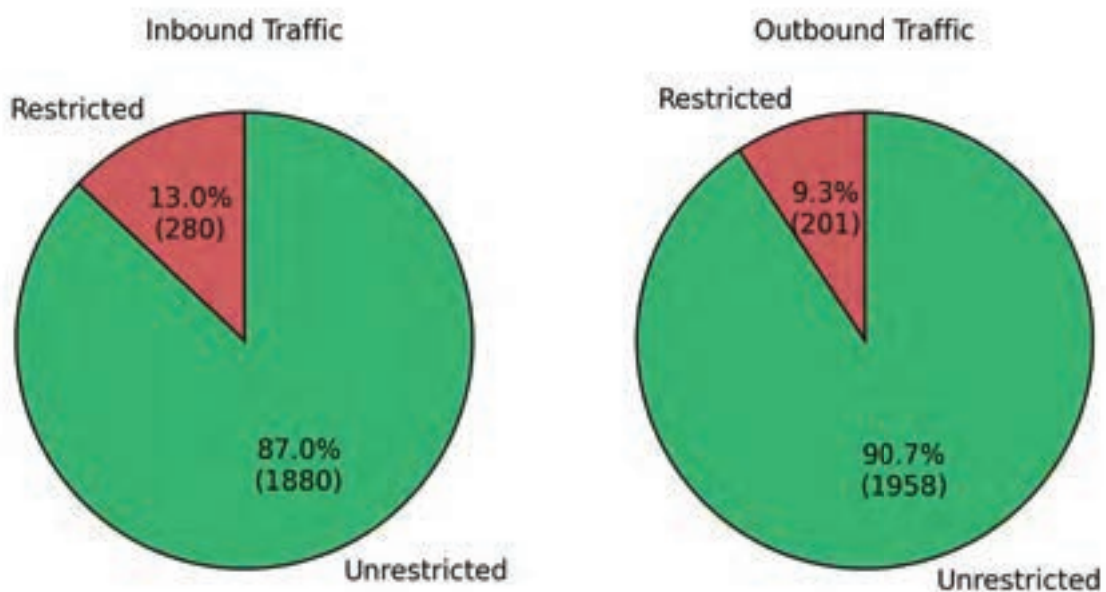


Figure 2-16. Proportion of Inbound and Outbound Flood-tide Restricted Vessel Traffic Passing DCT

2.7.3 Other Considerations

Projected ship traffic in the Delaware River and Bay is highly dynamic and shaped by non-linear factors, such as future economic conditions, trade regulations, and shifting shipping interests. Additionally, human involvement plays a major role in the organization and operation of ship traffic in the basin. Delaware River Pilots actively sequence vessels based on destination and characteristics, and the MAC provides Transit Advisories that define safe conditions and draft restrictions along the channel. These practices and protocols will continue in future years. These points convey a system that is controlled by people and,

because of this, is highly adaptable. Because ship traffic in the region is managed through active decision-making and coordination, the system is more efficient, and navigation is safer than a probabilistic model using random variables would present alone. Any changes in traffic patterns would likely be met with planning efforts aimed at minimizing delays and improving efficiency.

2.7.4 Data Limitations

The traffic analysis relied upon ship reporting data from the MEX for the Delaware River and Bay, along with historical AIS data from the Marine Cadastre. There are potential incongruencies between and inaccuracies within the MEX and Marine Cadastre data sets. For example, both data sets have instances of misreporting vessel drafts, and vessel counts may not perfectly add up to each other. In instances where data were incomplete, a conservative approach was taken by assigning a deeper draft or selecting the variable that presented the more challenging scenario. Despite the identified issues, the information is sufficient to support the objectives of this study.

2.8 Conflict (Monte Carlo) Analysis

2.8.1 Objective

Jacobs performed a Monte Carlo Analysis to understand how the development of DCT, and associated increase in deep-draft vessel traffic, may impact the existing capacity of the Federal Channel, considering potential factors that may increase the expected number of deep-draft vessels traveling in the River's Federal Channel and factors that may reduce the deep-draft vessel traffic capacity of the Federal Channel on any given tide.

The analysis involved assessing the potential impact of DCT's development on the Federal Channel's operational performance, focusing on both capacity and deep-draft vessel traffic. To appropriately allocate the impact of a given risk, two event matrices were developed, one for the Federal Channel's capacity threshold and one for the vessel traffic entering the Federal Channel. A probability and three impact values (most likely case, best case, and worst case) were developed for each event. Using these quantified inputs, a Monte Carlo simulation was performed by running 5,000 iterations to model the uncertainty and understand how these events could influence the Federal Channel's capacity and vessel traffic under different scenarios.

2.8.2 Methodology

The analysis was focused specifically on deep-draft, tide-restricted vessels because shallow-draft vessels are less restricted in when they can transit the River. Deep-draft vessel traffic patterns are linked to the area's tides and face tighter capacity limits within the Federal Channel, making deep-draft vessels the main focus of this analysis. The projected number of additional vessels expected from DCT's development, or 118 deep-draft vessels per year,²¹ was then incorporated into the baseline.

The analysis focused on two aspects impacting vessel congestion. The first aspect is vessel traffic on the River, or "shipping baseline" (per year), representing the number of deep-draft (tide-restricted) vessels

²¹ Jacobs considered an additional 118 vessels per year at DCT, which is the estimated number of vessel calls identified in the USACE-endorsed *Biological Assessment of Potential Impacts of the Edgemoor Container Terminal Port Project to Species Listed Under the Endangered Species Act Application*, CENAP-OP-R-2019-278, prepared by Duffield Associated, LLC on July 26, 2019, and revised on October 20, 2021 (Biological Assessment), and subsequent Biological Opinion.

using the Federal Channel within a year. Based on historical shipping data (refer to Section 2.4), the existing annual baseline was conservatively estimated at 420 vessels per year by increasing total deep-draft vessel traffic in 2024 by 10%. The projected DCT traffic was added to the baseline, raising it to 538 vessels for the analysis. The second aspect is the capacity threshold (per tide), representing the maximum number of vessels that can use the Federal Channel per tide, also derived from historical shipping and traffic data. The initial per-tide capacity was set at eight vessels, following the maximum number of vessels transiting during a single flood tide through the period of record (2019 through 2024). Derivation of the per-tide capacity is discussed in more detail in Section 2.4. After obtaining the results, these per-tide outcomes were converted to an annual scale using the factor of 707 tides per year, which was the total number of tidal cycles in the subject year (2024). The yearly results provided an annualized view while maintaining the original structure and relationships of the simulation model.

Jacobs' risk and port experts then identified and evaluated events (risks and opportunities) that could impact either the threshold capacity or the deep-draft vessel baseline. This resulted in two separate event matrices (Appendix D). Each event was assigned a likelihood of occurrence (probability), and an impact estimate was presented using a three-point range (minimum, most-likely, and maximum values). Events identified could be negative (risks or threats) or positive (opportunities).

Furthermore, the analysis acknowledged and captured the multitude of mitigation measures that are currently in place to prevent potential incidents and ensure safe operations. Table 2-2 provides a sample of events used in the analysis.

Table 2-2. Sample of Events

Category	Event	Impact	Mitigation Actions in Place	Notes
Shipping Baseline	Unanticipated short-term increase in vessel traffic volume due to other non-DCT projects	Increased vessel frequency or size of vessels impacting channel utilization	Highly scheduled and controlled transits already occurring	-
Capacity Threshold	Adverse weather conditions	Squall conditions (high wind speeds greater than 25 knots) – Major Impact (Event longer than 3 hours)	Current MAC Transit Advisories in place limit transits to safe conditions; multiple "bail-outs" exist should conditions change on the River during a transit	Determined probability by reviewing 2024 measured wind data at NOAA Station 8537121, Ship John Shoal, New Jersey. Counted number of tides that had wind speeds greater than 25 knots for longer than 3 hours.

Using these parameters and inputs, a Monte Carlo simulation was performed with 5,000 iterations for the baseline (which, in Jacobs' opinion, is typical for these types of analyses) and threshold events to identify

the probability of occurrence of various outcomes and calculate updated values for both the baseline and threshold after taking into consideration the impact of the identified events.

Jacobs' Monte Carlo Analysis used the following assumptions:

- **Vessel Type Scope:** The analysis was limited to deep-draft vessels, other vessel types were excluded in the analysis. Inclusion of all vessels using the Federal Channel would demand a different approach to the baseline and capacity simulation ²².
- **Data Availability:** The analysis is based on and limited to the information available at the time of the analysis. The data set is publicly maintained and made available by the MEX, and was not developed by Jacobs or DSPC.
- **Monte Carlo Analysis:** Jacobs used Palisade @Risk, a standard industry program, to run the Monte Carlo simulation and used 5,000 iterations (simulation trials) for the analysis.
- **Probability Distribution:** Probabilities were based on a P5/P95 TriGen Distribution.
- **Risk Likelihood and Impact Estimates:** Each event impact and likelihoods are estimated based on available data, project documents, project experience, team discussion, and other information.
- **Vessel Routes:** The analysis does not consider specific vessel routes within the Delaware River and does not involve a detailed route analysis.

2.8.3 Risk Identification and Assessment

Events were identified through a comprehensive process that included a thorough review of relevant project documentation, consideration of the environmental, operational, and industry conditions relevant to the DCT project, and consultation with subject matter experts and input from the Delaware River Pilots. It was also key to understand the current operations and mitigation measures in place, which was gathered through discussion with the Delaware River Pilots and tug companies. This approach captured a broad spectrum of potential events, providing a well-rounded understanding of potential challenges.

To determine the probabilities of occurrence and potential impacts for the identified events in both scenarios, the risks were categorized as either qualitative or quantitative. This distinction separated events that could be quantified using publicly available data (quantitative) from those that could not be reliably quantified because of limited data or the influence of multiple non-linear factors (qualitative). Some examples of quantitative and qualitative risks are discussed in the following sections, and Appendix D has a full list of all risks considered.

²² Excluding berth availability, which is assumed not to be a constraint and is beyond the scope of this study, deep-draft and shallow-draft vessel traffic face different capacity limitations. Deep-draft vessel traffic is the most constrained of all vessel traffic as transit is restricted to flood tides, and therefore, annual capacity is governed by the total number of vessels that can safely transit during each flood tide. In contrast, shallow-draft vessels can transit at any tidal stage, so their annual capacity is controlled by safe vessel spacing, overall traffic, and terminal operations. The deep-draft capacity analysis focuses on quantifying random factors that influence per-tide transit capacity, whereas the shallow-draft capacity analysis would require traffic analyses accounting for safe following distances, speeds, destinations, congestion, and more. As the deep-draft vessel traffic adheres to the same safety protocols as the shallow-draft traffic but with a smaller available transit window, it is reasonable to assume that the deep-draft vessel traffic capacity is lower. Therefore, this analysis focused only on deep-draft vessel traffic capacity because it is the most constrained and the additional traffic from DCT is primarily deep-draft.

2.8.3.1 Quantitative Event Occurrence Frequencies

Examples of quantitative events include some environmental events and marine casualty events. Occurrence frequencies for quantitative events were determined by referencing publicly available data sets relevant to the specific events. All quantitative events were associated with the capacity baseline and were related to environmental conditions or marine casualties. The number of occurrences per year for each quantitative event was estimated from its data set and then converted to a per-tide probability by dividing by the total number of tides in a year.

Environmental data such as visibility, tide conditions, wind speeds, and current speeds were extracted from various NOAA stations. The environmental data were analyzed in relation to the MAC's June 2024 Transit Advisory to identify weather events that exceeded safe transit conditions.

Marine casualty data such as vessel collisions, loss of propulsion, loss of electrical power, and groundings were extracted from a USCG data set of marine casualties from 2010 to present. Only incidents involving cargo or tanker vessels that occurred near the main navigation channel were included in the analysis since only these events would impact vessel traffic in the channel. The methodology for determining the probability for each quantitative event is further detailed in the event matrix (Appendix D).

2.8.3.2 Qualitative Event Occurrence Frequencies

Examples of qualitative events include events associated with vessel scheduling issues, berth availability, and so forth. Occurrence frequencies for qualitative risks were drawn from a preset range that extended from everyday occurrences to events expected only once in 50 years. Annual probabilities were directly determined by the return period. The annual probabilities were converted to a per-tide basis by dividing the number of events expected per year by the number of tides in a year (707 in 2024). The judgment of Jacobs' ports and maritime professionals guided the selection of the most appropriate probability in each case. Table 2-3 shows the occurrence frequency ranges used in the analysis.

Table 2-3. Probability Matrix

Rating	Return Period	Events per Year	Annual Probability	Per-tide Probability (Events per Year/Tides)
1	1 in 50 Years	0.02	2%	0.0028%
2	1 in 25 Years	0.04	4%	0.0057%
3	1 in 10 Years	0.1	10%	0.0141%
4	1 in 5 Years	0.2	20%	0.0283%
5	1 in 1 Year	1	100%	0.1414%
6	10 in 1 Year	10	-	1.4144%
7	50 in 1 Year	50	-	7.0721%
8	100 in 1 Year	100	-	14.1443%
9	Every other Day	182.5	-	25.8133%
10	Everyday	365	-	51.6266%

2.8.3.3 Impacts

The potential impacts for both qualitative and quantitative events were estimated as a percentage of the threshold or baseline as applicable, allowing for a range of low-medium-high impact scenarios. The model sheet (Appendix D) includes notes and basis of estimate for each event used in the calculations. For the capacity threshold, the impact percentages were multiples of 12.5% for non-fractional impacts. The magnitude of the impacts was qualitatively determined based on the severity of the event. For example, a vessel grounding in the Federal Channel near Delaware City would result in a full blockage of the Federal Channel and a 100% (8 vessels) reduction in vessels able to transit to upriver terminals. Comparatively, unsafe wind conditions lasting only an hour during the tidal cycle may only reduce the per-tide capacity by 12.5% or 25% (1 or 2 vessels).

2.8.4 Monte Carlo Analysis Results

2.8.4.1 Baseline (Traffic) Analysis

For deep-draft traffic on the River, which was measured on a yearly basis, the Monte Carlo results indicate that, based on the events identified, baseline annual traffic will likely increase. It is noted that most of the event scenarios that drive this increase are independent of DCT's development.²³ At P95 level, the analysis projects an increase of approximately 18 vessels per year, raising the annual baseline from 538 to 557 deep-draft vessels per year. The histogram in Figure 2-14 shows that, with 95% confidence, the maximum increase in vessel traffic is 17.71 vessels per year. The tornado diagram in Figure 2-15 highlights the risks that contribute most to baseline traffic variance, presenting the factors that most likely increase traffic volumes.

²³ The most impactful event scenarios are und-related to DCT's development, and include: unanticipated short-term changes to vessel traffic volumes, departure delays for vessels leaving other terminals on the River, uncertainty in long-term vessel traffic forecasts, vessels missing inbound tides, and cruise ships calling at other terminals on the River.

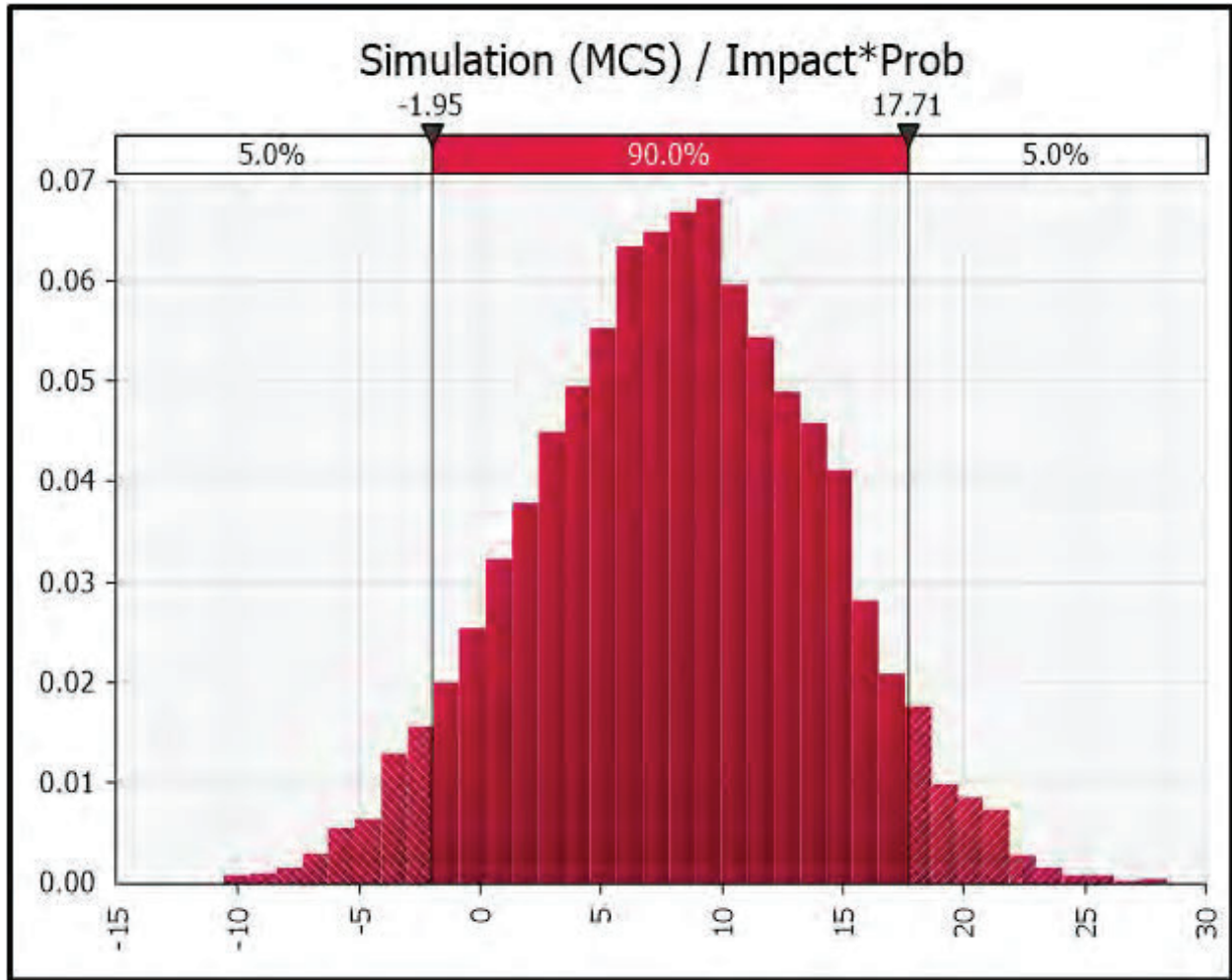


Figure 2-17. Baseline Monte Carlo Analysis Histogram

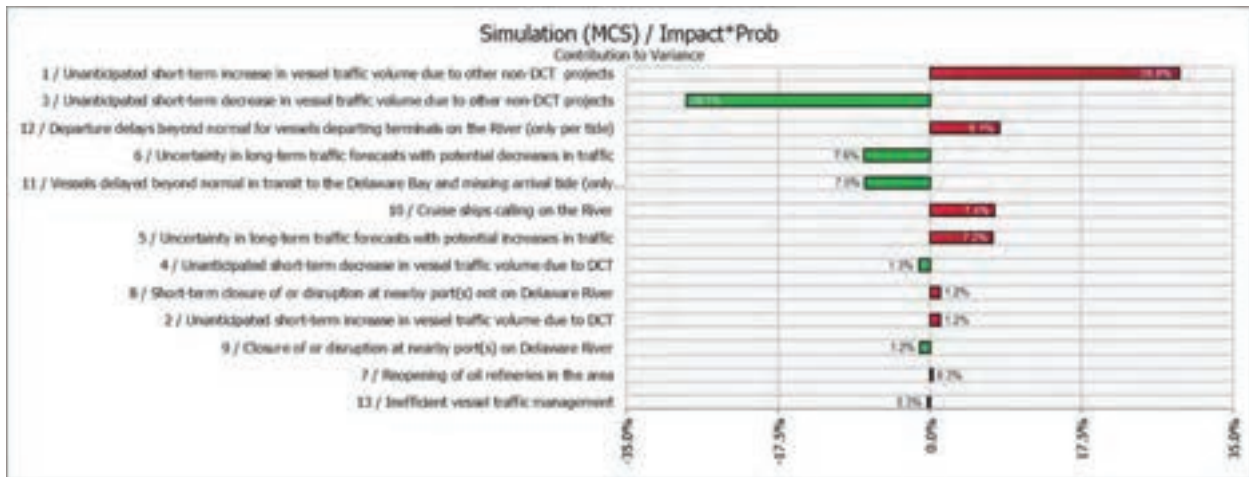


Figure 2-18. Baseline Monte Carlo Analysis Tornado Diagram

The major event factors identified to be contributing to variance in the results are related to unanticipated changes in number of vessels, either due to short-term increase/decrease or uncertainty in vessel traffic forecasts.

2.8.4.2 Threshold (Capacity) Analysis

For the threshold assessment, which was measured on a per-tide basis and converted to yearly totals, the Monte Carlo simulation results indicate that channel capacity for deep-draft vessels (threshold) decrease due to the identified events, most of which are independent of DCT's development. This decrease is expected as the initial threshold (capacity) represents ideal circumstances when 8 vessels can transit every single tide of the year. With a 95% confidence level (P95), the analysis shows that the threshold is reduced by approximately 1,018 vessels per year. This results in a reduction of the maximum channel capacity from 5,656 vessels per year to approximately 4,637 vessels per year. The decrease is the reduction in capacity due to the identified events related to environmental factors and marine casualties. The histogram on Figure 2-16 shows that, with 95% confidence, the maximum reduction in threshold capacity is 1.440 vessels per tide (or 1,018 vessels on a yearly basis). The tornado diagram on Figure 2-17 identifies the key events contributing most significantly to variance in threshold outcomes.

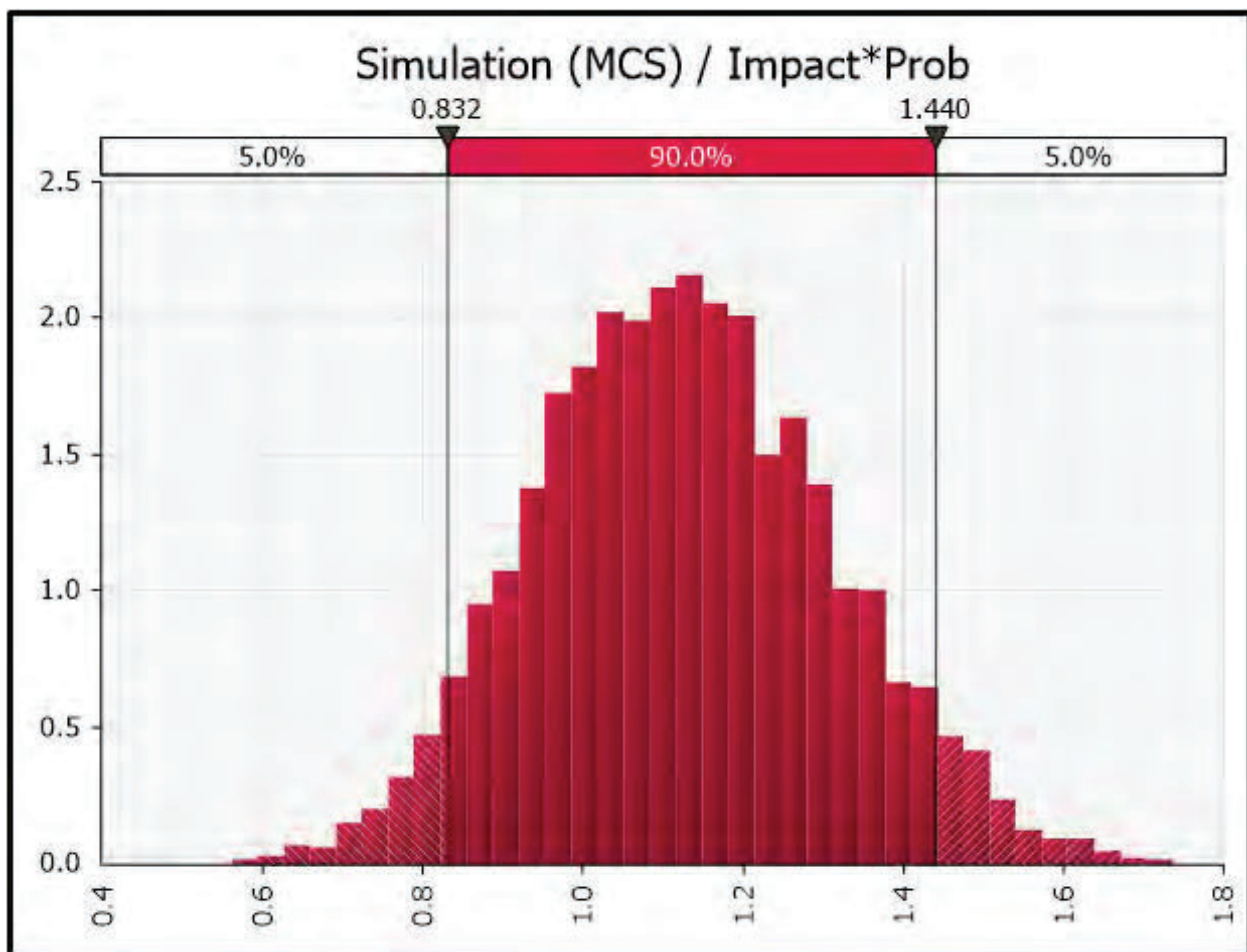


Figure 2-19. Threshold Monte Carlo Analysis Histogram

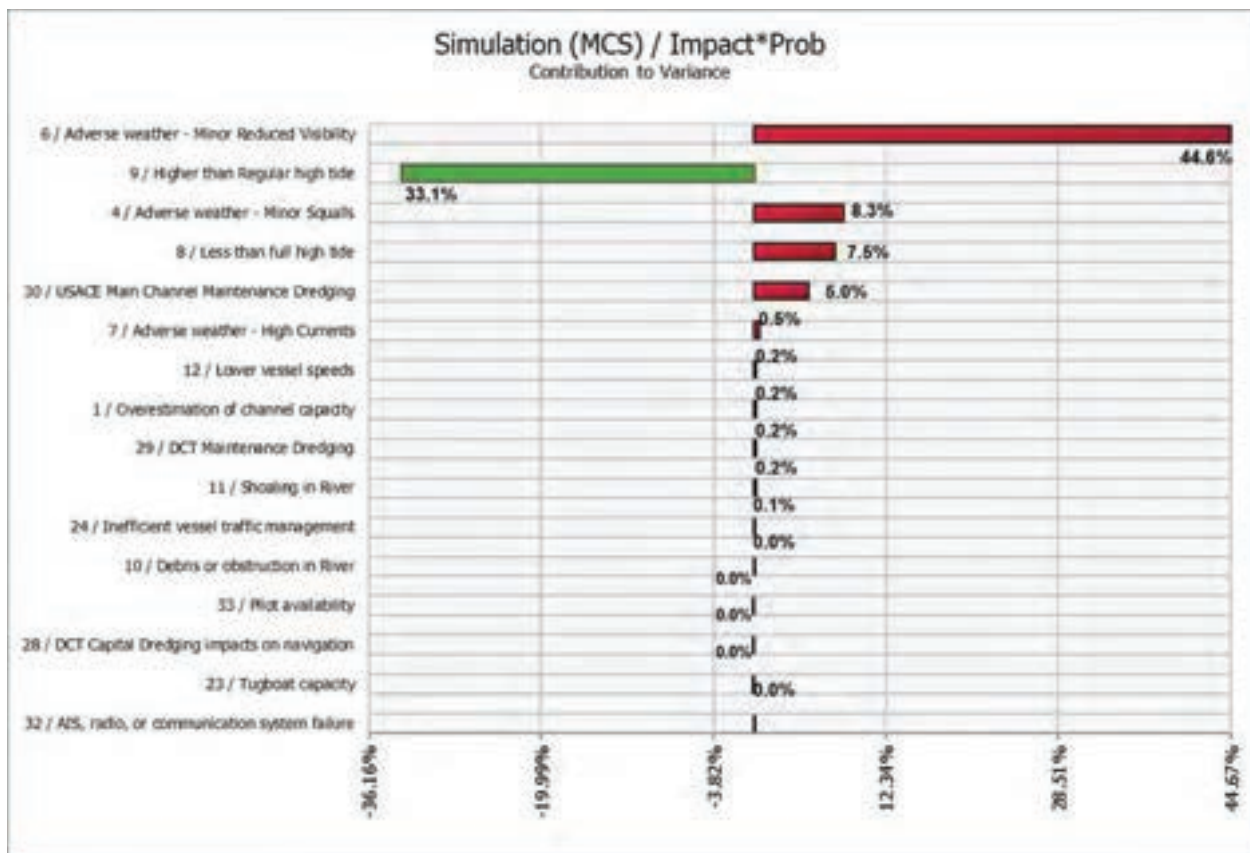


Figure 2-20. Threshold Monte Carlo Analysis Tornado Diagram

The major factors driving capacity reduction are related to adverse weather conditions, with USACE’s Federal Channel maintenance dredging (which is independent of DCT’s development) as the fifth-most contributing risk in results, noting that these are independent of DCT’s development.

2.8.5 Monte Carlo Analysis Conclusion

This Monte Carlo Analysis aimed to evaluate how DCT’s development, along with the anticipated increase in deep-draft vessel traffic, would affect the existing Federal Channel’s capacity. It examined factors that could contribute to a rise in deep-draft vessel transits, as well as those that might constrain the Federal Channel’s capacity during any given tide. The results shown in Table 2-4 compare the findings of both Monte Carlo simulations on a per-year and per-tide basis, noting:

- “Existing Conditions” represents current vessel traffic and events without DCT--related vessel traffic and events.
- “Existing with DCT” accounts for DCT-related vessel traffic and its associated events.
- “Existing with DCT” includes both non-DCT and DCT-related traffic and events

Table 2-4. Monte Carlo Analysis Summary

	Without Monte Carlo Analysis			Calculated Scenario (Monte Carlo Analysis Results)		
	Existing Conditions (Without DCT)	DCT-Related	Existing With DCT	Existing Conditions (Without DCT)	DCT-Related	Existing with DCT
Threshold capacity (P95)	5,656 deep-draft vessels per year/8 vessels per tide	n/a	5,656 deep-draft vessels per year/8 vessels per tide	4,648 deep-draft vessels per year / 6 vessels per tide	- 11 deep-draft vessels per year	4,637 deep-draft vessels per year/6 vessels per tide
Baseline traffic (P95)	420 deep-draft vessels per year/1 vessel per tide on average ^[a]	+ 118 deep-draft vessels per year	538 deep-draft vessels per year/1 vessel per tide on average ^[a]	434 deep-draft vessels per year / 1 vessel per tide ^[a]	+ 5 deep-draft vessels per year (plus 118 DCT calls per year)	557 deep-draft vessels per year/1 vessel per tide on average ^[a]
Utilization (Traffic / Capacity)	7.4%	n/a	9.5%	9.3%	n/a	12.0%

^[a]This average of 1 vessel per tide is an average calculated by dividing the number of vessels per year by the number of tides per year. Jacobs notes that in practice, and as shown in Section 2.4, the actual number of total (tide-restricted and non-tide-restricted) transits per tide fluctuates between 0 and 8. There was a relatively low quantity of deep-draft vessel transits compared to the number of tides.

As shown in Table 2-4 (and presented in Section 2), the addition of ULCVs due to development of DCT (without considering the events identified in this section) will not cause deep-draft capacity concerns on the Delaware River's Federal Channel (utilization increases from 7.4 to 9.5%). When incorporating events related to DCT and unrelated to DCT, and their potential impacts, Jacobs' Monte Carlo Analysis demonstrates the Delaware River's Federal Channel will still have sufficient channel capacity (the threshold, or capacity, of 4,637 vessels per year remains significantly greater than the baseline, or traffic, of 557 vessels per year, representing a utilization increase of 9.3% to 12.0%). Therefore, Jacobs finds that the development of DCT would not create a capacity constraint on the Delaware River's Federal Channel.

2.9 Conclusion

Jacobs undertook a multifaceted analysis and found that the Delaware River's Federal Channel is presently underutilized and that more deep-draft vessels, including the additional traffic contemplated by DCT, can be comfortably incorporated without causing congestion or meaningful transit delays.

Jacobs' analyses found the following:

- Vessel traffic on the Delaware River is significantly less than it was circa 2000-2005, with several hundred fewer vessels currently using the River. Given the closure or repurposing of refineries along the Delaware River, it is unlikely traffic volumes will approach these historical peaks. Delaware River Pilots have reported that congestion in the Delaware River was not a concern during those peak years. Projected traffic, even with new DCT vessels, would still be significantly less than these historical peaks.

- Most flood-tide windows remain underutilized and there is more than adequate capacity during the FTTW to accommodate the additional DCT traffic. This conclusion is based on the number of vessels projected to call at DCT that will likely need to use the FTTW, real-time historical ship traffic data, and Jacobs' statistical analysis performed to evaluate the capacity of FTTWs to accommodate additional vessels associated with DCT.
- Vessel spacing is generally wide enough, and transit times are scheduled to allow for berthing or unberthing operations at DCT without disruption to other traffic. Operational insights from the Delaware River Pilots further support that the system is flexible and well-managed.
- A Monte Carlo Analysis demonstrates that adequate capacity remains for deep-draft vessel transits, considering a multitude of events (risks and opportunities).

Therefore, Jacobs finds that the Delaware River and Bay has adequate capacity to support the additional vessel traffic related to DCT. The main limitations that cause transit delays are berth availability and available port infrastructure, not the Federal Channel itself.

Further, even with the additional DCT traffic, the number of ships transiting the River is less than the peak observed in 2000, during which no capacity or congestion issues were noted, as confirmed by the Delaware River Pilots and reflected in Jacobs' analyses, providing historical proof that the Federal Channel can sustain a greater annual volume of ship traffic.

3. Navigation and Safety Study

Jacobs conducted a navigation study of vessels on the Delaware River to address the concerns raised in the Kichner Report, including large vessels, various weather and tidal conditions, and the proposed turning basin. This study included the following elements:

- Review of the 2018 MITAGS Full Mission Bridge Simulation.
- Obtain input from the Delaware River Pilots to inform the study.
- Perform a desktop review of marine navigation procedures, policies, data, and references/guidelines.
- Perform fast-time ship simulations for vessel arrival/departure at DCT and for vessels meeting and passing in the channel in proximity to DCT.
- Perform a desktop review of historical vessel turning and passing scenarios on the River.
- Provide commentary on the proposed DCT turning basin.
- Provide commentary on the 2018 MITAGS Study.
- Perform a conflict analysis to provide a numeric assessment of the likelihood (probability) of vessel activity at DCT impacting vessel traffic in the Federal Channel.

3.1 Navigation Rules and Transit Safety

Code of Federal Regulations (CFR) Title 33, Chapter 1, Subchapter E, Part 83 contains the Federal Navigation Rules for vessel navigation, and CFR Title 33, Chapter 1, Subchapter P, Part 164 contains the Federal Navigation Safety Regulations. The USCG has also issued a document titled *International & U.S. Inland Navigation Rules*²⁴ that cites 33 CFR Part 83 and the International Maritime Organization's *International Navigation Rules* and subsequent resolutions, stating: "These Rules shall apply to all vessels upon the high seas and in all waters connected therewith navigable by seagoing vessels." It should be noted that the Delaware River is considered "international" as it is served by seagoing vessels.

33 CFR Part 83 and USCG include the following Subparts:

- Subpart A—General (Rules 1-3)
- Subpart B—Steering and Sailing Rules (Rules 4-19)
- Subpart C—Lights and Shapes (Rules 20-31)
- Subpart D—Sound and Light Signals (Rules 32-37)
- Subpart E—Exemptions (Rule 38)

These rules outline procedures, requirements, and responsibilities of vessels of all types and sizes to undertake safe navigation. Key rules relevant to DCT-related traffic on the River include the following:

- Safe Speed
- Risk of Collision
- Narrow Channels
- Overtaking
- Head-On Situation

²⁴ International and U.S. Inland Navigation Rules. U.S. Department of Homeland Security, United States Coast Guard. <https://nauticalcharts.noaa.gov/publications/coast-pilot/docs/NavigationRulesStandardSize.pdf>. Accessed September 30, 2025.

- Crossing Situation
- Action by Give-way Vessel
- Action by Stand-on Vessel
- Responsibilities Between Vessels
- Conduct of Vessels in Restricted Visibility
- Visibility of Lights
- Power-Driven Vessels Underway
- Vessels Not Under Command or Restricted in their Ability to Maneuver
- Vessels Constrained by their Draft
- Maneuvering and Warning Signals
- Sound Signals in Restricted Visibility
- Distress Signals

These Rules and Regulations outline procedures, requirements, and responsibilities of vessels of all types and sizes to undertake safe navigation. Key Rules relevant to DCT-related traffic on the River include the following:

- Safe Speed
- Risk of Collision
- Narrow Channels
- Overtaking
- Head-On Situation
- Crossing Situation
- Action by Give-way Vessel
- Action by Stand-on Vessel
- Responsibilities Between Vessels
- Conduct of Vessels in Restricted Visibility
- Visibility of Lights
- Power-Driven Vessels Underway
- Vessels Not Under Command or Restricted in their Ability to Maneuver
- Vessels Constrained by their Draft
- Maneuvering and Warning Signals
- Sound Signals in Restricted Visibility
- Distress Signals

33 CFR Part 164 includes the following sections, and applies to *"self-propelled vessels of 1600 or more gross tons operating in U.S. waters, with specific provisions for towing vessels and exceptions for certain government vessels"*:

- § 164.01 Applicability.
- § 164.02 Applicability exception for foreign vessels.
- § 164.03 Incorporation by reference.
- § 164.11 Navigation under way: General.
- § 164.13 Navigation underway: tankers.
- § 164.15 Navigation bridge visibility.
- § 164.19 Requirements for vessels at anchor.
- § 164.25 Tests before entering or getting underway.

- § 164.30 Charts, publications, and equipment: General.
- § 164.33 Charts and publications.
- § 164.35 Equipment: All vessels.
- § 164.37 Equipment: Vessels of 10,000 gross tons or more.
- § 164.38 Automatic radar plotting aids (ARPA).
- § 164.39 Steering gear: Foreign tankers.
- § 164.40 Devices to indicate speed and distance.
- § 164.41 Electronic position fixing devices.
- § 164.42 Rate of turn indicator.
- § 164.46 Automatic Identification System.
- § 164.51 Deviations from rules: Emergency.
- § 164.53 Deviations from rules and reporting: Non-operating equipment.
- § 164.55 Deviations from rules: Continuing operation or period of time.
- § 164.61 Marine casualty reporting and record retention.
- § 164.70 Definitions.
- § 164.72 Navigational-safety equipment, charts or maps, and publications required on towing vessels.
- § 164.74 Towline and terminal gear for towing astern.
- § 164.76 Towline and terminal gear for towing alongside and pushing ahead.
- § 164.78 Navigation under way: Towing vessels.
- § 164.80 Tests, inspections, and voyage planning.
- § 164.82 Maintenance, failure, and reporting.

While the Rules and Regulations are in some cases qualitative (such as “safe” speed must be maintained), they codify the requirements and responsibilities for the vessel operators (such as, captains, Delaware River Pilots and Docking Pilots). These Rules and Regulations exist to eliminate the potential for vessel conflict and are fundamental drivers of the communication and coordination which is employed in scheduling safe transit.

Therefore, the Rules and Regulations, and resulting coordination required, exist such that traffic and berthing operations associated with a new marine terminal can be accommodated without creating a safety or navigation hazard. Jacobs has reviewed the Rules and Regulations and finds that there is nothing unusual about or otherwise associated with the proposed DCT development that would conflict with the Rules and Regulations, or DCT-bound vessels’ ability to comply with them.

Further, and as discussed elsewhere in this report, the MAC publishes, and routinely updates, Transit Advisories²⁵ that outline safe travel conditions and practices to mitigate marine casualty risks in the River’s Federal Channel. These Transit Advisories specifically identify conditions such as communication,

²⁵ Reference the *MAC Transit Advisories as of June 13, 2024* (https://macdelriv.org/files/transit_advisory.pdf) for full details regarding the vessel traffic guidance.

safe weather conditions for transit, tug escorts, draft restrictions, and other safety measures regarding bail-outs, as well as traffic planning under which vessels can transit the River.

In summary, Jacobs has reviewed Federal Rules and Regulations related to Navigation Rules and Navigation Safety, the MAC's current Transit Advisory, and the robust systems, policies, and advisories in place on the River, as outlined by the Delaware River Pilots, tug companies, and other entities consulted (refer to Sections 2, 3, 4, 5, and 6), and find them to be consistent, with the ultimate goal of promoting safe transits on the River. Because DCT's development and ongoing operations will not negatively impact existing navigation and safety procedures, it will also function in accordance with the Rules and Regulations.

3.2 Fast-time Simulations

Jacobs undertook fast-time ship simulations to investigate navigation for a range of vessel types and sizes together with varying environmental conditions to address the concerns raised in the Kichner Report. Results and findings are summarized herein, and additional detail is included in Appendix B.

The simulations focused on the following:

- Arrival and departure of the maximum design container vessel at DCT, including maneuvering of the vessel in the turning basin
- Inbound and outbound ships meeting and passing in the channel adjacent to DCT, including for ULCVs, Suezmax tankers, pure car carriers (PCCs), and cruise ships

While the fast-time simulation software gives realistic results accounting for vessel maneuverability and behavior under specific hydrodynamic and environmental conditions, there are some limitations (noted in the following sections). To account for those limitations, fast-time simulations can be followed by real-time bridge simulations. Undertaking the fast-time simulations will identify the scenarios with greater difficulty, which can then be simulated using real-time bridge simulations, factoring in real-time behavior of local Delaware River Pilots and the interaction of vessels meeting and passing in the channel. As discussed in Section 3.3 Jacobs undertook real-time simulations of critical runs and scenarios as identified by the fast-time modeling.

3.2.1 Software

The study was undertaken by a Jacobs navigation specialist using SHIPMA software version 7.4.2, developed jointly by MARIN and Deltares in the Netherlands. The software is a fast-time simulation toolbox that simulates the maneuvering behavior of vessels in ports and fairways. In SHIPMA, a ship follows a predefined course under the influence of currents, wind, and waves in which the autopilot corrects and controls the behavior of the ship. The result presents the behavior of a ship controlled by an autopilot.

The software considers most factors that may impact a vessel's maneuvering behavior, including:

- Vessel type
- Port layout and bathymetry
- Environmental external forces (including wind, wave, currents, swells, and bank suction effects)

Most importantly, the predefined maneuvering strategy set by the modeler must simulate a captain's command as closely as possible. Available local knowledge, including information such as vessel speed,

available tugs, and so forth, is considered. However, when local knowledge is not available, assumptions were made and are explained herein.

SHIPMA's output includes the vessel footprint along the track using accurate dimensions, which provides a visual reference for arriving and departing, focusing on the vessel's required space in relation to the design dredge plan. This study does not include berthing and unberthing to the docks because SHIPMA's simulations stop at one or two vessel beams from the berth.

The SHIPMA software uses only metric units as inputs and outputs. The key parameters in the following sections are provided in the customary U.S. Imperial unit system equivalents.

3.2.2 Design Criteria

The fast-time simulations were performed using the design criteria described below.

3.2.2.1 General

Local NOAA charts and bathymetry were used to form the base layer for the simulation model, together with proposed geometry for the DCT dredging that would form the berthing area and turning circle. The extents of the model and runs were chosen to ensure a controlled movement of the vessel along the Federal hannel prior to either turning and berthing or before meeting and passing a vessel transiting in the opposite direction.

3.2.2.2 Design Vessels

Design vessels used in the simulations are presented in Table 3-1. The ULCV represents the design vessel for DCT, with a maximum draft allowed for by Delaware River Pilots on the River (45 feet). The Suezmax tanker is the maximum tanker typically navigating the Delaware River, with a maximum draft allowed for by the MAC's Transit Advisories²⁶ (42 feet) for all vessels other than ULCVs. The PCC selected is representative of the largest PCC class transiting the River in 2024 according to vessel call data sourced from the MEX. The cruise vessel was selected based on Norwegian Cruise Line's public announcement of the vessel expected to call PhilaPort in 2026, the Norwegian Jewel.²⁷

Table 3-1. Fast-time Simulation Design Vessels

Parameter	ULCV	Suezmax Tanker	PCC	Cruise
Capacity (approximate)	16,000 TEU	142,500 T	8,000 Cars	2,800 Passengers
DWT (Fully Loaded)	175,000	164,100	28,230	86,920
Displacement Tonnage	188,044	176,000	45,580	45,610
Length Overall (LOA)	397.0 meters (1,302.5 feet)	275.0 meters (902.2 feet)	235.0 meters (771.0 feet)	293.80 meters (963.91 feet)
Beam	56.4 meters (185.0 feet)	50.00 meters (164.0 feet)	32.2 meters (105.6 feet)	32.2 meters (105.6 feet)

²⁶ https://macdelriv.org/files/transit_advisory.pdf

²⁷ <https://www.ncl.com/newsroom/norwegian-cruise-line-announces-port-of-philadelphia-as-a-new-homeport-with-its-2026-spring-summer-season>

Draft	13.75 meters (45.1 feet)	12.80 meters (45 feet) ^[a]	9.00 meters (29.50 feet) ^[b]	7.70 meters (25.26 feet)
Engine Power (kW)	80,000	18,660	14,309	36,050
Bow Thruster (kW)	3,680	-	2,000	3 × 2,300
Stern Thruster (kW)	-	-	-	2 × 2,000 ^[c]

^[a] For the Suezmax Tanker, the available draft for the validated model is 16m (52.5 ft). Channel depth and under-keel clearance have been artificially adjusted to simulate 45 ft draft. Note that conservative a draft of 45ft has been adopted, even though it is understood that Delaware River Pilots would typically not allow transit for tankers with draft greater than 42ft.

^[b] Draft selected is not the maximum but corresponds to maximum windage area which represents the worst case for vessel navigation for PCCs.

^[c] Stern thrusters are typically Azipods, which allow greater movement and control compared to tunnel thrusters. However, SHIPMA cannot accurately model Azipods. Therefore, Jacobs conservatively modeled tunnel thrusters in the simulation, yielding conservative results.

DWT = deadweight tonnage

kW = kilowatt(s).

T = ton

TEU = twenty-foot equivalent

In the study, four tugs with a 65-ton bollard pull capacity have been assumed for all simulations, matching the number of tugs used for the larger container vessel runs in the 2018 MITAGS navigation study. On vessel arrival, tugs assist when the vessel decelerates at the inner channel's start point. On departure, tugs are available from the start and are released before the outer channel. For all meeting vessel runs, there is conservatively no tug assistance for the vessels.

3.2.2.3 Environmental Conditions

A wind speed of 25 knots was used in all simulation runs, based on the speeds used in the MITAGS real-time simulations undertaken in August 2018 and aligning to the maximum recommended wind speeds in the MAC's latest Transit Advisories. This wind speed was verified against NOAA data for period July 2025 to July 2025, as shown on Figure 3-1, and was considered appropriate for the fast-time simulation. It was noted in the MITAGS 2018 study that 90 degrees, 270 degrees, and 315 degrees are considered worst case and have, therefore, been similarly adopted for this study.

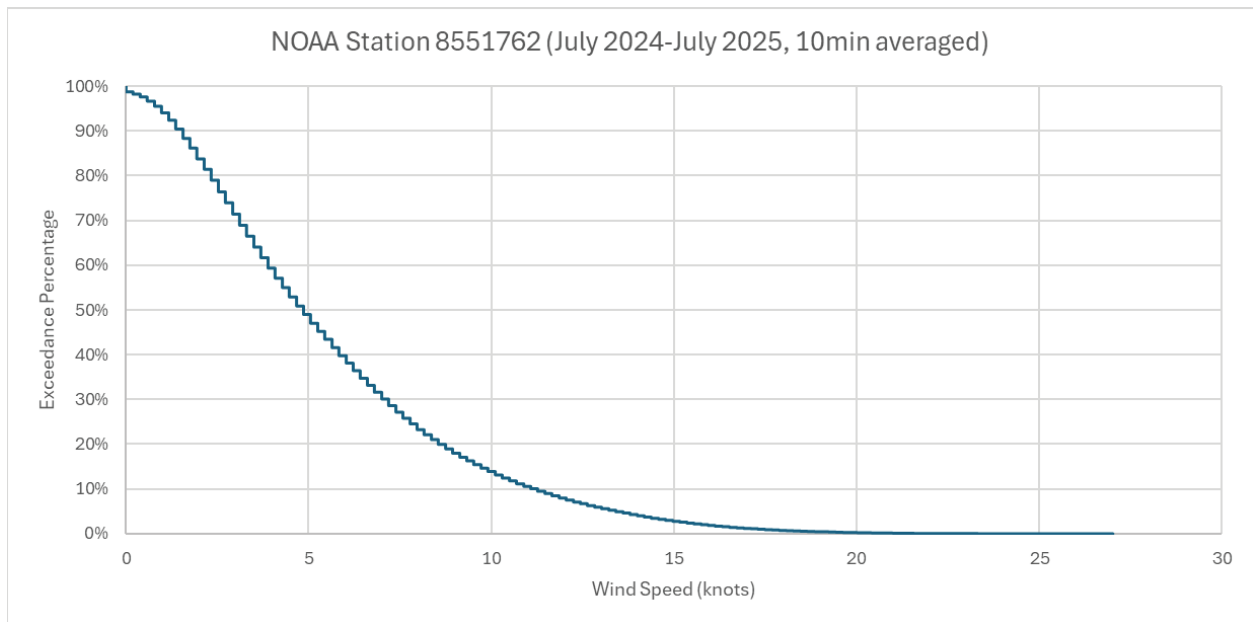


Figure 3-1. NOAA Station 8551762 10-minute Average Wind Speed Exceedance

Currents were applied to closely match the maximum ebb and maximum flood currently used in the 2018 MITAGS simulations, with examples shown on Figure 3-2. Note that a depth-averaged current profile was manually created in the model.

Similar to the previous MITAGS simulations, water depths of 3 and 5 feet were adopted for simulation runs, varying depending on the vessel draft to ensure adequate under-keel clearance, which is “the term used to define the distance between the ship’s bottom and the channel bed, [and is] an important economic and safety consideration.”²⁸

A 1.6-foot (0.5-meter) wind wave was also applied to all simulation runs.

²⁸ Permanent International Association of Navigation Congresses (PIANC). 1985. *Underkeel Clearance for Large Ships in Maritime Fairways with Hard Bottom*.

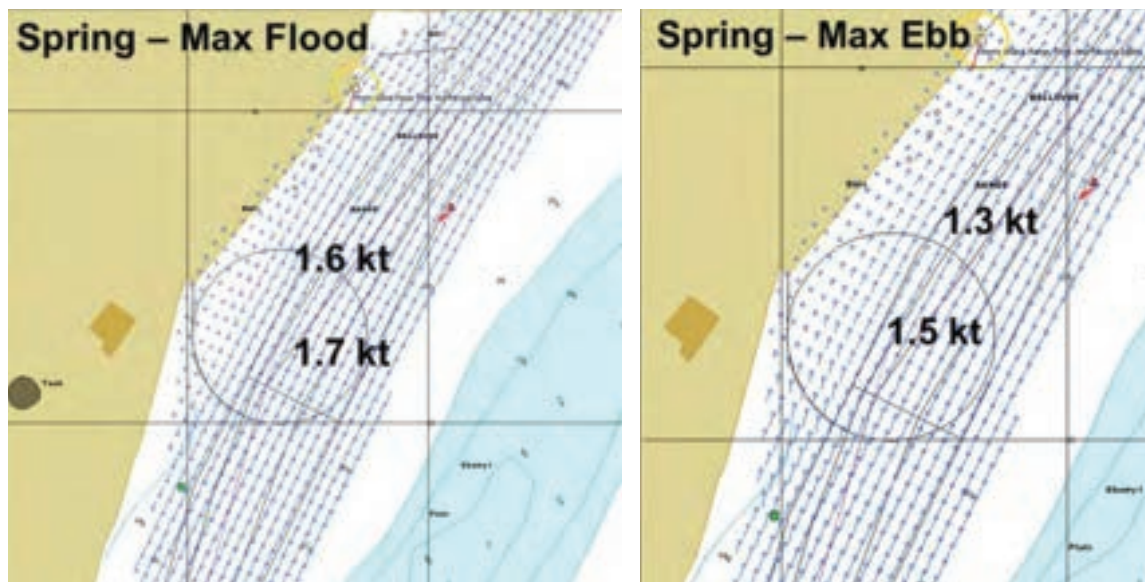


Figure 3-2. Indicative Current Fields (MITAGS 2018)

The Kichner Report asserted that night (dark) conditions, squalls, and low visibility had not been investigated in the 2018 MITAGS navigation study. Because the fast-time simulation software does not have the capability to model night time and no/low visibility situations, they have not been included in this fast-time analysis. However, Jacobs did model them in the real-time simulation (refer to Section 3.3). The Delaware River Pilots noted that they routinely operate at night and that their systems and operations allow transit to occur as it does during the day. Further, the MAC's Transit Advisories²⁹ do not recommend transit under squall conditions and state that "transit shall not commence when visibility is less than two nautical miles," and the Delaware River Pilots confirmed this practice. Should visibility be adequate at the start of a transit and then reduce, Delaware River Pilots noted that they will bring a vessel to an anchorage. Based on these representations, Jacobs did not model squall conditions in fast-time but did model them in the real-time simulations (refer to Section 3.3). Further, as discussed in Section 3.3, the real-time simulations included a scenario of adequate weather for transit but with changing conditions requiring a ship to divert to the nearby Marcus Hook Anchorage.

3.2.3 Simulation Runs

A simulation run matrix was developed based on the design criteria described herein and informed by the MITAGS simulation runs undertaken in 2018, with a focus on addressing the concerns raised in the Kichner Report.

Runs were generally split into two categories, as follows:

- Arrival and departure of the maximum design container vessel at DCT, including maneuvering of the vessel in the turning basin
- Inbound and outbound ships meeting and passing in the channel adjacent to DCT, including for ULCVs, PCCs, Suezmax Tankers, and Cruise Ships

²⁹ https://macdelriv.org/files/transit_advisory.pdf

For the DCT arrival/departure runs, each scenario was run for a vessel arriving and turning before berthing bow south, followed by vessel departing with the run commencing with vessel berthed bow north before turning and departing downriver.

The fast-time simulation software cannot run multiple vessels and cannot simulate hydrodynamic interaction of meeting vessels. Therefore, individual runs were undertaken for the inbound and outbound vessels with the resulting swept paths overlaid to view the proximity of vessels to each other in the channel. These resulting graphics serve to identify worst cases with smaller clearances between vessels and are used to inform the selection of meeting-vessel runs to be tested in future real-time bridge simulations.

The test matrix for the fast-time simulation runs is presented in Table 3-2.

All meeting-vessel runs were completed for the ship sizes and events that currently occur on the River. The introduction of DCT will have no impact on interactions³⁰ between vessels that are either originating in or destined for facilities upriver, which is the event being assessed for vessels meeting immediately east of DCT.

Table 3-2. Fast-time Simulation Run Matrix

Run	Vessel	Bow at Berth	Draft (feet)	Initial Direction of Travel	Wind Speed (knots)	Wind Dir. (deg.)	Wave Height (feet)	Start Current Condition	Tide Elevation (feet MLLW)	Tugs
Single Runs for DCT Arrival/Departure										
1	ULCV	S	45	In	25	90	1.65	Maximum Flood	5	4 × 65T
2	ULCV	S	45	In	25	315	1.65	Maximum Flood	5	4 × 65T
3	ULCV	S	45	In	25	270	1.65	Maximum Flood	5	4 × 65T
4	ULCV	N	45	Out	25	90	1.65	Maximum Ebb	5	4 × 65T
5	ULCV	N	45	Out	25	315	1.65	Maximum Ebb	5	4 × 65T
6	ULCV	N	45	Out	25	270	1.65	Maximum Ebb	5	4 × 65T
7	ULCV	N	45	In	25	90	1.65	Maximum Flood	5	4 × 65T
8	ULCV	N	45	In	25	315	1.65	Maximum Flood	5	4 × 65T

³⁰ Interactions between meeting vessels can include changed water conditions due to asymmetrical flow associated with the vessels and their wakes when transiting close to each other.

Run	Vessel	Bow at Berth	Draft (feet)	Initial Direction of Travel	Wind Speed (knots)	Wind Dir. (deg.)	Wave Height (feet)	Start Current Condition	Tide Elevation (feet MLLW)	Tugs
9	ULCV	N	45	In	25	270	1.65	Maximum Flood	5	4 × 65T
10	ULCV	S	45	Out	25	90	1.65	Maximum Ebb	5	4 × 65T
11	ULCV	S	45	Out	25	315	1.65	Maximum Ebb	5	4 × 65T
12	ULCV	S	45	Out	25	270	1.65	Maximum Ebb	5	4 × 65T
Meeting-vessel Runs										
13	ULCV	-	45	In	25	135	1.65	Maximum Flood	5	-
	ULCV	-	45	Out	25	135	1.65	Maximum Flood	5	-
14	ULCV	-	45	In	25	90	1.65	Maximum Flood	5	-
	ULCV	-	45	Out	25	90	1.65	Maximum Flood	5	-
15	ULCV	-	45	In	25	315	1.65	Maximum Ebb	5	-
	ULCV	-	45	Out	25	315	1.65	Maximum Ebb	5	-
16	ULCV	-	45	In	25	135	1.65	Maximum Flood	5	-
	Suezmax Tanker	-	45	Out	25	135	1.65	Maximum Flood	5	-
17	ULCV	-	45	In	25	90	1.65	Maximum Flood	5	-
	Suezmax Tanker	-	45	Out	25	90	1.65	Maximum Flood	5	-
18	ULCV	-	45	In	25	315	1.65	Maximum Ebb	5	-
	Suezmax Tanker	-	45	Out	25	315	1.65	Maximum Ebb	5	-

Run	Vessel	Bow at Berth	Draft (feet)	Initial Direction of Travel	Wind Speed (knots)	Wind Dir. (deg.)	Wave Height (feet)	Start Current Condition	Tide Elevation (feet MLLW)	Tugs
19	ULCV	-	45	In	25	135	1.65	Maximum Flood	5	-
	PCC	-	29.5	Out	25	135	1.65	Maximum Flood	5	-
20	ULCV	-	45	In	25	90	1.65	Maximum Flood	5	-
	PCC	-	29.5	Out	25	90	1.65	Maximum Flood	5	-
21	ULCV	-	45	In	25	315	1.65	Maximum Ebb	5	-
	PCC	-	29.5	Out	25	315	1.65	Maximum Ebb	5	-
22	ULCV	-	45	In	25	135	1.65	Maximum Ebb	5	-
	Cruise	-	25.3	Out	25	135	1.65	Maximum Ebb	5	-
23	ULCV	-	45	In	25	90	1.65	Maximum Ebb	5	-
	Cruise	-	25.3	Out	25	90	1.65	Maximum Ebb	5	-
24	ULCV	-	45	In	25	315	1.65	Maximum Ebb	5	-
	Cruise	-	25.3	Out	25	315	1.65	Maximum Ebb	5	-

deg. = degree(s)
Dir. = direction
MLLW = mean lower low water

3.2.4 Swept Path

All runs listed in Table 3-2 were completed successfully, with vessels remaining within the navigation areas and with reasonable clearance between meeting vessels. For both single runs and meeting-vessel runs, in some cases, the vessels did pass close to the edge of the channel and or turning basin.

A number of runs were completed to test the 4-knot extreme current referenced in the Kichner Report. These runs were not successful in most cases, particularly for single runs in which the ULCV must turn across the current. However, following discussions with the Delaware River Pilots, it was advised that the 4-knot extreme ebb current had not been witnessed, there is no supporting data to show the occurrence of

these current speeds, and, in their view, it is unlikely to ever occur. Nevertheless, a 4-knot current was simulated in real-time simulations (refer to Section 3.3), but it should be noted that the Delaware River Pilots noted that if this condition were to occur, vessel transits would not commence, and vessels in transit would be sent to an anchorage or managed with additional tugs.

Swept-path figures for all runs are provided in Appendix B; Figure 3-3 through Figure 3-6 show some of the more challenging runs.

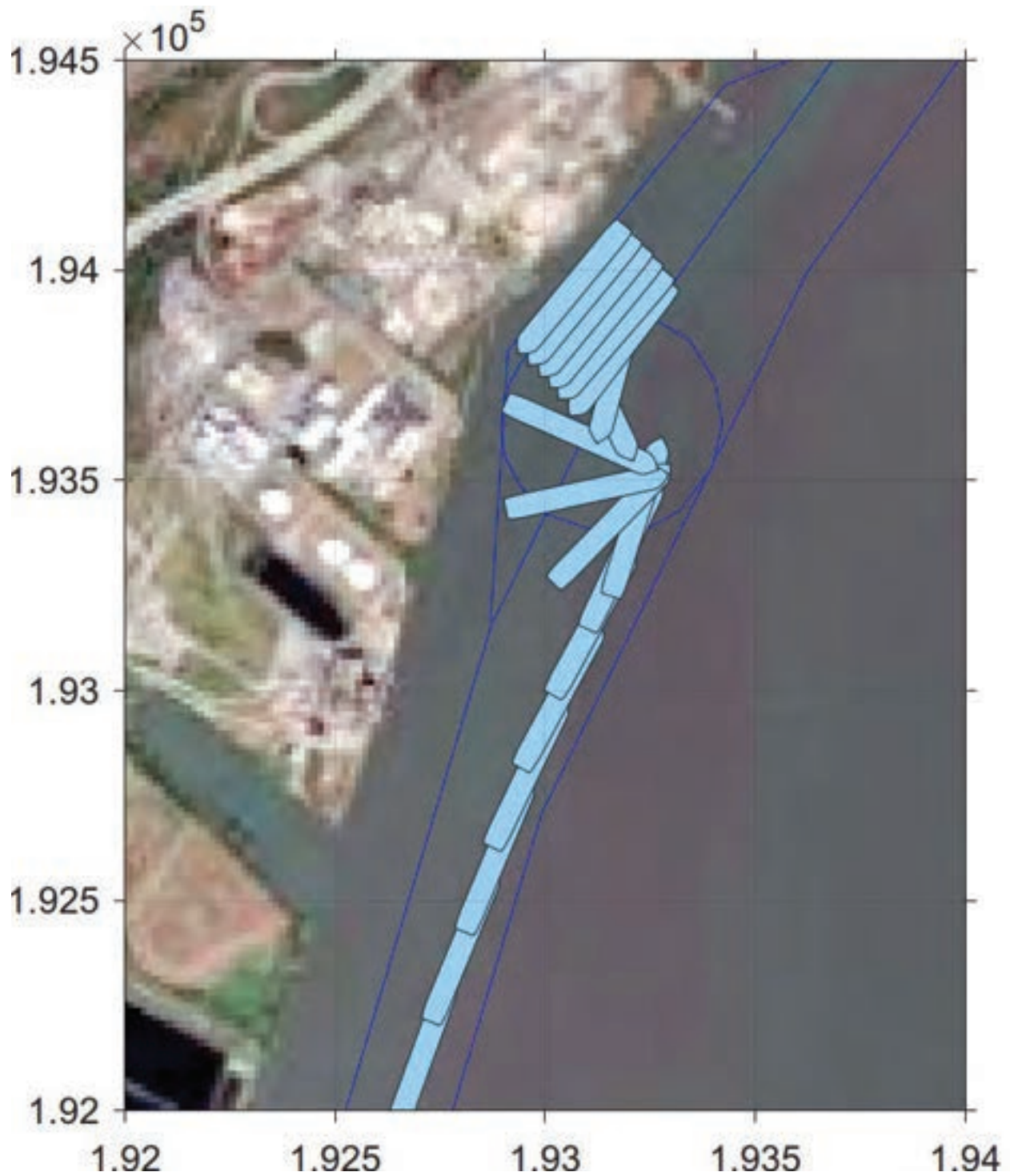


Figure 3-3. Fast-time Run No. 1 – ULCV Arrival at DCT Berthing Bow South

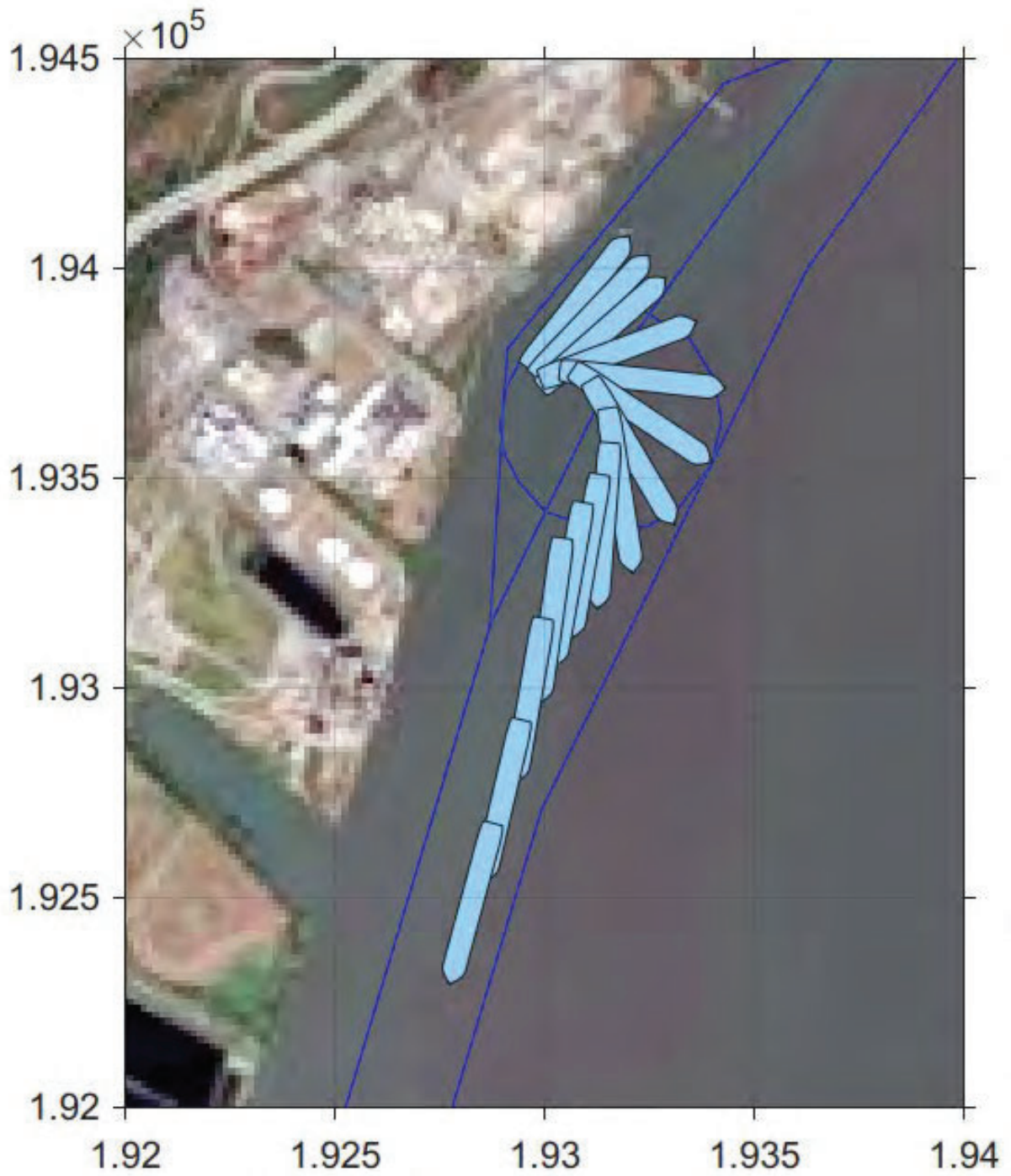


Figure 3-4. Fast-time Run No. 5 – ULCV Departing DCT Berthed Bow North

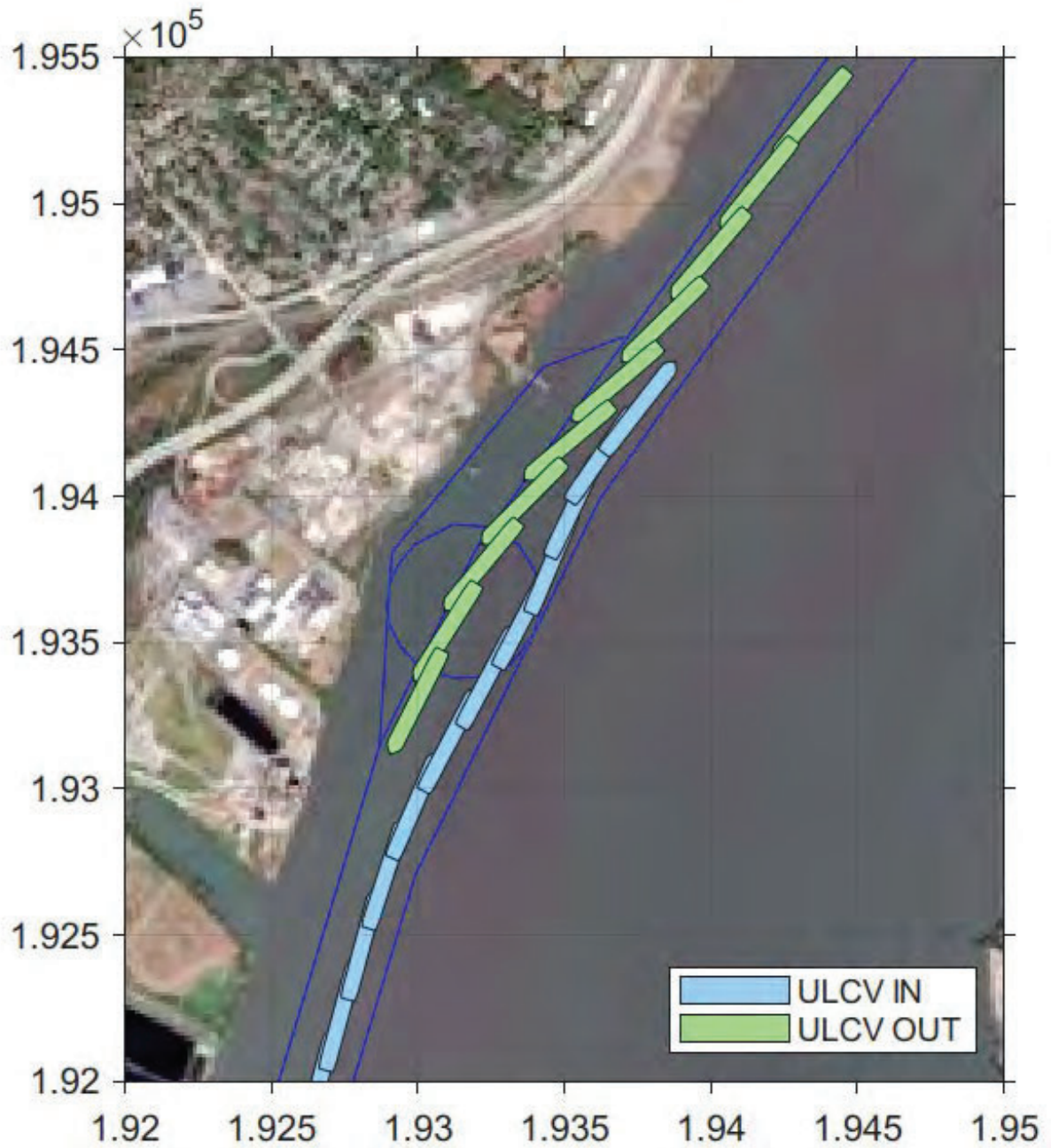


Figure 3-5. Fast-time Run No. 15 – ULCV Meeting and Passing ULCV

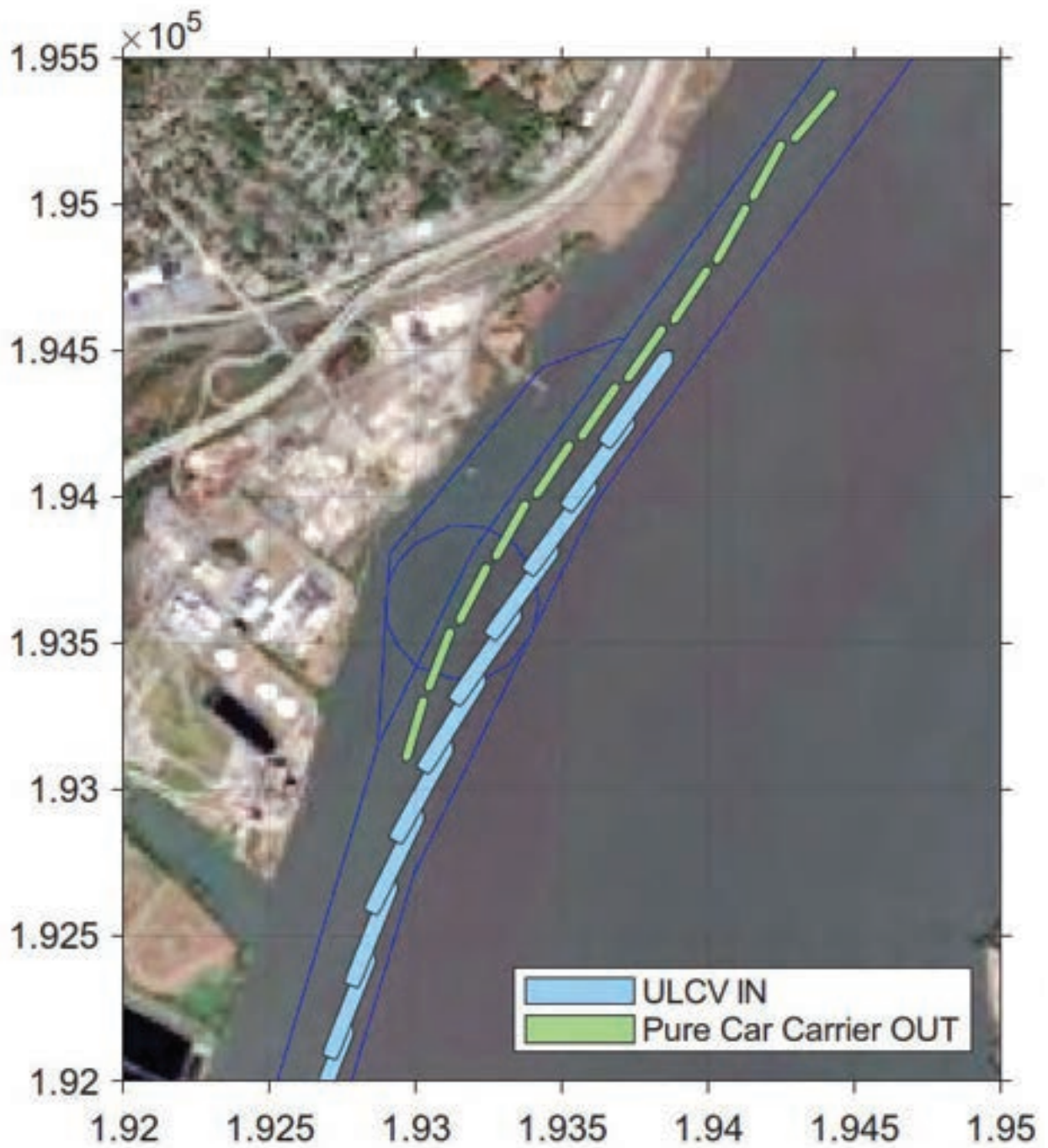


Figure 3-6. Fast-time Run No. 19 – ULCV Meeting and Passing Pure Car Carrier

3.2.5 Conclusions

All runs undertaken with typical maximum ebb and flow currents (see 3.2.2.3) were completed successfully, with vessels remaining within the navigation areas and with reasonable clearance between meeting vessels.

For the single runs, the approach channel and turning circle dimensions were sufficient for the arrival and departure maneuvers to the berth under the influence of critical wind, waves, peak currents, and bank suction, with 4 × 65-ton tug assistance.

For both single runs and meeting-vessel runs, in some cases, the vessels did pass close to the edge of the channel and or turning basin. For these cases, real-time simulations were undertaken by MITAGS (refer to Section 3.3) to verify the feasibility of the maneuvers.

For the meeting runs, the results demonstrate that an inbound ULCV can safely meet and pass an outbound ULCV, Suezmax Tanker, PCC, or Cruise Ship without tug assistance under the influence of critical wind, waves, peak currents, and bank suction. However, real-time simulations with MITAGS were undertaken to test the worst-case runs to take account of true hydrodynamic interaction between passing vessels and manual pilot control (refer to Section 3.3).

Single runs and meeting-vessel runs undertaken at 4-knot extreme currents were not successful in most cases, particularly for single runs in which the ULCV must turn across the current. However, the Delaware River Pilots advised that these conditions have not been observed, but if they did occur, they would not permit transits under these conditions. The real-time simulations demonstrated that turning of the ULCV at the DCT turning circle in 4 knots of current was challenging but achievable (refer to Section 3.3 for more detail).

3.3 Real-time Simulations

Jacobs engaged MITAGS, a DNV GL-certified Maritime Training Provider and author of the 2018 MITAGS Study, to undertake additional real-time simulations, focusing on specific conditions noted in the Kichner Report and critical runs identified in Jacobs' fast-time analyses. The simulations occurred from September 16 through 18, 2025, and were performed by two senior Delaware River Pilots, supported by MITAGS' tug captains and navigation specialists. Results and findings are summarized herein, and additional detail is included in Appendix C.

The simulations included the following:

- Arrival and departure of the maximum design container vessel at DCT, including maneuvering of the vessel in the turning basin
- Inbound and outbound ships meeting and passing in the Federal Channel adjacent to DCT, including ULCVs, tankers, and PCCs

The real-time simulations considered poor visibility, nighttime, high-wind, squall, and high-current conditions, both for single vessels arriving to and departing from DCT (including turning) and vessels meeting on the River in front of DCT.

3.3.1 Simulator and Team

MITAGS used a full-mission ship simulator for the study, which provides the most realistic 360-degree presentation in the world. The theater projection area is more than 24 meters wide and 12 meters high,

providing unsurpassed depth perception and visual accuracy. The large simulator control room has ample space for client representatives to remotely observe the entire simulation, including visuals, environmental conditions, and pilot orders and their effects on the vessel behavior. The full-mission shiphandling simulator meets or exceeds the Det Norske Veritas Class A standards, an industry standard. The tugs were operated by one live tug and additional Auto-Tugs operated from the console, and were representative of the same type, number, and bollard pull that would be available for actual operations, as confirmed by tug companies operating on the River and the Delaware River Pilots.

The MITAGS Simulation Engineering Department uses proprietary Wärtsilä modeling software that integrates the simulator's operating system, visual database, and vessel modeling. This approach provides the highest simulation fidelity levels. The software package includes the following:

- Simulator Operating System: NTPro – Version 6
- Visual Database Modeling: Model Wizard 6.70.001.026
- Ship/Tug Modeling: Virtual Shipyard 2 2.94.4030.0

Model Wizard imports the data from the electronic chart display information system (ECDIS). The software transfers ECDIS data into simulator database elements and links the visual and radar databases. The ECDIS data transferred includes the following:

- Hydrographic: Depth points, depth lines, depth contours, drying areas, three-dimensional (3D) channel bottom
- Landmass: 3D terrain, digital elevation model (DEM) data, coastlines, islands, pier structures, and so forth
- Navigation Aids: Buoys, ranges, and lighthouses
- Navigation Signals: Color, light timing, light sector, and so forth

The database is then overlaid with the new terminal parameters, approach channels, and other navigationally significant features that are available in AutoCAD format.

The simulator was supported by MITAGS' experienced, in-house simulation modeling team and ship handling experts. In addition to the Delaware River Pilots, MITAGS provided an experienced maritime pilot from the Association of Maryland Pilots, an experienced simulator operator, a naval architect/hydrodynamic ship modeler, a Master Mariner, and supporting staff during the study.

Participants and attendees included:

- Delaware River Pilots
 - Captain Robert Bailey
 - Dan MacElrevey
- MITAGS
 - Ms. Catherine Gianelloni – Academic Director, MITAGS East
 - Capt. Joseph Harnett – First Class, Pilot (Maryland) Master, Oceans Unlimited Tonnage
 - Ms. Colleen Schaffer, P.E. – Project Leader for Study
 - Mr. Jeremiah Sheahen – Simulation Engineer
 - Mr. Joshua DuPay – Naval Architect and Hydrodynamic Ship Modeler
 - Captain Robert Dempsey – Master Mariner and tug consultant.
 - Captain Samantha Dinesmore – Simulator Operator

- **Jacobs**
 - Duncan Kopp, P.E. – Jacobs Project Manager and Americas Market Director – Ports & Maritime
 - Christopher Lawrence, P.E. – Jacobs Global Principal for Port Development and Chief Engineer
 - Alistair Hart – Jacobs Global Principal for Port Planning, Operations, and Development
 - Sonny Rutkowski, P.E. – Jacobs Senior Engineer
 - Matthew Ninesling, E.I.T – Jacobs Coastal Engineer
- **DSPC/Enstructure**
 - Brian Devine, PE – DSPC Project Manager
 - Diego Lopez – Enstructure Vice President of Corporate Development

3.3.2 Design Criteria

The real-time simulations were performed under the following design criteria.

3.3.2.1 General

Having performed the 2018 Study, MITAGS used the same model for site and meteorological conditions in the 2025 simulation. The Delaware River Pilots' recommendations from the 2018 MITAGS study about deepening the approach area immediately downriver from the turning basin was incorporated into the new simulation (and has been adopted as part of the DCT project).

3.3.2.2 Underwater Conditions and Bathymetry

MITAGS first created underwater contours based on electronic charts for the area from publicly-available information and previous studies. MITAGS modelers then took bathymetric data provided to create a more realistic bank slope and contours. The bathymetric data is in latitude and longitude referenced to the World Geodetic System 1984 (WGS84) datum. This allows the visuals to line up with the ECDIS and radio detection and ranging (RADAR) displays. The format is in degrees to six decimal places. All longitude and latitude data are decimal degrees and use WGS84 datum reference. Depth values are in meters or feet and either positive or negative for underwater depth point.

MITAGS programmed and validated a hydrodynamically accurate geographic area database that included detailed visual scenes, RADAR, and ECDIS images. The local chart and bathymetric data were assembled to form the base layer of the database. The MITAGS Simulation Engineering Department used proprietary Transas database modeling software to import ECDIS data. This software automatically transferred the information from ECDIS into the simulator database and linked the visual and RADAR databases. The ECDIS data transferred included the following:

- Hydrographic: Depth points, depth lines, depth contours, drying areas, and 3D channel bottom (this includes a survey provided by Shell)
- Landmass: 3D terrain, DEM data, coastlines, islands, pier structures, and so forth
- Navigation Aids: Buoys, ranges, and lighthouses
- Navigation Signals: Color, light timing, light sector, and so forth

3.3.2.3 Environmental Conditions

Wind and current speeds were varied across the simulation runs and aligned to the maximum recommended wind speeds in the MAC's latest Transit Advisories and the goals of the simulation. Wind directions of 90 degrees, 270 degrees, and 315 degrees are considered worst case and were, therefore, adopted for this study.

Typical currents were applied to closely match the maximum ebb and maximum flood currently used in the 2018 MITAGS simulations, as shown on Figure 3-7.

Similar to the 2018 MITAGS Study, water depths of 3 and 5 feet were adopted for simulation runs, varying depending on the vessel draft to ensure adequate under-keel clearance, which is "the term used to define the distance between the ship's bottom and the channel bed, [and is] an important economic and safety consideration."³¹

A 1.6-foot (0.5-meter) wind wave was also applied to all simulation runs.

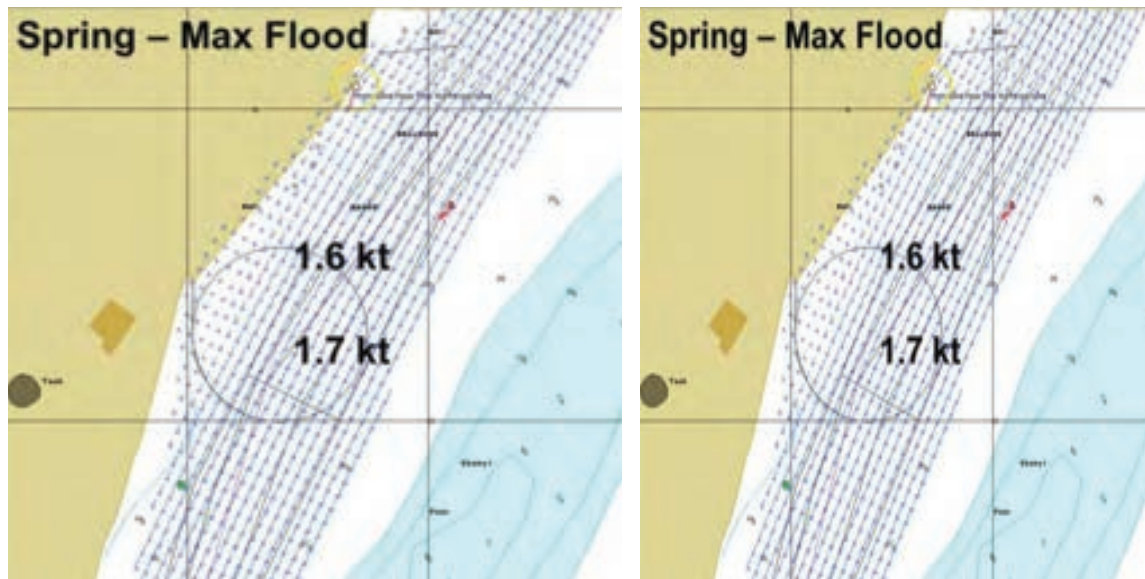


Figure 3-7. Indicative Current Fields (MITAGS 2025)

The Kichner Report asserted that night (dark) conditions and low visibility had not been investigated in the 2018 MITAGS navigation study. Because fast-time simulation software cannot accurately model these situations, these conditions were modeled in real time, noting that the Delaware River Pilots routinely operate at night and that their systems and operations allow transit to occur as it does during the day, and the MAC's Transit Advisories state that "transit shall not commence when visibility is less than two nautical miles," and the Delaware River Pilots confirmed this practice. Should visibility be adequate at the start of a transit and then reduce, Delaware River Pilots noted that they will bring a vessel to an anchorage.

³¹ Permanent International Association of Navigation Congresses (PIANC). 1985. *Underkeel Clearance for Large Ships in Maritime Fairways with Hard Bottom*.

While the MAC's Transit Advisories³² do not recommend transit when there is a notable risk of squall conditions occurring, to address the Kichner Report's concern, Jacobs and MITAGS also simulated squall conditions in the event a squall develops while in transit.

The team also simulated a scenario of adequate weather for transit but with changing conditions requiring a ship to divert to the nearby Marcus Hook Anchorage.

3.3.2.4 Design Vessels

Design vessels used in the simulations are presented in Table 3-3.

Table 3-3. Real-time Simulation Design Vessels

Parameter	ULCV	Tanker	Car Carrier	Tug
Capacity (approximate)	18,000 TEU	-	6,000 Units	N/A
DWT	185,199	88,657	19,631	N/A
Displacement Tonnage	252,754	135,281	38,070	N/A
Length Overall (LOA)	399.2 meters (1,309.7 feet)	332.0 meters (1089.2 feet)	191.0 meters (653.2 feet)	30 meters (98.4 feet)
Beam	54.0 meters (177.2 feet)	60 meters (196.9 feet)	32.2 meters (106 feet)	11.3 meters (37.1 feet)
Draft	16 meters ^[a] (52.5 feet)	11 meters (36.1 feet)	9.1 meters (28.9 feet)	4.88 meters (16.0 feet)
Engine Power (kW)	63,910	29,850	13,560	4849 (2 At 2,424.5 each)
Bow Thruster (kW)	2 x 2043	N/A	1,400	N/A
Stern Thruster (kW)	N/A	N/A	1,050	N/A
Bollard Pull (mT)	N/A	N/A	N/A	65

Note: parameters represent ship condition used in simulation, not maximum values

^[a] The fully laden draft is 16 meters; ULCVs calling the River come in lightly loaded to allow for a shallower draft compatible with the River's depth of 45 feet. The ULCV was modeled with 42- to 45-foot drafts as presented in Table 3-4.

N/A = not applicable

The study used tugs with a 65-ton bollard pull capacity, matching those that would be available for actual operations based on discussions with the Delaware River Pilots, Wilmington Tug, McAllister, and Moran. One live tug bridge was integrated with the simulation and operated by an experienced tug captain. Up to three other assist tugs were operated from the simulator console using the simulator's "AutoTug" feature, which were controlled by a live operator and Captain. For all meeting-vessel runs, there is conservatively no tug assistance for the vessels.

³² https://macdelriv.org/files/transit_advisory.pdf

3.3.3 Simulation Runs

A simulation run matrix was developed based on the design criteria described herein and the fast-time analyses discussed earlier in this report and was informed by the Delaware River Pilots and MITAGS experts, with a focus on addressing the concerns raised in the Kichner Report.

Runs were generally split into two categories, as follows:

- Arrival and departure of the maximum design container vessel at DCT, including maneuvering of the vessel in the turning basin
- Inbound and outbound ships meeting and passing in the channel adjacent to DCT, including ULCVs, PCCs, and tankers

The majority of the DCT arrival/departure runs simulated vessels arriving and turning before berthing bow south/downriver and departing from a bow-south/downriver position. Some runs were simulated with a bow-north/upriver scenario, with the turn happening on departure.

All meeting-vessel runs were completed for the ship sizes and events that currently occur on the River. The introduction of DCT will have no impact on interactions between vessels that are either originating in or destined for facilities upriver, which is the event being assessed for vessels meeting immediately east of DCT.

The test matrix for the real-time simulation runs is presented in Table 3-4.

Table 3-4. Real-time Simulation Run Matrix

Run	Vessel	Bow at Berth	Draft (feet)	In/Out Bound	Wind Speed (knots)	Wind Dir. (deg.)	Start Current Condition	Current	Daylight	Visibility	Tide (feet above MLLW)	Tugs
Single Runs for DCT Arrival/Departure												
1	ULCV	Bow South	45	In	15	315	Max Flood	Typical	Day	Good	5	3 x 65T BP
2	ULCV	Bow South	45	In	25	90	Max Flood	Typical	Day	Good	5	3 x 65T BP
3	ULCV	Bow South	45	In	25	270	Max Flood	Typical	Day	Good	5	3 x 65T BP
4	ULCV	Bow South	45	In	25	315	Max Flood	Typical	Day	Good	5	3 x 65T BP
5	ULCV	Bow South	45	Out	25	315	Max Ebb	Typical	Day	Good	5	3 x 65T BP
6	ULCV	Bow South	45	Out	25	270	Max Ebb	Typical	Day	Good	5	3 x 65T BP
7	ULCV	Bow South	45	Out	25	90	Max Ebb	Typical	Day	Good	5	3 x 65T BP
8	ULCV	Bow South	45	In	25	270	Max Flood	Extreme 4 Knots	Day	Good	5	4 x 65T BP
9	ULCV	Bow South	45	In	25	270	Max Flood	Typical	Day	0 nm	5	3 x 65T BP
10	ULCV	Bow South	45	Out	25	270	Max Ebb	Typical	Day	0 nm	5	3 x 65T BP
11	ULCV	Bow South	45	In	25	270	Max Flood	Typical	Night	Good	5	3 x 65T BP
12	ULCV	Bow North	45	Out	25	270	Max Ebb	Typical	Night/Dark	Good	3	3 x 65T BP
13	ULCV	Bow North	45	Out	25	90	Max Flood	Typical	Night/Dark	Good	3	3 x 65T BP
14	ULCV	Bow South	45	In	25 w/ squall	270	Max Flood	Typical	Day	Good	3	3 x 65T BP
15	ULCV	Anchorage	45	In	25	315	Max Flood	Typical	Day	Good	3	None
16	ULCV	Bow South	45	In	25	315	Max Flood	Typical	Day	Good	3	3 x 65T BP
17	ULCV	Bow South	45	In	0	0	Flood	Extreme 4 Knots	Day	Good	3	4 x 65T BP
18	ULCV	Bow North	45	In	25	270	Max Ebb	Typical	Night	Good	3	4 x 65T BP

Run	Vessel	Bow at Berth	Draft (feet)	In/Out Bound	Wind Speed (knots)	Wind Dir. (deg.)	Start Current Condition	Current	Daylight	Visibility	Tide (feet above MLLW)	Tugs
Meeting-vessel Runs												
19	ULCV	N/A	45	In	25	90	Max Flood	Typical	Day	Good	3	N/A
	ULCV	N/A	45	Out								
20	ULCV	N/A	45	In	25	315	Max Ebb	Typical	Day	Good	5	N/A
	ULCV	N/A	45	Out								
21	ULCV	N/A	45	In	25	315	Max Ebb	Typical	Night	Good	5	N/A
	ULCV	N/A	45	Out								
22	ULCV	N/A	45	In	25	315	Max Ebb	Typical	Night	Good	5	N/A
	ULCV	N/A	45	Out								
23	ULCV	N/A	45	In	25	315	Max Ebb	Typical	Day	0 nm	5	N/A
	ULCV	N/A	45	Out								
24	ULCV	N/A	45	In	0	0	None	Typical	Day	Good	5	N/A
	ULCV	N/A	45	Out								
26	ULCV	N/A	45	In	0	0	None	Typical	Day	Good	5	N/A
	ULCV	N/A	45	Out								
27	ULCV	N/A	45	In	25	315	Max Ebb	Typical	Day	0 nm	5	N/A
	ULCV	N/A	45	Out								
28	ULCV	N/A	45	In	25	90	Max Ebb	Extreme 4 Knots	Day	Good	5	N/A
	Tanker	N/A	45	Out								
29	ULCV	N/A	45	In	25	315	Max Ebb	Typical	Day	0 nm	5	N/A
	Tanker	N/A	42	Out								

Delaware Container Terminal
 U.S. Army Corps Permit
 Additional Technical Support

Run	Vessel	Bow at Berth	Draft (feet)	In/Out Bound	Wind Speed (knots)	Wind Dir. (deg.)	Start Current Condition	Current	Daylight	Visibility	Tide (feet above MLLW)	Tugs
30	ULCV	N/A	45	In	25	90	Max Flood	Typical	Day	0 nm	5	N/A
	Car Carrier	N/A	42	Out								
31	ULCV	N/A	45	In	25	90	Max Flood	Typical	Day	0 nm	5	N/A
	Car Carrier	N/A	29.5	Out								
32	ULCV	N/A	45	In	25	270	Max Ebb	Typical	Day	0 nm	5	N/A
	ULCV	N/A	29.5	Out								
33	ULCV	N/A	45	In	25	90	Max Flood	Typical	Day	0 nm	5	N/A
	ULCV	N/A	45	Out								
34	ULCV	N/A	45	In	25	270	Max Flood	Typical	Night	Good	5	N/A
	ULCV	N/A	45	Out								
35	ULCV	N/A	45	In	25	270	Max Ebb	Typical	Night	Good	5	N/A
	Tanker	N/A	45	Out								

deg. = degree(s)

Dir. = direction

MLLW = mean lower low water

nm = nautical mile(s)

MITAGS prepared a report, included as Appendix C, that summarized the simulation conducted. Their report contains additional detail regarding the simulation parameters and effort, the results (including swept-path figures), and pilot commentary on the runs.

For each run, the MITAGS report lists whether the pilots were able to complete the transit, with “yes” or “no” answers. This factor is considered the first criteria for success and is based on if the ship stayed in the channel and avoided collisions with other ships. The Pilots were also asked whether or not the tug power adequate, again with “yes” or “no” responses. The Pilots also ranked the Overall Difficulty of the Maneuver and the Overall Safety of the Run, based on their professional judgement. For these two evaluations, Pilots could rank them on a scale of 1 to 5, with 1 being “Most Difficult”/ “Unsafe” and 5 being “Least Difficult”/ “Very Safe.”

All runs listed were successfully completed, except for runs number 8 and 27, which had 4-knot currents and 25-knot wind speeds. The Delaware River Pilots noted that they would not bring in a vessel under these conditions and that a ship would be brought to anchorage or transit delayed. These runs were performed for the record only and will be incorporated into updated MAC Transit Advisories upon DCT’s development. It should also be noted that run number 1 (15 knot winds and typical conditions) was used to set up and calibrate the model, and re-familiarize the River Pilots with the simulator. The model was adjusted following this run to more accurately represent channel, condition, and vessel particulars. Therefore, no conclusions were drawn from this run.

The simulator experienced technical issues while performing run number 23, and the simulation was not completed. Therefore, Jacobs and MITAGS have disregarded the run, and it is not considered in the analysis. During Run 24, the Delaware River Pilots observed the vessel steering did not respond at dead-slow ahead speeds. Run 24 was therefore repeated as Run 25, with measures taken to address vessel response in the simulation model.

Run numbers 28, 29, and 34 were successfully completed but the Delaware River Pilots noted them as “unsafe.” Jacobs notes that these situations represented vessels meeting on the River adjacent to DCT, and are independent of DCT’s development. The conditions for these runs were outside the MAC’s Transit Advisory, and the Delaware River Pilots noted that they would likely not have transited vessels in these conditions. Jacobs further notes, and as noted elsewhere in this Report, construction of DCT’s turning basin effectively widens the Federal Channel, making transits safer in the area of DCT.

3.3.4 Conclusions

The single vessel real-time simulations show that the approach channel and turning circle dimensions were sufficient for the arrival and departure maneuvers to the berth under the influence of critical wind, waves, peak currents, squall conditions, and bank suction, except a 4-knot current in 25-knot winds. A run “bailing out” to Marcus Hook Anchorage was also successfully completed, showing that there are safe options should unsafe conditions arise during transit.

The meeting-vessel simulations show that an inbound ULCV can meet and pass an outbound ULCV, tanker, and PCC, except a 4-knot current in 25-knot winds, where a tanker passing a ULCV did not pass. Not only are 4 knot currents not observed at this reach of the River, but the Delaware River Pilots would not transit a vessel under these conditions. Therefore, the unsuccessful runs become good data points and informative when updating the MAC’s Transit Advisories, but do not represent unsafe operating conditions or project aspects. The three passing runs that the Delaware River Pilots rated “unsafe” are again in conditions beyond those in which they would transit a vessel. Regardless, the presence of DCT’s turning

basin provides additional width for vessels meeting and passing adjacent to DCT, thereby improving navigation locally.

3.4 Historical Vessel Passing

Jacobs reviewed recent AIS data from Marine Cadastre and found examples of passing and overtaking vessels on the River, further confirming Jacobs' fast-time analyses and Delaware River Pilots' statements that similar activities are occurring safely and routinely today, independent of DCT's development. These are presented on Figure 3-8, Figure 3-9, and Figure 3-10.

The review of AIS data did not identify regular occurrences of vessels overtaking one another in the Federal Channel in proximity to DCT's proposed location. Vessel overtaking typically occurs in the lower Delaware Bay, further seaward of DCT, due to the lack of port facilities potentially requiring slower speeds required for berthing in this lower reach. This is consistent with the Delaware River Pilots' assertion that vessels are sequenced to avoid the need to overtake, and when required, overtaking occurs in other reaches of the River that are straighter or wider. Figure 3-8 and Figure 3-9 depict examples of where vessel overtaking typically occurs. It is also noted that vessels commonly meet (traveling in opposite directions) at all places on the River today, independent of DCT's development. Figure 3-10 provides a recent example. Sections 3.2.3 and 3.3.3 contains a detailed analysis of meeting vessels.

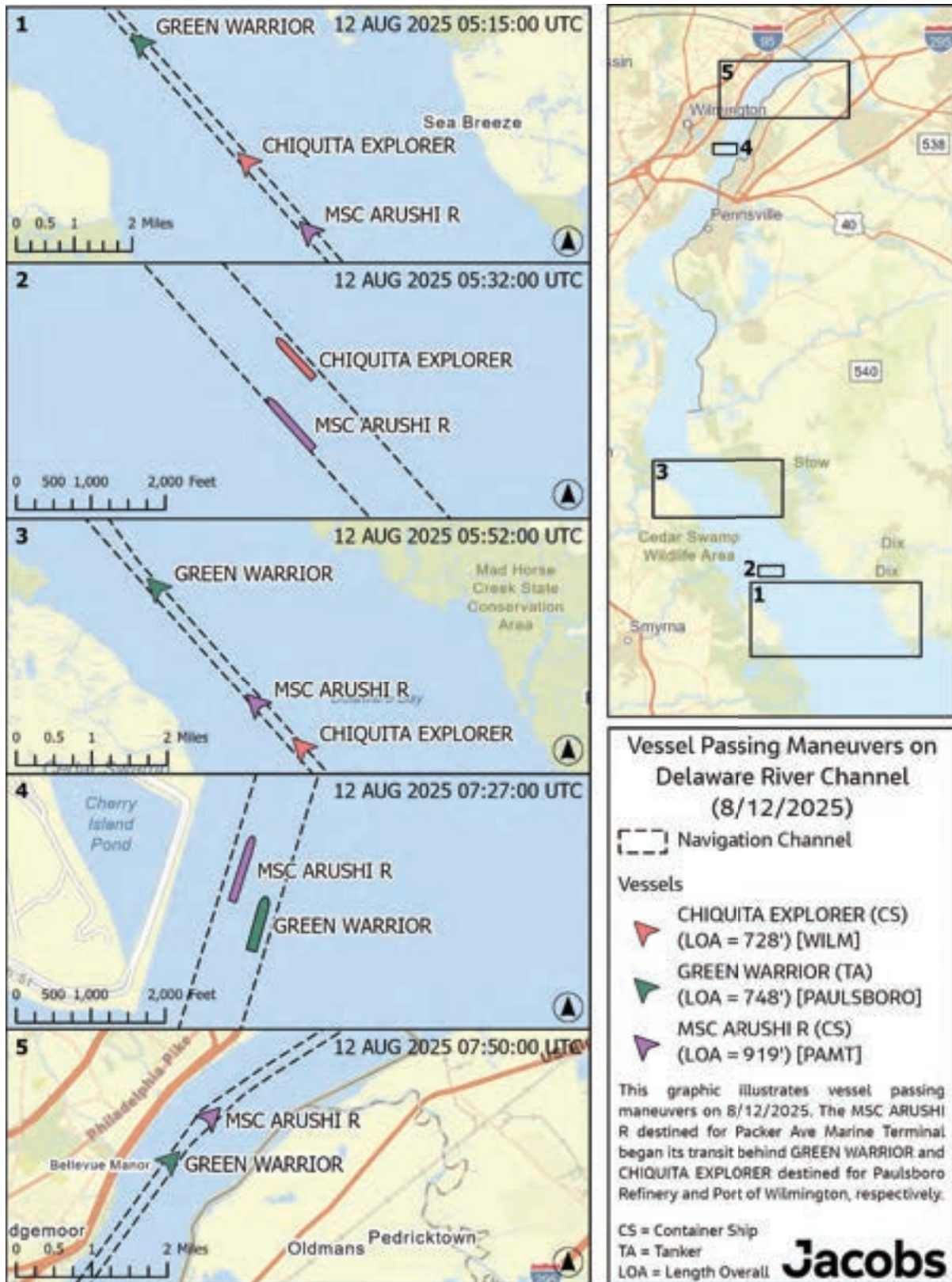


Figure 3-8. Inbound Overtaking Vessel Example, August 12, 2025

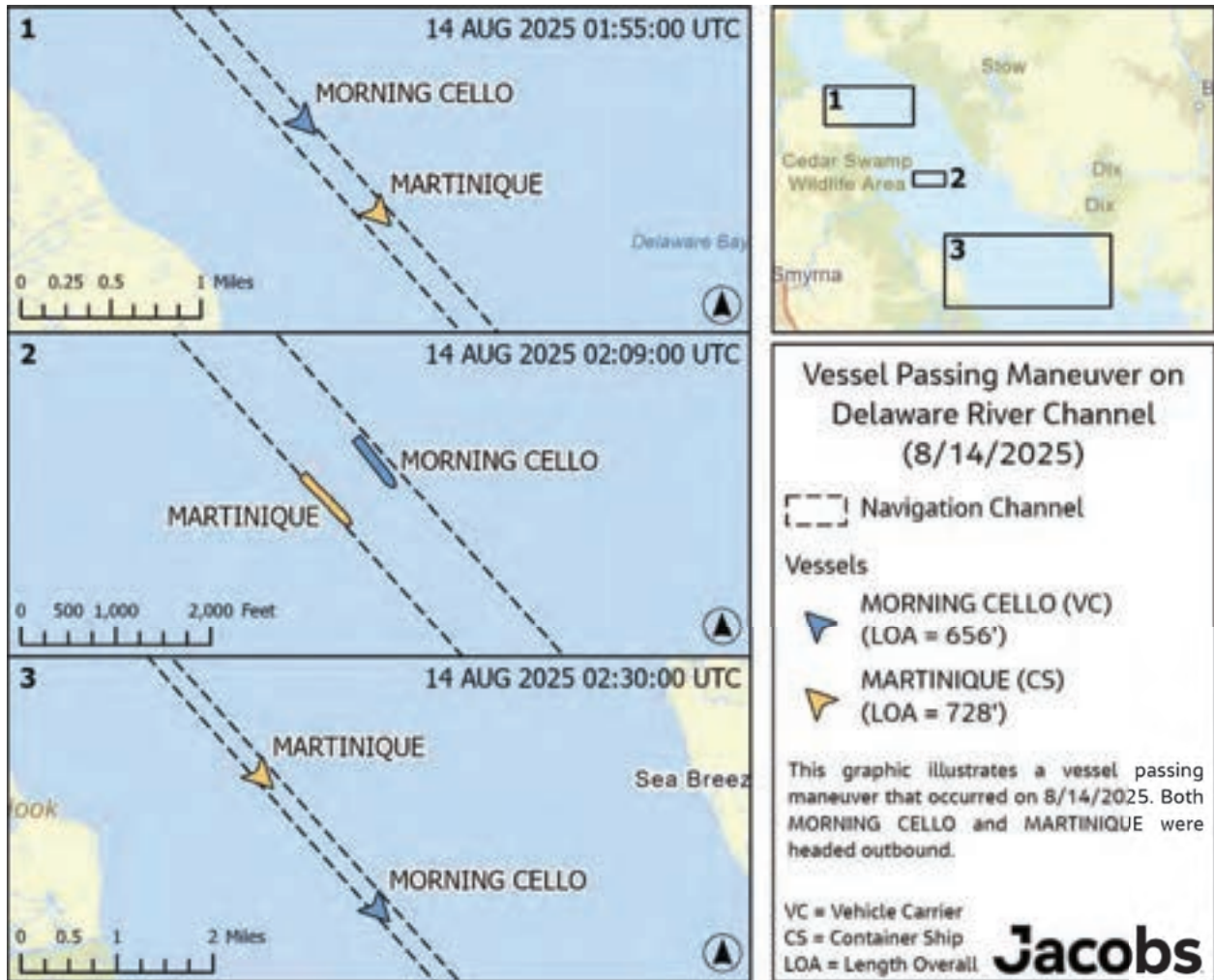


Figure 3-9. Outbound Overtaking Vessel Example, August 14, 2025

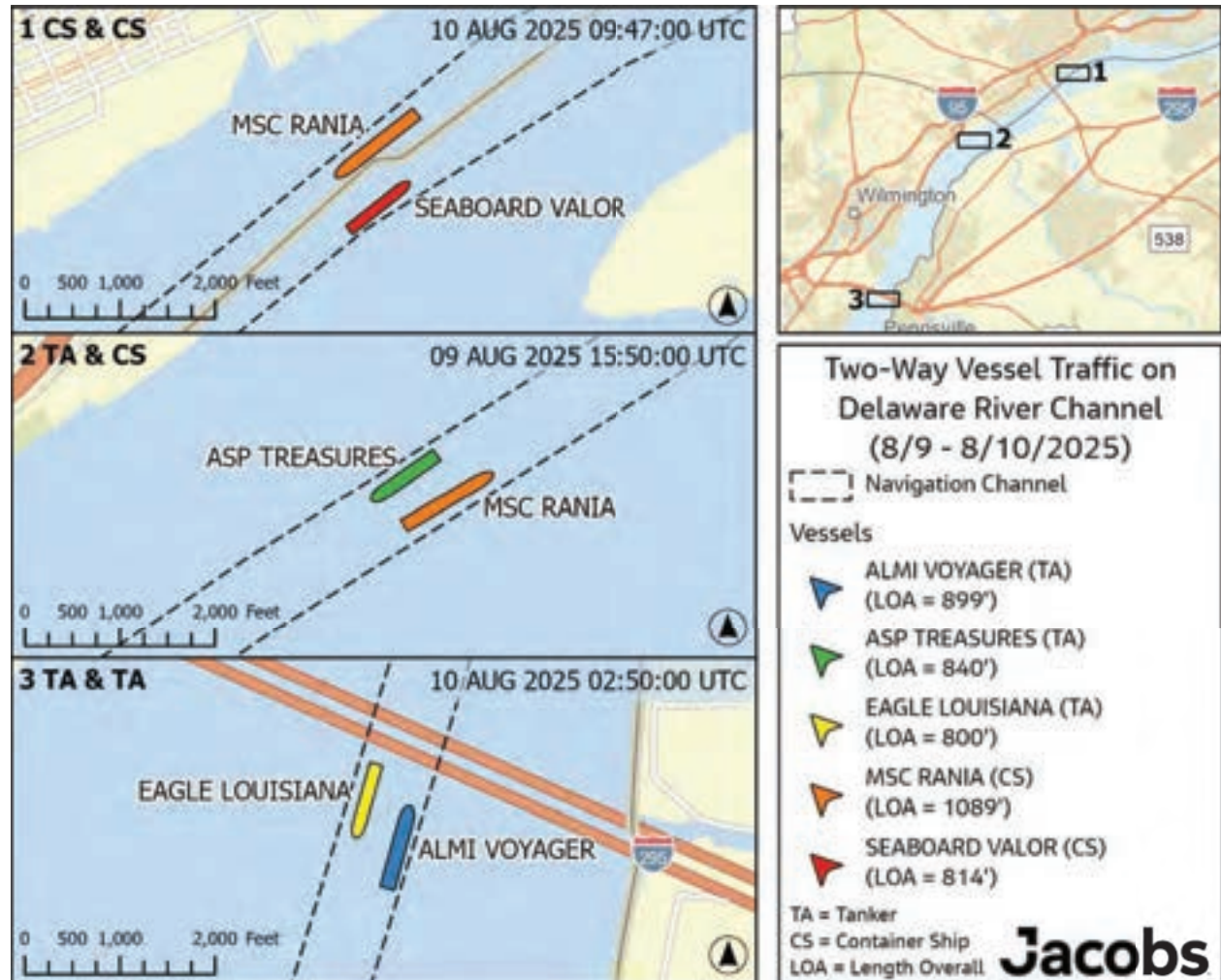


Figure 3-10. Inbound Meeting Vessel Example, August 9–10, 2025

3.5 Location of DCT’s Turning Basin

A turning basin is an area where vessels are turned prior to arrival at berth or upon departure from berth. Ships will turn before or after depending on a variety of factors, including meteorological conditions and, most importantly, terminal operations and stowage—that is, if the terminal requires containers stowed in a certain direction or location. Vessels are typically assisted by tugs during turning maneuvers.

As shown on Figure 3-11, DCT’s turning basin is 1,700 feet in diameter and encompasses a new Access Channel and a portion of the Federal Channel (see Figure 3-11).

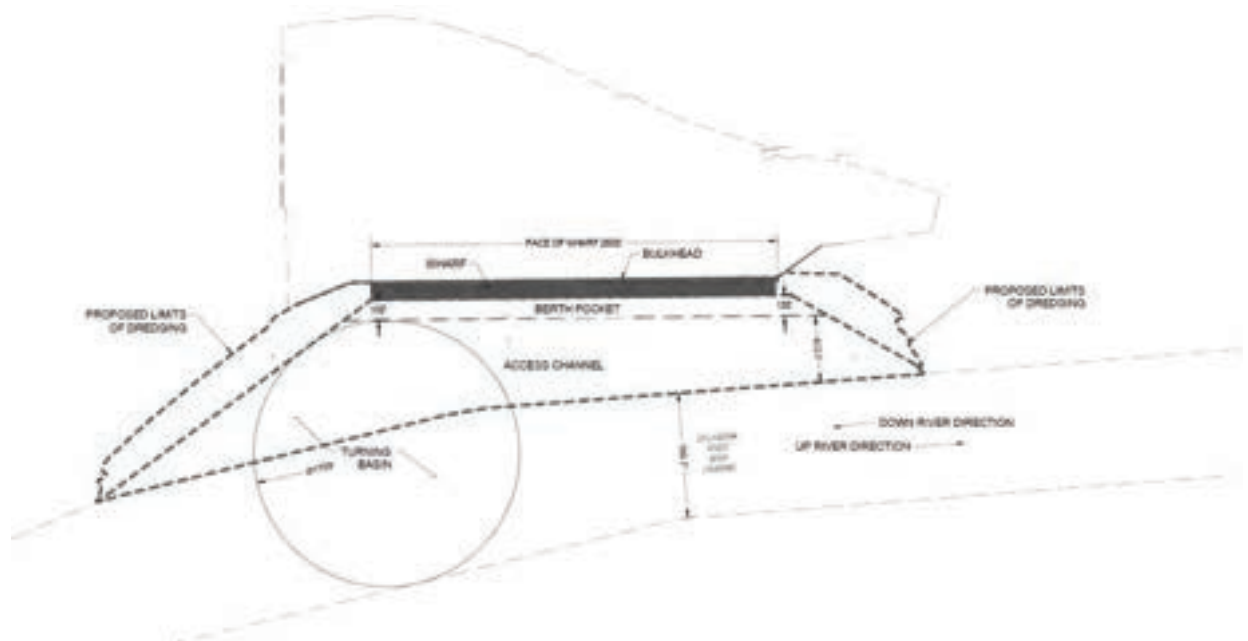


Figure 3-11. DCT Turning Basin

The Kichner Report states:

"PIANC (Permanent International Association of Navigation Congresses) is a recognized international industry and government standards body that publishes information on best practices, standards and procedures for the design and analysis of navigational channels. PIANC in concert with the International Association of Ports and Harbors (IAPH), the International Maritime Pilots Association (IMPA) and the International Association of Lighthouse Authorities (IALA) published a document titled Harbour Approach Channels Design Guidelines (2014). It is the world class standard for recommendations on good practice in the design and analysis of navigational channel and port design and operations. PIANC recommends that no Turning Basin intrude on a deep draft channel. In many ports in the United States, turning basins are part of the port infrastructure but are designed and placed so as not to impede or intrude on existing and critical deep draft navigational channels."

Jacobs notes that PIANC's Harbour Approach Design Guidelines (2014) are guidelines and not mandates, codes, or requirements. In fact, in many locations, including most terminals on the River, turning basins exist that do not adhere to these guidelines.

Jacobs further notes that the USACE *Hydraulic Design of Deep Draft Navigation Projects*³³ states: "Where traffic conditions permit, the turning basin should use the navigation channel as part of the basin area." It also provides recommendations for the shape and size of turning basins, as shown on Figure 3-11, and depicts conditions similar to DCT.

³³ U.S. Army Corps of Engineers (USACE). 2006. *Hydraulic Design of Deep Draft Navigation Projects*. Section 9-2. May 31.

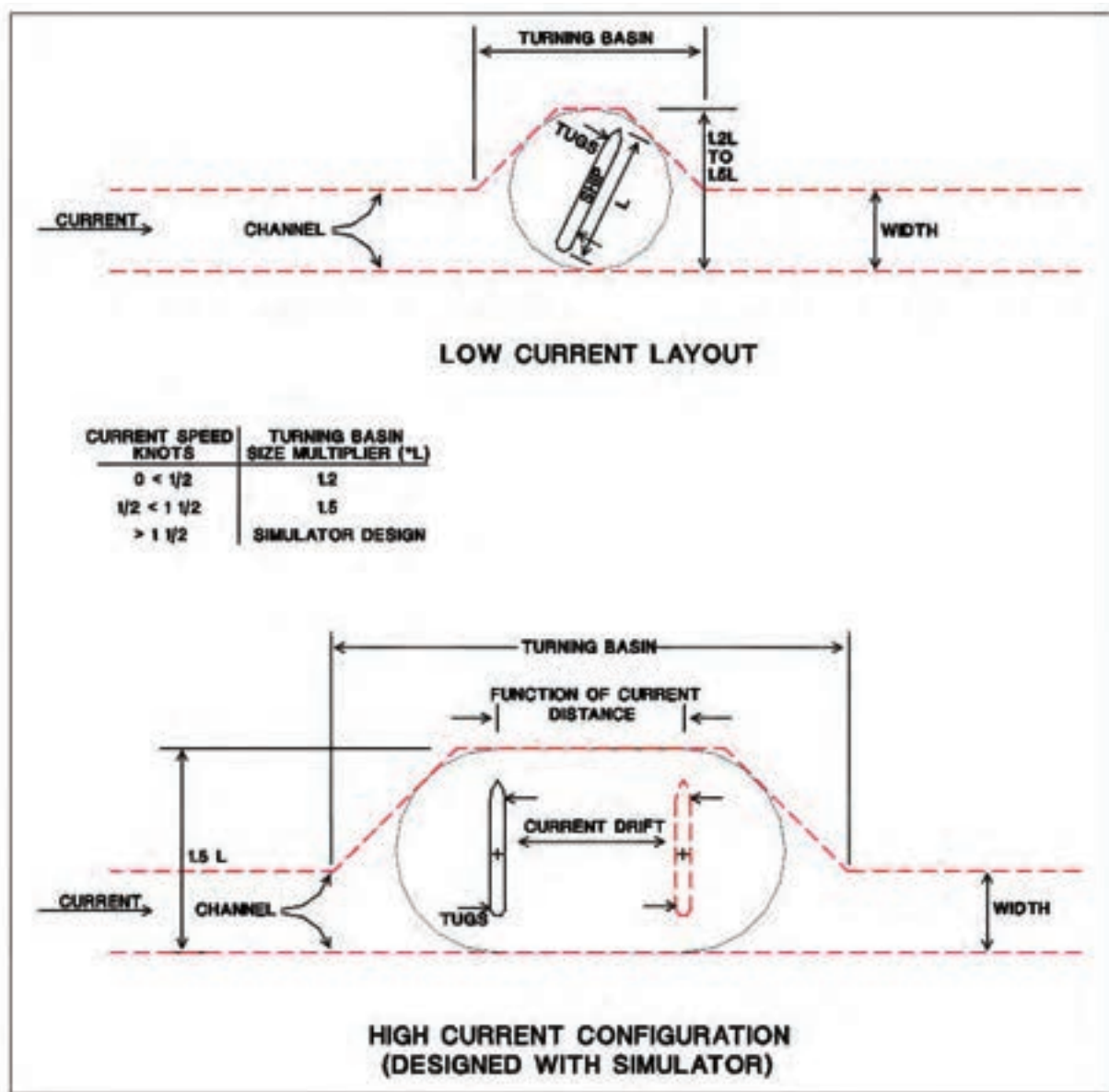


Figure 9-1. Turning basin alternative designs

Figure 3-12. Turning Basin Figure from USACE *Hydraulic Design of Deep Draft Navigation Projects Engineer Manual* ³⁴

Ultimately, local regulatory agencies, pilots, and vessel owners/operators must approve vessel maneuvering, impacts to navigation, environmental considerations, and more. Further, PIANC's *Harbour Approach Channels Design Guidelines* is only one of many relevant PIANC documents to consider when planning and designing ports. In fact, PIANC's Report No. 158-2014, *Masterplans for Development of Existing Ports*, states that "it is the task of the port planner to recommend the most attractive alternative

³⁴ U.S. Army Corps of Engineers (USACE). 2006. *Hydraulic Design of Deep Draft Navigation Projects*. Section 9-2. May 31.

after having analyzed and valued the pros and cons of each of them.”³⁵ DCT’s planning and engineering teams, along with local, state, and federal agencies, considered multiple alternatives in developing the proposed DCT plan, and the resulting plan with the turning basin including part of the Federal Channel was deemed “the most attractive.”

PIANC’s *Harbour Approach Channels Design Guidelines* (2014) further states that “if terminals are located along the boundary of a channel or river, the width of the channel or river may need to be widened to allow an appropriately sized turning area,” which is the case for DCT.

The Kichner Report states that “in **many** ports in the United States, turning basins are part of the port infrastructure but are designed and placed so as not to impede or intrude on existing and critical deep draft navigational channels” (emphasis added). Jacobs notes that in many ports in the U.S., and river ports in particular, turning vessels (whether in a defined turning basin or otherwise) necessarily intrude on deep-draft navigation channels. This includes terminals upriver from DCT.

More specifically, on the Delaware River, virtually all terminals at which large vessels call (other than Delaware City), the large vessels must significantly encroach on the Federal Channel when turning to arrive or depart a berth (refer to Section 3.3.1). Accordingly, no significant vessel is able to pass a vessel that is actively berthing or departing from a Delaware River Terminal.

The Delaware River Pilots are well versed in the practice of turning vessels in the Federal Channel and schedule vessel transits and movements to provide safe, unimpeded navigation (refer to Section 4). The Delaware River Pilots, through their experience handling the array of ships transiting the Delaware River and berthing at its terminals, know the total time required for a ship of a given size and maneuverability to complete its turning maneuver in the Federal Channel turning basin from arrival at its target terminal to when the ship has completely cleared the Federal Channel.

3.5.1 Turning Vessel Examples

Figures 3-8 provides a photographic example of the CMA CGM Marco Polo using and completely blocking the Federal Channel adjacent to the PAMT.

³⁵ Permanent International Association of Navigation Congresses (PIANC). 2014. *Masterplans for Development of Existing Ports*. Report No. 158-2014.



Figure 3-13. A Deep-draft Vessel Turning in the Delaware River and Federal Channel at PAMT ³⁶

Jacobs also used publicly available AIS data from Marine Cadastre to document that turning in the Federal Channel is a common occurrence at all deep-draft terminals on the River. The data show that all existing terminals on the River that serve deep-draft vessels use the Federal Channel to turn large vessels. The Delaware River Pilots confirmed this is done daily at numerous locations.

Figure 3-14 through Figure 3-25, which are based on actual vessel calls as indicated on each figure, show examples of vessels turning at each of the deep-draft marine terminals on the River.

- Tioga Marine Terminal
- PAMT
- Gloucester Marine Terminal
- Eagle Point
- Paulsboro Marine Terminal
- PBF Paulsboro
- Repauno Terminal
- Penn Terminals
- Monroe Energy

³⁶ [https://www.philaport.com/marco-polo/#iLightbox\[cdq3x\]/3](https://www.philaport.com/marco-polo/#iLightbox[cdq3x]/3)

- Marcus Hook (Energy Transfer Partners)
- Port of Wilmington
- Delaware City Refinery

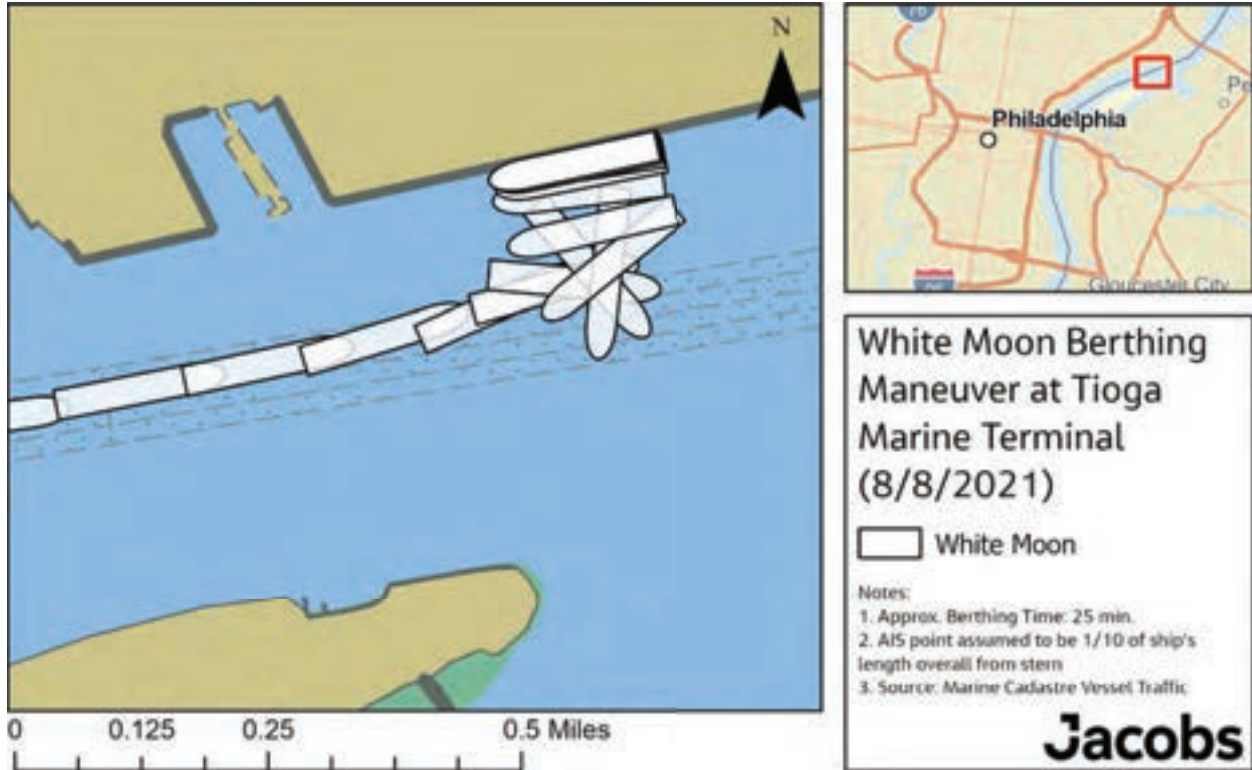


Figure 3-14. *White Moon* Maneuvering to Tioga Marine Terminal

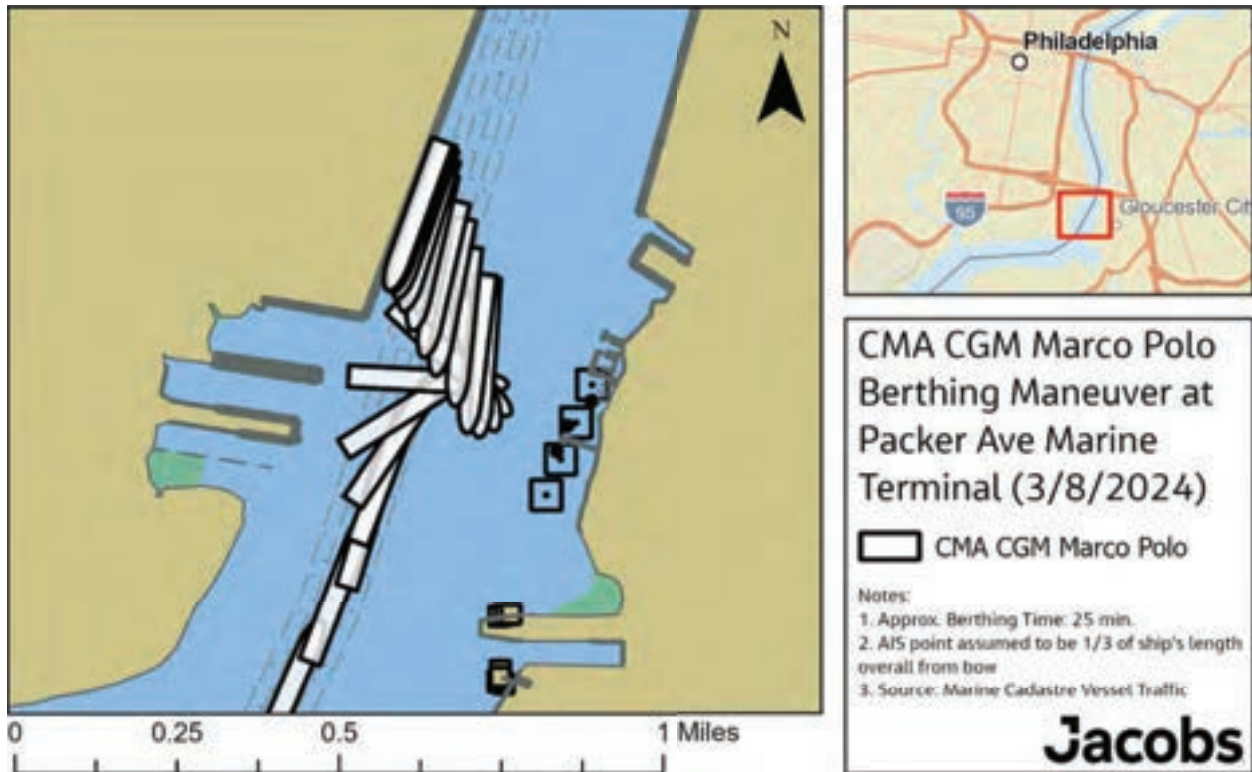


Figure 3-15. CMA CGM *Marco Polo* Maneuvering to PAMT

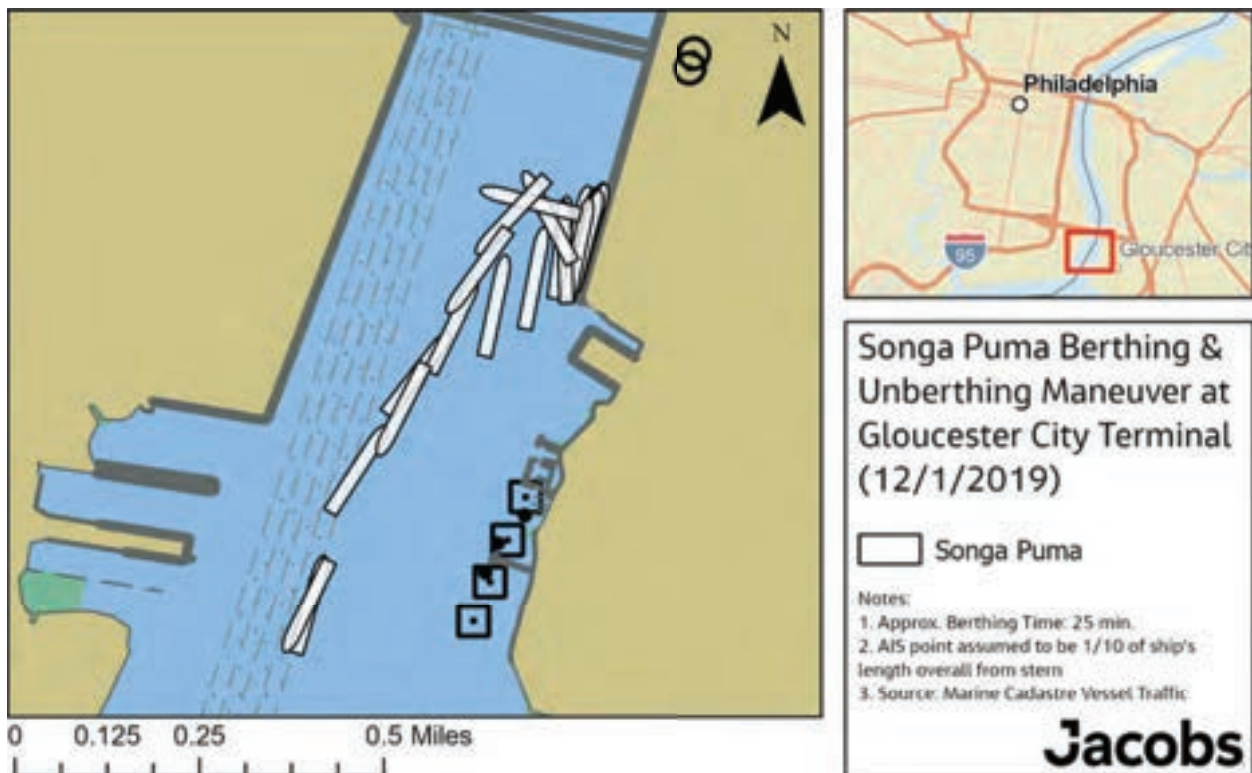


Figure 3-16. *Songa Puma* Maneuvering to Gloucester Marine Terminal

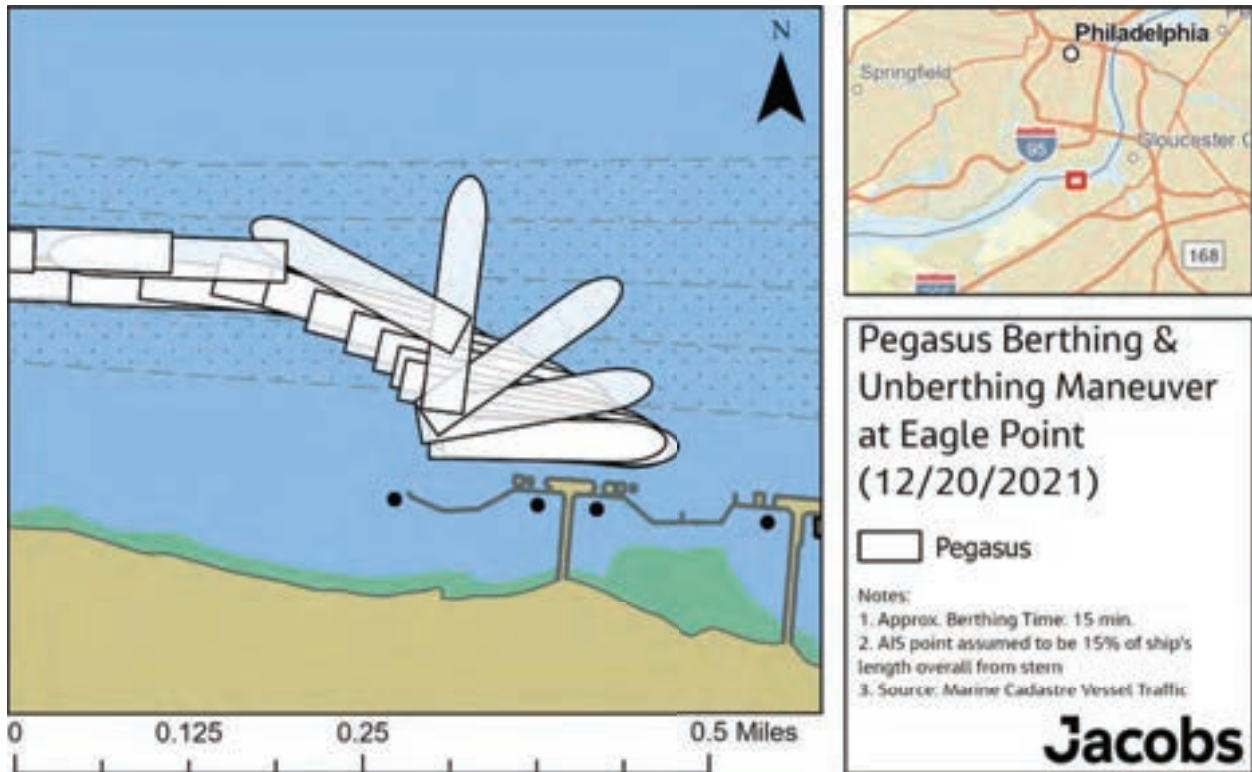


Figure 3-17. *Pegasus* Maneuvering to Eagle Point

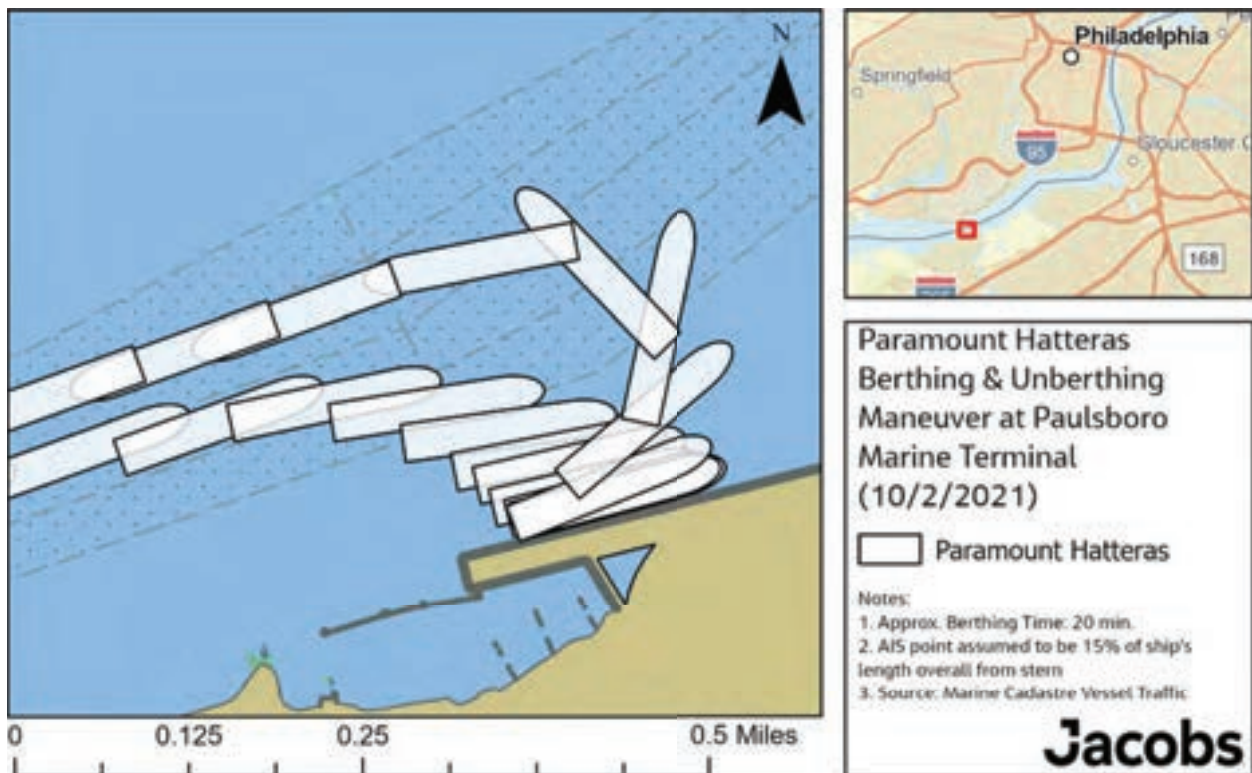


Figure 3-18. *Paramount Hatteras* Maneuvering to Paulsboro Marine Terminal

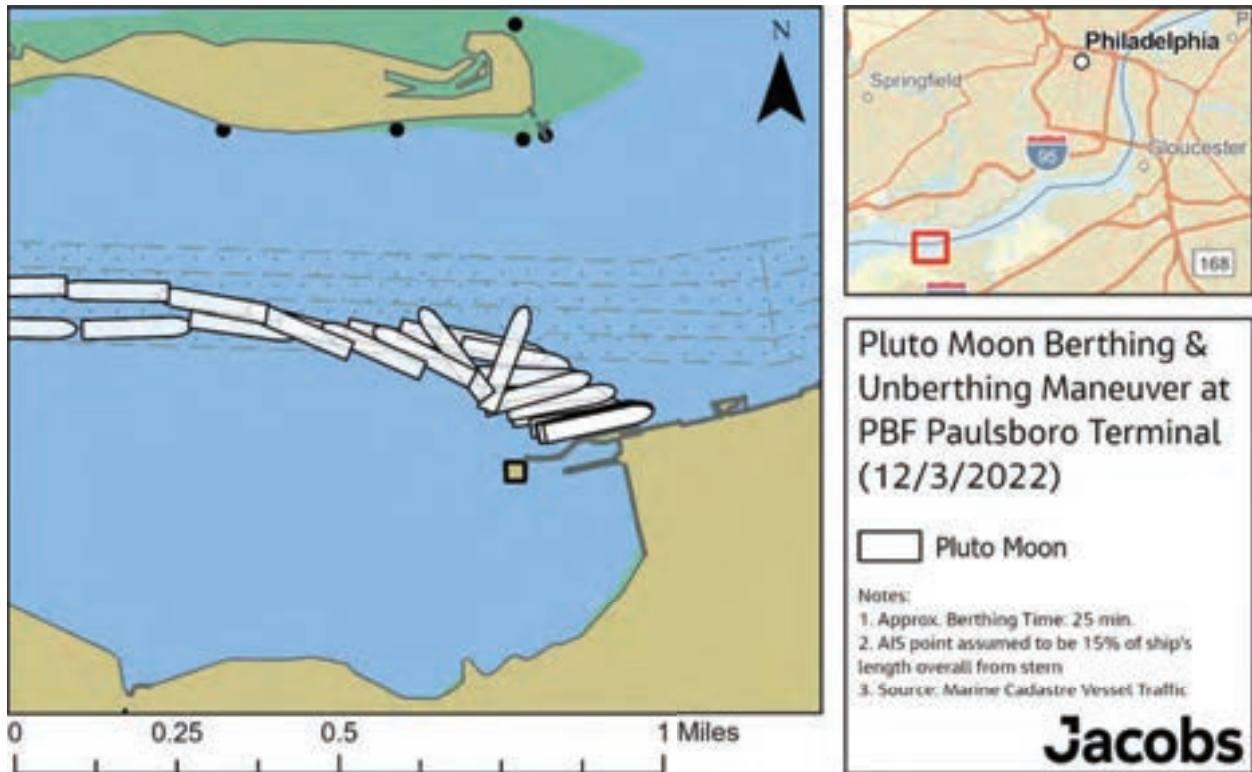


Figure 3-19. *Pluto Moon* Maneuvering to PBF Paulsboro

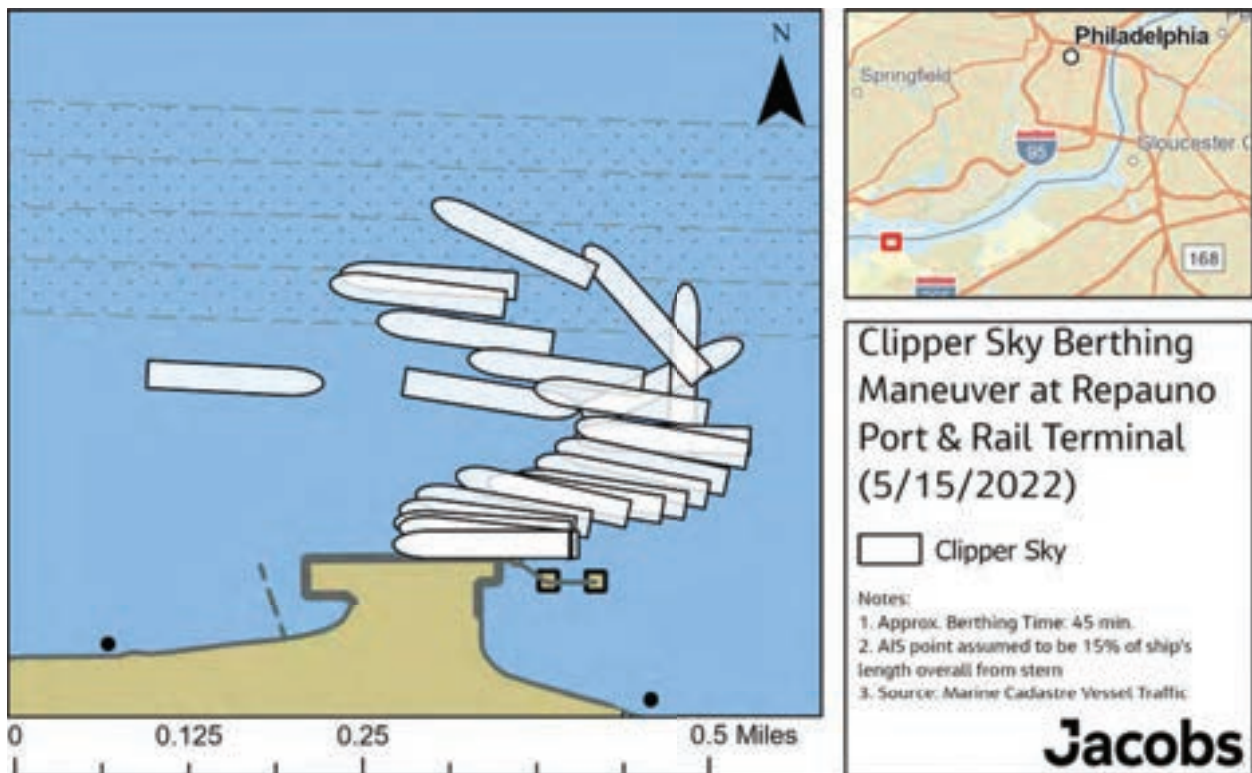


Figure 3-20. *Clipper Sky* Maneuvering to Repauno Terminal

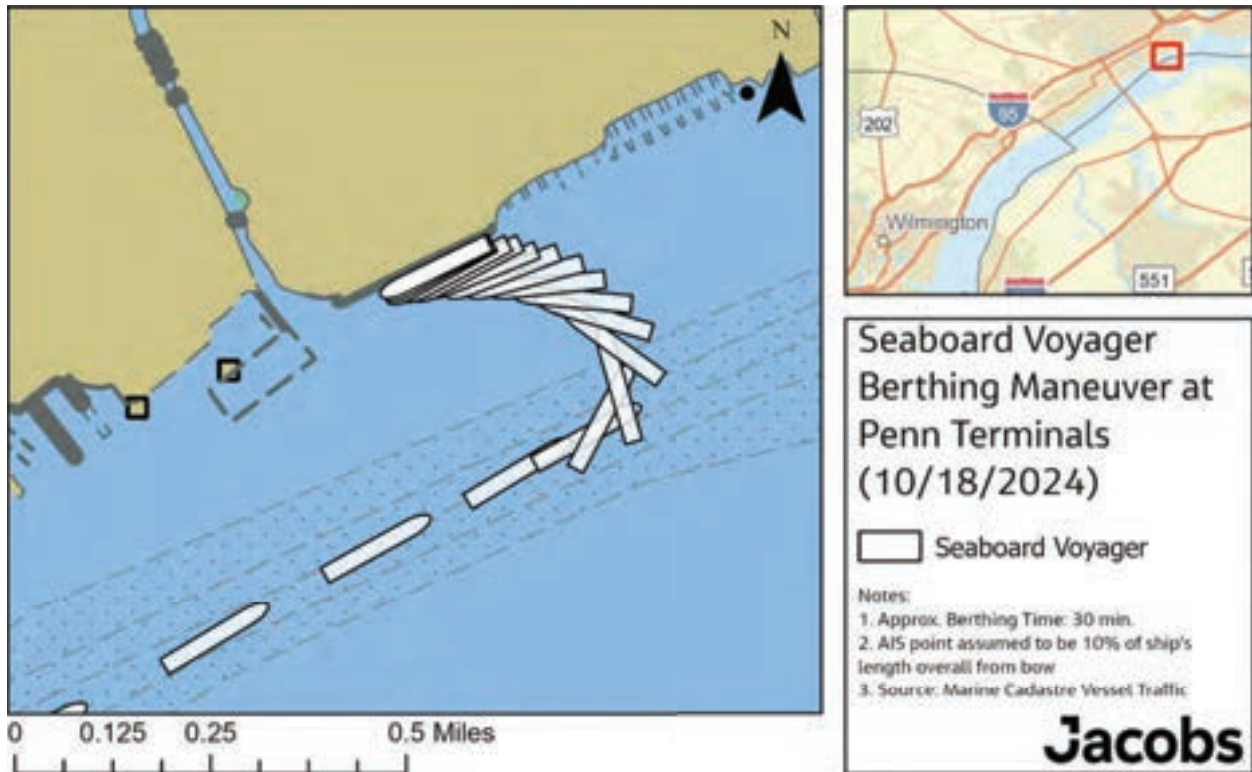


Figure 3-21. *Seaboard Voyager* Maneuvering to Penn Terminals

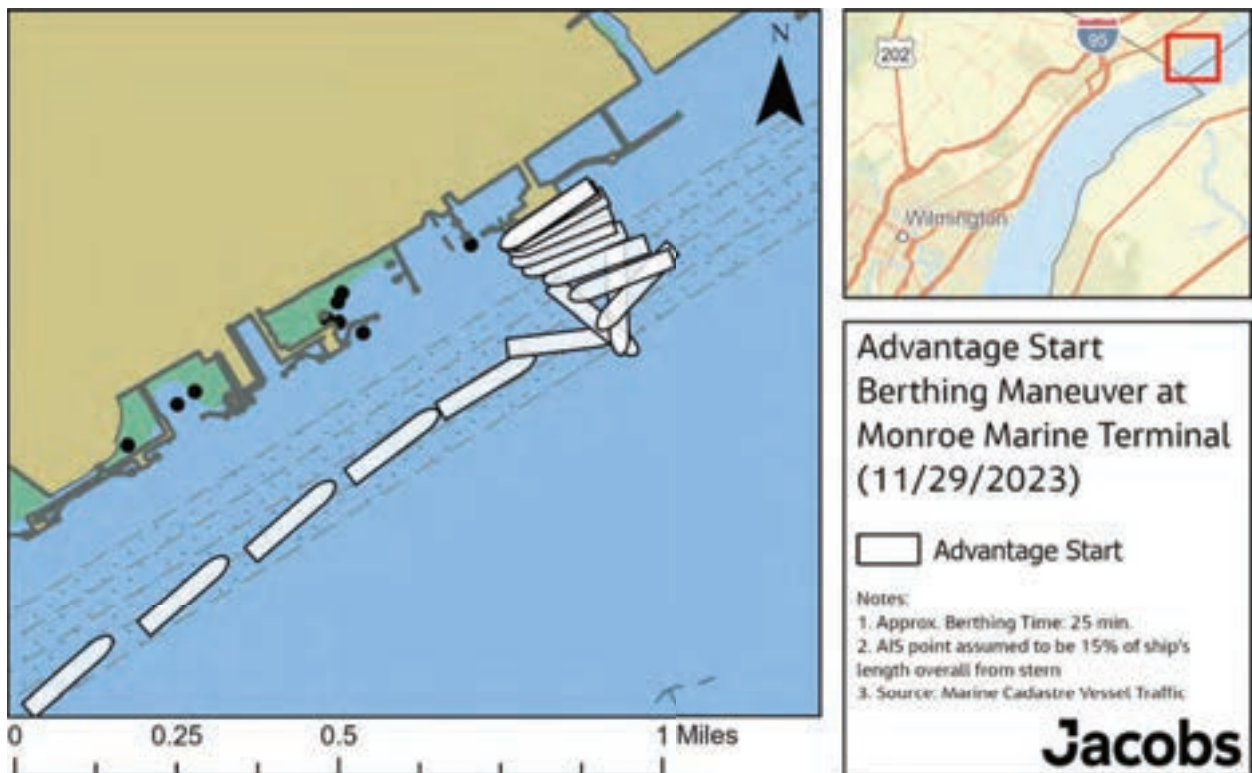


Figure 3-22. *Advantage Start* Maneuvering to Monroe

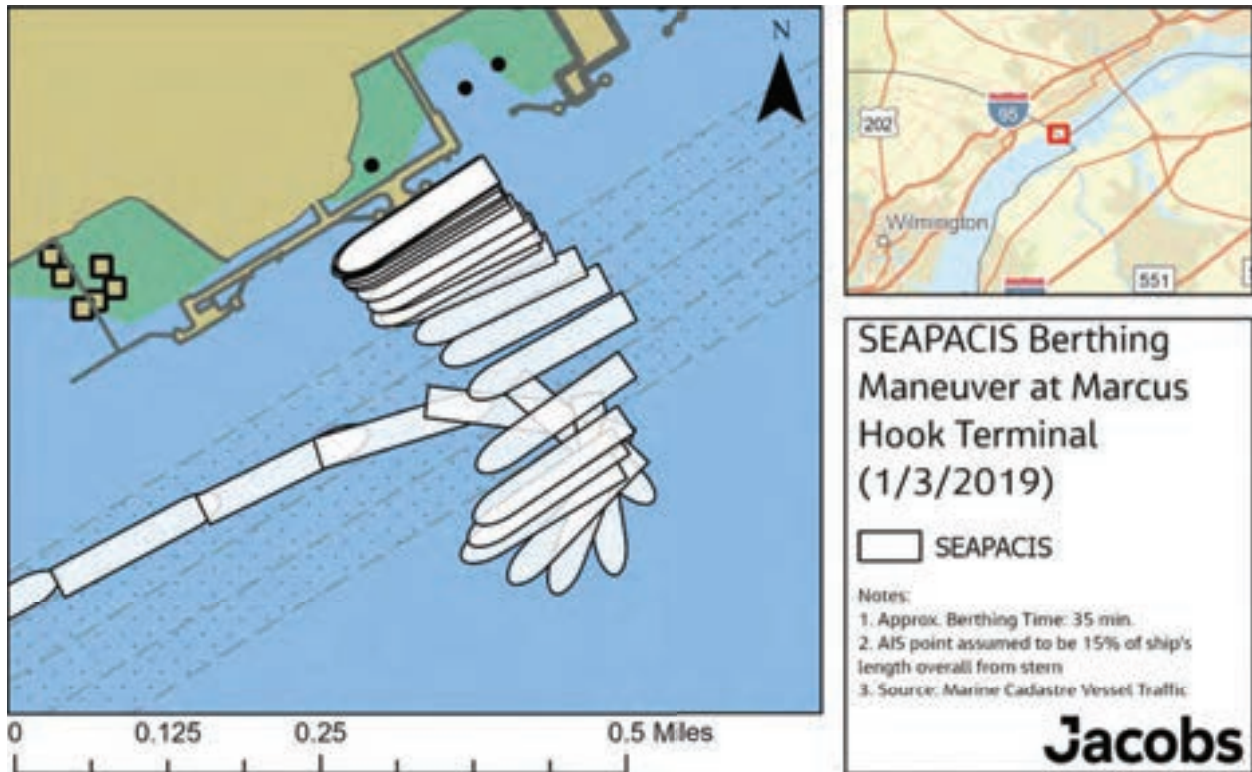


Figure 3-23. SEAPACIS Maneuvering to Marcus Hook

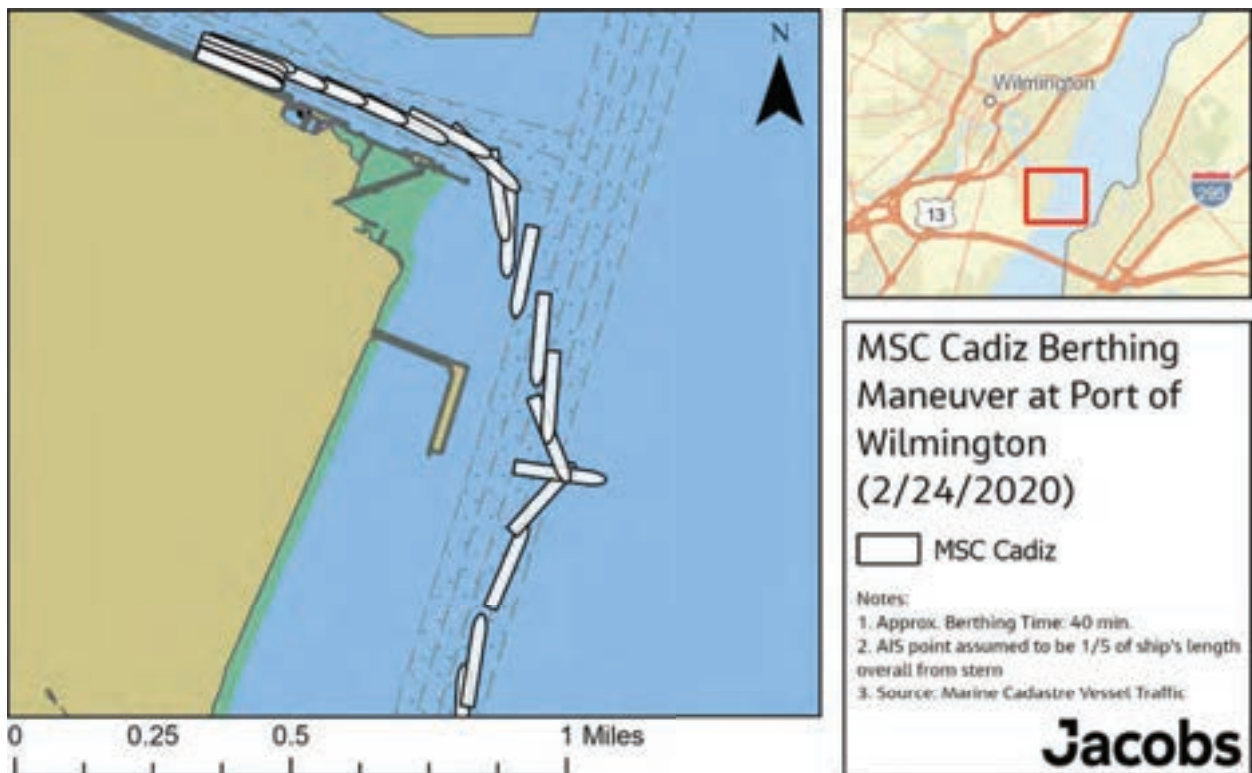


Figure 3-24. MSC Cadiz Maneuvering to Port of Wilmington

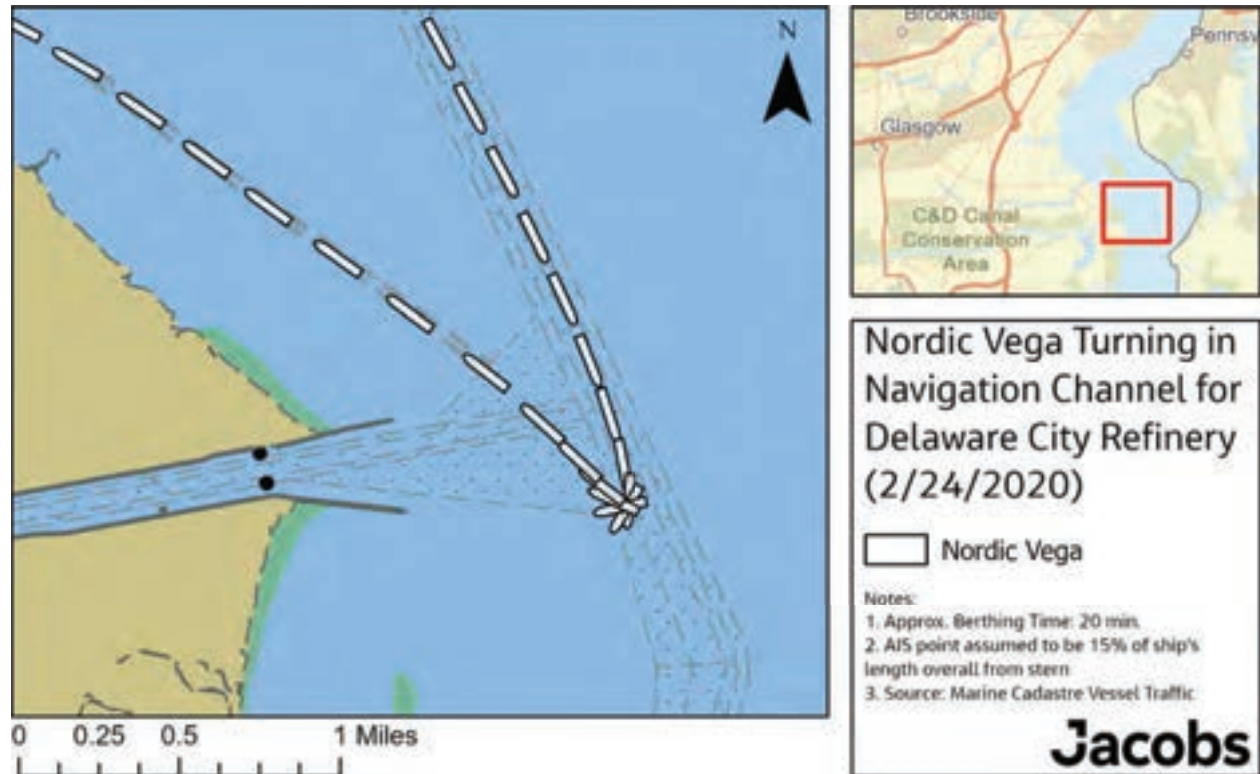


Figure 3-25. *Nordic Vega* Maneuvering to Delaware City Refinery

The Delaware River Pilots further noted that, in addition to the aforementioned existing deep-draft terminals on the Delaware River not having a turning basin fully outside the Federal Channel, it is common practice throughout the U.S. for vessels to turn in at least part of the Federal Channel.

For example, the Port of New York and New Jersey, the largest U.S. East Coast seaport, has five large container terminals that serve deep-draft vessels. For each of these five terminals, turning vessels on arrival or departure is done in the Federal Channel, similar to the Delaware River and similar to what is being proposed for DCT. Figure 3-26 through Figure 3-30 illustrate examples of actual vessels turning in the Federal Channel.

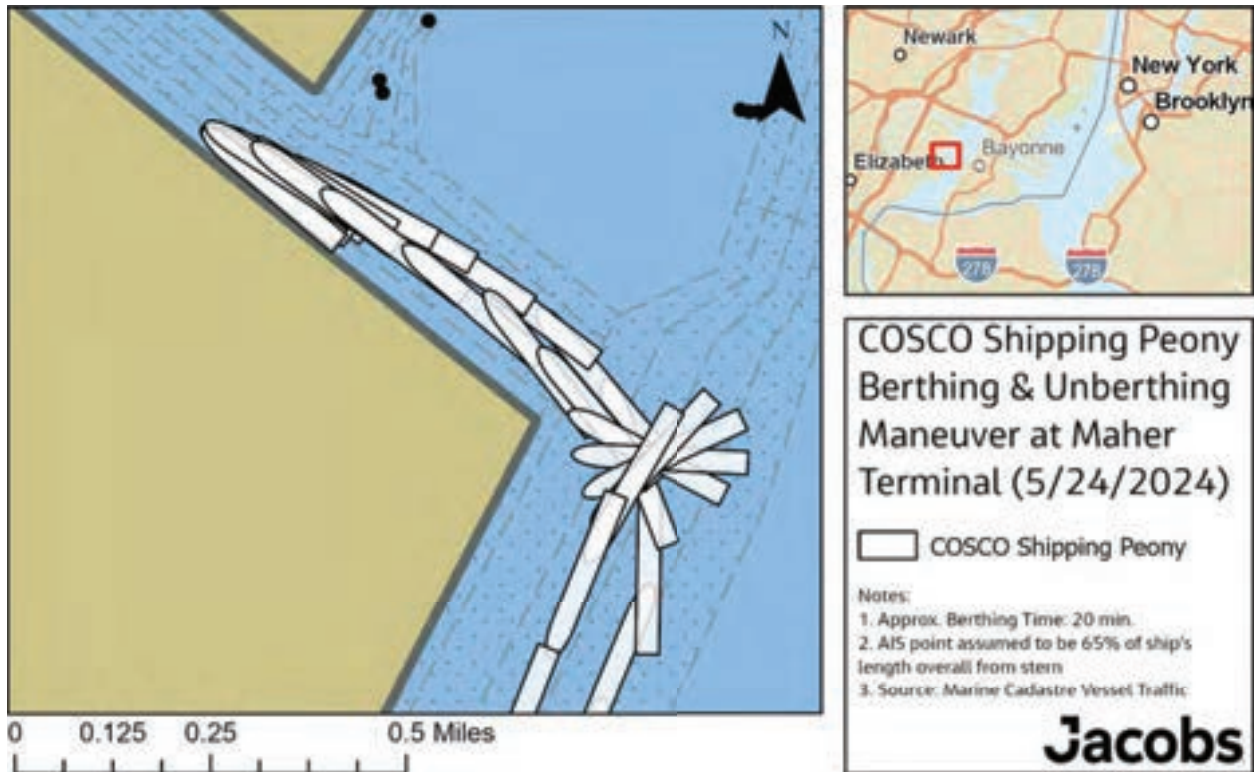


Figure 3-26. COSCO *Peony* Maneuvering to Maher Terminal in Port Elizabeth, New Jersey

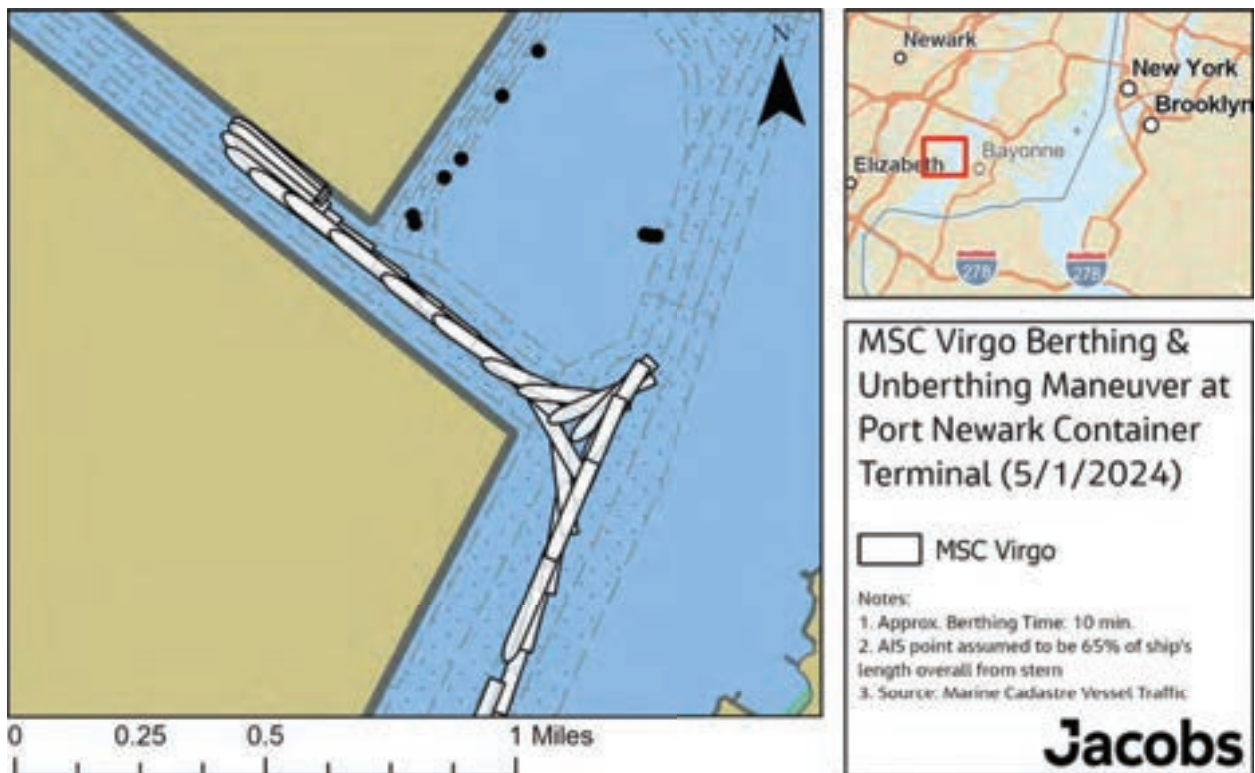


Figure 3-27. MSC *Virgo* Maneuvering to PNCT in Port Newark, New Jersey

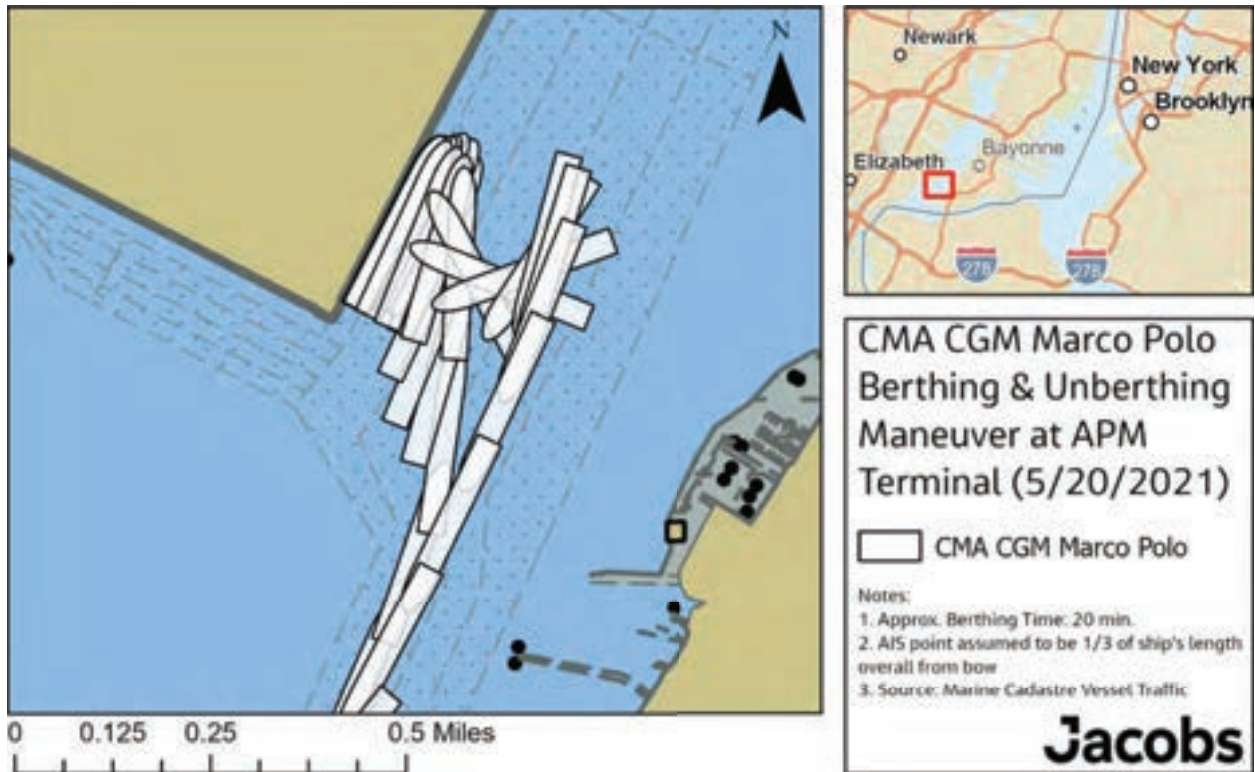


Figure 3-28. CMA CGM *Marco Polo* Maneuvering to APM Terminal in Port Elizabeth, New Jersey

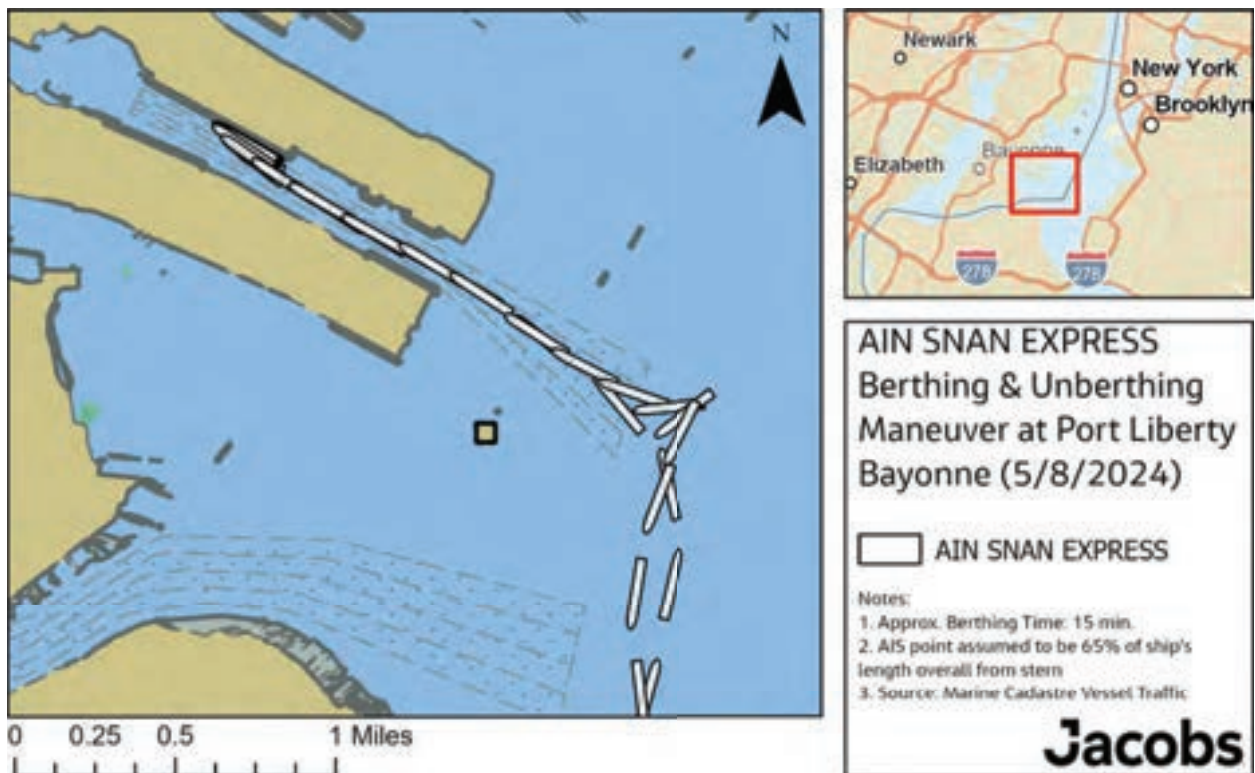


Figure 3-29. AIN SNAN EXPRESS Maneuvering to Port Liberty in Bayonne, New Jersey

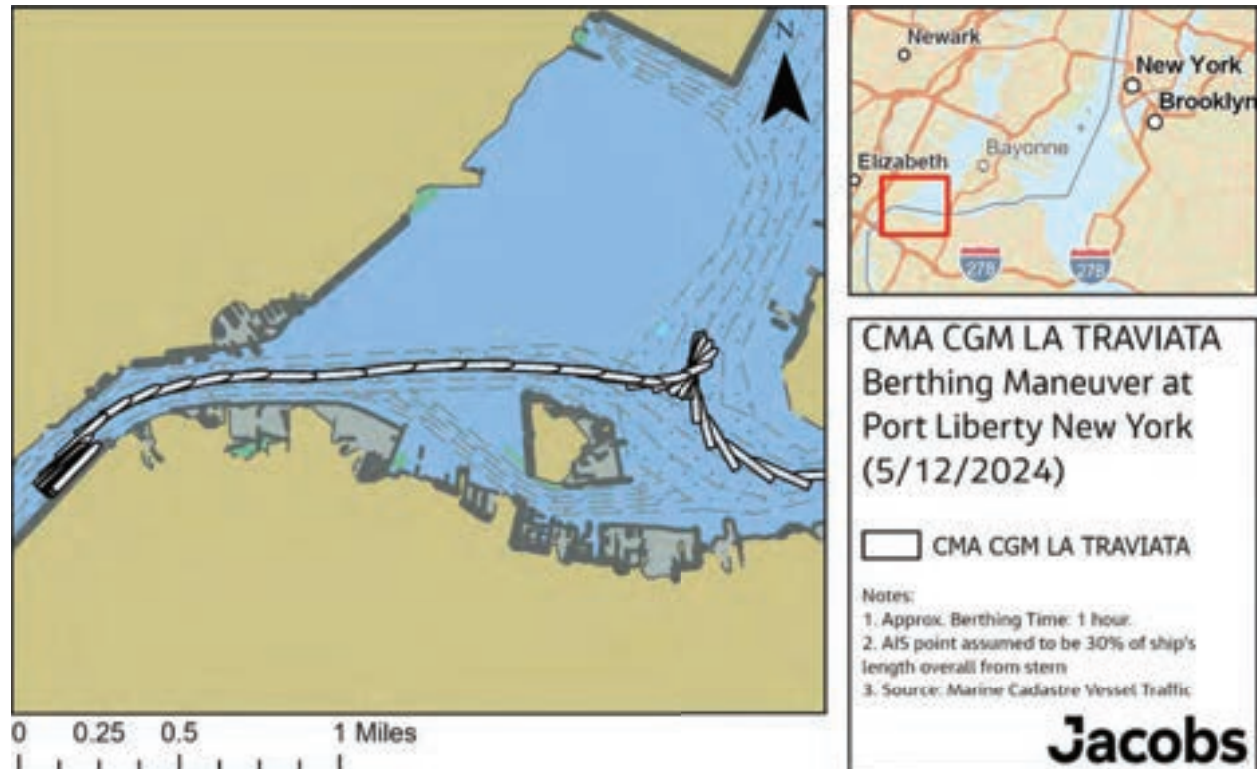


Figure 3-30. CMA CGM *La Traviata* Maneuvering to Port Liberty in Staten Island, New Jersey

3.5.2 DCT Berth Physical Setting

The DCT turning basin would provide a larger, wider turning basin than any other terminal on the Delaware River currently. Further, DCT would be the only terminal on the River with anchorages in close proximity both upriver and downriver to which a vessel could attach in the event of unanticipated or sudden weather or climate conditions not allowing it to berth. The Delaware River Pilots report that the availability of these two anchorages near DCT provide additional and important flexibility and contingent measures that are not possible at the other terminals on the Delaware River, thus meaningfully enhancing the navigation safety profile of DCT as compared to other terminals.

Further, there are no physical obstructions, such as a wharf, bridge abutment or other structures, near DCT, unlike other terminals on the River.

The physical setting of DCT and specifically the availability of the anchorages and absence of obstructions effectively provides comparatively safer conditions for turning and berthing a large vessel than at most of the existing Delaware River Terminals.

3.5.3 Restrictions During Berthing

As discussed in detail above, vessel turning in the Delaware River Channel is a typical, routine and common occurrence. It is important to note that, per conversations with the Delaware River Pilots, all berthing maneuvers are coordinated and scheduled and built into transit times and planning for all vessels transiting the River. Passing vessel traffic is restricted during berthing operations of all large vessels, regardless of the degree to which turning vessels encroach on the Federal Channel.

3.6 2018 Full Mission Simulation (MITAGS Study)

The 2018 Full Mission Simulation (2018 MITAGS Study) was conducted by MITAGS, an independent nonprofit that serves as the primary training center for International Organization of Masters, Mates, and Delaware River Pilots. MITAGS is widely viewed as providing the finest and forward thinking maritime continuing education programming in the U.S. While the MITAGS Study was commissioned by DSPC, it was not developed or conducted by DSPC.

In February 2018, DSPC hosted a 3-day design charrette with USACE experts and local stakeholders. This included representatives from the following:

- USACE Engineer Research and Development Center (ERDC)
- USACE Deep Draft Navigation Planning Center of Expertise (DDNPCX)
- USACE Philadelphia District Planning Group

During this period, the USACE team met independently with the Delaware River Pilots and traveled to the section of the River at the Edgemoor site to discuss river conditions and typical operational and safety considerations that may be impacted by DCT's development, which was in accordance with USACE procedures. Based on the site visit and the design charrette, the group jointly developed the proposed simulation scope.

Jacobs reviewed the MITAGS Study and Captain Kichner's comments. In so doing, Jacobs consulted with the Delaware River Pilots and MITAGS, conducted its own research, and relied on its internal expertise. Jacobs finds that the scope of the 2018 MITAGS Study was reasonable for the proposed project and was performed to a reasonable standard and in accordance with the proposed scope of work. Based on Jacobs' reviews, the follow is a point-by-point review of and response to particular issues raised by Captain Kichner.

The Kichner Report states:

"In conducting my evaluation, I focused on the Full Mission Ship Simulation for Edgemoor Navigation Feasibility Study (2018) prepared by MITAGS. The MITAGS study claims that the focus of the simulation was to determine the impact of the terminal on ships transiting the deep-draft navigation channel, but the study is inadequate for this purpose. It is my view that the MITAGS study was too limited and did not fully encompass the conditions, vessel types, and traffic impacts that would be expected for a terminal and turning basin in this location."

The 2018 MITAGS Study used expected vessel parameters, historical meteorological conditions, and senior Delaware River Pilots who perform vessel movements every day. The Delaware River Pilots noted that the results of the movement scenarios and safety/level of difficulty ratings performed in the 2018 MITAGS Study are consistent with current operating procedures and navigation maneuvering scenarios, as well as with actual experience piloting vessels on the River. As noted previously, the MAC issues and updates Transit Advisories that are specifically for the ULCVs calling on PAMT and expected to call on DCT, which are consistent with the 2018 MITAGS Study.

The USACE's *Hydraulic Design of Deep Draft Navigation Projects Engineer Manual*³⁷ notes the importance of involving local pilots, stating:

³⁷ U.S. Army Corps of Engineers (USACE). 2006. *Hydraulic Design of Deep Draft Navigation Projects*. Section 9-2. May 31.

"Shiphandling simulators have the distinct advantage over scale models in all for testing using human piloting in real-time rather than reduced Froudian time scaling. The inclusion of the local professional pilot in the channel project design process has proved distinctly advantageous in developing a safe and optimum channel... The use of professional pilots from the area being simulated may be the most important factor and a primary reason for conducting a simulation study."

It should be noted that since the Kichner Report, container vessels larger than those modeled in the Kichner Report have safely and successfully transited the River and called PAMT. While simulations are good tools pre-development, the Delaware River Pilots now have actual experience with these large vessels and have not encountered any issues, concerns, or situations that would impact traffic or safety and found the 2018 MITAGS Study to be consistent with their real-world experience. Finally, as presented in Section 3.3, Jacobs and MITAGS performed additional real-time simulations with larger vessels under a variety of conditions, which demonstrated that these vessels can safely navigate into/out of DCT and pass each other on the River and are also representative of actual conditions on the River.

The purpose and importance of simulations like the 2018 MITAGS Study are outlined in PIANC's Report No. 158-2014, *Masterplans for Development of Existing Ports*, which states:

"...manoeuvring simulation techniques provide a suitable and nowadays indispensable follow-up for verification and further refinement of the initial design."

"There are a number of specialist real-time vessel simulators, including full bridge simulators, which can be used to optimise channel layouts and manoeuvring areas within existing and proposed port developments. These simulators use computer modelling to take into account the effects on the vessels of winds, waves and currents and the response of the vessels to bridge controls. The simulators can be run individually, or a number of the simulators, typically a main vessel and one or more tugs, can be run simultaneously, allowing independent and interactive control between vessels and tugs within the same simulated marine environment."

The vessel simulation systems normally use sophisticated modelling techniques to represent the spatial and temporal behaviour of a ship. Hydrodynamic modelling requires full 'six degrees of freedom' ship response to waves, wind and currents, allowing for lift and drag effects and close quarter effects such as shallow water, bank effects, bow and stern thrusters, ship interaction and even collisions."

The USACE's *Hydraulic Design of Deep Draft Navigation Projects Engineer Manual*³⁸ also identifies when and how simulations are typically used, stating:

"Simulations are used to bring the skills and judgment of the pilot into the waterway design process and to determine the limits of the ship maneuvering characteristics in the specific navigation channel environment. Simulation studies are normally conducted as comparative studies in which one alternative channel design can be compared against a base (usually existing) condition or another design... Published channel design criteria are very conservative. Channel width, turning basin, and turn widening designs can all be less than the required dimensions, provided a simulator study is used to verify the design."

³⁸ U.S. Army Corps of Engineers (USACE). 2006. *Hydraulic Design of Deep Draft Navigation Projects*. Section 9-2. May 31.

As both PIANC and the USACE note, simulations are a great tool to validate designs and plans and create design iterations (as was done in the 2018 MITAGS Study, which recommended widening the approach channel). However, navigational safety and procedures are ultimately the responsibility of the Delaware River Pilots, so their involvement in scoping and performing the simulations is critical. The Delaware River Pilots were involved in scoping the 2018 MITAGS Study, ran the simulations, and were in agreement with the outcomes. The Delaware River Pilots remain involved, participating in Jacobs' recent simulations (refer to Section 3.3), and remain in agreement with the results showing that ULCVs can be brought safely into DCT.

Finally, the study scope was agreed to and approved by ERDC, the research and development center for the USACE and heavily involved in USACE-related navigation projects. ERDC staff also attended the 3-day simulation.

The Kichner Report also makes comments on specific aspects of the simulation. Jacobs has reviewed the Kichner Report and the 2018 MITAGS Study and provides commentary from desktop research, our analyses, and discussions with the Delaware River Pilots, MITAGS, Wilmington Tug, McAllister, and Moran, as follows:

1. Kichner Report, page 6: *"The MITAGS study was done by the applicant to support the USACOE and project stakeholders' desire for a ship navigation study to ensure that container ships anticipated to use the terminal are able to safely transit the waterway to the proposed Edgemoor Terminal on a regular basis, with minimum impact on existing vessel traffic. The primary purpose of the study was to determine the impact of the terminal on the ships transiting the deep-draft navigation channel, although as described below, the study was too limited to adequately evaluate this issue. The study used a full mission simulator to represent the transit and mooring of vessels at the Edgemoor Terminal under a narrow set of conditions. The study primarily processed 9300 TEU Container ships through a 3-day simulation, although the study also performed a preliminary assessment of the feasibility of a 12000 TEU container ship. The conclusion from the simulation was that the ships tested and Terminal design "...would have minimal impact on ships as they transit the existing navigational channel." However, the study recommended restrictions on transit to high tide and wind conditions less than 20 knots."*

The 2018 MITAGS Study was not conducted by DSPC, it was conducted by MITAGS with Delaware River Pilot participation, and it considered both 9,300- and 12,000-TEU capacity ships. Seven of the 29 simulations used 12,000-TEU vessels and showed that the larger ships can safely navigate. It should be further noted that TEU capacity does not directly define a vessel's properties or how a ship will handle. Parameters such as length, displacement, draft, beam, engine size, propeller type, and thrusters can vary within rough TEU capacity classes, and smaller TEU capacity vessels may be larger or have more critical parameters than larger ships. Notwithstanding the aforementioned, Jacobs has recommended and performed additional simulations with MITAGS (refer to Section 3.3).

Captain Kichner also noted that the study recommended transit restrictions of high tide and wind restriction of 20 knots. The MAC's Transit Advisories³⁹ already limit large ships to inbound transits on high tide, so the MITAGS Study is in concurrence. The MAC's Transit Advisories also state that "if winds are forecast to be in excess of 20 knots at the time of docking/undocking, four tugs shall be used for the evolution. If winds are forecast to exceed 25 knots sustained and/or 30 knot gusts during the transit or docking/undocking, transit is not recommended." The MAC and Delaware River Pilots are,

³⁹ https://www.macdelriv.org/files/transit_advisory.pdf

therefore, in concurrence with the recommendations made in the 2018 MITAGS Study and noted by Captain Kichner.

2. Kichner Report, page 6: *"The MITAGS study is incomplete. The simulation study concluded that there would be no adverse effects from vessels using the terminal, but this conclusion was based on six passing vessel tests under very limited test conditions. What this conclusion fails to mention is that it is only applicable to container vessels and only the two container vessel models used in the simulation. Although MITAGS acknowledged in the study that the "navigation channel handles oil tankers up to the Suezmax class, container ships up to 14,000 TEUs, and other vessel classes," the passing test failed to account for the different types of vessels using the channel and transiting past Edgemoor. A fully laden Suezmax class tanker or a light Suezmax tanker may handle much differently than the modeled container ships used in the passing study. By the report's own admission "Model behavior is highly dependent on the accuracy of the bathymetry, the current, and wind flows. In real world situations, such forces could vary significantly over the operating area. In addition, the models used in these tests were representative of vessel classes similar in size and displacement. Vessels of the same class may have significant differences in handling characteristics in real-world conditions." This fact is even more relevant to deep draft vessels of a different class (tankers etc.). Also, the study was limited to container vessels and did not take into account other types of vessels using the channel, including tugs and barges."*

The "test matrix" used in the 2018 MITAGS simulation was developed in coordination with, and approved by, USACE, the Delaware River Pilots, tugboat companies, and consultants specializing in marine planning and operations. The group concluded that the ULCVs simulated were likely to be the worst-case scenarios because container ships have large profiles, deep drafts, and long lengths. The Delaware River Pilots stated that a Suezmax tanker has maneuverability similar to ULCVs and felt the ULCV-ULCV scenario was the critical scenario to simulate.

Since Captain Kichner prepared his report, the Delaware River Pilots have successfully passed ULCVs, car carriers, tankers, and other ships pass each other in the River. These passing scenarios are routine occurrences and the Delaware River Pilots have not experienced any adverse scenarios. Recent examples of passing vessels on the River, including tankers, PCCs, and ULCVs are shown in Section 3.3. Thus, actual practice on the Delaware River since the 2018 MITAGS Study was performed validates the conclusions reached in the 2018 MITAGS Study. It is also important to note that the passing-vessel concerns noted in the Kichner Report are independent of DCT's development, as the traffic is on the River today, and those vessels already meet or pass, regardless of DCT.

The Delaware River Pilots noted that a simulation is a tool to help predict real life scenarios, and that simulations are tools to predict how vessels would handle. Further, PIANC's Report No. 158-2014, *Masterplans for Development of Existing Ports*, states that simulations can "*produce representative models based on numerical design and tested models of similar type and size of ships...real-time simulator should also have replicated ship's controls so the vessel can be controlled in a realistic manner.*" There is no more "realistic" way to control ships than to pilot and navigate vessels in real time, as the Delaware River Pilots are successfully doing, with ULCVs, tankers, PCCs, and other ships in the River currently, both passing and meeting. Thus, while the 2018 MITAGS Study results and conclusions were sound, the actual safe maneuvering and navigating of vessels since 2018 is compelling and provides a more definitive resolution of this issue.

It is also noted that the Delaware River Pilots undertook a separate 5-day simulation at MITAGS in 2018 with PhilaPort, joined by Docking Pilots and tug operators including personnel from Moran,

McAllister, and Wilmington Tug, Inc., to “train for these new class of vessels 12,000–14,000 TEUs.”⁴⁰ The simulation “(1) Developed and validated “best practices” for ULCV transit, berthing and unberthing plan; (2) Established of initial operational environmental limits (wind, current, sea state and visibility); (3) Identified tug packages (number of, type, power, placement and use); and (4) Response[d] to unusual situations (loss of tugs(s), ship steering/propulsion, severe weather, etc.).” These are the same type and size of vessels expected to call DCT, and based on the PhilaPort simulation, the President of the Pilots’ Association for the Bay and River Delaware stated: “We always knew we could bring these vessels up the newly deepened channel but practicing in real life conditions give us a greater comfort level.”

Finally, building DCT’s turning basin creates more deep-draft room for non-DCT vessels to pass (overtake or meet) outside the current Federal Channel, if needed, in the vicinity of DCT. This effectively widens the Federal Channel and improves navigational safety on the River. Therefore, the addition of DCT and its vessels would not change the passing-vessel protocols or procedures and serve to improve safety.

3. Kichner Report, page 7: “Further, no simulations were conducted to assess the impact of a turning basin that occupies the entire deep draft channel on transiting ship traffic. A ship using the proposed turning basin would prevent the use of this section of the main channel by transiting vessels for a significant period of time resulting in potential delays to upbound and downbound traffic. In addition, as stated by the USCG in the PAWSA, “Vessels with high wind-profile areas (car carriers, larger container ships) are most impacted by winds and must maintain sufficient speed in order to maintain vessel maneuverability.” This means that large vessels constrained to the confines of the channel (constrained by draft) cannot slow down without themselves potentially impacting their own navigational safety under certain weather conditions. Therefore, if a vessel using the main channel were to have to slow for a vessel obstructing the channel in the turning basin, it could impact the transiting vessel and cause it to ground or collide with the maneuvering vessel and thereby block the channel. It is therefore imprudent to conclude that construction and location of the Edgemoor Terminal as proposed would not have an effect on passing traffic or that passing traffic would not have an effect on vessels moored at the Edgemoor Terminal without additional study.”

As described in more detail in Section 4, Delaware River Pilots schedule all vessel transits and maneuvers well in advance. Draft-restricted vessels transit in caravans or convoys and are sequenced based on destination, with upriver-bound ships first. DCT-bound vessels would be slotted toward the end of the caravan, which would limit the likelihood of delaying vessels bound for terminals farther upriver. Further, the Delaware River Pilots, Docking Pilots, agents, shipping lines, vessel captains, terminals, and tugs schedule these caravans and vessel turning maneuvers (which typically takes less than 30 minutes) with extra buffer times, and Delaware River Pilots will modify maneuvering speeds to ensure there is no conflict or congestion and can slow speeds farther downriver to speeds that allow for safe and adequate maneuverability. The Delaware River Pilots are in constant communication with each other, so every Pilot is aware of slowing, turning, and maneuvering vessels well before any potential conflict arises.

These procedures are in place today at every terminal on the River and are not expected to change due to the development of DCT. Additionally, relying solely on ship simulations to inform this consideration is inappropriate because the Delaware River Pilots’ existing methods for scheduling and sequencing ship transits account for more than just the maneuvering times (which are one of the

⁴⁰ <https://www.philaport.com/philaport-moves-quickly-to-accommodate-surge-in-cargo/>

result from the simulation) and include events (such as pre-planned vessel speed changes) beyond the duration of a ship maneuver. Further, since the Kichner Report was prepared, the Delaware River Pilots have regularly and successfully maneuvered ULCVs, PCCs, tankers, and other ships past each other on the River and behind/ahead of vessels maneuvering into terminals. The addition of DCT's vessels will not have a negative impact.

4. Kichner Report, page 7: *"The MITAGS study's simulations were only conducted in "clear visibility." No simulation runs were done under adverse or restricted visibility conditions. Certainly, the maneuvering of vessels under good visibility, with all of the visual navigation aids available, would achieve better results in the simulation. A complete simulation to adequately assess the safety of these maneuvers needs to be done under adverse conditions of night transits, sudden squalls, and restricted visibility so as to determine the safe limits of vessel navigation and maneuvering alongside the Terminal. The USCG PAWSA report states that fog routinely occurs year-round but is more prevalent in the spring and fall. Spring and fall are traditionally low visibility times of year. An additional question that needs to be explored is how the studied vessels would react in the middle of a turn during a sudden squall and/or change in visibility. Without simulating such adverse conditions, the study cannot reliably conclude that ship traffic can safely use the terminal and turning basin."*

The 2018 MITAGS simulation was performed under clear visibility because the MAC's Transit Advisories⁴¹ state "transits shall not commence when visibility is less than two nautical miles," meaning that visibility must be adequate to transit vessels. The Delaware River Pilots are professionals trained to undertake vessel movements in all weather conditions and for all vessel types and sizes. If visibility worsens in transit or while turning or berthing, River and Docking Pilots are empowered to adapt and make decisions to limit berthing operations and attach to a nearby anchorage (of which DCT has two choices, whereas most other terminals only have one). Further, because large ship inbound transits are limited to high tides, Delaware River Pilots have the ability to change speeds to avoid or arrive ahead of poor visibility conditions or to turn around and leave the River.

DCT's turning basin is large compared to other terminals on the River, thereby providing additional safety to vessels turning in and transiting past the site. Jacobs finds that the 2018 MITAGS Study, and Pilot/MAC current procedures, adequately address concerns raised in the Kichner Report. Notwithstanding, Jacobs and MITAGS conducted simulations in nighttime conditions, sudden squalls, and restricted visibility, as summarized in Section 3.3, all of which showed that the Delaware River Pilots can safely transit vessels.

5. Kichner Report, page 7: *"The study also indicated that "No maximum ebb currents were used during the inbound runs." Unless the turning and mooring of any and all container vessels that may call on Edgemoor will never take place during max ebb, simulation of turning and mooring a vessel under those conditions needs to be explored."*

The 2018 MITAGS Study considered the ULCVs that would be calling on DCT, with drafts of 40, 42, and 45 feet. The MAC's current navigation procedures⁴² limit inbound container vessels greater than 38 feet, 6 inches to inbound transits on flood tides. Therefore, inbound simulations of ebb tides are not relevant because ULCVs are not permitted to transit upriver at maximum ebb currents.

⁴¹ https://www.macdelriv.org/files/transit_advisory.pdf

⁴² https://www.macdelriv.org/files/transit_advisory.pdf

It should be noted that the 2018 MITAGS Study did consider maximum ebb tides for both outbound single and meeting vessels and found that vessels could safely navigate.

6. Kichner Report, page 7: *"In addition, simulations were conducted during what were claimed to be "worst case" conditions of spring max flood of 1.6 -1.7 knots and spring max ebb of 1.3 – 1.5 knots. However, according to the USCG PAWSA, "significant rain events in the spring and snow melt run-off from the winter increases water flow movement and can increase current speeds from the normal 1-2 knots, to over 4 knots." There were no simulation runs for passing vessels or for turning vessels to moor at Edgemoor under those conditions or conditions that combine high current and higher wind speeds."*

The USCG PAWSA as cited by Kichner encompasses the entire Delaware River and is not specific to this reach of the Delaware River. The reach of the River by DCT is wide and tidal, meaning it is less influenced by runoff than narrower, further upriver reaches. Jacobs reviewed historical current data surveyed at Edgemoor, NOAA Station DEB2118,⁴³ during the Delaware Bay and River Current Survey 2021. The ebb and flood currents are close in magnitude at Edgemoor, highlighting the diminished impact of River discharge, which tends to amplify ebb currents. The currents in the Delaware River at DCT range from approximately 1.9 knots maximum flood to 2.0 knots maximum ebb on average. The long-term current record in Philadelphia, NOAA Station db0301,⁴⁴ shows that the currents are remarkably consistent, with extremely high currents only exceeding the average by 0.3 to 0.5 knot, even during some of the more notable storms over the last several decades, such as Superstorm Sandy, Hurricane Ida, and Hurricane Floyd. The maximum observed currents were 2.5 knots ebb current, recorded during a hurricane.

The Delaware River Pilots confirmed that they do not recall currents of 4 knots or greater by DCT and cannot recall an instance in which they observed a current of even 3 knots, which is consistent with the NOAA data. It is a reasonable and common practice to limit simulations to scenarios that actually occur. Further, in the very unlikely event that currents exceed 4 knots, of which there is no evidence of this happening on the Delaware River, the Delaware River Pilots have the ability and authority to pause, suspend, or refuse to commence vessel transits and maneuvers if they deem conditions unsafe. Delaware River Pilots could also request additional tugs in the event of stronger currents, as they currently do during stronger winds, or send a vessel to an anchorage and wait for currents to reduce. Notwithstanding, Jacobs and MITAGS conducted simulations under high-current conditions, as summarized in Section 3.3, which demonstrated that the Delaware River Pilots can safely transit vessels. Jacobs and MITAGS also conducted a simulation of a vessel bound for DCT but "bailing out" to the Marcus Hook Anchorage, which also demonstrated that the Delaware River Pilots can safely handle this situation.

The Delaware River Pilots use NOAA's National Weather Service Delaware Bay/River Design Support Page⁴⁵ to check forecasted weather ahead of any vessel transits. NOAA's Delaware Bay Operational Forecast System Currents Forecast Guidance⁴⁶ provides real-time and forecasted current information. Delaware River Pilots use this information, along with their historical knowledge of the River and vessels and communication with ship captains, to make informed decisions prior to starting any transits. In making that decision, the Delaware River Pilots take into consideration the water currents.

⁴³ <https://tidesandcurrents.noaa.gov/cdata/StationInfo?id=DEB2118>

⁴⁴ <https://tidesandcurrents.noaa.gov/cdata/StationInfo?id=db0301>

⁴⁵ https://www.weather.gov/phi/dss_port

⁴⁶ https://tidesandcurrents.noaa.gov/ofs/ofs_mapplots.html?ofsregion=db&subdomain=0&model_type=currents_forecast

7. Kichner Report, page 8: *"Further, it is also not clear in the simulation conducted whether the tugs modeled and used would be of the same type, number and bollard pull that would be available for actual operations. The availability, type and adequate number of tugs to guide and turn a container vessel within a confined area as proposed and simulated is crucial. This is especially the case when impacted by weather and current and other factors. A tug's bollard pull and maneuverability are critical factors in determining the adequate number necessary to safely handle a vessel especially in a situation that rapidly develops and may not be planned for. Although the MITAGS study included a letter from Wilmington Tug certifying that "the simulated tug service [in the study] appears consistent with our experience and expectations, "it is unclear whether the letter by Wilmington Tug confirmed that the tugs used in the simulation were the ones that will be used for actual mooring of the container vessels at Edgemoor, or if the tugs used in the simulation responded accurately as the tugs owned and operated by Wilmington Tug. In any case, the Simulation Report stated that future work was needed to determine the berthing procedures, tug power required, and emergency procedures to be developed."*

The 2018 MITAGS Study used Z-Tech 65-ton tugs, controlled by the simulation operator in Auto-Tug mode. This tug was chosen to represent tugs to be used to bring vessels in.

As with any simulation, the 2018 MITAGS Study was conducted to identify any concerns and areas that may need modification prior to design and operation. For example, the 2018 MITAGS Study recommended that the design of the DCT berthing area should consider expanding the southern portion of the area to depth to provide additional maneuvering space as the inbound vessels turn in the turning basin. This recommendation was incorporated into the designs and permit applications by DSPC. Ultimately, the Delaware River Pilots and tugs agreed that **"the simulation results indicated the proposed Edgemoor Terminal would have minimal impact on ships as they transit the existing navigation channel."** Therefore, the design and simulation process worked as it should by noting improvements to be made, and DSPC incorporated those suggested improvements.

As noted by Captain Kichner, future policies and procedures will be implemented to determine specific berthing procedures and tug power required. Prior to opening DCT, the Delaware River Pilots expect the MAC to update its Transit Advisory upon completion of DCT, noting that updating the Transit Advisory is routine. The updates are expected to include where and when DCT vessels would pick up their tugs and be developed in coordination with the tug captains. The USCG, as a member of the MAC, will also provide input and approvals.

Emergency procedures are currently in place, including for ULCVs transiting the River, and are not expected to change.

8. Kichner Report, page 8: *"Finally, in the Pilot Recommendations section, the Delaware Pilots recommended high tide and winds less than 20 knots for inbound transits. It is assumed that this restriction is applicable only to the vessels used in the simulation. This is a very broad and general statement. Further clarification is needed as to what this actually means and where and how it is applicable. Is it required that the vessel moor at the terminal at high tide or is the requirement for high tide transit applicable in initiating the transit to Edgemoor from the sea buoy or anchorage? Restricting vessels to high tide transits confines the window of opportunity to certain parts of the day or night and may impact the ability for other vessels to transit the River. Similarly, the transit may start on high tide with favorable winds, but prior to reaching the destination, winds have increased beyond the threshold limit recommended. The applicant should identify appropriate measures for such a scenario to ensure that navigational safety can be maintained."*

The Delaware River Pilots and the MAC have very well-defined processes for inbound draft-restricted vessels, as detailed in Section 4. For example, the MAC's current Transit Advisory⁴⁷ limits inbound container vessels greater than 38 feet, 6 inches to inbound transits on flood tides so that adequate underkeep clearance is maintained at all times. This is consistent with the inputs, assumptions, and results of the 2018 MITAGS Study. Should wind, visibility, or other conditions arise during transit that present unsafe conditions, as noted elsewhere in this report, Delaware River Pilots adapt and make decisions to change maneuvering speeds, limit berthing operations, go to a nearby anchorage (of which DCT has two choices, whereas most other terminals only have one), turnaround and leave the River, or leave the vessel at berth.

Similarly, as noted previously, the MAC's current Transit Advisory⁴⁸ states *"if winds are forecast to be in excess of 20 knots at the time of docking/undocking, four tugs shall be used for the evolution. If winds are forecast to exceed 25 knots sustained and/or 30 knot gusts during the transit or docking/undocking, transit is not recommended."* The 2018 MITAGS Study is consistent with these requirements.

As described in more detail in Section 4, Delaware River Pilots schedule all vessel transits and maneuvers well in advance. Draft-restricted vessels transit in caravans or convoys and are sequenced based on destination, with upriver-bound ships first. DCT-bound vessels would be slotted toward the end of the caravan, which would limit the likelihood of delaying vessels bound for terminals farther upriver. Further, the Delaware River Pilots, Docking Pilots, agents, shipping lines, vessel captains, terminals, and tugs schedule these caravans and vessel turning (which takes less than 30 minutes) with buffer times to allow for such maneuvers, and Delaware River Pilots will modify maneuvering speeds to ensure there is no conflict or congestion and can and do slow down farther downriver to speeds that allow for safe and adequate maneuverability. The Delaware River Pilots are in constant communication with each other, so every pilot is aware of slowing, turning, and maneuvering vessels well before any potential conflict.

The Recommendation Section of the 2018 MITAGS Report, which was prepared by the Delaware River Pilots, incorporated the applicable MAC Transit Advisories and in challenging situations that fall outside of those advisories. The Delaware River Pilots are responsible for vessel safety and bring decades of experience transiting vessels on the Delaware River.

3.7 Input from Delaware River Pilots

Jacobs held a series of discussions with the Delaware River Pilots to understand and document current navigational procedures, requirements, and concerns on the River and to understand how they would accommodate vessels calling DCT.

3.7.1 General Navigation

The Delaware River Pilots, along with the ship's agent, tugboat companies, and marine terminals, schedule arrival and departure times at each terminal and the timing and order of inbound vessels leaving the Breakwater Anchorage (Anchorage B) at the mouth of the Delaware Bay. Delays have not been encountered for ships traveling up or down the River due to other transiting vessels, given this advance

⁴⁷ https://www.macdelriv.org/files/transit_advisory.pdf

⁴⁸ https://www.macdelriv.org/files/transit_advisory.pdf

planning. The Delaware River Pilots on board each ship communicate with each other in real time to ensure that transits go smoothly, are safe, and are on schedule.

As summarized in Section 4, draft-restricted vessels are scheduled for upriver transit in a convoy or caravan, with the upriver-bound vessels first so as to avoid conflicts and delays due to vessels turning or slowing. Vessels are typically spaced as close as 2 miles apart, providing adequate room to maintain safe operations and allow for maneuvering speeds.

Delaware River Pilots do not dictate the maximum number of ships that can transit a particular flood current, but they note that there is adequate capacity at the tidal windows for additional deep-draft vessels. This is confirmed by Jacobs' empirical analysis in Section 2. The Delaware River Pilots further report that draft-restricted ships occasionally miss the tidal windows and are delayed until the next window, but this is due to their destination berth being occupied, weather conditions that yield unsafe conditions (such as a sustained northwest wind causing the tidal heights to be below predictions, or reduced visibility), or delays at sea prior to arrival at the River. The Delaware River Pilots reported that such delays are not caused by traffic congestion on the Delaware River, and they do not believe the additional traffic contemplated by DCT will cause additional delays. Finally, while the deep-draft ships require high tides, smaller vessels with shallower drafts do not and, therefore, are not limited to certain windows.

The Delaware River Pilots stated that vessel speed is based on the type and draft of the vessel—smaller ships with light drafts can proceed with a higher speed than large ships with deep drafts. Small ships can reach speeds between 10 and 18 knots up to the Delaware Memorial Bridge and then must decrease their speed to a range of 6 to 10 knots for the remainder of the route because of ships berthed at terminals. Large ships can reach speeds from 9 to 15 knots up to the Delaware Memorial Bridge and then also must reduce their speeds to a range of 6 to 10 knots. If the tides are lower than predicted, the larger deep-draft ships must travel at a slower speed to maintain adequate water under the keel. Because DCT vessels are similar in size to deep-draft vessels on the River today, the Delaware River Pilots noted that there would be no change from the existing speeds or requirements. The Delaware River Pilots also noted that the ULCVs that will call on DCT (and are calling on PAMT) are significantly more maneuverable than other large vessels, such as oil tankers, due to modern controls and systems.

3.7.2 2018 Full Mission Bridge Simulation

Delaware River Pilots were significantly involved in the 2018 MITAGS Study, including scoping the study, performing the simulation, and making recommendations to the DCT project scope based on the results of the simulation. The Delaware River Pilots believe that the scope of simulations was adequately representative of the vessels, tugs, conditions (tide, wind, and so forth), navigational aids, and physical conditions that exist on the River and would be expected with DCT. The Delaware River Pilots provided some recommendations to improve navigational safety, including the following:

- Limiting environmental limitations to:
 - Wind 20 knots or less
 - High tide for inbound transits
- Modifying the design to widen the southern end of the Access Channel to provide a larger area for maneuvering and turning inbound vessels
- Updating the MAC's Transit Advisories to include tug power required for DCT vessels

DCT's design has been revised to incorporate the larger Access Channel, and the MAC's Transit Advisories are in line with the recommended environmental condition. With these, the Delaware River Pilots feel that the simulation's results indicated that DCT would have minimal impact on ships as they transit the existing navigation channel and that ships bound for or departing from DCT can be safely navigated to/from the berth, just as similar-size vessels are doing today on the River.

3.7.3 Turning Basin

The majority of deep-draft vessels calling on existing terminals on the River use the Federal Channel to turn, as discussed and shown in examples in Section 3.5. The Delaware River Pilots do not expect that additional use of the Federal Channel for vessels calling on the DCT would present an operational or safety concern for several reasons. First, the size of DCT's turning basin provides better and safer turning when compared to other terminals on the River. Second, DCT would provide additional deep water for non-DCT vessels to pass each other (overtaking or meeting) near Edgemoor due to the addition of the Access Channel. Third, navigation of DCT-bound vessels and other traffic in the Federal Channel would be coordinated and scheduled, so that DCT-bound vessels would be in a sequence behind vessels bound for terminals further upriver. If the sequence were to become out of order, Delaware River Pilots would let other ships overtake DCT-bound ships before they turned; adequate time would be allowed at the mouth of the channel to complete the turn before the next ship arrived at DCT. This scheduling is commonplace today and is not expected to lead to delays and congestion.

Vessels are most likely to conflict with passing vessels in the Federal Channel when turning the arriving/departing vessel. Separate from the turning maneuver, berthing operations occur, but passing traffic is not impacted. As summarized in Section 4, Delaware River Pilots, ship captains, the marine terminals, USCG, and other parties are in regular communication to schedule the turning of vessels to prevent passing vessels from having to slow to unsafe speeds. This slowing is accounted for in transit time planning and is currently undertaken daily.

Assuming a starboard berthing at DCT (which is the most time-consuming scenario because it requires the incoming vessel to turn and occurs during flood tide when the rate of incoming ships is highest), the Delaware River Pilots estimate that the maximum duration to turn ULCVs would be approximately 30 minutes. This is likely a conservative estimate, as the 2018 MITAGS simulations show that the time is closer to 20 to 25 minutes, and AIS data generally showed that large vessels on the River are currently taking less than 30 minutes to turn. As previously noted, the turning and berthing time under different river conditions and vessel types is known prior to vessels transiting the River and scheduled accordingly. More details on scheduling and communication are included in Section 4.

3.8 Conclusion

The Delaware River Pilots, who are responsible for ship transit in the Federal Channel, and transiting vessels follow established protocols that include sequencing and spacing the ships to ensure safe and efficient traffic patterns for every transit. The Delaware River Pilots expect that these proven protocols will remain adequate with the development of DCT and the addition of DCT's vessels.

Further, the sizes and types of ships expected to call on DCT are already navigating the River to PAMT and are doing so in a safe, coordinated, and effective manner. Jacobs' analyses show that ULCVs, Suezmax tankers, and PCCs can, and already do, safely pass each other, which was confirmed by Delaware River Pilots who noted no safety concerns.

The Delaware River Pilots maintain that DCT's location is important from a safety perspective in that it provides more anchorages and "bail-out" points than other terminals on the River. These additional navigation areas upriver and downriver of DCT would not only permit additional navigation options in the event of adverse conditions, it would also permit DCT to be accessed without the use of the turning basin if necessary. Moreover, the new Access Channel would essentially widen the River, enhancing safety for navigation and passing vessels in front of DCT.

Jacobs' analyses confirmed prior studies showing that vessels can safely turn and enter/depart from DCT in a variety of conditions, well within the Delaware River Pilots' standard operating procedures.

Jacobs also found that the practice of using the Federal Channel to turn vessels is currently commonplace on the Delaware River and at other major U.S. seaports. The Delaware River Pilots noted the DCT turning basin, because of its location in a wider reach of the Federal Channel and the dredging of DCT's Access Channel, would be one of the better locations for turning a vessel on the River, as compared to some upriver terminals. Further, DCT's Access Channel would effectively widen the Federal Channel adjacent to DCT, enhancing safety for all vessels on the River.

4. Communication and Scheduling Plan

Jacobs conducted a review of the current communications and scheduling plans and procedures in use on the Delaware River, focused on deep-draft vessels that require access to the Federal Channel and high-tide windows. This included the following elements:

- Obtain input from the Delaware River Pilots and Wilmington Tug.
- Perform a desktop review of procedures, policies, data, and references/guidelines.
- Validate information against Jacobs' analyses in Section 2.

4.1 Communications

Jacobs held discussions with the Delaware River Pilots and Wilmington Tug regarding current operational and navigational procedures for vessel movements on the River. Their main priority is and will continue to be the safe navigation of vessels. Every draft-restricted vessel and many smaller vessels have Delaware River Pilots on board who communicate with each other. The MAC issues Transit Advisories to help vessels safely navigate up and down the River. The Transit Advisories as of June 13, 2024,⁴⁹ state that *"before any vessel movement, the master should take into consideration all of the prevailing circumstances, including the advice of his or her local pilot."* Delaware River Pilots and the tugs routinely coordinate with the USCG, vessel captains, other Delaware River Pilots, other tug captains, Docking Pilots, and terminals and expect to continue to do so with the development of DCT.

When boarding a vessel, Delaware River Pilots are provided with the latest traffic reports. Delaware River Pilots have well-developed and highly functional communication systems currently in use, such as very high frequency (VHF) and ultra-high frequency (UHF) radios, cell phones, and AIS. Each vessel and tugboat has multiple radios for redundancy.

The MAC's Transit Advisories also provide that all vessels, except tugs operating without barges, report when they anchor, their anchoring position, and when they get underway to MEX over VHF radio. The Transit Advisory also states that vessels are to report their position and status to the MEX over VHF radio when passing through Marcus Hook, when entering or exiting the C&D Canal, and when making fast to the dock.

In addition to GPS and AIS on board the vessels, Delaware River Pilots and tug captains have real-time access to updates electronically on their smartphones, often the ship computer, both VHF/UHF marine radio communication on multiple channels, and their cell phones. Cell phones are not to be used as a primary communication device because cell phone communication limits communication between only two Delaware River Pilots/vessels, but they can be an effective communication tool and provide redundancy in communications. The Delaware River Pilots and Wilmington Tug noted that they do not foresee a need to establish additional communication systems beyond those already in use or foresee a need to change communication protocols.

The MAC also issued a document titled *Delaware River Vessel Reporting System*⁵⁰ that *"is intended to provide mariners with specific information as to the best practices for operations within the tristate*

⁴⁹ https://www.macdelriv.org/files/transit_advisory.pdf

⁵⁰ Mariners' Advisory Committee for the Bay and River Delaware (MAC). 2008. Delaware River Vessel Reporting System. October.

Delaware River port complex. The Vessel Reporting System (VRS) document contains key information for safe transit of vessels and outlines key reporting requirements. These include the following:

- **Important phone numbers**, including the Pilots Associations, MEX, USCG, National Response Center, and tug companies
- **Communication**
 - **Types:** AIS, radar, radiotelephone, video cameras, and telephone
 - **Monitoring:** *"Voice Call Signs and Designated Frequencies: Delaware Maritime Exchange is the voice call sign for Delaware Bay & River Vessel Reporting System. Use Channel 14 VHF FM for communicating with both Delaware Pilot Tower and Delaware Maritime Exchange. All users shall continuously monitor channels 13 & 14 VHF and respond when hailed while operating in these areas. All communication must be in the English language."*
- **Reporting**
 - **Report Types:** The following reports are required from Participants to provide necessary information to Delaware MEX so that watch standers can use and pass along timely, relevant, and accurate information to VRS users: (1) Sailing Plan (check-in); (2) Sail Plan Deviation (destination or route change); (3) Position Report (Passing designated reporting points); and (4) Final Report (Check - Out).
 - **Sailing Plan (Check-in):** *"Participants shall report the following information via VHF-FM to Delaware Maritime Exchange prior to entering or getting underway within the VRS" (preferably in this order): (1) Vessel Name; (2) Location; (3) Destination (include any anticipated stops and intended anchorages where applicable—refer to Anchorage Intention & Reports); (4) Tow Configuration (how many and number of loaded/unloaded barges); and (5) Type of cargo being carried.*
 - **Sailing Plan Deviation:** *"Participants shall report any change in destination."*
 - **Check-in and Check-out Points – Delaware MEX:** *"Brown Shoal Beacon – Changing over from "Pilot Traffic Tower" to "Delaware Maritime Exchange" systems. Biddle Point in C&D Canal (East Bound). Reedy Point Entrance to C&D Canal (West Bound)."*
 - **Check-in and Check-out Points – Pilot Traffic Tower:** *"Inbound at McCrie Shoal Lighted Gong buoy "2MS" (Two Way Traffic Route). Inbound when entering the Five-fathom sea-lane buoy. Inbound when entering Delaware sea lane."*
 - **Position Reports:** *"Participants shall contact Delaware Maritime Exchange with name and position when passing the following Reporting Points: 1) Off Harbor or Refuge Light Station (inbound only); 2) Marcus Hook Range; 3) Mifflin Range; and 4) any other location when directed by Delaware Maritime Exchange."*
 - **Anchorage Intention and Report:** *"Any vessel intending to anchor at any anchorage within the Delaware Bay and River shall be guided by the anchorage recommendations contained in the Transit Advisories published by the Mariners Advisory Committee for the Bay and River Delaware as published in Chapter 6 of Coast Pilot Volume 3. Notify Delaware Maritime Exchange prior to arriving at the anchorage. This notification shall include the estimated time of arrival (ETA), intended time that the vessel will be at the anchorage and the reason for anchoring. Notify Delaware Maritime Exchange of any change as to this intention, including changes of the ETA at the anchorage. Delaware Maritime Exchange, to the best of its ability with information provided, will notify the anchorage intended vessel of other vessels that are in the anchorage and their estimated time of*

departure (ETD), other vessels bound for the anchorage, current limitations of the intended anchorage and any other possible conflicts with this intention. No vessel may remain at anchor in any anchorage covered by this section longer than 48 hours unless receiving a waiver from U.S.C.G. Sector Commander. Authority to anchor for more than 48 hours may be given upon application to the U.S.C.G. Sector Commander; however, extensions at Marcus Hook and Mantua Creek Anchorages will be by exception only."

- **All Vessels While at Anchor:** *"Any vessel while at anchor in all anchorages within Delaware Bay and River shall: 1) Continuously monitor VHF Channels 14 and 16; 2) Continuously monitor position; 3) Be prepared to get underway as directed by U.S.C.G. Sector Commander; 4) Have propulsion machinery available within 30 minutes in case of anchor dragging or other situation; 5) Update Delaware Maritime Exchange of any changes as to the vessel's ETD from the anchorage; 6) Insure [sic] that the vessel's AIS is turned on, operating and transmitting properly while underway and at anchor; and 7) Vessels at anchor in Marcus Hook or Mantua Creek Anchorages may have to temporarily move to facilitate the maneuvering of large vessels while docking or undocking at the adjacent terminals. Tugs with barges shall be in attendance of their tows or barges. Any towing vessel that is departing, but leaving its tow at anchor in any anchorage, shall inform Delaware Maritime of the estimated time of returning to the barge, continuously monitor VHF Ch 14, and by any means appropriate monitor the position and status of the tow."*
- **Vessels Leaving Anchorage:** *"All vessels leaving an anchorage shall inform Delaware Maritime as directed in the Sailing Plan section of this manual."*
- **Meeting Passing and Overtaking:** *"All VRS users must comply with the appropriate Inland Navigational Rules or International Rules for Prevention of Collisions at Sea for all meeting, crossing, or overtaking situations in this area."*
- **Final Report:** *"Participants shall report name and position: On arrival at the vessel's destination within the VRS, or When departing this VRS area."*
- **Dredges and Floating Plants:** *"Dredges and floating plants shall provide the following information to the VRS prior to beginning operations within the VRS Area: 1) Name; 2) Location and duration of intended operation; 3) Description of intended operation – including any channel obstructions; 4) Configuration of pipeline; 5) Termination point of pipelines; 6) Time required to re-open the channel for vessel passage; 7) Any operating impairments; 8) Any notification requirements to channel traffic (e.g., requests for Slowbell, no meeting or overtaking, divers in the water, etc.); 9) Means of contacting the dredge control station; 10) Telephone numbers and names of assist vessels; 11) Telephone number and name of project superintendent; and 12) Dredges and floating plants that will obstruct the Main channel shall be equipped with and utilize AIS."*

Based on these requirements, Jacobs finds that the current communication procedures, plans, techniques, technology, and requirements are well established and implemented to ensure the safe navigation of all vessels on the River. These plans and protocols are not expected to change with the addition of DCT, except that the MAC's Transit Advisory will be updated to incorporate ULCVs calling on DCT, specifically, the timing and location of where they would pick up their tugs. Jacobs does not expect additional communications plans or procedures would be required with the addition of DCT.

4.2 Scheduling

As discussed in Section 2, a majority of vessels on the River are not draft-restricted and do not require high tides to transit the Federal Channel. For draft-restricted vessels, Delaware River Pilots communicate with

ships' agents, tugboat companies, Docking Pilots, and terminals in advance to identify and schedule the vessels. As vessels approach the Breakwater Anchorage at the mouth of the River, the sequencing and schedule is established. Changes can be made to schedules in the event vessels are early or late, based on delays prior to arrival. Schedule changes can be made to reorder inbound ships if their destination berth is occupied. The Delaware River Pilots on board each ship communicate with each other to ensure the transits go smoothly, safely, and on schedule.

Draft-restricted vessels transit up the River to capture the high-water levels of an incoming high tide, which is typically a 5- to 6-hour window. Vessels start transit approximately 2 hours before the flood tide so that the current catches up with the vessel, and it can pick up tugs when scheduled. The tide moves up the River approximately 15 miles every hour from the mouth of the Bay. Vessels in the caravan can be spaced as close as approximately 2 miles, which equates to approximately 5 to 10 minutes depending on vessel speed. The spacing or following distance is dictated by the Delaware River Pilots depending on the vessels, tides, and Delaware River Pilots. Delaware River Pilots on the vessels will adjust speeds as needed to maintain spacing.

Vessels are placed in a sequence or "caravan" based on destination, with ships bound for the upriver-most terminals going first (that is, the first ship would be the one destined to the farthest-upriver terminal and have longer transit times). Under this protocol, DCT-bound ships would be slotted toward the end of the caravan because most draft-restricted ships are upriver of DCT. Therefore, DCT ships would have little impact on existing upriver terminals. Delaware City is the only terminal downriver of DCT receiving draft-restricted ships, so Delaware City-bound ships would be behind DCT-bound ships. However, DCT-bound ships would not interfere because Delaware City-bound ships would pick up their tugs farther south.

Figure 4-1 depicts a sequence of vessels organized for upriver transit during a flood tide, with the vessels' respective names and destinations identified. Vessels are not always stringently sequenced if there is sufficient time between the leading and following vessels such that the berthing maneuver of the leading vessel would not cause a significant delay for the trailing vessel. Vessel sequencing is enacted when vessels are queued near the mouth of the Bay waiting for the next flood tide to transit or for when vessels arrive to the Bay at the same time. If vessels do not begin their transit in the desired sequence, then passing typically occurs in the naturally deeper, wider portion of the lower Delaware Bay or prior to the Delaware Memorial Bridge in the Deepwater Range.



Figure 4-1. Inbound Vessel Sequence with Vessel Names and Destinations (March 11, 2024)

Delaware River Pilots do not dictate the maximum number of ships that can transit a particular flood current and do not expect a change in current procedures with the introduction of DCT. They do not expect any capacity or congestion issues in the tidal windows for draft-restricted ships. As confirmed by Jacobs' analysis in Section 2, there is significant unused capacity on high-tide windows.

Smaller, non-draft-restricted ships calling terminals other than DCT would be able to use other tidal windows or would follow DCT-bound ships in the caravan and be able to avoid the larger deep-draft ships. In this case, Delaware River Pilots would establish a 30-minute lead time for ships following DCT vessels, so the following ship does not approach the DCT ship until it is docked.

Ships' speeds are based on their type and draft. Small ships with light drafts maintain higher speeds than large ships with deep drafts. Small ships can make anywhere from 9 to 18 knots, while large ships can make anywhere from 9 to 15 knots. At Delaware Memorial Bridge, all vessels must decrease speed to 6 to 10 knots for the remainder of the route because of ships berthed at terminals. DCT is near other existing terminals, meaning that speed restrictions are already in place, and slowing in the channel adjacent to DCT will have minimal impact on vessel transit times.

Further, Delaware River Pilots currently allow transit times of 7 to 7.5 hours per ship for vessels destined for PAMT, which is the farthest-upriver deepwater terminal and has the longest transit time allowance. AIS data confirms that transit times to PAMT from the mouth of the Bay typically range from 7 to 7.5 hours, depending on the vessel and environmental conditions. This time allows for changes in speed to maneuver vessels and to slow down for passing vessels or vessels at berth. Typically, the last 2 to 2.5 hours of vessels' transits will be at maneuvering speeds. If the tides are below their predicted levels, the larger

deep-draft ships must travel at a slower speed to maintain adequate water under the keel. Caravan and transit times are scheduled in advance and incorporate maneuvering speeds, time for tugs to set up, and to accommodate passing vessels. Speeds are planned prior to transiting and can be adjusted during transit well in advance to prevent conflicts and maintain scheduled arrival times at the terminals.

Under current operations, Delaware River Pilots typically allow 20 to 30 minutes for berthing vessels to clear the channel, which can include turning, transiting to the dock, and breasting. The vessel turning plots included in Section 3.5.1 confirm that berthing times typically take 20 to 30 minutes and vary depending on the vessel and terminal. During this period, Delaware River Pilots communicate with Delaware River Pilots on other vessels and tugs and put out security call. Delaware River Pilots on other vessels make appropriate speed adjustments to time their passing to ensure safe clearances and maneuvering.

Vessels bound for different terminals on the River pick up their tugs at varying locations; DCT-bound ships would pick up tugs at the Delaware Memorial Bridge. When ULCVs are scheduled, the Delaware River Pilots, ship captains, and tug operators also make sure that there is space available in anchorages should ships need to head to an anchorage during transit.

In summary, scheduling of the draft-restricted (high-tide transit) vessel caravans, vessel transit times, and vessel movements is well coordinated, performed in advance, and includes allowances for other ongoing River traffic. The main reasons that vessels would have to wait for the next tide are because their berth was occupied, a vessel was late arriving to the Bay, or the Delaware River Pilots determine weather conditions make it unsafe to transit the vessel until conditions clear, and not due to a large number of vessels intending to transit on a high tide.

4.2.1 Turning and Docking

Turning is typically performed at high-water slack tide, which occurs during periods within the same tide stage the vessels ride when transiting to/from the berths. Vessels bound for DCT would have the option to turn upon arrival, and then berth starboard side-to, or arrive directly at DCT and berth portside-to. Turning upon arrival requires more time upon arrival, arriving port-to requires more time disembarking because the turn would be done at that time. This decision would be made based on the terminal's plan for cargo unloading/loading, wind/tide conditions, and coordination and communication with the Delaware River Pilots, Docking Pilots, and tugs. The option to turn at either end of a call is an option available to pilots to manage traffic and safety on the River. The Delaware River Pilots also noted that not all container ships are loaded to allow unloading for both starboard-to and port-to berthing.

All existing terminals on the River can and do accommodate turning on arrival or departure. Turning of vessels is scheduled in advance and coordinated with the River Pilot on board, the terminal, tugs, Docking Pilots, and Delaware River Pilots on other vessels on the River. Turning times are incorporated into scheduled transits, both for the subject vessel and other vessels on the River. The Delaware River Pilots noted some circumstances in which they hold vessels at dock to allow smaller ships to pass, but regular communication allows this to happen with no impacts to overall navigation.

As discussed in Section 3, DCT will include an Access Channel adjacent to the Federal Channel to allow turning. This widens the deepwater area, and the Delaware River Pilots have noted that this would provide a safer area to turn, enter, and depart vessels relative to other terminals on the River. Additionally, the Access Channel effectively widens the Federal Channel, providing more deep water for non-DCT vessels to pass at this stretch of the River.

4.2.2 Departing DCT

Upon departing DCT, if requiring turning, vessels would undertake a controlled maneuver with tugs to turn. The River Pilot on board would put out a security call to other Delaware River Pilots and ensure that there is no traffic in or near the turning basin. Vessels would then enter the caravan to head downriver, similar to the upriver procedure described previously. This is standard operating procedure today at all existing terminals on the River, and the Delaware River Pilots do not expect changes to procedures with the development of DCT.

4.3 Summary

Scheduling and communication for DCT vessels would be undertaken in the same manner in which all ships transiting the River undertake today. The proposed scheduling and communication would operate as “business as usual” and would not cause the need for separate or parallel communications or scheduling plans than the existing functional systems. The Delaware River Pilots expect the MAC to update its Transit Advisory upon completion of DCT, noting that updating the Transit Advisory is routine, and the Advisory states “this document is subject to future revisions.” The updates are expected to include where and when DCT vessels would pick up their tugs and developed in coordination with the tug captains. The USCG, as a member of the MAC, will also provide input and approvals.

Adding DCT’s vessels to the schedule is easily done and, as discussed in Section 2, there is adequate capacity on the River—not only overall, but also at high tides for draft-restricted vessels. Delaware River Pilots have not experienced delays for ships transiting the River due to vessel interference and do not expect the addition of DCT vessels to cause delays. Delaware River Pilots will continue to communicate with each other as they do today to ensure the transits go smoothly and are safe and on schedule.

The creation of DCT’s turning basin would provide additional room for passing and turning, making it an improvement from existing terminals.

5. Emergency Procedures

Emergency procedures are well established on the Delaware River and will not be materially affected with DCT's development. The Kichner Report, nonetheless, raised non-DCT-specific concerns regarding the impact of DCT and emergency procedures on the Delaware River, so the issue is addressed in the following.

In response to the Kichner Report, which states:

A major marine casualty would have a significant impact on the port complex. Shutting down the waterway would have a major impact to the oil refiners who rely upon daily imported crude oil shipments to keep the refineries operating.

Shore-side infrastructure would also be impacted by a port closure. Outbound shipments of refined products by railroad tank car would be disrupted.

There are several railroads that could be utilized to bring in and ship out limited amounts of cargo, but the capacity of the rail lines could not sustain long term operations.

Shore side facilities that rely upon daily and weekly cargo transfers (crude oil for example) would be greatly impacted by a port closure. The larger refineries receive in some cases 1 million-gallon shipments of crude oil daily; an extended port closure could result in the refinery running out of crude oil to processes and having to shut-down refining operations. Facilities that receive vessels every few weeks would be less impacted by a port closure.

Jacobs conducted a review of the current emergency procedures in place on Delaware River today. This included the following elements:

- Perform a desktop review of publicly available emergency procedures on the River.
- Hold discussions with the Delaware River Pilots and Wilmington Tug regarding current operational and navigational procedures for vessel movements on the River.

It should be noted that the main priority for Delaware River Pilots and USCG, as well as all stakeholders, is and will continue to be safe navigation of vessels.

As discussed elsewhere in this report, there are currently tankers, ULCVs, car carriers, and other vessels transiting the River every day. The Delaware River Pilots are responsible for managing safe transit of ships up the Delaware River and have the ability and authority to sequence ships at the Breakwater Anchorage (located at the mouth of the Delaware Bay) based on a number of factors, including size, draft, destination, transit speed, and berthing time, including turning and other maneuvering in the Federal Channel. They have established protocols to sequence the ships into a safe and efficient traffic pattern. As part of this protocol, they build additional spacing and timing into planned transits to allow safe navigation.

5.1 Communication & Procedures

As discussed in Section 4, the Delaware River Pilots, MAC, USCG, USACE, terminals, and shipping lines have established, approved, and detailed the emergency procedures in place today for existing traffic on the River. The development of DCT, and the addition of 118 annual vessel calls, is not expected to adversely affect these safety plans or require any protocol outside of what is already followed for current operations.

Plans are expected to be updated to include DCT when operational, but procedures and policies will remain the same.

All vessels calling U.S. ports are required to have “Salvage and Marine Firefighting” plans, which include the professional services and trained personnel that respond to maritime incidents, such as ship fires, groundings, or sinkings, to recover vessels and cargo, prevent pollution, and minimize damage to the marine environment and transportation systems. Services include specialized equipment and trained teams for refloating sunken vessels, extinguishing fires on board ships, and providing emergency standby services for commercial vessels to ensure compliance with regulations like the U.S. Oil Pollution Act of 1990. CFR Title 33, Chapter I, Subchapter O, Part 155, Subpart I, *Salvage and Marine Firefighting*, requires that “*all new or existing vessels operating on the navigable waters of the United States... must identify, in the geographical-specific appendices of [their Vessel Response plan], the salvage and marine firefighting services listed in Table 155.4030(b)—Salvage and Marine Firefighting Services and Response Timeframes. Additionally, you must list those resource providers that you have contracted to provide these services.*” These requirements include Salvage Assessment & Survey, Salvage Stabilization, Specialized Salvage Operations, Marine Firefighting Assessment and Planning, and Marine Firefighting Fire Suppression.

The introduction of DCT and its turning basin would not introduce any unique safety hazards, would not impact existing emergency response plans, requirements, or procedures, and as discussed in Section 2, there is sufficient adequate capacity on the River. It should be noted again that the development of DCT includes widening of the Federal Channel for vessel turning, which improves navigational safety and provides additional space for passing vessels. With its turning basin, DCT would be the only terminal with a turning basin of its size, and there are no obstructions (such as bridges) adjacent to the area, in contrast to other existing terminals. Also, unlike many other terminals currently on the River, Jacobs notes that there are adjacent anchorages, both upriver and downriver, to which a ship could head in the event of weather or other events.

5.2 U.S. Coast Guard

In addition to the Delaware River Pilots, the USCG is involved in safety on the River and a member of the MAC. The USCG’s mission is ensuring “... *the safety and security of the oceans, coastal areas, and marine transportation system within America’s Mid-Atlantic Region. We focus on risk reduction and prevention, but are prepared to respond with courage and speed to any maritime incident. U.S. Coast Guard East District’s 156,000 square miles of ocean, bays, rivers, wetlands and tidal marshes are unique and filled with historical significance, encompassing six states, vital geographic waterways, several major mid-Atlantic ports, the largest naval base in the world, and our Nation’s capital.*”⁵¹

The USCG maintains a 24-hour Command Center (telephone number: 833-453-1269) and is ready to respond to emergencies. The USCG’s Eastern District 5, Sector Delaware Bay, maintains many subunits and local units on and near the Delaware, including 10 small-boat stations and 5 cutter stations.

The USCG is required to prepare, and regularly update, a Ports and Waterways Safety Assessment (PAWSA), for 61 ports/waterways in the U.S., including the Delaware River. A PAWSA “*is a disciplined approach designed to identify major waterway safety hazards, estimate risk levels, evaluate potential mitigation measures, and set the stage for the implementation of selected risk reduction strategies*”⁵² The

⁵¹ <https://www.atlanticarea.uscg.mil/Our-Organization/District-5/>

⁵² U.S. Coast Guard (USCG). 2018. *Ports and Waterways Safety Assessment Workshop Report Delaware River*. U.S. Coast Guard Marine Transportation Systems Directorate.

USCG's 2018 Delaware River PAWSA included a workshop hosted by the Coast Guard Sector Delaware Bay, which was attended by 28 participants representing a variety of stakeholders and had the purpose of bringing "waterway users, stakeholders and members of the Delaware River maritime community together for collaborative discussions... Over the two-day workshop, the participants discussed and then numerically evaluated 23 risk factors in the PAWSA Waterways Risk Model. The primary goal of a PAWSA workshop is to improve coordination and cooperation between government agencies and the private sector. A PAWSA workshop is intended to involve stakeholders in decisions affecting them, and provide the Coast Guard and members of the waterway community with an effective tool to evaluate risk and work toward long-term solutions tailored to local circumstances. In support of these goals, this report should be viewed as a starting point for continued dialogue within the Delaware River maritime community. The Coast Guard will use this PAWSA report, together with other information, to determine whether, and to what extent, regulatory or other actions are needed to address navigation safety risk. Any rulemaking efforts will follow Coast Guard public notice and comment rulemaking procedures to allow for public participation in the process."⁵³

It should be noted that the current PAWSA was completed before the USACE's Delaware River Federal Channel Deepening project was completed in 2021. Jacobs understands that the USCG will be performing an updated PAWSA workshop in the near future, in which DSPC and Enstructure will be active participants, which will capture updated conditions (such as the deepened Federal Channel and vessel mix) and risks on the River.

While the Kichner Report identified several concerns from the 2018 Delaware River PAWSA, it did not highlight the positive key findings or mitigation measures already in place, which include (emphasis added by Jacobs):

- *Deep-draft Vessels*
 - *Trends and Observations*
 - ***Deep draft vessel quality is very good.*** *This class of commercial vessels are subject to internal annual examinations, independent safety audits, Classification Society inspection requirements, and company imposed maintenance standards and policies that go beyond USCG vessel inspection regulations"*⁵⁴
 - *The USCG Port State Control (PSC) vessel inspection program has resulted in inspections deficiencies and **vessel detentions rates trending downward** over the last several years.*
 - ***Crewmember proficiency is also very good.***
 - ***The material condition and crew proficiently for tank vessels is great overall.*** *Tank vessels and chemical ships have very high crew training and certification standards that improve crew proficiency to a higher level than that normally found on bulk carrier vessels.*
 - ***The material condition and crew proficiency for the larger container ships is very good.***
 - *Deep draft vessels are subject to USCG inspection regulations, International Maritime Organization (IMO) 5 convention requirements, and Classification Society inspection and safety standards.*

⁵³ U.S. Coast Guard (USGC). 2018. *Ports and Waterways Safety Assessment Workshop Report Delaware River*. U.S. Coast Guard Marine Transportation Systems Directorate.

⁵⁴ Jacobs notes that many large vessels have thrusters, which significantly improve

- *Existing Mitigations:*
 - *USCG Vessel Inspection regulations*
 - *USCG Port State Control regulations*
 - *USCG Notice of Arrival and Departure reporting regulations*
 - *Standards of Training, Certification, and Watchkeeping standards*
 - *Oil Companies International Marine Forum safety initiatives*
 - *International Maritime Organization convention requirements*
- *Additional Mitigations:*
 - **Risks determined to be balanced by existing mitigations**
- *Volume of Commercial Traffic*
 - *The Mariners Advisory Committee for the Bay and River Delaware (MAC) provides a significant amount of navigation safety information that is not common in other ports. The MAC publishes Transit Advisories to alert mariners to waterway safety issues, provides recommendations for deep draft vessel transits, and guidance on the efficient use of designated anchorages. Information provided by the MAC drives down risk for many of the PAWSA risk factor categories.*
 - *For very large deep draft vessel movements transit planning is conducted and includes input from the USCG. Communications and dialog are very good between the Coast Guard, the Pilots, and the commercial vessel operators involved in the transit."*
 - *Existing Mitigations:*
 - *Mariners Advisory Committee for the Bay and River Delaware*
 - **Good communications** between the USCG, Pilots and commercial vessel operators
 - *Additional Mitigations:*
 - **Risks determined to be balanced by existing mitigations**
- *Traffic Mix*
 - *Trends and Observations*
 - *Commercial vessel operators routinely communicate the locations of small craft to improve their overall situational awareness of the presence, locations and volumes of small craft.*
 - *Transit planning is conducted between the pilots and commercial vessel operators before the deep draft vessels enter or leave the port. Having a transit plan in place helps to minimize dangerous crossing situations and close quarter interactions.*
 - *The maritime community works very well together to minimize risks associated with traffic mixing. Conflicts happen from time to time, but they are rare. Occasionally, an out-of-town boat, or an out-of-town company, will be less cooperative but overall the Delaware River marine transportation system is very functional."*
 - Jacobs notes, that, as stated in the PAWSA and discussed in Section 4, the existing communication and scheduling procedures adequately address traffic interaction concerns.
 - *Existing Mitigations*
 - *USCG Broadcast Notice to Mariners*
 - *USCG Local Notice to Mariners*
 - *Mariners Advisory Committee for the Bay and River Delaware*

- *Good communications between the USCG, Pilots and commercial vessel operators*
- *Transit planning*
- *Additional Mitigations:*
 - *See Appendix C [of the PAWSA], which recommends 1) developing a comprehensive boater education, training and certification program for small craft operators who operate on the Delaware Bay and River; 2) increasing public outreach to educate the recreational boating community on the navigational safety risks of operating small craft on the Delaware Bay and River; and 3) developing an enhanced technology alert system to warn boaters of dangerous vessel traffic conditions.*

Jacobs notes that these are good recommendations but are independent of the development of DCT.

- **Congestion**

- *Trends and Observations*
 - ***Congestion is very seasonal, with certain areas in the assessment area being more congested than other areas.***⁵⁵
 - *From Penn's Landing to the Walt Whitman Bridge the channel runs directly parallel to the Philadelphia waterfront. Shore-side events attract large numbers of small craft who loiter in the area, which increases congestion and the risk of collisions.*

Jacobs notes that this stretch of the River is upriver of all ULCV traffic and not impacted by DCT. Refer to Section 2 for Jacobs' traffic analysis.

- *Existing Mitigations*
 - *USCG Broadcast Notice to Mariners*
 - *USCG Local Notice to Marines*
 - *Mariners Advisory Committee for the Bay and River Delaware*
 - *Anchorage Management Working Group*
 - *Tug escorts for large deep draft vessels transits*
- *Additional Mitigations*
 - *See Appendix C [of the PAWSA], which recommends: 1) placing AIS transponders on unattended barges; 2) establishing a Vessel Traffic Service (VTS) for the Delaware River; 3) simplifying the regulatory processes for establishing designated anchorages; and 4) encouraging and supporting the ongoing operations of the MAC Anchorage Management Working Group.*

Jacobs notes that these are good recommendations but are independent of the development of DCT.

- **Wind, Water Movements, Visibility, and Obstructions**

- *Trends and Observations*

⁵⁵ The PAWSA highlights that seasonal congestion is largely due to small/recreational craft upriver from DCT related to shoreside events from Penns Landing to the Walt Whitman Bridge. Given the location, this congestion will not impact, or be impacted by, DCT's development. As shown in Section 2, deep-draft vessel traffic does not show a meaningful seasonal bias.

- *The Delaware Bay and River has a NOAA Physical Oceanographic Real-Time System (PORTS) installed that provides meteorological information in real time, and is readily available to help mariners plan and prepare for changes in weather conditions. Also, unlike other PORTS installed at other U.S. ports, the maritime community worked with the NOAA to develop the Delaware Bay Operational Forecast System (DBOFS) which provides forecast predictions of water levels, water temperatures, salinity levels, current velocities and wind speeds and directions.*

Jacobs notes that the MAC's Transit Advisories provide requirements and recommendations for vessel transits in adverse conditions.

- *The Delaware Bay and River PORTs provides real-time meteorological information that is readily available to help mariners plan/prepare for changes in weather conditions*
- *Fog routinely occurs along the Chesapeake and Delaware Canal year round including the eastern entrance, forming more frequently in the winter. Fog forms overnight and usually dissipates by around 10:00 am in the morning. If the canal is closed due to fog the Marine Exchange of Philadelphia announces the closure and disseminates e-mails to the maritime community.*
- *Fog is seasonal, spring and fall are traditionally low visibility times of the year. Fog occurs approximately 24 times each year, with impacts lasting less than 24 hours.*

Jacobs notes that closures due to fog are accounted for in our analysis in Section 2.

- *The USCG places ice buoys that are more resilient in the winter environment, approximately 18 ice buoys are placed in service every winter.*
- *There are very good lines of communication between the Delaware River maritime community and the USCG; mariners assist the USCG with tracking off station ATON by notifying the USCG about the position and operating status of the ATON.*
- *The USCG also utilizes AIS to broadcast the presence, identity, position and status of ATON.*
- *Each year the USCG sponsors an ice-conference to collaborate with the Delaware River maritime community and prepare for the winter navigational season. Federal presence includes the USCG and NOAA. USCG Sector Delaware Bay operates two 65-foot ice breakers to ensure the river remains open to navigation during the winter season*
- *When high wind events are forecast, shore-side facilities are reminded to secure items on the facility that could be blown into the water and become an obstruction to navigation.*
- *Existing Mitigations*
 - *PORTS*
 - *DBOFS*
 - *ATON ice buoys*
 - *Schuylkill River small trash recovery vessel*
 - *USCG ice breakers*
 - *Strong lines of communications between all segments of the maritime community*
 - *Annual ice-conference*
 - *AIS ATON*
 - *USCG BNM*
 - *USCG LNM*
- *Additional Mitigations:*
 - *Wind, Water Movements, Visibility: **Risks determined to be balanced by existing mitigations.***

- *Obstructions: See Appendix C [of the PAWSA], which recommends: 1) developing a crowd-sourced mobile phone application for boaters to report the locations of obstructions sighted in the waterway; and 2) establishing a dedicated debris-removal vessel that is capable of removing large obstructions from the waterway.*

Jacobs notes that these are good recommendations but are independent of the development of DCT.

- *Personnel Injuries*

- *Trends and Observations*

- *The assessment area is a **relatively protected body of water/river system that reduces the risk of personnel injury incidents.** If bad weather is predicted, passenger vessels will sometime elect to stay moored up.*
 - *There are **numerous federal, state and local emergency response resources available along the entire assessment area to quickly respond in the event of an emergency.** Passenger vessels are also not far from shore-side moorings and can quickly return to a dock if an emergency arises.*
 - ***Passenger vessel operations are mostly limited to the upper river system, off Penn's Landing, and are short in duration.***

- *Existing Mitigations*

- ***Mass rescue operation plans have been developed and exercises are conducted that involve numerous Federal, State (Pennsylvania, New Jersey and Delaware) and local emergency response agencies***

- *Additional Mitigations:*

- ***Risks determined to be balanced by existing mitigations.***

- *Petroleum Discharge*

- *Trends and Observations*

- ***The petroleum industry is very well regulated and takes safety measures above and beyond regulatory requirements.***
 - ***Petroleum discharge and hazardous materials release response exercises are conducted annually and include representation from Pennsylvania, New Jersey and Delaware State Regulatory agencies.***
 - *The oil and transportation industries established the Delaware Bay and River Cooperative (DBRC) that leverages first responder resources (people and equipment) to respond to pollution spills and hazardous material releases. Members of the DBRC include firefighters trained to fight industrial fires.*
 - ***First responder training includes having members of the Philadelphia Fire Department go aboard vessels so they are aware of the differences between fighting a shore side fire as opposed to a vessel fire.***
 - *USCG Sector Delaware Bay Area Committee meetings are also held on a quarterly basis to discuss port readiness, logistics, emergency preparedness and response planning for domestic emergencies and regional contingencies. The Area Committee (at-large) meets quarterly and*

includes approximately 300 members. The Area Committee (Executive Steering) also meets on a quarterly basis.

- *The maritime industry has established guidelines and procedures that limits maneuvering, and conducting lightering operations, when wind velocities reach a certain thresholds.*
- *Existing Mitigations*
 - *Delaware Bay River Cooperative*
 - *U.S. Government initiated unannounced exercises*
 - *Emergency response exercises include the deployment of personnel resources and equipment*
 - *Training shore side fire-fighters on ship-board firefighting principles*
 - *Independent safety audits*
 - *USCG Sector Delaware Bay Area Committee*
- *Additional Mitigations:*
 - ***Risks determined to be balanced by existing mitigations.***
- *Hazardous Materials Release*
 - *Trends and Observations*
 - ***The chemical ships are not as larger as the tank ships entering the port with the average chemical ship being approximately 55,000 deadweight tons.***
 - *Compared to crude oil and product shipments, the amount and frequency of bulk hazardous materials shipment is very low. There is only one chemical facility within the assessment area that handles bulk hazardous materials.*
 - *The chemical industry, like the petroleum industry, is very well regulated and takes safety measures above and beyond regulatory requirements. Response exercises are conducted annually and include representation from Pennsylvania, New Jersey and Delaware State Regulatory agencies.*
 - *Existing Mitigations:*
 - *Delaware Bay River Cooperative*
 - *U.S. Government initiated unannounced exercises*
 - *Emergency response exercises include the deployment of personnel resources and equipment*
 - *Independent safety audits*
 - *USCG Sector Delaware Bay Area Committee*
 - *Additional Mitigations:*
 - ***Risks determined to be balanced by existing mitigations.***
- *Mobility*
 - *Trends and Observations*
 - ***Bridge fending systems have been upgraded for several bridges located within the assessment area.***

- **Updated fending systems offer a higher degree of protection to preclude the bridge abutments from being struck by a vessel. Emergency response exercises have been conducted that focused on how to respond to a port closure as a result of a vessel striking a bridge.**
- **There are several large marine construction companies that operate within the assessment area; heavy lift and salvage response equipment is readily available to assist in re-opening the port in the event of a port closure. Salvage and marine firefighting plants are now required for vessels that call on the port.**
- **The USCG has established Marine Transportation System Recovery Units to assist in restoring port functions and resuming commercial activity as quickly as possible following a significant port disruption.**
- Existing Mitigations:
 - USCG MTSRU
 - Emergency response exercises include the deployment of personnel resources and equipment
 - Salvage and heavy lift response capabilities
 - Salvage and marine firefighting plans
- Additional Mitigations:
 - **Risks determined to be balanced by existing mitigations.**
- **Health and Safety, Environmental, and Aquatic Resources**
 - **Risks determined to be balanced by existing mitigations.**

In summary, the PAWSA brought together a diverse group of stakeholders on the River, and identified numerous risks and mitigation measures. For most risk categories, the PAWSA found that additional mitigations were not necessary, and risks were determined to be balanced by existing mitigations. The PAWSA highlights that there are robust emergency response procedures, plans, and drills in place, and that broad and thorough coordination and communications occurs. Additional mitigation measures were recommended for a few risks, but none were in the control of a single port authority or terminal operator, and none were specific to DCT. Finally, Jacobs understands that the USCG will be performing an updated PAWSA workshop in the near future, in which DSPC and Enstructure will be active participants, which will capture updated conditions and risks on the River.

5.3 Summary

The diverse group of stakeholders on the River work collaboratively to reduce risk and respond to emergency procedures. The USCG's PAWSA workshop identifies risks, current mitigations, and additional mitigations, and found that there was consensus that 16 of the 23 risks (70%) were balanced by existing mitigation. Participants could not achieve consensus if 5 of the 23 (22%) risks were balanced by existing mitigation (but all resulted in risk levels of 4.4 to 5.6 out of 9, or "mid-risk" values⁵⁶). The remaining two risks were deemed to not be balanced, and include Small Craft Quality and Obstructions, both of which are risks regardless of DCT's development. Jacobs notes that small crafts were noted to be largely upriver of

⁵⁶ The PAWSA states: "1.0 represents low risk (best case) and 9.0 represents high risk (worst case), with 5.0 being the mid-risk value. Risk values...at or above 7.7 denote very high baseline risk levels. Risk values...at or below 2.3 denote very low baseline risk levels."

DCT, and obstructions could be anywhere in the River, but were accounted for in Jacobs traffic study in Section 2.

The PAWSA further noted that commercial and deep-draft traffic is of good quality, crewed by competent crew members, and follows international and U.S. standards and policies. It notes that the *"MAC publishes Transit Advisories to alert mariners to waterway safety issues, provides recommendations for deep draft vessel transits, and guidance on the efficient use of designated anchorages."* And that ***"information provided by the MAC drives down risk for many of the PAWSA risk factor categories."***

The collaboration between parties and stakeholders, coupled with the focus on safety, has helped create a safe environment for ULCVs and other deep-draft vessels, and the Delaware River Pilots noted that current procedures and communications would continue with DCT's development. While it is impossible to eliminate all risks, Jacobs expects that DCT's development would not adversely alter emergency procedures on the River. In summary, well-established, approved emergency procedures, plans, and training are in place today and will continue to be in place, regardless of the development of DCT.

Further, DCT will provide benefits to safe vessel navigation through widening of the channel (also reducing the risk of a vessels impacting or blocking the Federal Channel), and vessels calling on DCT will have more anchorages available than at other existing terminals on the River.

6. Maintenance Dredging Plan

In response to concerns raised by commenters to the project that future maintenance dredging in or adjacent to the DCT Approach Channel could disrupt vessel traffic, Jacobs conducted a review of historical and ongoing dredging operations the River, and of DCT's proposed dredging. This included the following elements:

- Perform a desktop review of historical and ongoing dredging operations on the River, independent of DCT, noting that maintenance dredging of the Federal Channel and other marine terminals is a common occurrence on the Delaware River to maintain current depths and provide safe navigation to vessels.
- Review proposed DCT dredging, both capital and maintenance, including location, volumes, process, and disposal sites.
- Obtain input from the Delaware River Delaware River Pilots, the local dredging community, and local tug companies.
- Identify potential impacts of DCT's dredging on vessel traffic in the Federal Channel.
- Respond to the Court's comments regarding sediment fans.

This section will discuss potential impacts of DCT's dredging on safety and vessel navigation in the Federal Channel

6.1 Summary of Discussions with Dredging Contractors

In support of this report, Jacobs held discussions with three nationally recognized dredgers who have long histories of successfully performing work on the Delaware River. These include the following:

- GLDD⁵⁷
- Norfolk Dredging⁵⁸
- Cottrell Contracting, Inc.⁵⁹

6.1.1 Dredgers' Experience on the River

GLDD is the largest American company providing construction services in dredging and land reclamation. GLDD operates primarily in the U.S. but conducts one-quarter of its business overseas. GLDD has a long history of performing significant dredging projects, including previously performing the USACE "Philly to Sea" Federal Navigation Channel Maintenance Dredging several times over the last decade.

Norfolk Dredging Company has more than 125 years of dredging experience in the U.S. and Caribbean and has performed most of the maintenance dredging of the Delaware River's Federal Channel over the past several decades. They also undertake non-federal dredging on the River and were a major player in the USACE Delaware Federal Channel Deepening (refer to Section 6.2.5 for more information on this

⁵⁷ <https://gldd.com/>

⁵⁸ <https://www.norfolkdredging.com/>

⁵⁹ <https://www.cottrellcontracting.com/>

project). Norfolk has been awarded at least one contract per year for all but 3 to 5 years and has completed a majority of the USACE maintenance dredging contracts over this period.

Cottrell is a leading provider of dredging services in the U.S. with a long history of performing significant dredging projects, including their ongoing “Philly to Sea” contract for the USACE. Cottrell has a good history on the River, performing the ongoing Philly to Sea contract and historically dredging Wilmington Harbor (which used to be a separate USACE contract to the Philly to Sea contract). Cottrell has been on the Delaware River at least once per year for the last 3 years.

6.1.2 Dredging Process

Major dredging projects on the Delaware River are typically performed with a hydraulic cutterhead dredge, and the dredged material is conveyed through a pipeline to the various disposal facilities along the Delaware River in New Jersey and Delaware. The pipeline starts from the dredge as a floating flex hose, which is approximately 1,500 feet long, and allows the dredge to maneuver within its cuts without continually attaching and reattaching the discharge pipe. The float hose is attached to a sink hose, which goes from the surface to the bottom outside the channel, where it runs along the River outside the channel to the disposal site. The sink hose is connected to a steel pipe that lays on the seabed and runs to a disposal site that is specified in the dredging contract documents.

6.1.3 Dredging Pipeline Channel Crossings

If the disposal site is on the side of the channel opposite of where the dredge is working, a channel crossing is required. Typically, only one channel crossing is required for a contract, unless the reaches in a contract are far apart and/or the location of the disposal site necessitates two channel crossings to minimize pipe length.

Channel crossings are typically installed in a deeper cross section of the channel so that the top of the pipe is below the navigable channel depth. If no deep cross section exists, the channel-crossing pipe is jetted to depth, or the dredger cuts a trench through the channel to maintain the navigable channel depth.

Pipes are typically 24 to 36 inches in diameter and generally lay atop the seabed but will sink a bit into the soft material being dredged. USACE did not require trenching of the pipe for their current Philly to Sea contract on the River, but it is a requirement of other dredging contracts if USACE determines the pipe will impose draft restrictions in the channel.

The pipe typically can be laid across the channel in 1 to 2 hours, but with unanticipated equipment issues or adverse weather/current issues, it is typically completed within 3 to 4 hours in hours. If jetting or dredging is required to install the pipeline crossing to adequate depth, the entire process could take an additional 12 hours. Removing the channel crossing prior to demobilizing takes the same or less time.

Pipelines are ideally installed at slack water, with preparations occurring in advance to minimize the time spent in the Federal Channel. The channel is closed for this brief window, but it is well coordinated with the Delaware River Pilots, vessels, shipping agents, terminals, and USCG and built into the Delaware River Pilots’ scheduling of transits. USCG puts out marine broadcasts to all vessels. Channel crossings are typically installed and removed at periods of low vessel traffic, such as overnight, but can be adjusted if traffic requires.

After laying the pipe on the seabed, the dredgers survey the location and elevations to ensure the top of the pipe is lower than the design navigation draft of the channel. They provide USACE, the Delaware River Pilots, and USCG the bathymetric surveys in three dimensions and plots as required.

When planning the schedule to install dredge pipe channel crossings, the dredgers work with the Delaware River Pilots and USCG to find suitable times that do not impede vessel traffic and to maintain safety for all traffic. When laying pipe across the Delaware River's Federal Channel, dredgers must give a minimum 48-hour written notice.

Delaware River Pilots may opt to bring in non-draft-restricted ships early ahead of dredging or bring draft-restricted ships in on an earlier tide. Again, these decisions are communicated in advance with the vessels, agents, terminals, USCG, dredgers, tugs, and Delaware River Pilots.

Pipe crossings are typically laid in locations to maintain a 45-foot depth in the Federal Channel. Pipeline crossings are typically installed during times of slack water, when currents are at a minimum. Although somewhat counter-intuitive, the minimum currents do not occur during times of high and low water. **Error! Reference source not found.** shows a plot of water levels compared to currents at the Marcus Hook NOAA tide and current stations for several recent tidal cycles. Shaded are the times of slack water, defined as currents less than 0.5 knot in either direction. Note these periods of slack water occur approximately 1.5 to 2 hours following the maximum and minimum water levels at Marcus Hook

Figure 6-2 shows a similar plot of water levels and currents for Reedy Point NOAA tide and current station. Shaded are the times of slack water. Note the periods of slack water at Reedy Point demonstrate a slightly shorter period between high/low water levels and slack water further downriver at Reedy Point or about 1 to 1.75 hours following the maximum and minimum water levels at Marcus Hook. Pipeline crossings for dredging at DCT would be located between these locations on the river. Since vessels requiring the highest water levels typically time their transits during the 3- to 4-hour window before high tide to approximately 1 hour following high tide, vessel passages would pass locations outside of the tides and current windows during which dredge pipe river crossings would be installed and removed. It should also be noted that because DCT dredge areas are entirely outside the Federal Channel, a channel crossing of the Federal Channel would only be required if Pedricktown is the designated disposal site for DCT dredging.

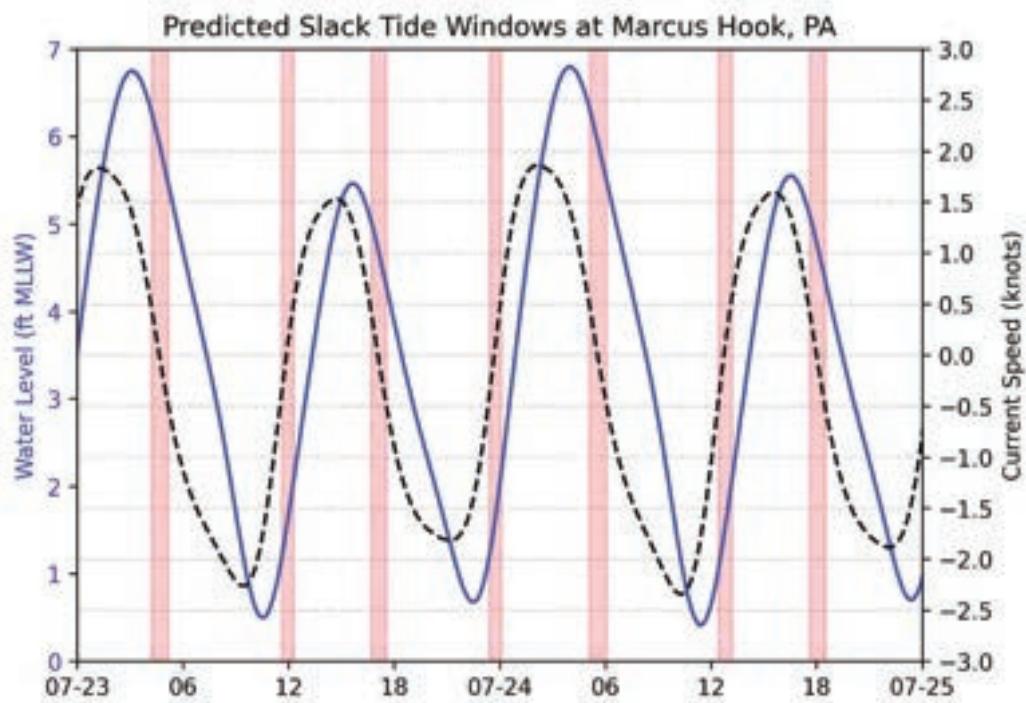


Figure 6-1. Typical Currents (Blue Line) and Tides (Dotted Black Line) at Marcus Hook, Showing Pipe Crossing Windows in Red Shading

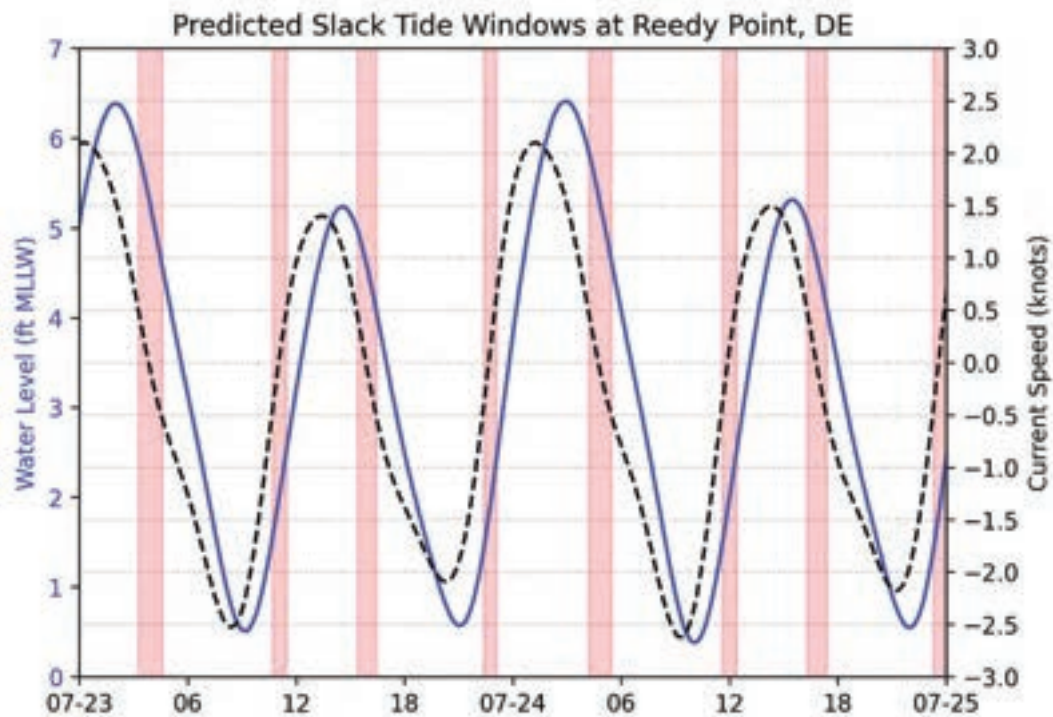


Figure 6-2. Typical Currents (Blue Line) and Tides (Dotted Black Line) at Reedy Point, Showing Pipe Crossing Windows in Red Shading

Dredgers noted that, to their knowledge, there have never been draft restrictions due to channel-crossing pipes or associated pipe laying equipment in the River. Also, to their knowledge, dredgers are not aware of a ship being delayed due to dredging or dredging-related activities in the Delaware River Federal Channel. The Delaware River Pilots confirmed that they have not seen conflicts, such as draft restrictions, channel closures due to maintenance dredging or dredging activities including pipeline crossings, that impede or delay vessel navigation that could not be avoided with scheduling.

Dredging contractors are aware that the Delaware River Pilots must give priority to vessel traffic and defer to Delaware River Pilots' instructions to stand down or relocate when instructed. Dredgers also noted the Delaware River Pilots provide them more than ample advanced notification of vessel passages for them to safely clear equipment from the channel,

6.1.4 USACE Maintenance Dredging

USACE typically issues one bid solicitation for Federal Channel dredging projects each year, awarding one contract to the qualified dredging contractor with the lowest bid that includes all Federal Channel reaches requiring maintenance. Work is typically accomplished by hydraulic dredging.

USACE will occasionally issue a second solicitation for the same year if additional funding becomes available or emergency maintenance is needed. USACE self performs smaller, as-needed work to dredge high spots using the USACE-owned hopper dredge *McFarland*.

Dredging of the Federal Channel requires dredges to be in the Federal Channel during operations because the dredge is positioned over the target dredge area. This has minimal impacts on navigation and vessel traffic because the dredgers work around vessel traffic and coordinate with the Delaware River Pilots and the USCG. The dredges can relocate to the margin of the channel to allow ships to pass. A dredge has a dedicated tug and crew 24 hours per day, 7 days per week from project mobilization to demobilization, allowing the dredges to move to avoid vessel traffic. On the rare occasion that two ships are bound to overtake each other at the dredge location, the dredge can completely exit the channel because they have a shallow draft.

Dredgers are required to obtain USACE and USCG approvals prior to commencing work. This includes submitting plans to the agencies (refer to Section 6.2.5).

All Federal Channel maintenance dredging requires at least one channel crossing per reach. Two crossings are required when multiple reaches are included in a contract and located far apart or on opposite sides of the target disposal site.

A USACE Federal Channel dredging contract is issued annually, with different reaches included from year to year in a rotation since each reach requires maintenance dredging after a period of 3 to 10 years.

The USACE main contract is the "Philly to Sea" contract,⁶⁰ which is typically bid annually and consists of maintenance dredging of approximately 2.6 million to 3.25 million cubic yards of sediment within the Delaware River. The contract includes maintenance dredging of parts of the Delaware River's Federal Channel between Stations 117+000 and 237+500 and Christina River for Wilmington Harbor. Mobilization, equipment deployment, and dredging operations for a given channel reach would be done

⁶⁰ <https://www.nap.usace.army.mil/Missions/Factsheets/Fact-Sheet-Article-View/Article/490808/delaware-river-philadelphia-to-the-sea/>

similarly, regardless of the dredging contractor performing the work. The Philly to Sea contract will typically include multiple reaches in the Federal Channel, which are as follows:

- Wilmington Harbor and Christina River, where an annual average of approximately 700,000 cubic yards of material is typically dredged.
- Marcus Hook Range and MH Turning Basing, where approximately 1.25 to 1.5 million cubic yards of material is to be dredged.
- Deepwater Point Range, where approximately 500,000 cubic yards of material is typically dredged.
- New Castle Range, where approximately 500,000 to 600,000 cubic yards of material is typically dredged.
- Cherry Island and other reaches are dredged less frequently (less than every 5 to 10), with as much as 300,000 cubic yards dredged in a year if dredged at all.

Because Wilmington Harbor requires annual maintenance dredging, it may be included in the annual contract along with other reaches, but it is sometimes a standalone contract.

In addition to the annual USACE Delaware River Philly to Sea Federal Navigation dredging contracts, there are other federal and non-federal projects performed regularly, but not often annually, and involve much lower volumes when considered on an annual basis, including as follows:

- Philly to Trenton (head of river) – every 3 years and mainly the Fairless Hills Turning Basin
- Philadelphia non-Federal Berth Dredging – performed annually at deeper-draft terminals like PAMT, Delaware City Refinery, Penn Terminals, Tioga Marine Terminal, and others; dredging in these locations does not occur in the Federal Channel or require a pipeline channel crossing
- Salem River maintenance dredging – performed last year
- Delaware City Refinery – recently bid out

USACE contract specifications include performance requirements, which are approximately 20,000 cubic yards/day upriver and 18,000 cubic yards/day downriver shoals. When considering these production rates and range of volumes, the USACE Philly to Sea contract completion times would be as shown in Table 6-1.

Table 6-1. Approximate Days Annual Maintenance Dredging Occurs in the River

Philly to Sea		Production Rates (CY/day)			Days Required to Dredge		
Volume (CY)	Notes	Low End	Midpoint	High End			
2,600,000	Low End	17,000	18,500	20,000	152.94	140.54	130.00
2,925,000	Midpoint	17,000	18,500	20,000	172.06	158.11	146.25
3,250,000	High End	17,000	18,500	20,000	191.18	175.68	162.50

CY = cubic yard(s)

As shown in Table 6-1, the average number of days a dredge would be in the Federal Channel performing maintenance dredging ranges from 130 days to 191 days per year. Therefore, the presence of dredges and dredging activity is a routine occurrence on the River, supporting the Delaware River Pilots and dredgers statements that dredging is not unusual nor atypical, and all parties routinely work together to undertake dredging successfully and with minimal impacts to transiting vessels.

The addition of approximately 15 to 20 days for DCT's approximate annual maintenance dredging quantity of 275,000 CY of accumulated sediment from the DCT berth and access channel stated in the USACE permits⁶¹ represents a minimal increase in dredging days on the River. Because DCT dredge areas are fully outside the Federal Channel, there is no net increase in the number of days that dredging activities could impede navigation. Further, as described in the following, any pipeline crossing needed for DCT's maintenance dredging would likely use a crossing laid for other USACE dredging projects if a crossing is required.

6.1.5 USACE Capital Dredging

In 2008, USACE commenced the USACE Delaware Federal Channel Deepening,⁶² which deepened the Delaware River's Federal Navigation Channel from a depth of 40 feet to a depth of 45 feet. This contract was successfully completed using multiple dredgers on the Delaware River through 10 different contracts. The project stretched 102.5 miles and included approximately 16 million cubic yards of capital dredging. It also included blasting of bedrock in some locations. The project was substantially completed by the late 2010s.

Typical USACE Delaware River maintenance dredging contracts include requirements to dredge the Channel to 45 feet with a paid 1-foot over dredge (dredgers are paid up to 46 feet). The USACE may deduct payment from the dredger on a one-to-one basis for over-depth dredging (that is, dredging deeper than the -46-foot over-depth limit), mainly due to this additional dredge material taking up limited space in the disposal sites.

Prior bid documents for USACE dredging contracts, including Plans and Specifications, can be found at the website www.SAM.gov.

6.1.6 Communication and Planning

As noted in Section 4.1, the MAC's *Delaware River Vessel Reporting System*⁶³ includes key requirements for dredgers to communicate and report their position and activities. Specifically, it states:

"Dredges and floating plants shall provide the following information to the VRS prior to beginning operations within the VRS Area:

- *Name;*
- *Location and duration of intended operation;*
- *Description of intended operation – including any channel obstructions;*
- *Configuration of pipeline;*
- *Termination point of pipelines;*
- *Time required to re - open the channel for vessel passage;*

⁶¹ U.S. Army Corps of Engineers (USACE). 2022c. *CENAP-OPR-2019-00287-86 Department of the Army Individual Permit and Section 408 Permission Diamond State Port Corporation – Port of Wilmington, Edgemoor Expansion Project, New Castle County, Delaware*. Department of the Army, U.S. Army Corps of Engineers, Philadelphia District. August 4.

⁶² <https://www.nap.usace.army.mil/Missions/Civil-Works/Delaware-River-Main-Channel-Deepening/>

⁶³ Mariners' Advisory Committee For the Bay and River Delaware (MAC). 2008. *Delaware River Vessel Reporting System*. October.

- *Any operating impairments;*
- *Any notification requirements to channel traffic (e.g., requests for Slowbell, no meeting or overtaking, divers in the water, etc.);*
- *Means of contacting the dredge control station;*
- *Telephone numbers and names of assist vessels;*
- *Telephone number and name of project superintendent;*
- *Dredges and floating plants that will obstruct the Main channel shall be equipped with and utilize AIS."*

Additionally, dredgers are in constant communication with USACE, the Delaware River Pilots, USCG, and vessel captains.

Further, before commencing work, dredgers must prepare written work plans, which include the following:

- Accident Prevention Plan
- Dredging Plan
- Disposal Plan
- Environmental Protection Plan
- Project Schedule (is part of their bid)

USACE specifications, on which the dredgers bid, include requirements to minimize channel closures. The USACE's recent Philly to Sea Specifications require that the dredging contractor provide work plans to the USACE that include coordination with vessel traffic on the River. The following is an example of the language from the Philly to Sea specifications and is consistent with other USACE maintenance dredging projects (emphasis added):

"SECTION 01 30 00 ADMINISTRATIVE REQUIREMENTS ⁶⁴

*d. Channel Traffic. Traffic in the work area consists of ocean going and coastwise vessels, tugs and barges, and pleasure craft. Passing vessels may interfere with dredging operations. Vessels docked at the Wilmington Harbor Marine Terminal may extend into the Federal Navigation Channel. **It is the Contractor's responsibility to schedule dredging around shipping schedules.***

*g. Obstruction of Channel. The Government will not undertake to keep the channel free from vessels or other obstructions, except to the extent of such regulations if any, as may be prescribed by the Secretary of the Army, in accordance with the provisions of Section 7 of the River and Harbor Act approved 8 August 1917. **The Contractor must to conduct the work in such manner as to obstruct navigation as little as possible, and in case the Contractor's plant so obstructs the channel as to make difficult or endanger the passage of vessels, said plant shall be promptly moved on the approach of any vessel to such as extent as may be necessary to afford a practicable passage. The Contractor shall request the U.S. Coast Guard to issue a Notice to Mariners for each work assignment advising navigation interests that the Contractor's dredging plant will be operating in the area. The Contractor shall submit each such request to the U.S. Coast Guard, MSO/Group Philadelphia, 1 Washington Avenue, Philadelphia, PA 19147-4395. The Contractor shall furnish a copy of each request to the Contracting Officer not less than five days prior to***

⁶⁴ U.S. Army Corps of Engineers (USACE). 2024a. *Maintenance Dredging Wilmington Harbor and Delaware River Philadelphia to the Sea PA, NJ and DE Construction Solicitation and Specifications*. U.S. Army Corps of Engineers, Philadelphia District. August 7.

the start of dredging. Each request shall contain the approximate time required for completion of dredging. Upon completion of dredging, the Contractor shall promptly remove his plant, including ranges, buoys, piles and other marks placed by him under the contract in navigable waters and on shore.

h. Navigation Aids. Do not relocate or move any aids to navigation that have been established by the U.S. Coast Guard. If it becomes necessary to have any aid to navigation moved in order to complete dredging operations under this contract, the Contractor shall notify the Fifth Coast Guard District (dpw) at least 45 days prior to the desired date for movement of navigation aids. To request a relocation, Contractors shall contact Waterways Management Section, Assistant Section Chief/NJ, DE, PA at (757)398-6371 or e-mail cgd5waterways@uscg.mil at least 45 days before the desired date for movement of the aid. When making a request by telephone, Contractors must speak to the designated points of contact. The leaving of voicemail messages will not be acceptable. The Fifth CG District (dpw) will coordinate all temporary relocations or discontinuances. A copy of each request (including records of telephone conversations) shall be furnished to the Contracting Officer.

j. Laying of Submerged Pipelines and Obstruction of Channel. All discharge pipelines crossing the navigation channel shall be submerged. Should it become necessary in the performance of this contract to use a submerged pipeline, the Contractor shall notify the Contracting Officer in advance of the schedule for placement of the pipeline. **If the submerged line is to be placed across a navigable channel, the Contractor shall submit a request for approval, at least 3 working days (Sundays and holidays excluded) prior to the desired closure date,** to the U.S. Coast Guard, Sector Delaware Bay, 1 Washington Avenue, Philadelphia, PA 19147-4395. A copy of each request to the USCG for placing submerged pipelines across the channel shall be furnished to the Contracting Officer. This request shall contain the following information:

- (1) Location (Channel Centerline Stationing) and depth (over the top of the pipeline) at which the submerged line will be placed;
- (2) The desired length of time the channel is to be closed;
- (3) The date and hour placement or removal will commence;
- (4) The date and hour of anticipated completion; and
- (5) The name and telephone number of the person to be contacted for information and response to any emergency condition.**

The Coast Guard has indicated that the requirements of navigation may make it necessary to establish times other than those requested. Coordinate plans with the Coast Guard sufficiently in advance of the planned closing to prevent delay to the dredging operations and comply with the Coast Guard requirements. The minimum depth to the top of any submerged pipe in the Christina River shall not be less than 35 feet mean lower low water (MLLW) between stations 0+000 and 1+650 or 38 feet MLLW between stations 1+650 and 6+236. The minimum depth to the top of any submerged pipe in the Delaware River shall not be less than that shown as the required dredging depth."

It is noted that the execution plan does not contain schedules for times the channel is blocked to lay the pipe crossings, but this is handled through a Preconstruction Conference and daily emails and calls with the Delaware River Pilots and USCG.

Prior to construction, the dredgers must hold a Preconstruction Conference, during which, the Delaware River Pilots, USCG, and USACE will review with the dredger how to address channel crossings, coordinate with other parties, and perform and schedule the work. As part of their bid to USACE, dredgers must also prepare a Notice to Mariners. These notices are updated prior to dredging and sent to the USCG. The USCG then publishes this notice, which describes the schedule, activity, and location. The MAC publishes a list of all Notices to Mariners on the River on their main website,⁶⁵ with links to the full notice. These notices are updated daily. A sample Notice to Mariners for the ongoing Philly to Sea Maintenance Dredging contract can be found at https://macdelriv.org/a/1751393791_1.PDF.

Dredgers communicate with the Delaware River Pilots and USCG by daily emails each morning that state where the dredge and plant are located, where they will be within the next 24 hours, and where the pipeline is located. Location data is provided at a granular level through specific stationing on the River. Phone calls are used to supplement emails when needed, and the Delaware River Pilots will call or email with any questions or concerns during operations.

Dredge equipment is well marked, and markers are maintained for the safety of transiting ships.

Dredges defer to shipping traffic, and temporary relocation is a routine part of these contracts. The timing of relocation considers lead time of transiting ships and minimizes dredge down time while also building in adequate buffer time to clear the channel ahead of the passing ship's arrival. This is accomplished without issue through the standard operations of communications between the Delaware River Pilots and dredge captains.

It was also noted that not every large commercial ship passing a dredging area has a pilot on board; sometimes the smaller vessels do not. The dredgers communicate directly with the vessels in these scenarios.

Cottrell noted that for their current Philly to Sea contract, they have been able to maintain two-way ship traffic at Marcus Hook during dredging operations through constant communication with the Delaware River Pilots.

The Delaware River Pilots understand that maintenance dredging occurs at least annually and is performed with seasonal restrictions included in the USACE dredging contracts. Delaware River Pilots receive notice of all dredging activities, including crossings and soundings/surveys of the crossing elevations. The Delaware River Pilots are on board vessels to ensure safe navigation for situations such as this.

6.2 DCT Dredging

DSPC and Enstructure will undertake capital dredging of both the approach channel and berth pocket. USACE, through DSPC's application under Section 204(f) of the Water Resources Development Act of 1986, as amended, will assume the operation and maintenance responsibilities for DCT's approach channel, including maintenance dredging. DSPC and Enstructure will undertake berth pocket maintenance dredging.

⁶⁵ <https://www.macdelriv.org/>

6.2.1 Capital Dredging

DCT's capital dredging includes the DCT Approach Channel (approximately 2,350,000 square feet), and DCT berth area (approximately 350,000 square feet, 3,200 feet by 150 feet). The total estimated volume will be 3.2 million cubic yards, including side slopes. A dredging plan is shown on Figure 3-11.

All capital dredging will be performed using a hydraulic cutterhead suction dredge and pumped through a series of discharge pipes and booster pumps to their target disposal facilities. The dredged material is planned to be disposed of at the Wilmington Harbor North and Wilmington Harbor South Confined Disposal Facilities (CDFs) in Delaware. Each of these CDFs are owned and operated by the USACE Philadelphia District.

The dredges performing the work at DCT will not require deep water and, other than initial mobilization to and final demobilization from the site, will not be within the Federal Channel nor impact navigation in the waterway. As is routinely done with any work in or adjacent to a navigation route, the dredging contractor will submit work plans detailing their planned operations, locations, and movements to the Delaware River Pilots, USCG, and USACE for approval prior to commencing work. If a dredge discharge pipeline must cross the Federal Channel to reach the disposal site, the crossing would be located in a deep area of the channel so the operating draft of the Federal Channel would not be compromised (refer to Section 6.1 for more details). However, current plans do not anticipate a channel crossing would be required due to the location of the CDFs and the DCT project site.

6.2.2 DCT Maintenance Dredging

Maintenance dredging of DCT's berths and access channel is expected to include an annual volume of approximately 275,000 cubic yards,⁶⁶ which is comparable to the annual maintenance dredging USACE undertakes at the existing Port of Wilmington and the Delaware City refinery. Maintenance dredge material is expected to be placed in the Pedricktown CDF in New Jersey, which is owned and operated by the USACE Philadelphia District. Based on historical productivities and USACE requirements, it is anticipated that such dredging would take approximately 17 days per year. Maintenance dredging will follow the same procedures as the Federal Channel maintenance dredging (as described below).

Because DCT's turning basin, approach, and berth pocket is completely outside the Federal Channel, its maintenance dredging will not require the dredge plant to be in the Federal Channel (other than during initial mobilization, laying and removing the crossing, and final demobilization). DCT's maintenance dredging will have therefore negligible impacts on traffic in the Federal Channel. All activities in the channel will be coordinated with Delaware River Pilots to ensure navigational safety, as is routinely done today.

As noted previously and detailed in following sections, routine maintenance dredging occurs annually in the River, the large majority of which is in the Federal Channel and requires a channel crossing (refer to Section 6.1 for more details).

Therefore, Jacobs and parties with which we consulted, do not expect that the addition of the DCT dredging operations to the many that are routinely conducted in the Federal Channel will pose a concern

⁶⁶ U.S. Army Corps of Engineers (USACE). 2022c. *CENAP-OPR-2019-00287-86 Department of the Army Individual Permit and Section 408 Permission Diamond State Port Corporation – Port of Wilmington, Edgemoor Expansion Project, New Castle County, Delaware*. Department of the Army, U.S. Army Corps of Engineers, Philadelphia District. August 4.

because it is limited to the berthing and approach areas, which are completely outside the Federal Channel and would follow established, approved procedures and coordination.

6.2.3 Dredgers' Comments on DCT Dredging

During its initial berth and access channel deepening, DCT would require no crossing of the Federal Channel, but would require one crossing of the Christina River channel at the Port of Wilmington to dispose in the Wilmington Harbor South disposal area. This would be similar to the crossing that dredgers install when they undertake the annual Christina River dredging work.

Maintenance dredging of DCT would require a pipeline crossing the Federal Channel if the material was to be disposed of in Pedricktown, but if so, only one crossing would be needed because it could be used for the entire berth and Access Channel maintenance dredging. Further, dredgers noted that because USACE combines several reaches into one maintenance dredging contract, it is likely the dredge area at DCT that the USACE will maintain would be included in the same contract as other reaches. If so, one channel crossing could likely be used for all reaches of the contract as is often currently done, meaning no additional channel crossings would be needed, and DCT-related maintenance dredging would not impact the Federal Channel.

To reiterate, maintenance dredging of DCT's access channel and berths will not require dredges to be in the Federal Channel. However, as it occurs today, dredging of the Federal Channel adjacent to DCT does require dredges to be in the Federal Channel. It should be noted that the channel in front of DCT is currently 800 to 1,000 feet wide, which the Delaware River Pilots describe as a "nice and wide" stretch that allows two-way ship traffic to continue during Federal Channel dredging. This wide area provides more clearance than at other locations, and upon completion of DCT's Access Channel capital dredging, it would be even wider and safer.

In summary, the proposed capital and maintenance dredging are not materially different than what dredgers have done, and are doing, with no additional challenges, impediments to navigation, or vessel conflicts expected. Communication would continue as it does today.

6.2.4 Comparison of DCT Dredging with Federal Channel Dredging

Federal Channel maintenance dredging typically requires at least one channel crossing per reach, possibly two crossings when multiple reaches are included in a contract and located far apart or in the rare event a contract includes multiple target disposal sites and they are located on opposite sides of the River..

DCT's capital dredging (turning basin and berth) will not require the dredger or dredge pipeline to be in the Federal Channel because the dredged material from initial capital dredging will most likely be sent to disposal sites which are on the same side of the River (Wilmington Harbor South and Wilmington Harbor North). Also, because the scope of capital dredging does not include the Federal Channel, dredgers will not be in Federal Channel in front of DCT as occurs during dredging of the Cherry Island reach. Therefore, DCT dredging will result in no additional days of dredges in the Federal Channel

Maintenance dredging for DCT, both the Access Channel (federal) and berths (non-federal) will be undertaken in the same manner that federal and non-federal dredging occurs today, using channel crossings that have been, and are expected to be, used for Federal Channel maintenance dredging. It is expected that crossings would likely be shared by the Federal Channel contract dredging of adjacent reaches. The dredgers and the Delaware River Pilots do not anticipate any changes to procedures,

requirements, or operations and expect communication procedures to continue to ensure safe operations, both for dredging and vessel traffic.

Dredging related to DCT is therefore, not expected to adversely impact the navigation of transiting ships, the safety of ship traffic, or ship congestion in the Federal Channel. The installation and removal of channel crossings is routine and regularly undertaken on the Delaware River, and dredgers and Delaware River Pilots noted no concerns with additional dredging for DCT. Dredge equipment is well marked, communication is regular and thorough, and all users are committed to safety. The addition of one dredging project (DCT) to the many that are conducted in the Federal Channel should not pose a concern.

6.3 Dredging Summary

Both the initial dredging required at DCT and the future regular maintenance dredging are not expected to interfere with the Federal Channel and would be undertaken consistently with historical and ongoing dredging techniques, procedures, requirements, and communication. Dredging related to DCT would not adversely impact the navigation of transiting ships, the safety of ship traffic, or ship congestion in the Federal Channel, and any conflicts due to dredgers or dredge pipelines would be handled with approvals from and communication with the Delaware River Pilots, USCG, and USACE, as it does today.

DCT's dredging requires no dredging in the Federal Channel, and the only potential conflict would be during the installation and removal of a pipeline channel crossing. However, the installation and removal of channel crossings is routine and regularly undertaken on the Delaware River, takes a very short amount of time, and would likely be shared with other annual USACE maintenance dredging contracts.

Beyond deep-draft vessels, there is recreational vessel traffic and recreational fishing activity on the River. DCT's maintenance dredging would not impact either pleasure craft or recreational fishing because these vessels are not draft constrained (not limited to the Federal Channel), and the River is wide at DCT's location, providing room for small craft to navigate around dredging activities and dredge pipe. Further, no recreational boat ramp would be impacted by the dredge pipe or plant, meaning the recreational craft would not be prevented from accessing the River, and fishing along the shoreline would not be impacted by the dredge pipe or plant. While setting or dismantling the pipe, barges, tugs, and dredging-related activities would be marked and lighted, communicated over the radio, and included in USCG's Notice to Mariners as described previously, and recreational vessels could navigate around dredging activities, meaning any potential impacts would be minimal and of short duration.

All dredging activities (including mobilization and pipeline crossings) would be scheduled around ship traffic with the Delaware River Pilots and USCG. Dredge equipment is well marked, and markers are maintained for the safety of transiting ships. The addition of one dredging project (DCT) compared to the many that are routinely conducted in the Federal Channel should not pose a concern, especially one in which the dredge plant for capital dredging itself remains **completely out of the Federal Channel**. Further, the additional maintenance dredging related to DCT would use channel crossings that have been and are expected to be used for Federal Channel maintenance dredging and would likely be shared by USACE dredging contractors when dredging adjacent reaches.

6.4 Sediment Fans

In earlier permit and public comment dialog, sediment fans were mentioned as an area of concern. However, Jacobs notes that sediment fans are no longer considered as part of the project and were not in the previously issued USACE permit. All sediment dredging volumes currently considered by the USACE do not account for sediment fans. Therefore, additional commentary on sediment fans is not warranted.

7. Conclusion and Summary

As detailed in this report, Jacobs undertook several analyses, performed outreach to key stakeholders, and reviewed existing procedures and policies to assess the potential impact of DCT's development and operation on the Delaware River's Federal Channel. Jacobs' findings are as follows:

- **Traffic Study:** The additional vessel traffic related to DCT will have minimal impact on both draft-restricted and non-draft-restricted vessels because there is adequate capacity to support the additional vessel calls. Further, even with the additional DCT traffic, the number of ships transiting the River is less than the peak observed in 2000, in which no capacity or congestion issues were noted. Jacobs performed a Monte Carlo Analysis of the channel traffic and capacity, which demonstrates at a 95% probability that, even with multiple events considered, the Federal Channel has adequate capacity to accommodate DCT's deep-draft traffic.
- **Navigation and Safety Study:** The size and types of ships expected to call on DCT are already navigating the River to PAMT and doing so in a safe, coordinated, and effective manner.
 - **Simulations.** Jacobs' fast-time and real-time simulations confirmed prior studies showing that ULCVs can safely turn and enter/depart from DCT in a variety of weather and wind conditions. Jacobs also simulated tankers, car carriers, and cruise vessels passing ULCVs in front of DCT, and the results confirmed that these vessels can safely pass each other.
 - **Passing Vessels.** Jacobs' analysis of AIS data demonstrated that ULCVs routinely pass Suezmax tankers, car carriers, and other ULCVs without issue or safety concerns. Interviews with the professional Delaware River Pilots, who have responsibility for vessels on the River, confirmed that these vessels can and do safely pass each other with entry and turning maneuvers conducted well within the Delaware River Pilots' standard operating procedures.
 - **Location.** DCT's location has more nearby anchorages and "bail-out" points than other terminals on the River, providing further navigation safety mitigation. Jacobs' simulation of a "bail-out" scenario confirmed that this is feasible and safe.
 - **2018 MITAGS Study.** Jacobs' review of the 2018 MITAGS Study, and Captain Kichner's comments on it, found that it was adequately scoped for the proposed project, was scoped with input from multiple parties, including USACE, and was performed in accordance with the proposed scope of work and to reasonable standards. Many of comments in the Kichner Report were found to be addressed in the 2018 simulation (that is, ebb currents), contradictory to established procedures (that is, the MAC's Transit Advisories or the Delaware River Pilots' standard procedures), or not in alignment with other publicly available data (that is, historical weather conditions). Notwithstanding, Jacobs and MITAGS undertook additional simulations that demonstrated, under the conditions noted in the Kichner Report, vessels can safely transit to DCT, and non-DCT vessels can safely meet by DCT.
 - **Turning Basin.** With respect to potential navigation impacts on the Federal Channel, Jacobs found that the practice of using the Federal Channel to turn vessels is commonplace today on the Delaware River and at other major U.S. seaports and is in accordance with recommendations in USACE's *Hydraulic Design of Deep-Draft Navigation Projects Engineer Manual*. Further, because DCT's Access Channel would effectively widen the Federal Channel adjacent to DCT, this would enhance safety for all vessels navigating the River in front of DCT.
- **Communications and Scheduling Plan:** The Delaware River Pilots, USCG, tug companies, and other organizations and stakeholders have well-established communications and scheduling plans and

protocols that were developed to ensure the safe navigation of vessels. These plans and protocols are not expected to change with the addition of DCT, except that the MAC's Transit Advisory will be updated to incorporate ULCVs calling on DCT, specifically the timing and location of where they would pick up their tugs. Modification of the Transit Advisory would not adversely impact other vessel traffic on the River but would serve to maintain and improve safety of all vessels on the River.

- **Emergency Procedures:** The Delaware River Pilots, USCG, tug companies, vessels, terminals, first responders, and other stakeholders have well-defined emergency procedures, training, and plans in place today. These plans will remain in place and would not be adversely affected by the development of DCT and the addition of its vessel traffic. The USCG's current PAWSA notes that many risks are "balanced by existing mitigations," and those that are not, are not high risk.
- **Dredging:** Both capital and maintenance dredging have occurred on the River in recent years, with maintenance dredging happening annually. DCT-related dredging will follow the same requirements, procedures, and plans and would require similar approvals. DCT's capital dredging will occur outside the Federal Channel and will not impact navigation. Maintenance dredging of DCT's approach channel would also occur outside the Federal Channel and have a minimal impact on vessel traffic, no different than current regular (and ongoing) maintenance dredging.

In summary, Jacobs finds that development of DCT would not result in traffic, navigational, safety, communications, scheduling, or emergency procedure-related concerns. The Delaware River's Federal Channel has adequate capacity, the Delaware River Pilots are safely handling ULCVs on the River today with no concerns, and dredging will not impede navigation. Well-established safety, communications, scheduling, and emergency plans, which are approved by multiple parties and agencies, will remain in place to provide safe and efficient vessel navigation for all users.

8. Disclaimer

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In preparing this report, Jacobs relied, in whole or in part, on data and information provided by the Client and third parties, as well as publicly available information, which information has not been independently verified by Jacobs, and which Jacobs has assumed to be accurate, complete, reliable, and current. Therefore, while Jacobs has used its best efforts in preparing this report, Jacobs does not warrant or guarantee the conclusions set forth in this report, which are dependent or based upon data, information, or statements supplied by third parties or the client. Jacobs prepared this report in accordance with the typical Industry Standard of Care.

Appendix A

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Appendix B

Fast-time Simulation Results



FAST TIME SIMULATION

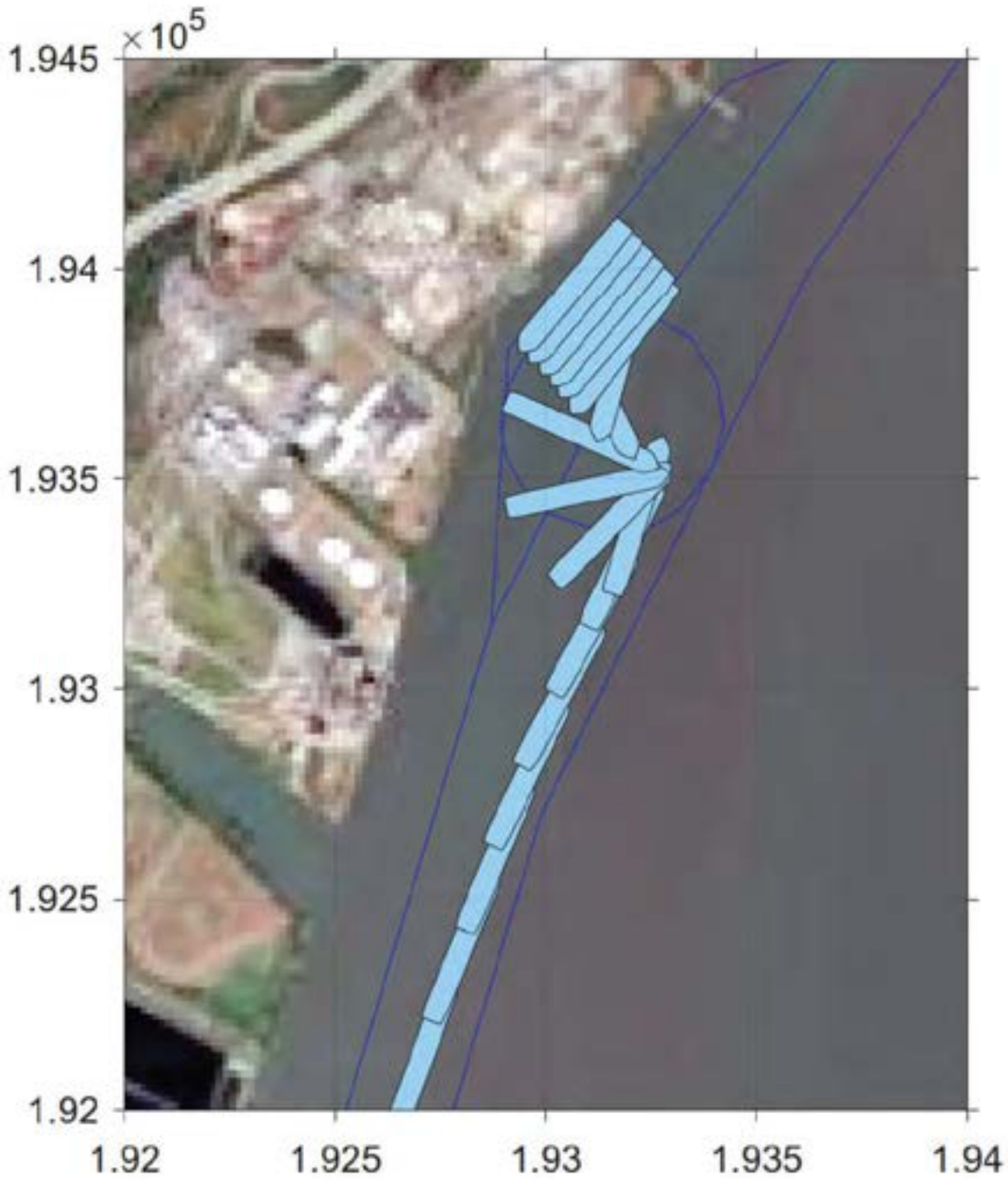
Run Matrix Summary

Run	Vessel	Bow at Berth	Draft (feet)	Initial Direction of Travel	Wind Speed (knots)	Wind Dir. (deg.)	Wave Height (feet)	Start Current Condition	Tide Elevation (feet MLLW)	Tugs
Single Runs for DCT Arrival / Departure										
1	ULCV	S	45	In	25	90	1.65	Maximum Flood	5	4 × 65T
2	ULCV	S	45	In	25	315	1.65	Maximum Flood	5	4 × 65T
3	ULCV	S	45	In	25	270	1.65	Maximum Flood	5	4 × 65T
4	ULCV	N	45	Out	25	90	1.65	Maximum Ebb	5	4 × 65T
5	ULCV	N	45	Out	25	315	1.65	Maximum Ebb	5	4 × 65T
6	ULCV	N	45	Out	25	270	1.65	Maximum Ebb	5	4 × 65T
7	ULCV	N	45	In	25	90	1.65	Maximum Flood	5	4 × 65T
8	ULCV	N	45	In	25	315	1.65	Maximum Flood	5	4 × 65T
9	ULCV	N	45	In	25	270	1.65	Maximum Flood	5	4 × 65T
10	ULCV	S	45	Out	25	90	1.65	Maximum Ebb	5	4 × 65T
11	ULCV	S	45	Out	25	315	1.65	Maximum Ebb	5	4 × 65T
12	ULCV	S	45	Out	25	270	1.65	Maximum Ebb	5	4 × 65T
Meeting Vessel Runs										
13	ULCV	-	45	In	25	135	1.65	Maximum Flood	5	-
	ULCV	-	45	Out	25	135	1.65	Maximum Flood	5	-
14	ULCV	-	45	In	25	90	1.65	Maximum Flood	5	-
	ULCV	-	45	Out	25	90	1.65	Maximum Flood	5	-

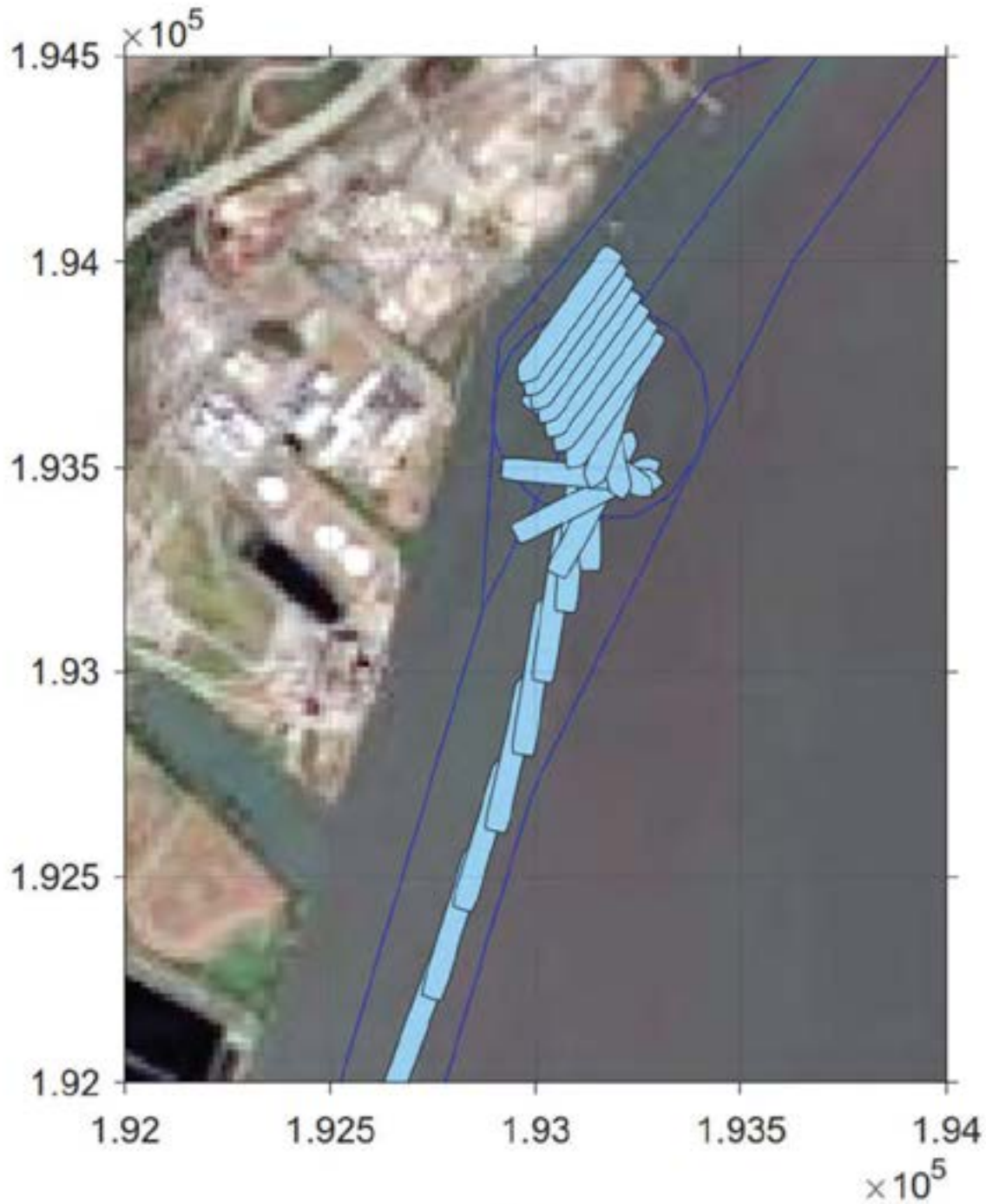
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	ULCV	-	45	Out	25	315	1.65	Maximum Ebb	5	-
16	ULCV	-	45	In	25	135	1.65	Maximum Flood	5	-
	Suezmax Tanker	-	45	Out	25	135	1.65	Maximum Flood	5	-
17	ULCV	-	45	In	25	90	1.65	Maximum Flood	5	-
	Suezmax Tanker	-	45	Out	25	90	1.65	Maximum Flood	5	-
18	ULCV	-	45	In	25	315	1.65	Maximum Ebb	5	-
	Suezmax Tanker	-	45	Out	25	315	1.65	Maximum Ebb	5	-
19	ULCV	-	45	In	25	135	1.65	Maximum Flood	5	-
	PCC	-	29.5	Out	25	135	1.65	Maximum Flood	5	-
20	ULCV	-	45	In	25	90	1.65	Maximum Flood	5	-
	PCC	-	29.5	Out	25	90	1.65	Maximum Flood	5	-
21	ULCV	-	45	In	25	315	1.65	Maximum Ebb	5	-
	PCC	-	29.5	Out	25	315	1.65	Maximum Ebb	5	-
22	ULCV	-	45	In	25	315	1.65	Maximum Ebb	5	-
	Cruise	-	25.3	Out	25	315	1.65	Maximum Ebb	5	-
23	ULCV	-	45	In	25	315	1.65	Maximum Ebb	5	-
	Cruise	-	25.3	Out	25	315	1.65	Maximum Ebb	5	-
24	ULCV	-	45	In	25	315	1.65	Maximum Ebb	5	-
	Cruise	-	25.3	Out	25	315	1.65	Maximum Ebb	5	-

Run Swept Paths

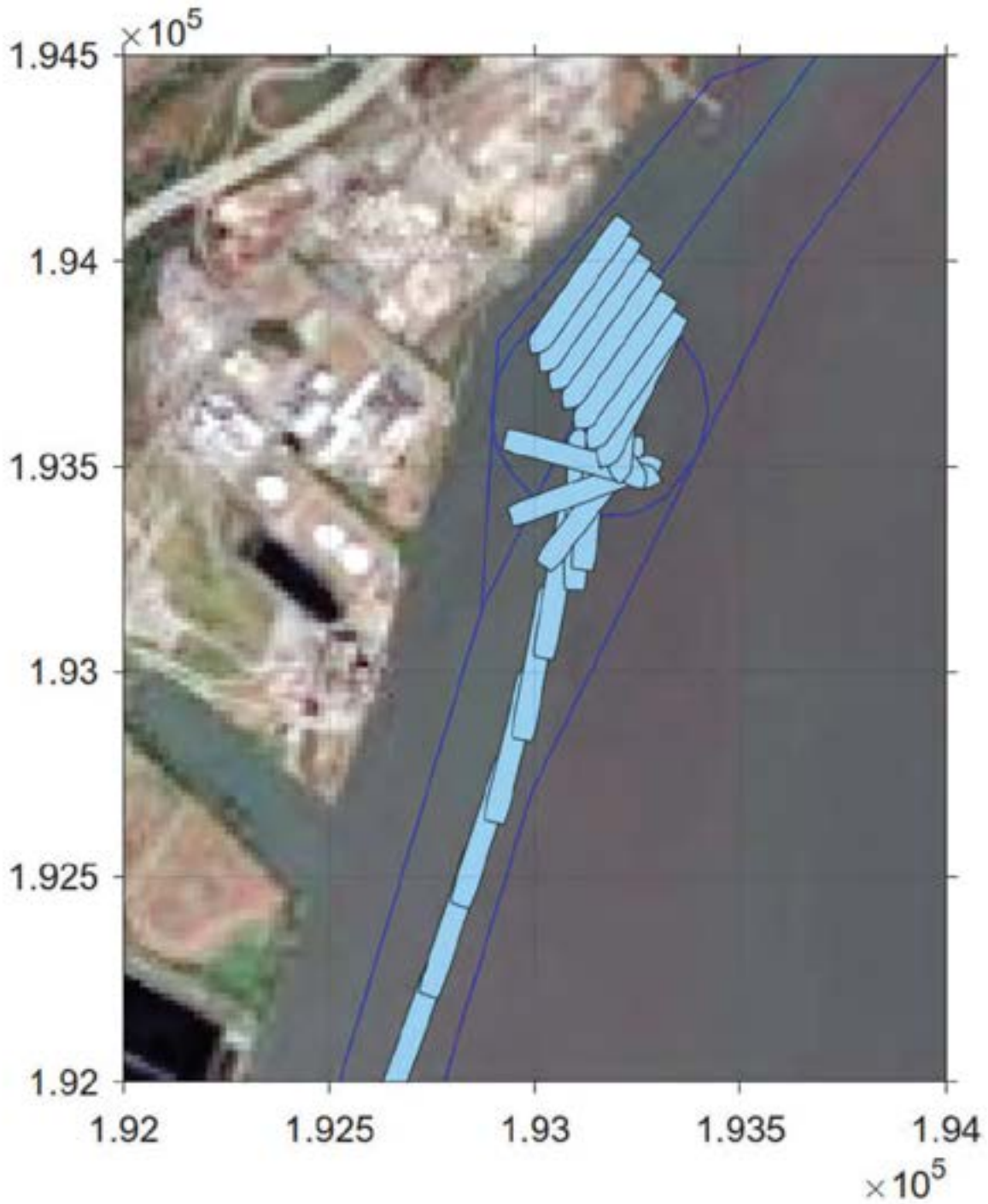
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Single Runs for DCT Arrival / Departure										
1	ULCV	5	45	In	25	90	1.65	Maximum Flood	5	4 x 65T



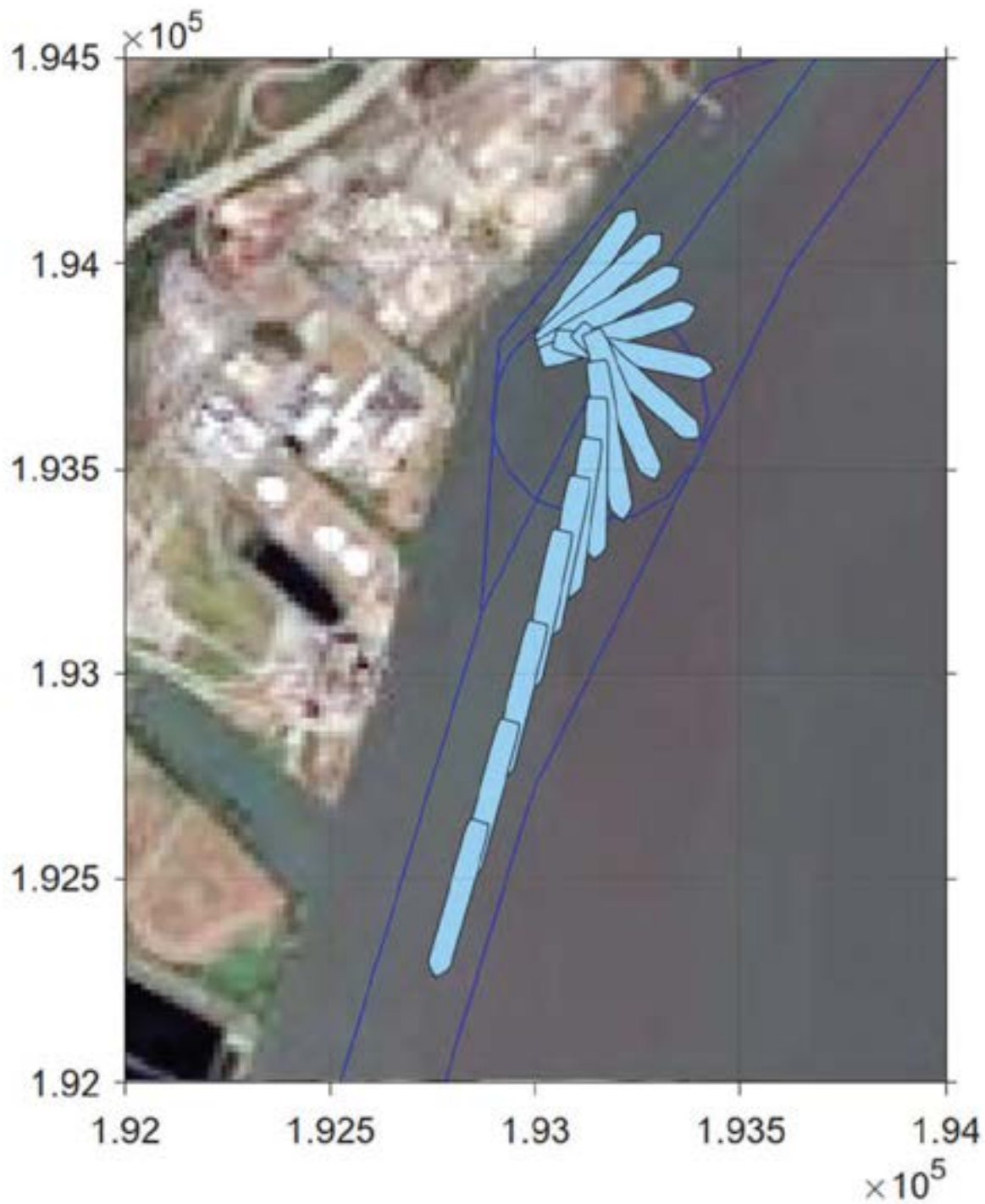
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Single Runs for DCT Arrival / Departure										
2	ULCV	5	45	In	25	315	1.65	Maximum Flood	5	4 × 65T



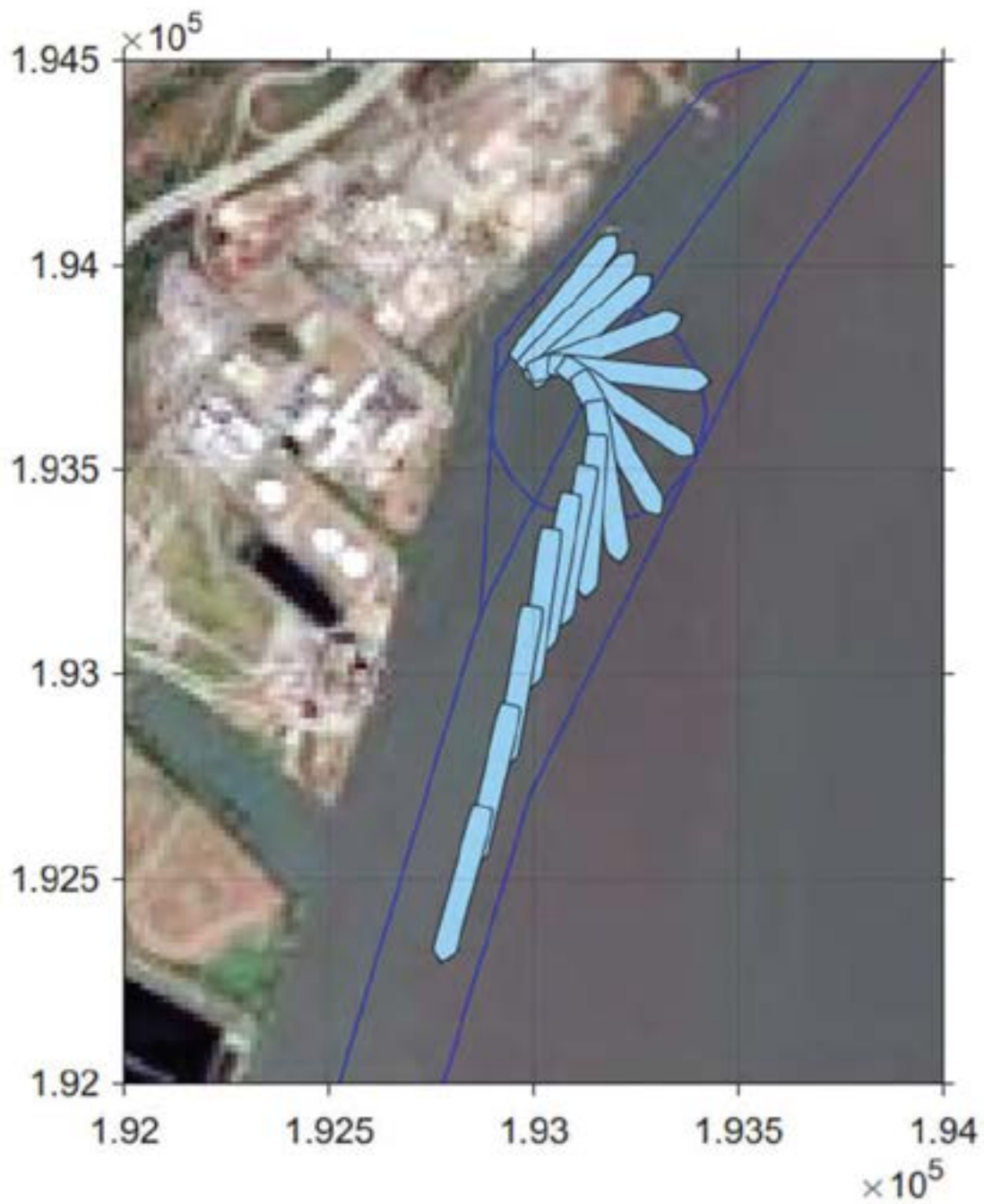
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Single Runs for DCT Arrival / Departure										
3	ULCV	S	45	In	25	270	1.65	Maximum Flood	5	4 x 65T



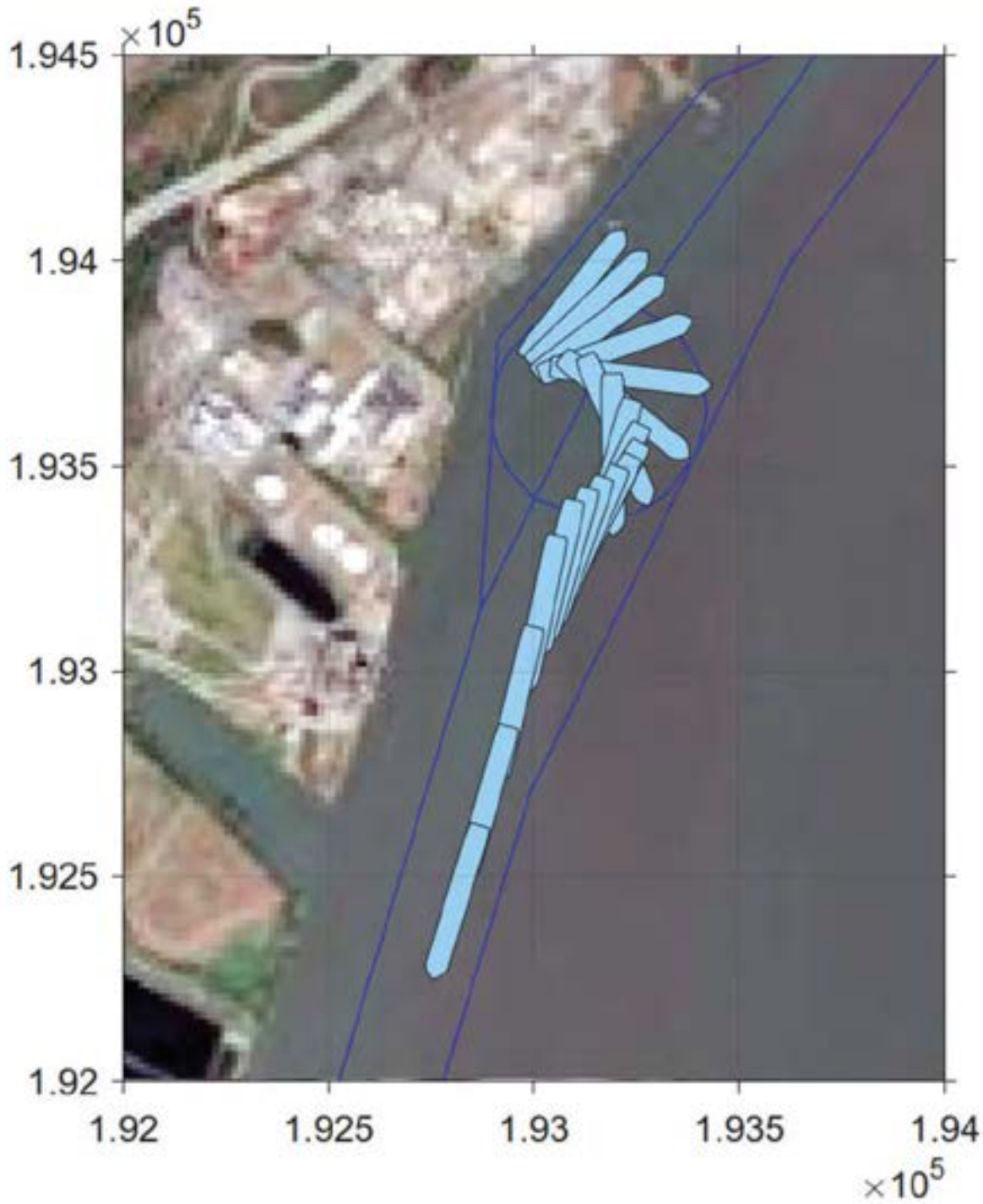
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Single Runs for DCT Arrival / Departure										
4	ULCV	N	45	Out	25	90	1.65	Maximum Ebb	5	4 × 65T



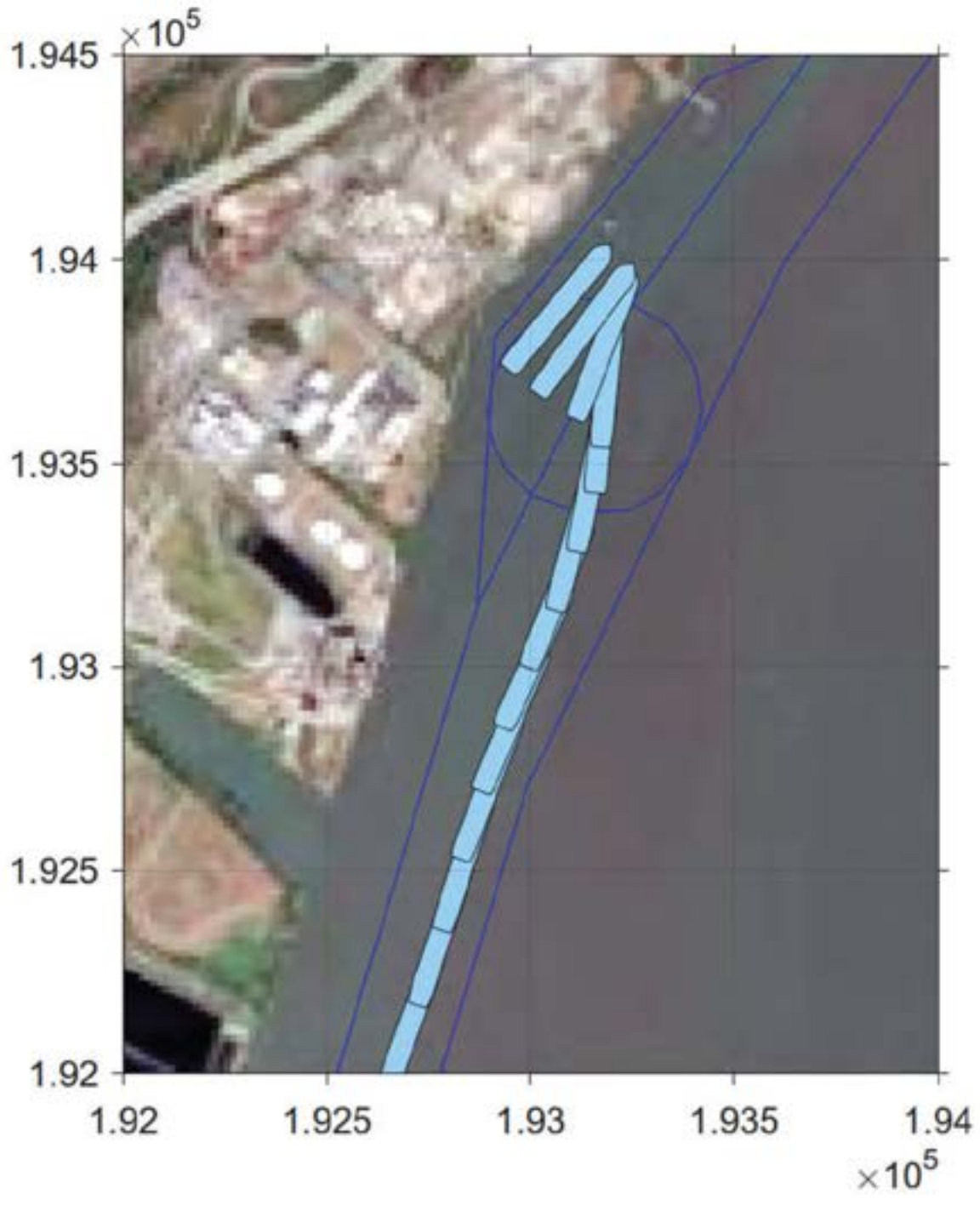
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Single Runs for DCT Arrival / Departure										
5	ULCV	N	45	Out	25	315	1.65	Maximum Ebb	5	4 x 65T



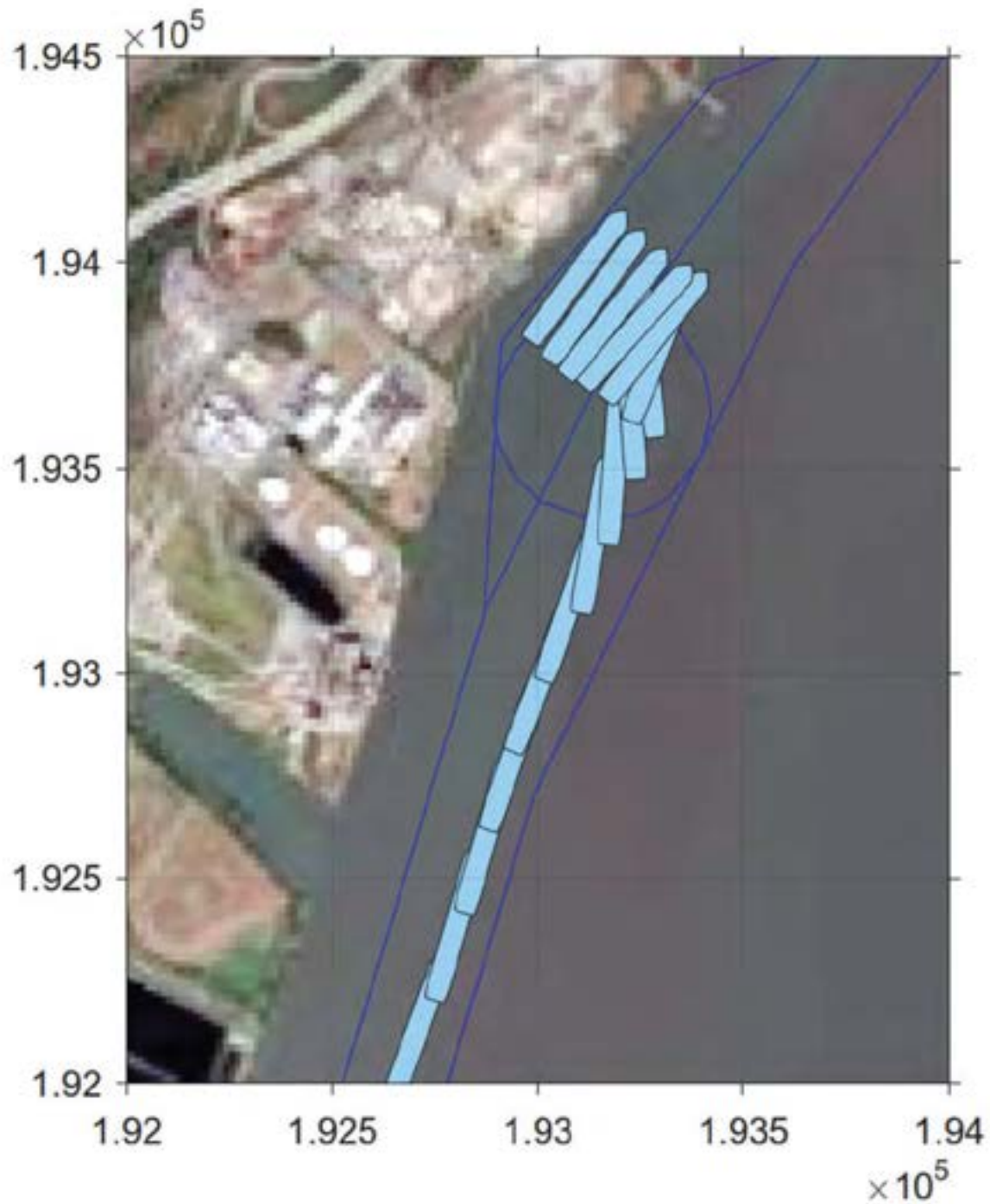
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Single Runs for DCT Arrival / Departure										
6	ULCV	N	45	Out	25	270	1.65	Maximum Ebb	5	4 x 65T



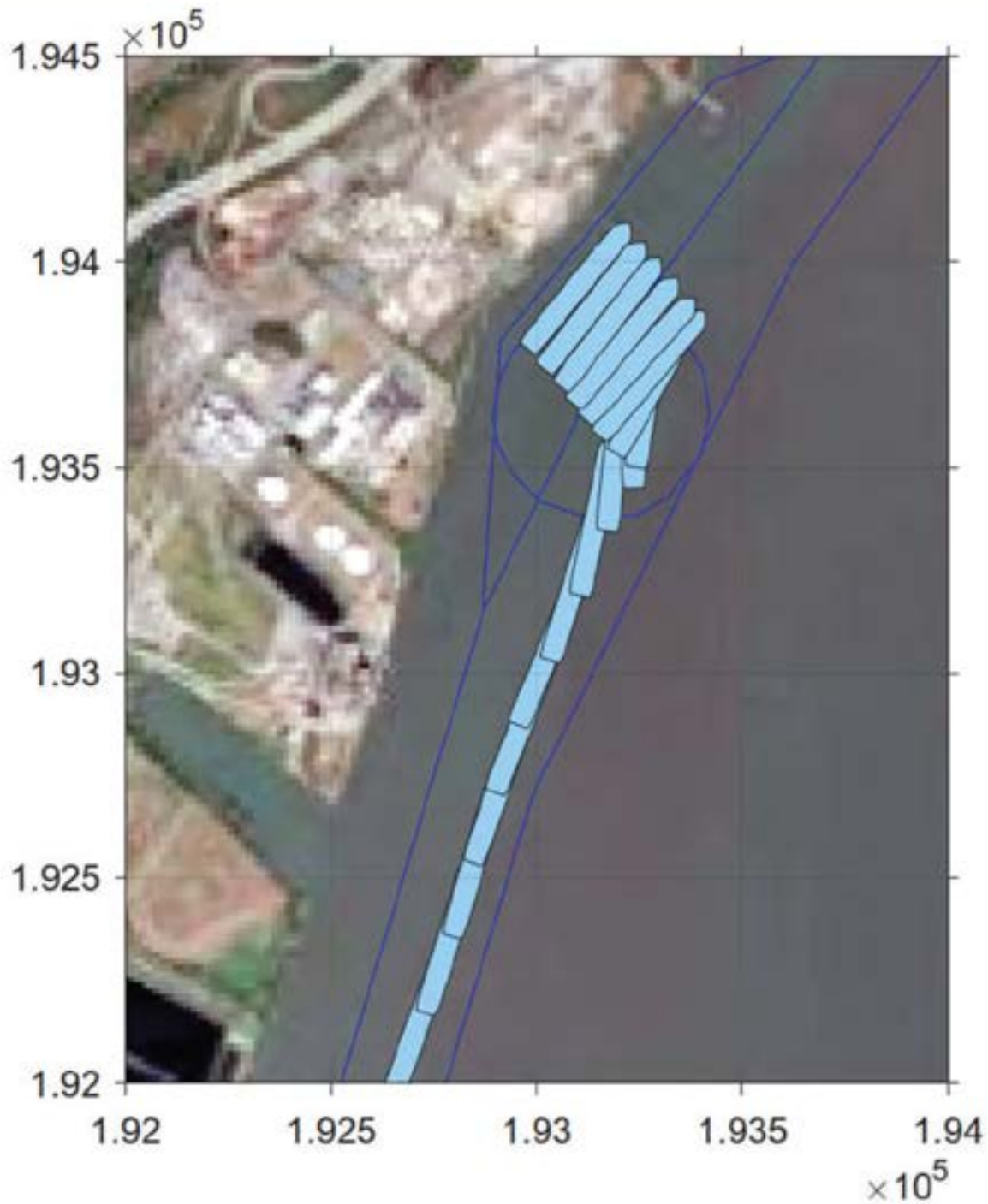
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Single Runs for DCT Arrival / Departure										
7	ULCV	N	45	In	25	90	1.65	Maximum Flood	5	4 × 65T



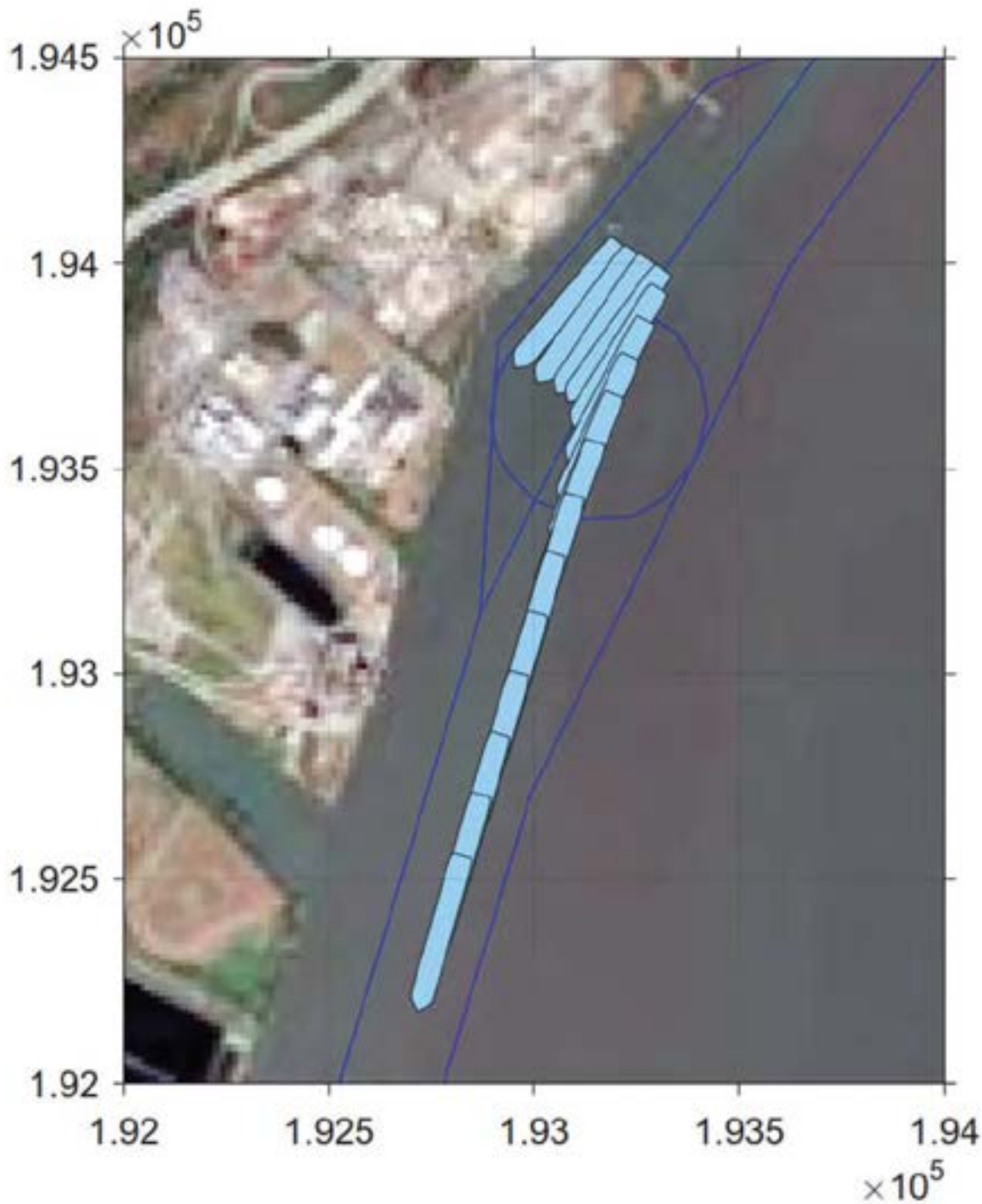
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Single Runs for DCT Arrival / Departure										
8	ULCV	N	45	In	25	315	1.65	Maximum Flood	5	4 x 65T



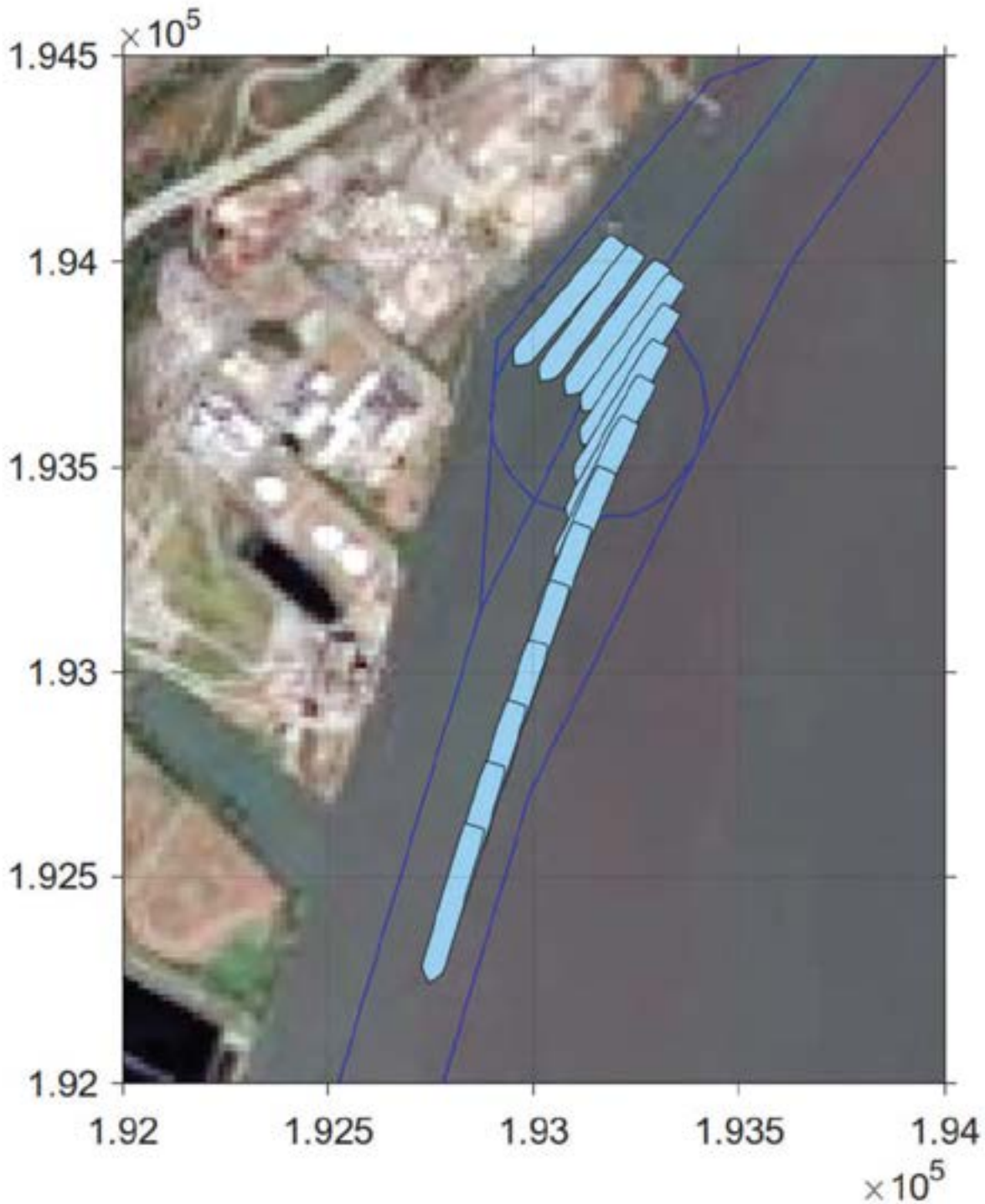
Run	Vessel	Bow at Berth	Draft (feet)	Initial Direction of Travel	Wind Speed (knots)	Wind Dir. (deg.)	Wave Height (feet)	Start Current Condition	Tide Elevation (feet MLLW)	Tugs
Single Runs for DCT Arrival / Departure										
9	ULCV	N	45	In	25	270	1.65	Maximum Flood	5	4 x 65T



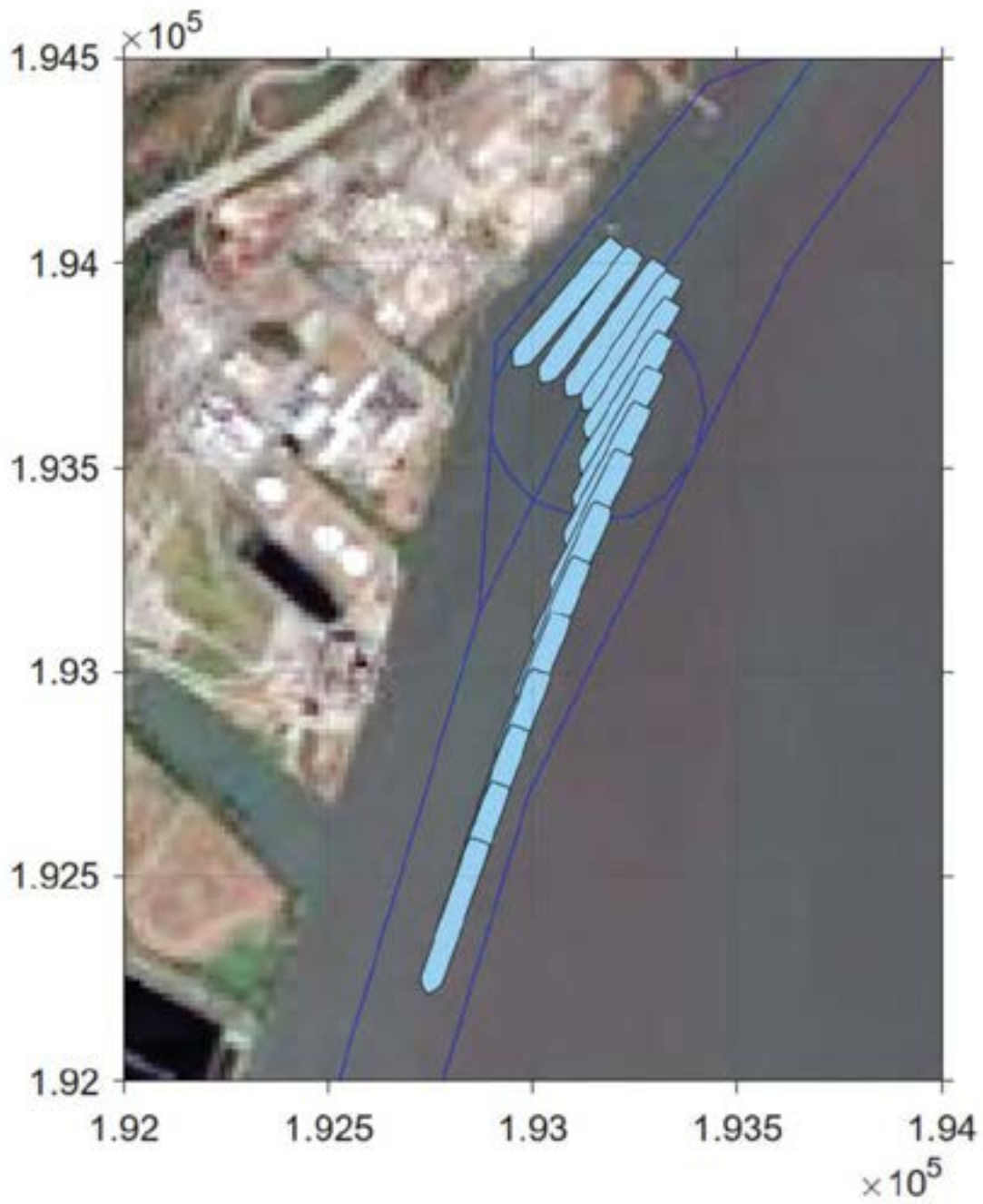
Run	Vessel	Bow at Berth	Draft (feet)	Initial Direction of Travel	Wind Speed (knots)	Wind Dir. (deg.)	Wave Height (feet)	Start Current Condition	Tide Elevation (feet MLLW)	Tugs
Single Runs for DCT Arrival / Departure										
10	ULCV	5	45	Out	25	90	1.65	Maximum Ebb	5	4 × 65T



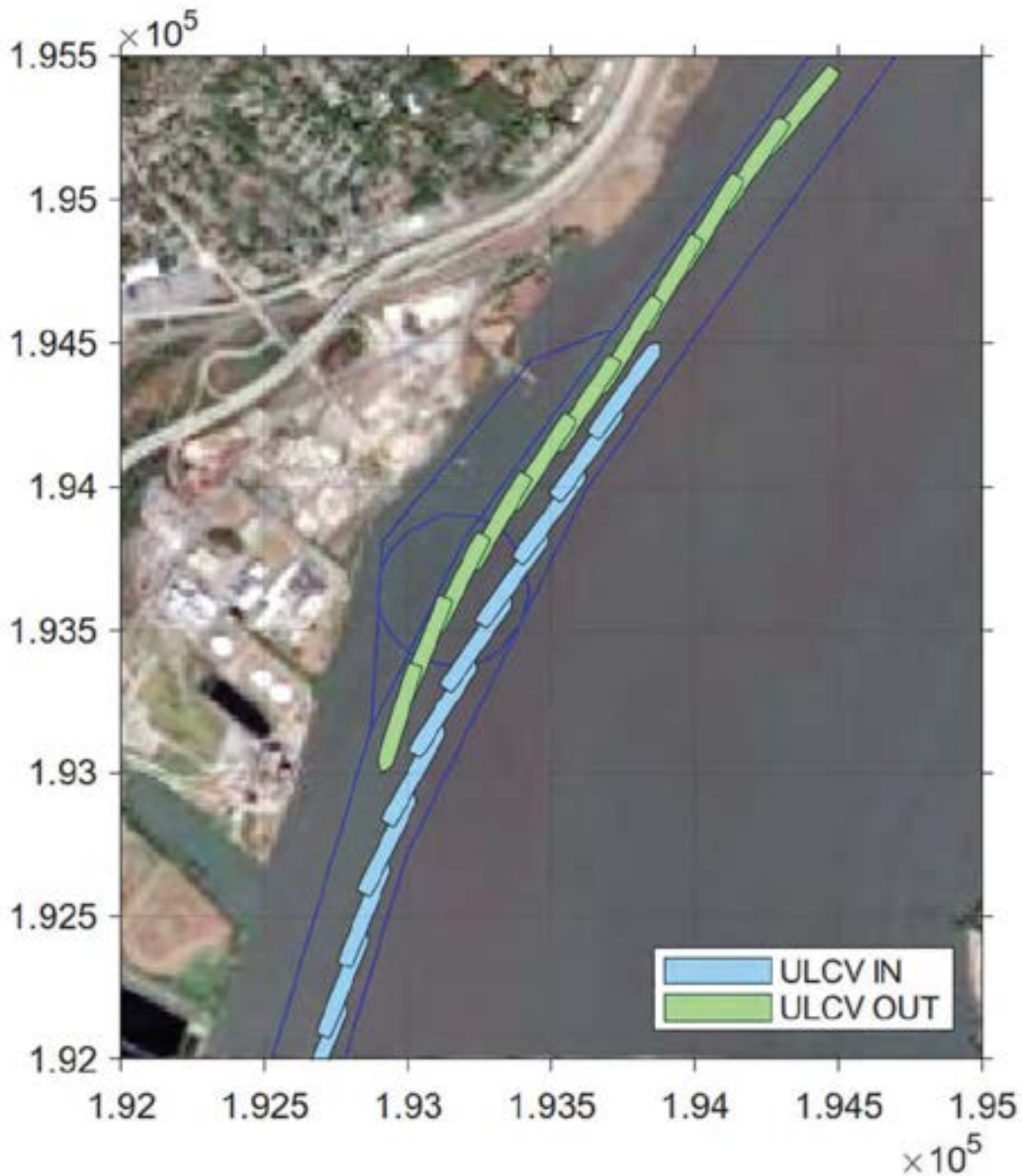
Run	Vessel	Bow at Berth	Draft (feet)	Initial Direction of Travel	Wind Speed (knots)	Wind Dir. (deg.)	Wave Height (feet)	Start Current Condition	Tide Elevation (feet MLLW)	Tugs
Single Runs for DCT Arrival / Departure										
11	ULCV	5	45	Out	25	315	1.65	Maximum Ebb	5	4 × 65T



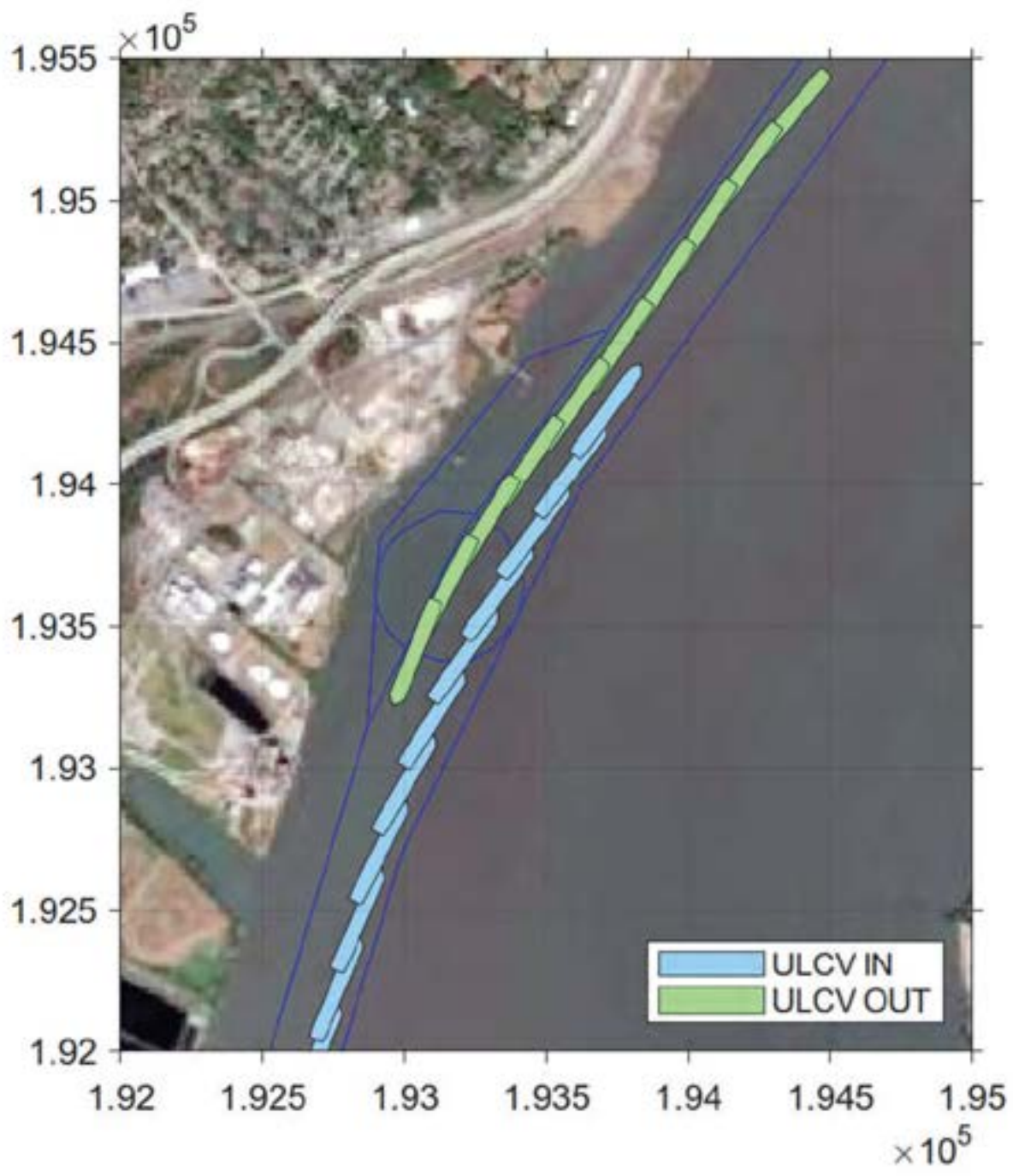
Run	Vessel	Bow at Berth	Draft (feet)	Initial Direction of Travel	Wind Speed (knots)	Wind Dir. (deg.)	Wave Height (feet)	Start Current Condition	Tide Elevation (feet MLLW)	Tugs
Single Runs for DCT Arrival / Departure										
12	ULCV	5	45	Out	25	270	1.65	Maximum Ebb	5	4 × 65T



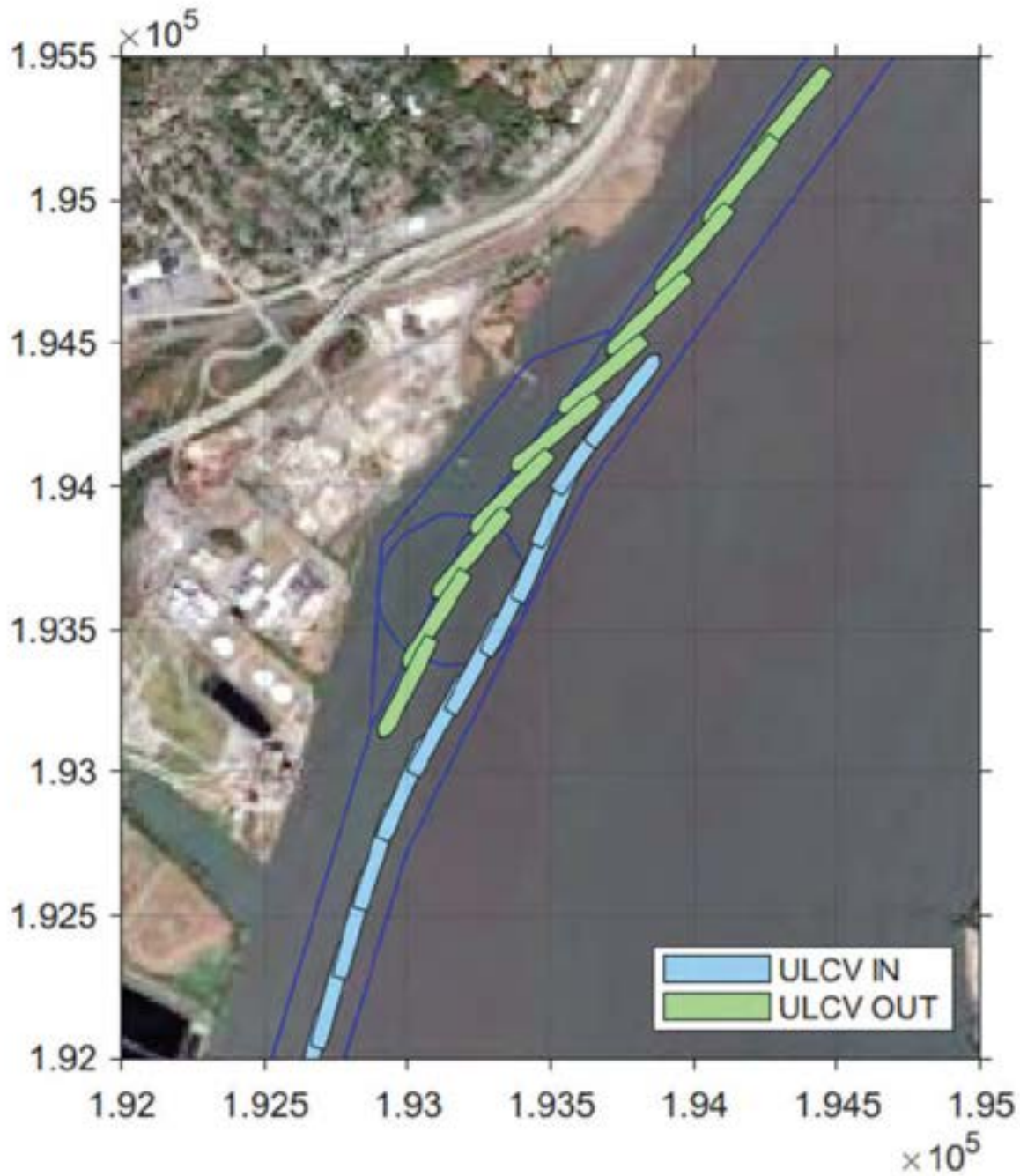
Run	Vessel	Bow at Berth	Draft (feet)	Initial Direction of Travel	Wind Speed (knots)	Wind Dir. (deg.)	Wave Height (feet)	Start Current Condition	Tide Elevation (feet MLLW)	Tugs
Meeting Vessel Runs										
13	ULCV	-	45	In	25	135	1.65	Maximum Flood	5	-
	ULCV	-	45	Out	25	135	1.65	Maximum Flood	5	-



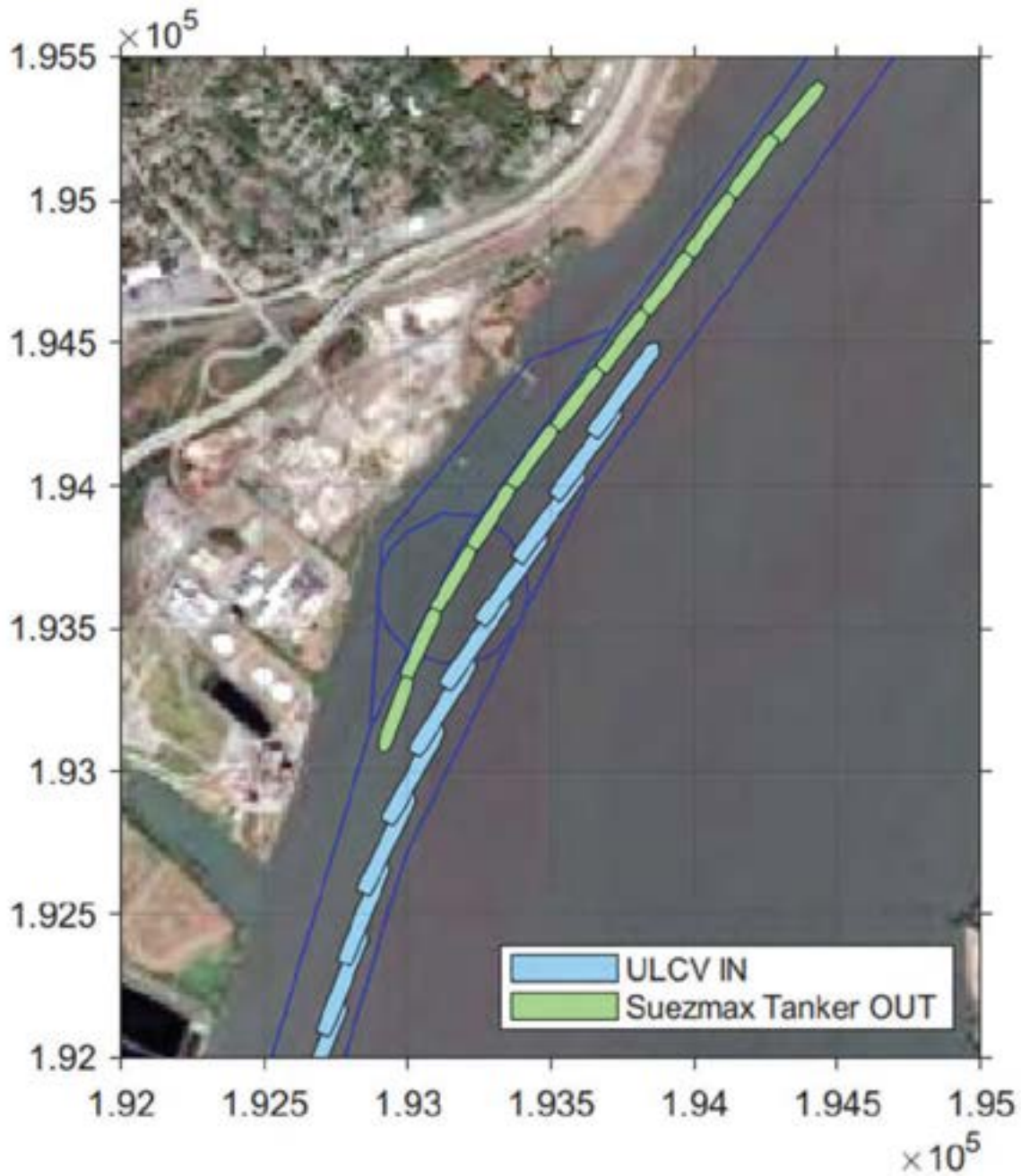
Run	Vessel	Bow at Berth	Draft (feet)	Initial Direction of Travel	Wind Speed (knots)	Wind Dir. (deg.)	Wave Height (feet)	Start Current Condition	Tide Elevation (feet MLLW)	Tugs
Meeting Vessel Runs										
14	ULCV	-	45	In	25	90	1.65	Maximum Flood	5	-
	ULCV	-	45	Out	25	90	1.65	Maximum Flood	5	-



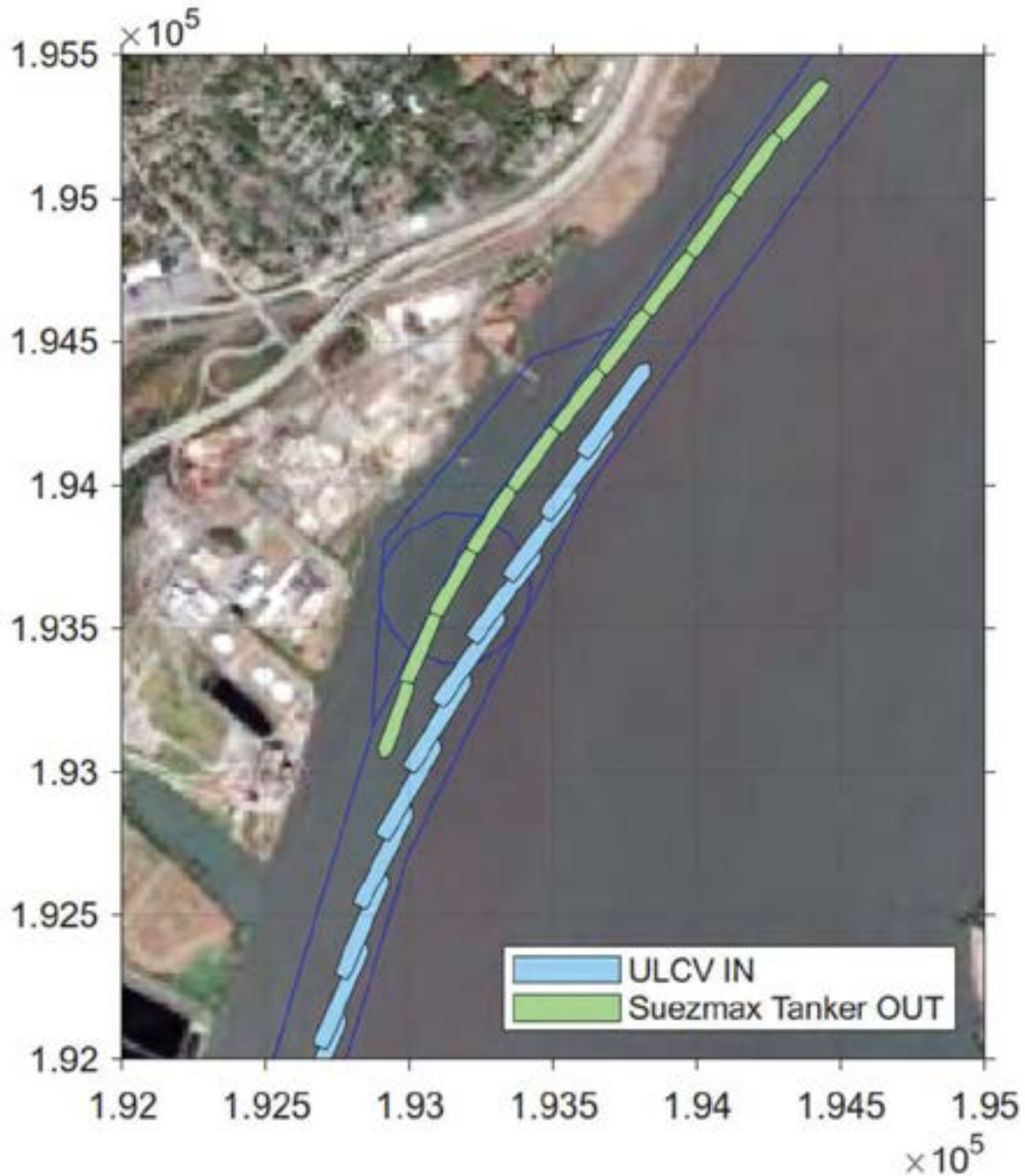
Run	Vessel	Bow at Berth	Draft (feet)	Initial Direction of Travel	Wind Speed (knots)	Wind Dir. (deg.)	Wave Height (feet)	Start Current Condition	Tide Elevation (feet MLLW)	Tugs
Meeting Vessel Runs										
15	ULCV	-	45	In	25	315	1.65	Maximum Ebb	5	-
	ULCV	-	45	Out	25	315	1.65	Maximum Ebb	5	-



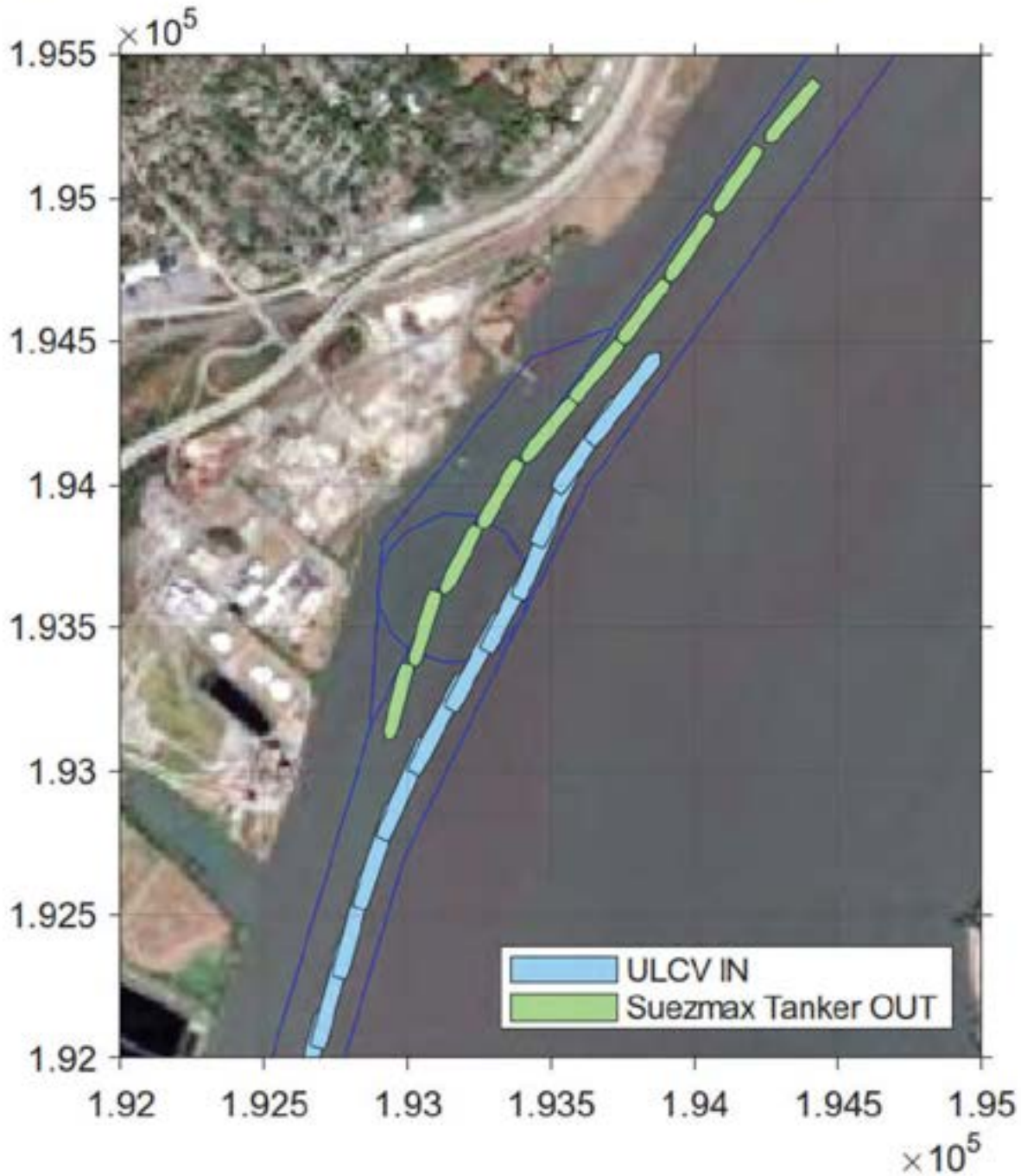
Run	Vessel	Bow at Berth	Draft (feet)	Initial Direction of Travel	Wind Speed (knots)	Wind Dir. (deg.)	Wave Height (feet)	Start Current Condition	Tide Elevation (feet MLLW)	Tugs
Meeting Vessel Runs										
16	ULCV	-	45	In	25	135	1.65	Maximum Flood	5	-
	Suezmax Tanker	-	45	Out	25	135	1.65	Maximum Flood	5	-



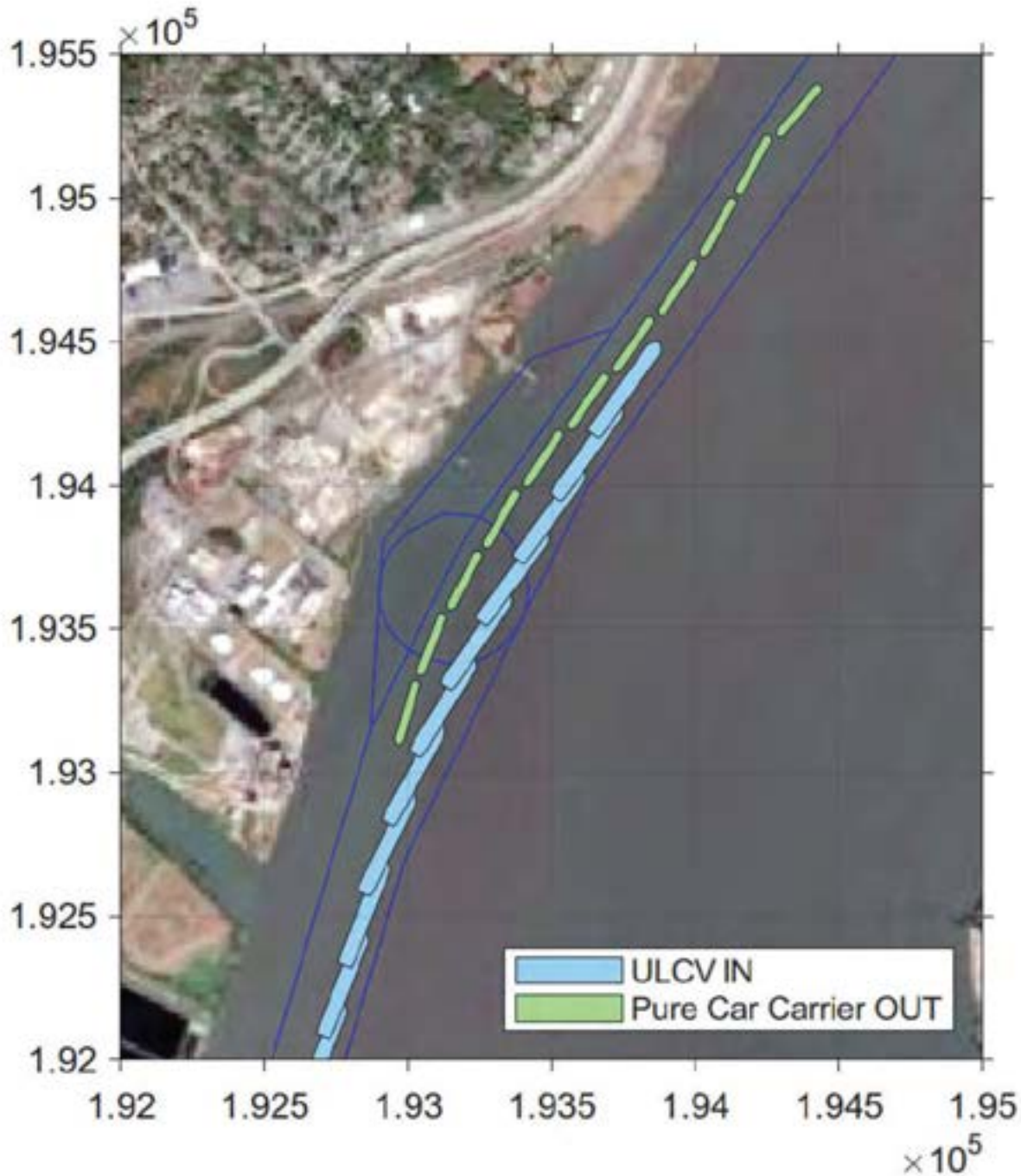
Run	Vessel	Bow at Berth	Draft (feet)	Initial Direction of Travel	Wind Speed (knots)	Wind Dir. (deg.)	Wave Height (feet)	Start Current Condition	Tide Elevation (feet MLLW)	Tugs
Meeting Vessel Runs										
17	ULCV	-	45	In	25	90	1.65	Maximum Flood	5	-
	Suezmax Tanker	-	45	Out	25	90	1.65	Maximum Flood	5	-



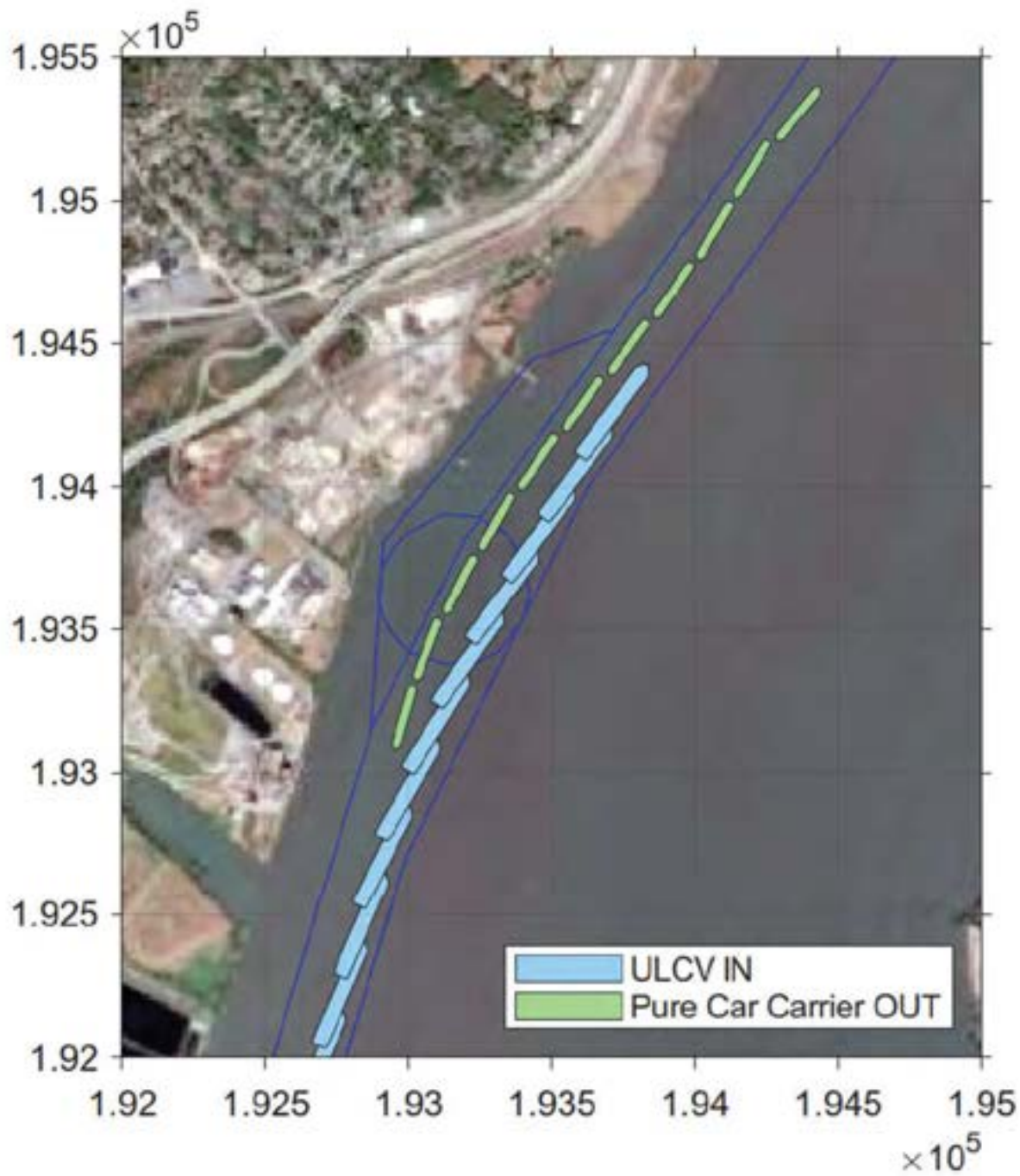
Run	Vessel	Bow at Berth	Draft (feet)	Initial Direction of Travel	Wind Speed (knots)	Wind Dir. (deg.)	Wave Height (feet)	Start Current Condition	Tide Elevation (feet MLLW)	Tugs
Meeting Vessel Runs										
18	ULCV	-	45	In	25	315	1.65	Maximum Ebb	5	-
	Suezmax Tanker	-	45	Out	25	315	1.65	Maximum Ebb	5	-



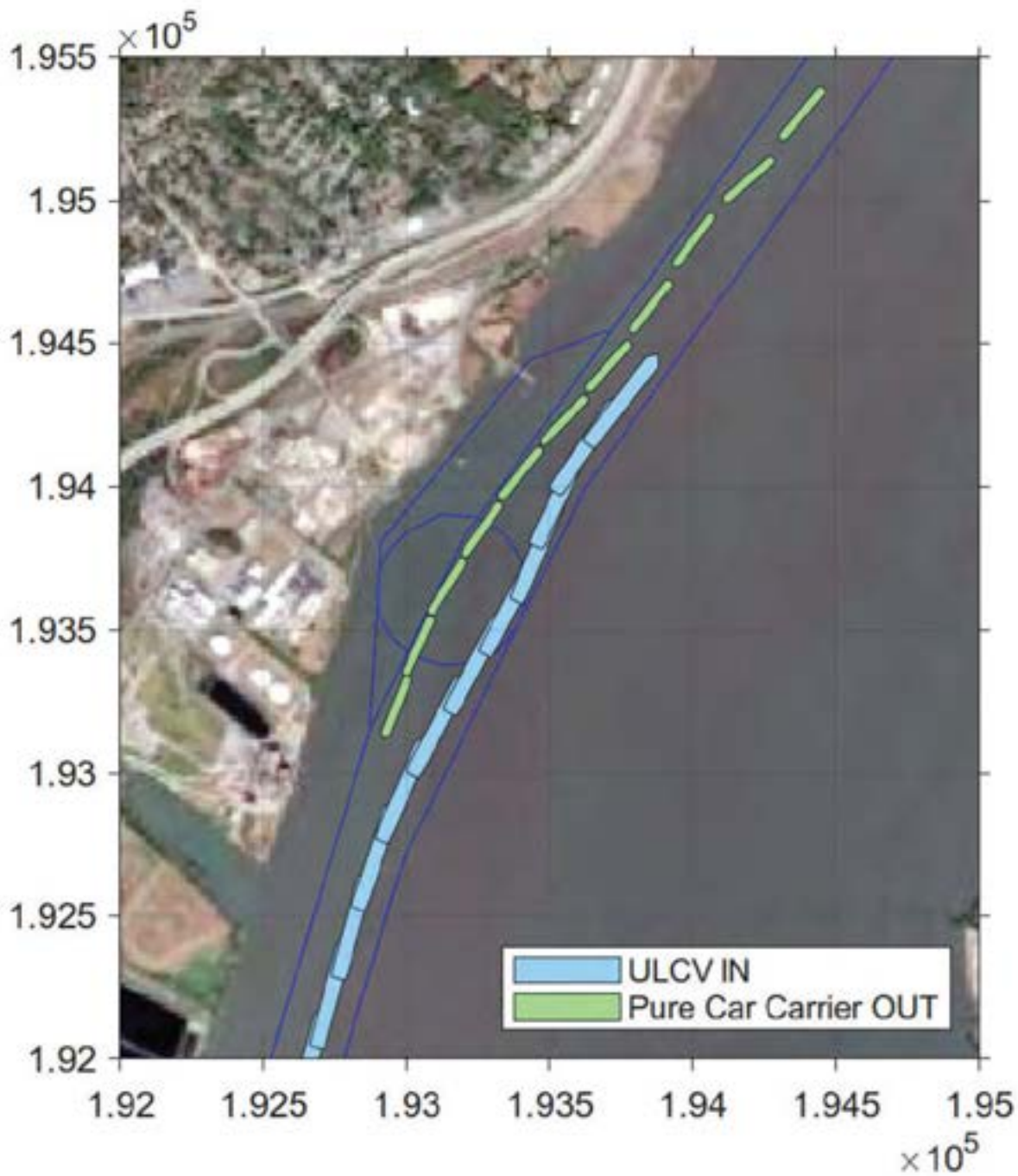
Run	Vessel	Bow at Berth	Draft (feet)	Initial Direction of Travel	Wind Speed (knots)	Wind Dir. (deg.)	Wave Height (feet)	Start Current Condition	Tide Elevation (feet MLLW)	Tugs
Meeting Vessel Runs										
19	ULCV	-	45	In	25	135	1.65	Maximum Flood	5	-
	PCC	-	29.5	Out	25	135	1.65	Maximum Flood	5	-



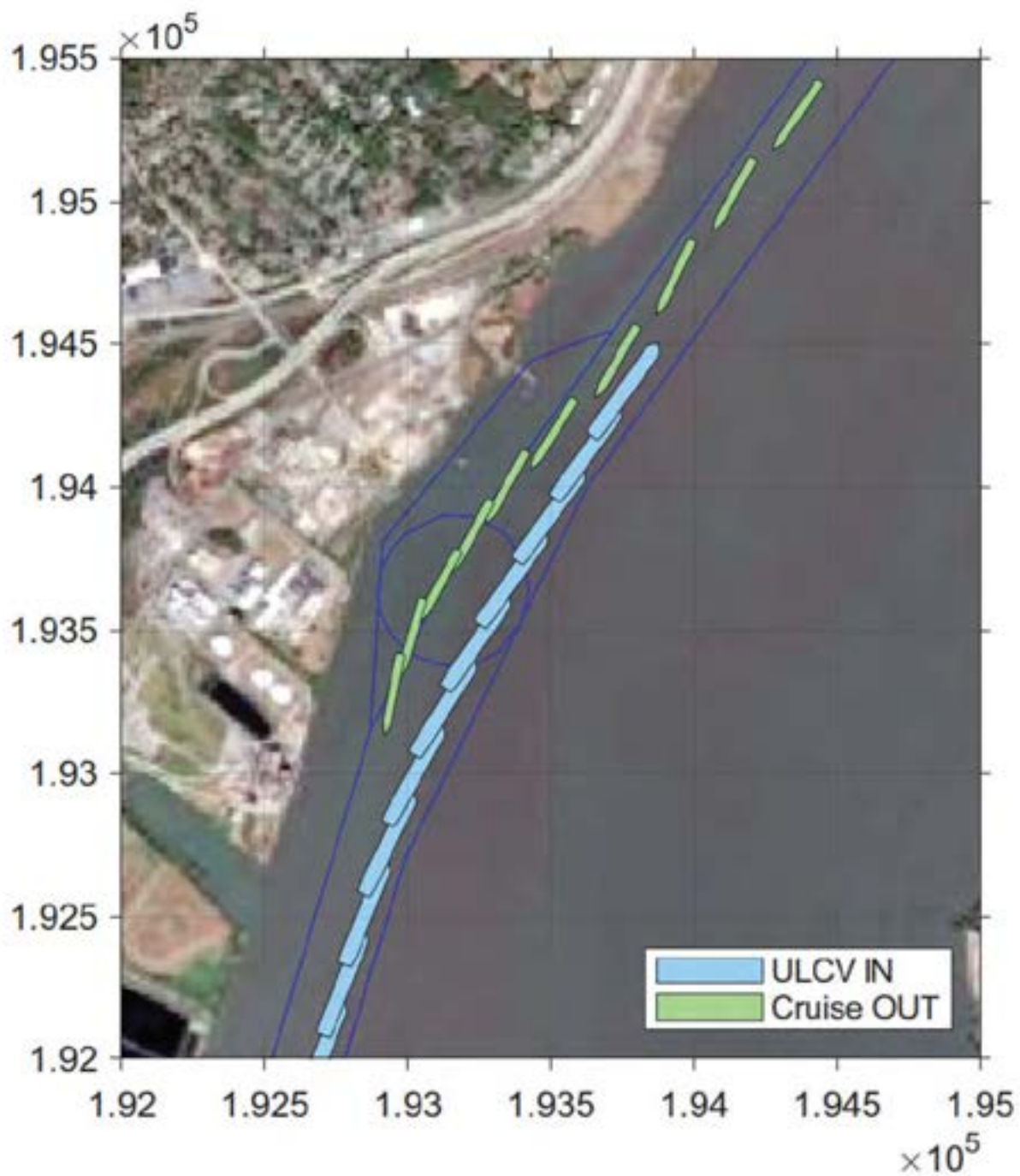
Run	Vessel	Bow at Berth	Draft (feet)	Initial Direction of Travel	Wind Speed (knots)	Wind Dir. (deg.)	Wave Height (feet)	Start Current Condition	Tide Elevation (feet MLLW)	Tugs
Meeting Vessel Runs										
20	ULCV	-	45	In	25	90	1.65	Maximum Flood	5	-
	PCC	-	29.5	Out	25	90	1.65	Maximum Flood	5	-



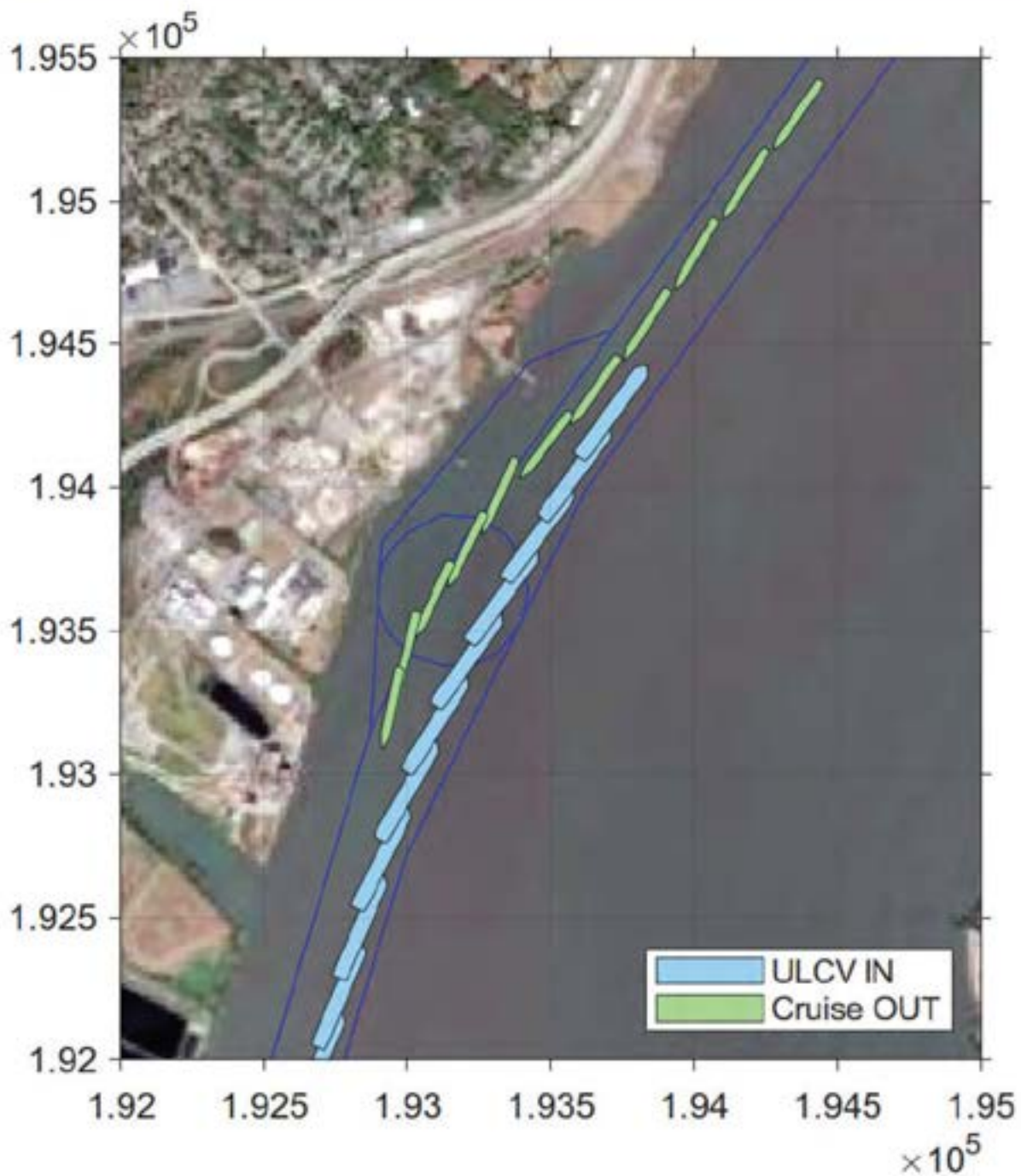
Run	Vessel	Bow at Berth	Draft (feet)	Initial Direction of Travel	Wind Speed (knots)	Wind Dir. (deg.)	Wave Height (feet)	Start Current Condition	Tide Elevation (feet MLLW)	Tugs
Meeting Vessel Runs										
21	ULCV	-	45	In	25	315	1.65	Maximum Ebb	5	-
	PCC	-	29.5	Out	25	315	1.65	Maximum Ebb	5	-



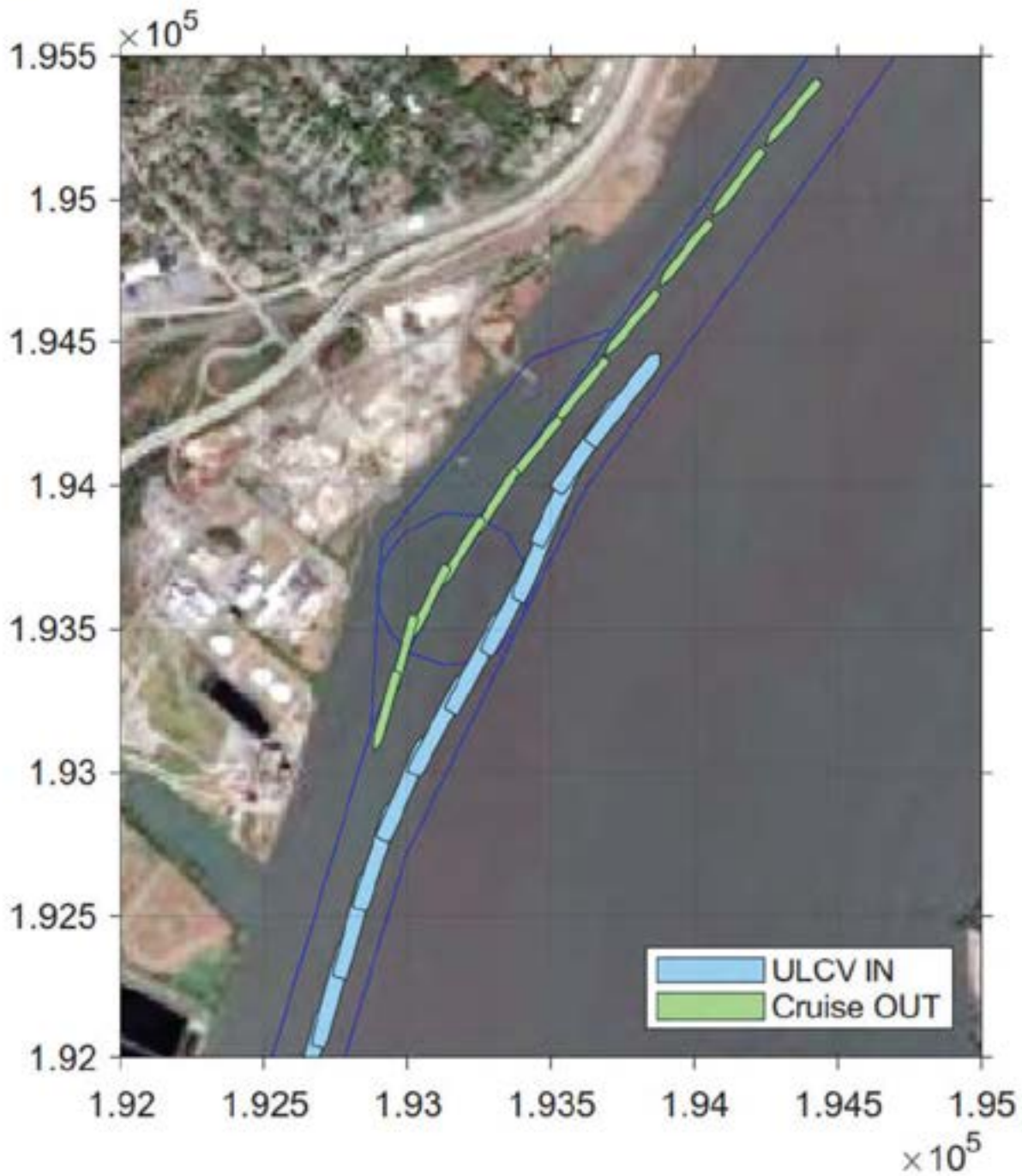
Run	Vessel	Bow at Berth	Draft (feet)	Initial Direction of Travel	Wind Speed (knots)	Wind Dir. (deg.)	Wave Height (feet)	Start Current Condition	Tide Elevation (feet MLLW)	Tugs
Meeting Vessel Runs										
22	ULCV	-	45	In	25	135	1.65	Maximum Ebb	5	-
	Cruise	-	25.3	Out	25	135	1.65	Maximum Ebb	5	-



Run	Vessel	Bow at Berth	Draft (feet)	Initial Direction of Travel	Wind Speed (knots)	Wind Dir. (deg.)	Wave Height (feet)	Start Current Condition	Tide Elevation (feet MLLW)	Tugs
Meeting Vessel Runs										
23	ULCV	-	45	In	25	90	1.65	Maximum Ebb	5	-
	Cruise	-	25.3	Out	25	90	1.65	Maximum Ebb	5	-



Run	Vessel	Bow at Berth	Draft (feet)	Initial Direction of Travel	Wind Speed (knots)	Wind Dir. (deg.)	Wave Height (feet)	Start Current Condition	Tide Elevation (feet MLLW)	Tugs
Meeting Vessel Runs										
24	ULCV	-	45	In	25	315	1.65	Maximum Ebb	5	-
	Cruise	-	25.3	Out	25	315	1.65	Maximum Ebb	5	-



Appendix C

Real-time Simulation Results

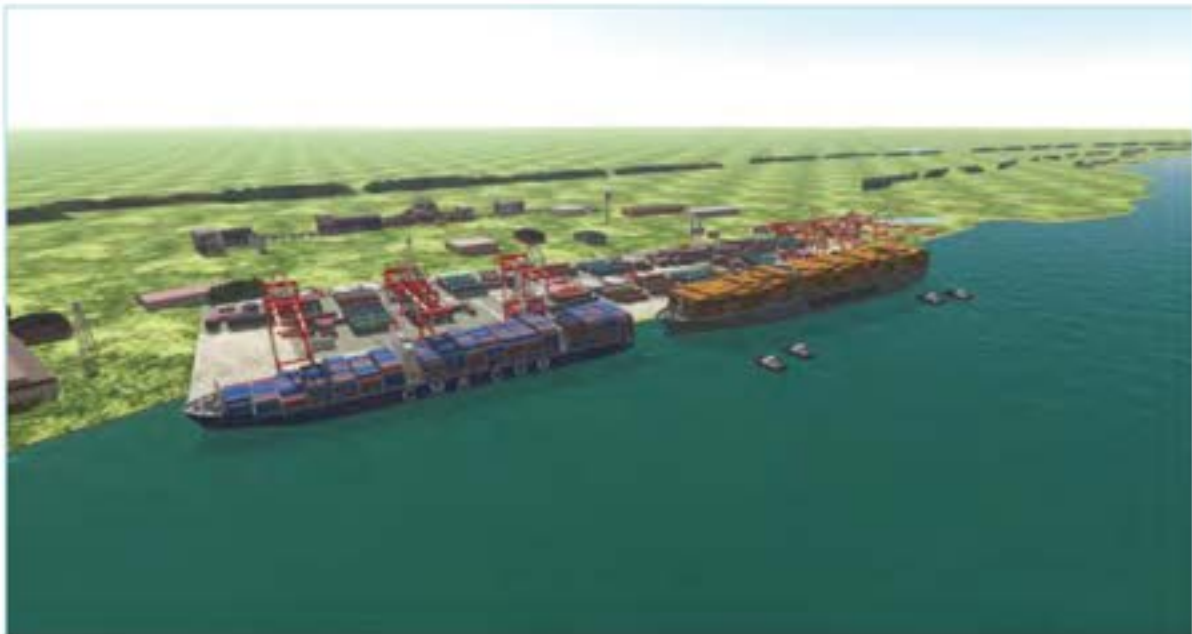




MITAGS

MARITIME INSTITUTE OF TECHNOLOGY
AND GRADUATE STUDIES

Navigation Feasibility Study Report Of The Delaware Container Terminal Wilmington, Delaware For Jacobs Engineering Group, Inc. September 16-18, 2025



BY
MITAGS, INC.

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Center by DNV GL.

RFP Name	Navigation Feasibility Study Proposal for the Delaware Container Terminal (ex Edgemoor)
Project Location	The "Edgemoor Site" upriver from the Port of Wilmington, Delaware
Purpose	ULCV Navigation Feasibility Study
Customer	Jacobs Engineering Group, Inc.
Customer Representative	Mr. Duncan R. Kopp, PE (RI, MA, CT) Jacobs Vice President, Americas Market Director for Ports & Maritime
Bidder Legal Name and East Coast Headquarters Location (MITAGS)	MITAGS, Inc. 692 Maritime Boulevard, Linthicum Heights, MD 21090-1952 Tel: 410-859-5700, Fax: 410-859-8416 Email: exdir@mitags.org Web: http://www.mitags.org
West Coast Location	1729 Alaskan Way South, Seattle, WA 98134-1146
Provider Description	<p>MITAGS, Inc. is a 501(c) 3 non-profit subsidiary of The M.M. & P. Maritime Advancement, Training, Education and Safety Program "MM&P MATES Program," DBA the Maritime Institute of Technology & Graduate Studies (MITAGS).</p> <p>The MM&P Mates Program is a 501(c) 3 Trusteeship. The International Organizations of Masters, Mates, and Pilots and its contracted companies founded the "MATES" Program in 1968. The mission of MITAGS is to enhance professionalism through the development and presentation of internationally recognized programs in leadership, education, training and safety for the maritime industry.</p> <p>MITAGS East and West Coast Campuses are the primary training and simulation centers for the MMP professional deck officers and pilots.</p>
Report Release Date	December 1, 2025
Primary Author	Ms. Colleen Schaffer, P.E., Director of Simulation Engineering
The Project Leader has the authority to bind MITAGS to the terms listed within this proposal	

MITAGS accepts no liability for the use of the findings, conclusions and recommendations provided by the conning pilots in this simulation study. Additionally, MITAGS cannot be held responsible for errors in the data provided by the client and other third parties used for the programming of the simulator hydrodynamic ship / tug models, and databases. The recommendations from this simulation study are for guidance. The final decision on whether it is safe to transit in real-world conditions rests with the master of the vessel and the local pilot.

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1. BACKGROUND AND PURPOSE

Jacobs is the premier ports and maritime service provider. They provide clients with value-added consulting, planning and engineering services for maritime infrastructure. They also develop long-term, trusted relationships with clients around the globe in the containerized, bulk, general cargo, oil and gas and cruise/ferry industries, as well as for port authorities, governments and the world's leading naval forces. Their specialists address top-of-mind issues, including de-carbonization, electrification, resiliency, sea-level rise, infrastructure life extension, renewal and beyond.

Their port and maritime professionals have navigated the world's largest and most complex programs, bringing in-depth understanding of the complex nature of maritime infrastructure, backed by global knowledge and local experience. Jacobs delivers across all sub-sectors including containers, dry and liquid bulk, break bulk, cruise and ferries and defense. Their logistics experience and knowledge of intermodal terminals further enhance how we serve clients in these sub-sectors. They also provide coastal modelling and engineering, port and marine structural and civil engineering, marine and waterway gates, barriers and dry docks¹.

The Diamond State Port Corporation (DSPC) is a public instrumentality of the State of Delaware that promotes the State's economic vitality by sustaining and promoting the Port of Wilmington, Delaware as a competitive and viable full service, multi-modal operation through its ownership of the port terminal facilities. The Port of Wilmington, Delaware is a full-service deep-water port and marine terminal complex handling more than 400 vessels and 6 million tons of import/export cargo annually including containers, perishable, bulk, Ro-Ro and various project cargos.

Strategically located on the Delaware River 65 miles from the Atlantic Ocean with convenient and rapid access to major Eastern Seaboard highways and Class-I rail service, the Port of Wilmington currently features 10 berths, 1 million square feet of cold storage and ambient warehousing, more than 2,000 reefer plugs, and five cranes across 400 acres.

Diamond State Port Corporation (DSPC) contracted Jacobs to conduct a feasibility study of the proposed Delaware Container Terminal² located alongside the Delaware River at the "Edgemoor Site."

As part of the study, Jacobs requested a full-mission bridge (FMB) Study from MITAGS. This was a follow-up Study to the MITAGS' *FMB Edgemoor Navigation Feasibility Study* conducted in 2018 for Seabury Marine, PRRA, LLC.

The Maritime Institute of Technology and Graduate Studies (MITAGS) provided this simulation using one full-mission bridge simulator (FMB) integrated with one live assist tug bridges, and up to three "Autotugs" operated from the simulator console. The simulation evaluated berthing evolutions under various environmental conditions for winds, currents, and visibilities. A secondary objective was to evaluate river

¹ <https://www.jacobs.com/what-we-do/transportation/ports-maritime-solutions>.

² Formerly known as the Edgemoor Container Terminal.

meeting situations in the main navigation channel adjacent to the proposed container berths. The FMB exercises were conned by Delaware River Pilots, and the live tug bridge operated by a Tug Consultant.

The MITAGS full-mission bridge simulators (FMB) provide unsurpassed visual presentations for the pilots and tug operators. The simulators can be integrated with four or more live assist-tug bridges. The simulator operator is also capable of running up to four assist tugs from the console using the Wärtsilä® Auto-tug® feature. The simulator records the swept paths of the ownship ships and tugs within the exercises.

1.1 MITAGS QUALIFICATIONS AND EXPERIENCE

MITAGS is uniquely qualified to conduct this type of study. Our organization has over 40 years of experience with ship simulators and modeling, and is among the leading maritime training and simulation centers. We have successfully completed hundreds of navigation studies for clients from around the world. We are also the primary training facilities for the International Organizations of Masters, Mates and Pilots. The facilities include nine real-time ship and tug simulators with another six part task ones in two locations (Baltimore, Maryland, and Seattle, Washington State). Both locations have modern observation / briefing rooms, and simulation engineering support teams. Remote viewing, for clients that area unable to attend in person, can be provided.

Past ULCV studies included Virginia (2016, 2017, 2018), Maryland (Port of Baltimore and Chesapeake Bay, 2011, 2015, 2018, 2023), New York (2016-2017, 2021, 2023, 2024), Georgia (Savannah – 2015, 2018, 2020), Florida (PortMiami – 2015 to 2019), Houston, Texas, Port of Los Angeles, California, and the Port of Tacoma, Washington State. International container ports studies included the Port of Itaguaí, (Brazil), Port of Itapoá (Brazil), Superport Acu (Brazil), Port of Antofagasta (Chile), Port of Colombo (Sri Lanka), and the Port of San Antonio (Chile).

For more information on the MITAGS, please visit www.mitags.org, and YouTube® for videos of simulation projects at <http://www.youtube.com/user/MaritimeInstitute>.

1.2 SCOPE OF WORK

The tests used one, full-mission bridge (FMB) integrated with one live tug bridge for ULCV berthing simulations. River meeting scenarios used two, live FMBs integrated in the same exercise. The Delaware Pilots conned the FMBs in the berthing, and meeting scenarios. The study ran for three days (September 16 – 18, 2025) at the MITAGS Linthicum Heights, Campus.

1.2.1 Deliverables

The following services were provided in order to meet the study’s objectives:

- Updated the existing Delaware Container Terminal Visual Database with the latest AutoCAD drawings provided by the client. This included the updated turning basin geometry to incorporate the 2018 Pilots’ recommendations from the 2018 Report; the wharf, and the main Delaware River Navigation Channels.
- Updated the depth contours based on the client soundings. This enhanced the simulation of the “bank effect” experienced by a deep-draft vessel transiting in a restricted channel.

- Provided MITAGS existing Delaware River two-dimensional, depth averaged water current models used in the 2018 Study. (The study also used manual currents for the “extreme” current tests of 3 knots or more.)
- Reprogrammed the MITAGS library’s ULCV hydrodynamic ULCV model (399LOA x 54Beam x 12.8 and 13.7 drafts even keel).
- Reprogrammed the MITAGS library’s VLCC hydrodynamic ship model to client requested draft and trim (partial load to accommodate limited channel depths in the Delaware River).
- Provided the MITAGS library’s PCC hydrodynamic ship model for meeting exercises.
- Reviewed and commented on client’s test matrix.
- Pre-validated database and models prior to the client’s arrival.
- Conducted simulation tests with appropriate support staff of project manager / report writer, shiphandling expert, tug consultant, simulator operator, and engineering support.
- Generated this report of simulation tests with conclusions, recommendations, and supporting data.

1.3 ASSUMPTIONS

MITAGS used the following assumptions for this Study.

1. The client provided the necessary data for programming the terminal and turning basin into the database.
2. The client provided the climatological data on the environmental conditions simulated.
3. In the berthing scenarios, the simulation assumed three assist tugs (with bollard pulls of 65 metric tons) were available, and a fourth tug, if needed, to assist the conning pilot.

1.4 LIMITATIONS OF SIMULATION

Inherent in any simulation is the accuracy of the data programmed into the simulator. The accuracy of the data will have an impact on the validity of the test results. The visual scenes are based on the local electronic chart, Google Earth® images, and client provided data. For confined channel simulations, accurate surveys of the navigation channel contours along with the area outside of the channel is critical. Errors in the electronic charts create errors in the database. This is especially true of electronic charts that are using dated surveys and datum reference other than WGS-84. Errors may also occur when converting AutoCAD® drawings of channels and terminals to the WGS-84 datum reference.

The environmental forces (wind, sea, swell, tide, and current) are separate inputs into the simulator. It is important for the client to provide accurate environmental data of the area to be simulated. The simulator is limited in its ability to model swell “refraction,” and breaking waves.

The fidelity of the hydrodynamic model is dependent on the accuracy of the source data, mathematical formulas, and recommended adjustments provided by subject matter experts (pilots and captains). Models are programmed using the sea trial reports, pilot cards, wheelhouse posters, windage, general arrangement plans, squat tables, mooring arrangement plans, and other data. The model behaviors, as calculated by the simulator, are adjusted based on the consensus opinion of the MITAGS shiphandling

experts and the pilots. Since the adjustments are “subjective,” the recommended model adjustments may vary depending on the collective experience of the testing captains and pilots at each session.

The MITAGS simulators provide an approximation of vessel squat and bank effects in shallow water. However, an adequate safety margin must be maintained in order to account for changes in squat due to vessel speeds, displacements, channel shoaling, and tidal actions.

Model behavior is highly dependent on the accuracy of depth contours (shape), the current and wind flows. In “real world” situations, such forces could vary significantly over the operating area. In addition, the models proposed for these tests are representative of “vessel classes” similar in size and displacement. Vessels of the same class may have significant differences in handling characteristics in real-world conditions.

During berthing exercises, the simulator does not account for the forces on the berth due to a ship rolling in a swell. Damage may occur to the berth in real-world situations with a deeply laden vessel rolling at the berth due to a low swell.

The “auto-tug” feature of the simulator provides a more realistic simulation of the assist tug than vector forces. The hydrodynamic tug model used may also have an impact on the results.

Finally, the test results assume highly experienced pilots and tug masters operating vessels with the current technology. Operational limits should take into account the need for all local pilots and tug masters to gain experience using the new equipment and techniques. Restrictions should be gradually reduced as the pilots and tug masters gain experience.

1.5 SIMULATION FACILITIES AND PROJECT TEAM

The MITAGS Full Mission Ship Simulators (FMSS) have the large bridges and projection areas that enhance the realism of the simulation. In addition to the bridge, the simulator control room has ample space for remote client observation. The full-mission shiphandling simulator meets or exceeds the Det Norske Veritas (DNV) Class A standards. MITAGS is DNV-GL certified as a “Maritime Training Provider, and Maritime Simulator Center.” Please refer to the MITAGS Simulation Capability & Facilities Guide for further details on team member qualifications and simulation capabilities. The simulators are supported by experienced in-house simulation modeling team and ship handling experts.



Figure 1-1: Full-Mission Simulation Projection Theater and Simulator Control Console.

Table 1-1: Support Team

MITAGS Team Member	Position and Duties
Ms. Catherine Gianelloni Academic Director, MITAGS East	Responsible for facility / staff coordination, and scheduling.
Capt. Joseph Harnett, First Class Pilot (Maryland) Master, Oceans Unlimited Tonnage	Responsible for review of test matrix, and validation processes. Support conning pilots during the tests as required.
Ms. Colleen Schaffer, P.E. Master of Science, Civil, Coastal and Ocean Engineering Direct of Simulation Engineering	Project Leader for Study. Responsible for overseeing simulation project and primary author of report on findings, conclusions and recommendations with supporting data.
Mr. Jeremiah Sheahan Simulation Engineer	Responsible for the overall technical support of simulators, bridges, and projection systems.
Mr. Joshua DuPay, Naval Architect Hydrodynamic Ship Modeler	Responsible for the programming of the ship models, databases, and underwater depth contours. Also provides support for simulator projection system and maintenance during tests. Assist in review of report. Simulator operator.
Captain Robert Dempsey Master Mariner	Tug consultant. Provides technical expertise in the safe operation of assist tugs. <i>Tug bridge Captain</i>
Simulator Operator Captain Samantha Dinsmore	Responsible for operating the simulator and AutoTugs.

Additional attendees:
Delaware River Pilots

- Captain Robert Bailey, Delaware Pilots (conning pilot).
- Captain Daniel MacElrevey, Delaware Pilots (conning pilot).

Jacobs Engineering Group, Inc.

- Mr. Duncan Kopp, P.E.
- Mr. Christopher Lawrence, P.E.
- Mr. Alistar Hart
- Mr. Sonny Ruthowski, P.E.
- Mr. Mathew Ninesling

DSPC and Enstructure

- Mr. Brian Devine, P.E. (DSPC)
- Mr. Diego Lopez (Enstructure)

1.6 TIME LINES

The tests were conducted at the MITAGS-East Linthicum Heights, Maryland, USA Campus from Tuesday, September 16, through Thursday, September 18, 2025.

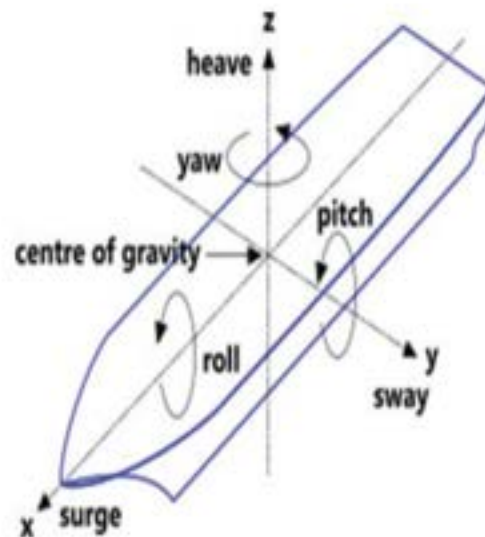


Figure 1-2: Hydrodynamic Model's Six Degrees of Movement

2 VESSEL MODELING

The particulars of the hydrodynamic ship models provided for this Study are listed below.

Table 2-1: Hydrodynamic Models				
	ULCV	VLCC	PCC	Assist Tug
Hydrodynamic Model	Franklin	VLCC Del	Richmond	Edward Moran
Bridge Location	Mid	Aft	Forward	--
Displacement Loaded (tonnes)	252,753 (@12.8)	215,651	37,070	--
Length (meters)	399	332	199.1	30
Beam	54	60	32.2	11.3
Trim	Even	Even	Even	Even
Load Draft 1	13.7	13	9	4.88
Load Draft 2	12.8	--	--	--
Engine kW and Propeller	LSP 1@63,910kW	LSD 1@29,850kW FPP	LSD 1@13,560 FPP	HSD 2 @2,424.5kW ea.
Rudder Type	Balanced	Balanced	Semi Suspended	ASD
Bow Thrusters	2@2,043kW ea.	--	1 Bow @1,400kW 1 Stern @ 1,050kW	--
Bollard Pull	--	--	--	65*

*The tug model *Edward Moran* has a maximum BP of 83 metric tonnes. The tug captain kept the pull at 65mt or below.

The test matrix used assessed the impact of the following forces on the handling of these simulated vessels:

- Prevalent local environmental conditions (waves, wind, currents, and tides).
- Forces created by tugs.
- The reduction in under keel clearance due to squat and interaction.
- Bank effects depending on the channel conditions and ship operating speed.

The hydrodynamic models had six degrees of movement that were recorded.

2.1 PILOT CARDS

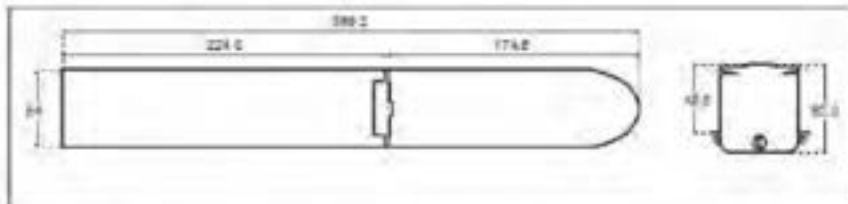
ULCV Pilot Card (13.7 meter draft)

18/02/25 11:31 AM

P&C Cont : Container Berth/Finals_2025_V5 (V3) LHA-00326 (M) NO. 2,205,189,238 (Rev. 08/10/2025) (1/2)

PILOT CARD			
Ship name	Container Ben Franklin 2025 V5 3.0 26.0 *	Date	09/10/2025
IMO Number	9454436	Call Sign	2FYD5
Load Condition	Partial Loaded 1	Year built	2012
Displacement	246115.1 tons	Draft forward	13.7 m / 45 ft 0 in
Deadweight	185199 tons	Draft forward extreme	13.7 m / 45 ft 0 in
Capacity		Draft after	13.7 m / 45 ft 0 in
Air draft	48.6 m / 159 ft 10 in	Draft after extreme	13.7 m / 45 ft 0 in

Ship's Particulars			
Length overall	399.2 m	Type of bow	Bulbous
Breadth	54 m	Type of stern	Tracon
Anchor(s) (No./types)	2 (PortBow / Starboard)		
No. of stacks	17 / 17	(1 stackle ~25 m / 13.7 (athorn))	
Max. rate of heaving, min/m	13.2 / 13.2		



Steering characteristics			
Steering device(s) (type/No.)	Normal balance rudder / 1	Number of bow thrusters	2
Maximum angle	35	Power	2043 kW / 2043 kW
Rudder angle for neutral effect	+0.3 degrees	Number of stern thrusters	N/A
Hard over to over(2 pumps)	13 seconds	Power	N/A
Flanking Rudder(s)	0	Auxiliary Steering Device(s)	N/A

Stopping		Turning circle	
Description	Full Time	Head reach	Ordered Engine: 100%. Ordered rudder: 35 degree
FAH to FAS	345.6 s	6.49 cbls	Advance
HAI to HAS	450.6 s	7.95 cbls	Transfer
SAH to SAS	671.6 s	7.55 cbls	Tactical diameter
			6.29 cbls
			3.16 cbls
			7.87 cbls

Main Engine(s)			
Type of Main Engine	Low speed diesel	Number of propellers	1
Number of Main Engine(s)	1	Propeller rotation	Right
Maximum power per shaft	1 x 63910 kW	Propeller type	FPF
Astern power	85 % ahead	Min. RPM	14
Time limit astern	N/A	Emergency FAH to FAS	31.2 seconds

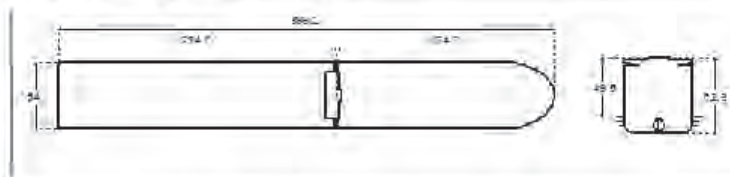
Engine Telegraph Table				
Engine Order	Speed, knots	Engine power, kW	RPM	Pitch ratio
"PSAH"	31.2	60714	84	0.92
"FAH"	24.8	30603	66.8	0.92
"HAH"	18.5	12575	49.7	0.92
"SAH"	12.1	3533	32.6	0.92
"DSAH"	5.7	374	15.4	0.92
"DSAS"	-3.4	660	-13.4	0.92
"SAS"	-7.1	6258	-32.6	0.92
"HAS"	-10.8	22308	-49.8	0.92
"FAS"	-14.6	54324	-67	0.92

ULCV Pilot Card (12.8 meter draft)

10/16/25, 2:30 PM Pilot Card : Container Ben Franklin_2025_V5 (NOY:2.04.4282.0, SHM_FID:2.228.1610.35, Date: 09.10.2025 01:59)

PILOT CARD			
Ship name	Container Ben Franklin	2025 V5 3.0.26.0 *	Date 03.10.2025
IMO Number	9454436	Call Sign 2PYDS	Year built 2012
Load Condition	Partial Loaded 2		
Displacement	252753.52 tons	Draft forward	12.8 m / 42 ft 1 in
Deadweight	185199 tons	Draft forward extreme	12.8 m / 42 ft 1 in
Capacity		Draft after	12.8 m / 42 ft 1 in
Air draft	49.5 m / 162 ft 9 in	Draft after extreme	12.8 m / 42 ft 1 in

Ship's Particulars			
Length overall	399.2 m	Type of bow	Bulbous
Breadth	54 m	Type of stern	Transom
Anchor(s) (No./types)	2 (PortBow / StbdBow)		
No. of shackles	17 / 17	(1 shackle =25 m / 13.7 fathoms)	
Max. rate of heaving, m/min	13.2 / 13.2		



Steering characteristics			
Steering device(s) (type/No.)	Normal balance rudder / 1	Number of bow thrusters	2
Maximum angle	35	Power	2043 kW / 2043 kW
Rudder angle for neutral effect	-0.3 degrees	Number of stern thrusters	N/A
Head over to over(2 pumps)	13 seconds	Power	N/A
Flanking Rudder(s)	0	Auxiliary Steering Device(s)	N/A

Stopping		Turning circle	
Description	Full Time	Head reach	Ordered Engine: 100%, Ordered rudder: 35 degrees
EAH to FAS	349.6 s	8.66 cbls	Advance 6.31 cbls
HAH to HAS	456.6 s	8.11 cbls	Transfer 3.08 cbls
SAH to SAS	682.6 s	7.72 cbls	Tactical diameter 7.68 cbls

Main Engine(s)			
Type of Main Engine	Low speed diesel	Number of propellers	1
Number of Main Engine(s)	1	Propeller rotation	Right
Maximum power per shaft	1 x 63910 kW	Propeller type	RPP
Astern power	85 % ahead	Min. RPM	14
Time limit astern	N/A	Emergency FAH to FAS	31.2 seconds

Engine Telegraph Table				
Engine Order	Speed, knots	Engine power, kW	RPM	Pitch ratio
"FSAH"	31.3	60714	84	0.92
"FAH"	24.9	30603	66.8	0.92
"HAH"	18.5	12575	49.7	0.92
"SAH"	12.1	3533	32.6	0.92
"DSAH"	5.7	374	15.4	0.92
"DSAS"	-3.4	660	-15.4	0.92
"SAS"	-7.2	6258	-32.6	0.92
"HAS"	-11	22308	-49.8	0.92
"FAS"	-14.8	54324	-67	0.92

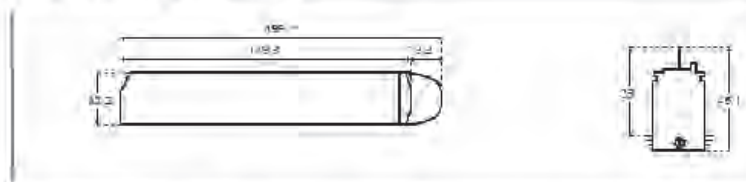
Car Carrier Pilot Card

8/28/05, 10:02 AM

Pilot Card : Car Richmond V3 (NOV; 204,40630, 0MM; RD: 2228,101020, Date: 25.07.2025;11:43)

PILOT CARD			
Ship name	Car Richmond V3	3.0.18.0 *	Date: 25.07.2025
IMO Number	N/A	Call Sign: N/A	Year built: 2005
Load Condition	Full load		
Displacement	37070 tons	Draft forward	9.1 m / 29 ft 11 in
Deadweight	19631 tons	Draft forward extreme	9.1 m / 29 ft 11 in
Capacity		Draft after	9.1 m / 29 ft 11 in
Air draft	36 m / 118 ft 5 in	Draft after extreme	9.1 m / 29 ft 11 in

Ship's Particulars			
Length overall	199.1 m	Type of bow	Bulbous
Breadth	32.2 m	Type of stern	U-shaped
Anchor(s) (No./type)	2 (PortBow / StbdBow)		
No. of shackles	13 / 13	(1 shackle =25 m / 13.7 fathoms)	
Max. rate of heaving, m/min	9 / 9		



Steering characteristics			
Steering device(s) (type/No.)	Semisuspended / 1	Number of bow thrusters	1
Maximum angle	35	Power	1400 kW
Rudder angle for neutral effect	0.47 degrees	Number of stern thrusters	1
Hard over to over(2 pumps)	7 seconds	Power	1050 kW
Flanking Rudder(s)	0	Auxiliary Steering Device(s)	N/A

Stopping			Turning circle	
Description	Full Time	Head reach	Ordered Engine: 100%, Ordered rudder: 35 degrees	
EAH to FAS	309.6 s	6.51 cble	Advance	4.62 cble
EAH to HAS	308.6 s	4.55 cble	Transfer	2.63 cble
SAH to SAS	353.6 s	4.2 cble	Tactical diameter	5.87 cble

Main Engine(s)			
Type of Main Engine	Low speed diesel	Number of propellers	1
Number of Main Engine(s)	1	Propeller rotation	Right
Maximum power per shaft	1 x 13560 kW	Propeller type	FPP
Astern power	75 % ahead	Min. RPM	10
Time limit astern	N/A	Emergency EAH to FAS	57.2 seconds

Engine Telegraph Table				
Engine Order	Speed, knots	Engine power, kW	RPM	Pitch ratio
100%	21.2	10994	102.3	0.98
80%	15.5	5039	77	0.98
60%	11.6	2784	60.9	0.98
40%	9.9	1649	51	0.98
20%	5.9	438	30.2	0.98
-20%	-3.2	738	-30.6	0.98
-40%	-5.4	3003	-51	0.98
-60%	-6.4	5124	-61.4	0.98
-80%	-8	9760	-76.5	0.98



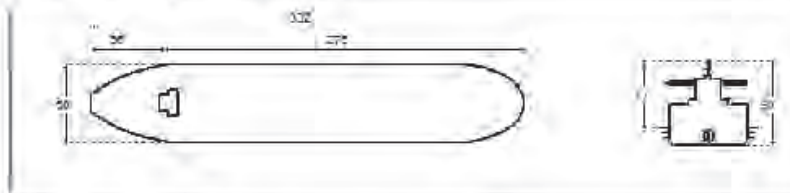
Tanker Pilot Card

8/10/25, 10:04 AM

Pilot Card : VLCC_Del (NF: 2.84.4083.0, SBM_FD: 2.228.1819.23, Date: 14.08.2025:10.08)

PILOT CARD					
Ship name	VLCC Del	3.0.41.0 *	Date	19.09.2025	
IMO Number	N/A	Call Sign	N/A	Year built	N/A
Load Condition	Partial Load				
Displacement	215651.04 tons	Draft forward	13 m / 42 ft 9 in		
Deadweight	169027.28 tons	Draft forward extreme	13 m / 42 ft 9 in		
Capacity		Draft after	13 m / 42 ft 9 in		
Air draft	77 m / 253 ft 3 in	Draft after extreme	13 m / 42 ft 9 in		

Ship's Particulars			
Length overall	332 m	Type of bow	Bulbous
Breadth	60 m	Type of stem	Transom
Anchor(s) (No./type)	2 (Port/Bow / Starboard)		
No. of shackles	14 / 14	(1 shackle ~25 m / 13.7 fathoms)	
Max. rate of heaving, m/min	18 / 18		



Steering characteristics			
Steering device(s) (type/No.)	Normal balance rudder / 1	Number of bow thrusters	N/A
Maximum angle	35	Power	N/A
Rudder angle for neutral effect	0 degrees	Number of stern thrusters	N/A
Hand over to over(2 pumps)	15 seconds	Power	N/A
Flanking Rudder(s)	0	Auxiliary Steering Device(s)	N/A

Stopping			Turning circle	
Description	Full Time	Head reach	Ordered Engine: 100%, Ordered rudder: 35 degrees	
FAH to FAS	660.6 s	12.54 cbls	Advance	6.6 cbls
HAH to HAS	734.6 s	11.71 cbls	Transfer	2.29 cbls
SAH to SAS	894.6 s	11.09 cbls	Tactical diameter	6.7 cbls

Main Engine(s)			
Type of Main Engine	Low speed diesel	Number of propellers	1
Number of Main Engine(s)	1	Propeller rotation	Right
Maximum power per shaft	1 x 29850 kW	Propeller type	FPP
Astern power	50 % ahead	Mtu. RPM	22
Time limit astern	N/A	Emergency FAH to FAS	16.2 seconds

Engine Telegraph Table				
Engine Order	Speed, knots	Engine power, kW	RPM	Pitch ratio
"FSAH"	20.2	20255	76.8	0.8
"FAH"	17.2	12785	63.5	0.8
"EAH"	14	7079	53.2	0.8
"SAH"	11	3616	42	0.8
"DSAH"	7.7	1327	29.3	0.8
"DSAS"	-3.1	2286	-29.1	0.8
"SAS"	-4.1	4515	-37.3	0.8
"HAS"	-4.7	7510	-44.1	0.8
"FAS"	-5.6	11724	-51.4	0.8
"FSAS"	-4.2	15164	-55.5	0.8

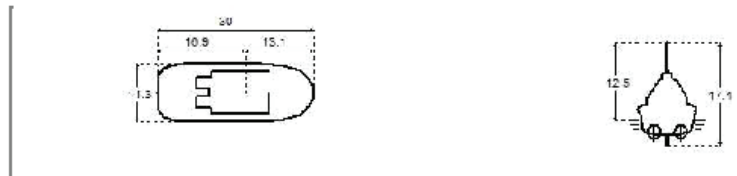
Assist Tug Pilot Card #1

02/09/25, 10:08 AM

Pilot Card : Tug Edward Moran (8366) Vts_G (VET: 2.94.4063.0, SHM_ID: 2.216.1076.208, Date: 26.09.2025:10.08)

PILOT CARD					
Ship name	Tug Edward Moran (8366) Vts_G 3.0.82.0 *			Date	26.09.2025
IMO Number	N/A	Call Sign	N/A	Year built	N/A
Load Condition	Full Load				
Displacement	442.69 tons	Draft forward	4.88 m / 16 ft 0 in		
Deadweight	105 tons	Draft forward extreme	4.88 m / 16 ft 0 in		
Capacity		Draft after	4.88 m / 16 ft 0 in		
Air draft	12.52 m / 41 ft 2 in	Draft after extreme	4.88 m / 16 ft 0 in		

Ship's Particulars			
Length overall	30 m	Type of bow	-
Breadth	11.3 m	Type of stern	U-shaped
Anchor(s) (No./types)	2 (PortBow / StbdBow)		
No. of shackles	11 / 11	(1 shackle =25 m / 13.7 fathoms)	
Max. rate of heaving, m/min	10.2 / 10.2		



Steering characteristics			
Steering device(s) (type/No.)	Azimuth thruster / 2	Number of bow thrusters	N/A
Maximum angle	180	Power	N/A
Rudder angle for neutral effect	0 degrees	Number of stern thrusters	N/A
Hard over to over(2 pumps)	6 seconds	Power	N/A
Flanking Rudder(s)	0	Auxiliary Steering Device(s)	N/A

Stopping		Turning circle	
Description	Full Time	Head reach	Ordered Engine: 100%, Ordered rudder: 35 degrees
FAH to FAS	10.7 s	0.2 cbls	Advance
EAH to HAS	10.7 s	0.18 cbls	Transfer
SAH to SAS	10.7 s	0.17 cbls	Tactical diameter
			0.21 cbls
			0.08 cbls
			0.2 cbls

Main Engine(s)			
Type of Main Engine	High speed diesel	Number of propellers	2
Number of Main Engine(s)	2	Propeller rotation	Left/Right
Maximum power per shaft	2 x 2424.5 kW	Propeller type	Azimuth FFP
Astern power	0 % ahead	Min. RPM	600
Time limit astern	N/A	Emergency FAH to FAS	15.6 seconds

Engine Telegraph Table				
Engine Order	Speed, knots	Engine power, kW	RPM	Pitch ratio
"100%"	12.5	4607	235	1
"90%"	12.5	3548	215.4	1
"80%"	11.7	2774	198.5	1
"70%"	10.8	2167	182.8	1
"60%"	10	1735	169.7	1
"50%"	9.6	1365	156.7	1
"40%"	9.2	1201	150.1	1
"30%"	8	790	130.6	1
"20%"	6.7	404	104.5	1
"10%"	5.6	217	84.9	1

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1/1

3 DATABASE DEVELOPMENT

The MITAGS Simulation Engineering Department used proprietary Wartsila® modeling software that integrates the simulator's operating system, visual database, and vessel modeling. This approach provided the highest simulation fidelity levels. The software package included:

- Simulator Operating System: *NTPro – Version 6*
- Visual Database Modeling: *Model Wizard 6.70.001.026*
- Ship / Tug Modeling: *Virtual Shipyard 2 2.94.4030.0*

Model Wizard imported the data from the electronic chart display information system (ECDIS). The software transferred ECDIS data into simulator database elements, and links the visual and radar databases. The ECDIS data transferred included:

- Hydrographic: depth points, depth lines, depth contours, drying areas, three dimensional (3D) channel bottom.
- Landmass: 3D terrain, DEM data, coastlines, islands, pier structures, etc.
- Navigation Aids: buoys, ranges, and lighthouses, and Navigation Signals: color, light timing, light sector, etc.

The database was then overlaid with the proposed terminal design, turning basin geometry, the navigation channels, and any other navigationally significant feature.

3.1 UNDERWATER CONTOURS

The first stage of the programming created the underwater contours based on the electronic chart data for that area from the Wärtsilä® World Library. The modelers then programmed additional bathymetric data to create a more realistic bank slope and contours. The bathymetric data coordinates were programmed in latitude and longitude referenced to WGS-84 datum. (This insured that the visuals line up with the ECDIS and RADAR display databases.) The coordinates' format was degrees and decimal degrees to six places.



Figure 3-1: Google Earth® Image of Proposed Delaware Container Terminal Location.



Figure 3-2: Existing Main Navigation Channel Overlaid with Proposed Berth Pocket, and Expansion of Turning Basin depth to 45 ft. from 2018 Design Consideration Comments.



Figure 3-3: Main Navigation Channel of Terminal.

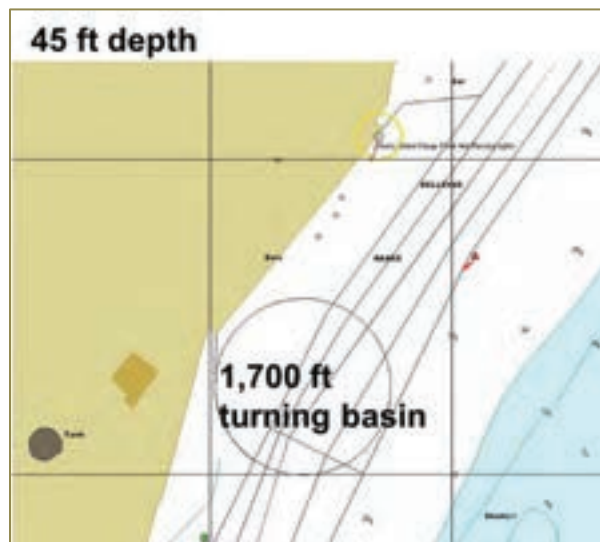


Figure 3-4: Close up of Turning Basin off Berths.

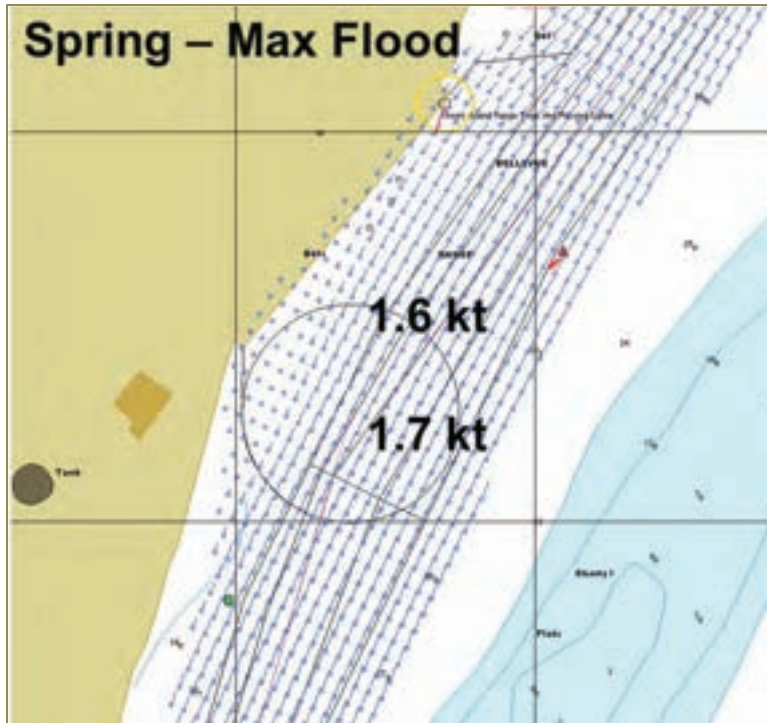


Figure 3-5: Sample of 2-D, depth averaged water current models for off Terminal for Max Flood Spring Tide.

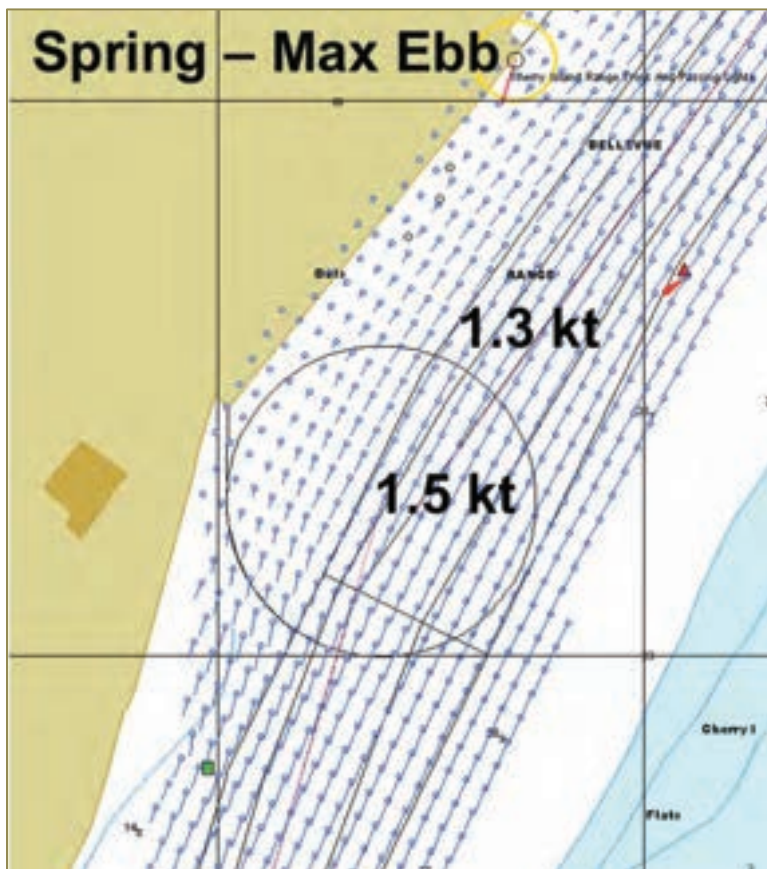


Figure 3-6: Sample 2-D, depth averaged water current models off Terminal for Max Ebb Spring.

The following is a summary 2018 Edgemoor Container Terminal Study (Section 5 "Conclusion Summary," Pages 27-28).

The purpose of this study was to validate the design of the Edgemoor Terminal, and turning basin. Throughout the study, 29 runs were completed including 19 inbound, 4 outbound, and 6 passing vessel runs. In all of the runs, the ships transited within the channel limits including the existing and proposed terminal limits as shown.

The Delaware River Pilots, provided the following additional recommendations

ENVIRONMENTAL CONDITIONS:

The current environmental limitations apply:

- Wind 20 kts. or less
- High tide for inbound transits

5.1.3 PASSING VESSELS:

Of the 6 passing vessel tests, the distance between the vessels when passing ranged from 290 ft. to 425 ft. allowing safe passing distances.

No adverse effects occurred; the addition of the Edgemoor Terminal and resultant deepening reduces the bank effect in the channel adjacent to the terminal making navigation safer.



5.1.4 FUTURE CONSIDERATIONS

Berthing procedures, tug power required, and emergency procedures will be developed in future simulation studies. The simulation results indicated the proposed Edgemoor Terminal would have minimal impact on ships as they transit the existing navigation channel.

DESIGN CONSIDERATIONS

The design should consider deepening the red hatched area to provide additional maneuvering space as the inbound vessels turn in the turning basin.

Note:

This 2018 Design Consideration (recommended by the pilots) was programmed into the simulator for the 2025 Study.



5 2025 STUDY OBJECTIVES AND METHODOLOGY

This Study expanded on the 2018 results by adding the following scenarios:

1. Berthing evolutions with a larger ULCV (399x54x 12.8 & 13.7 drafts versus 366x48 in 2018).
2. Meeting situations in the main nav. channel off proposed terminal with larger ULCVs; ULCV – Tanker; ULCV – PCC.
3. Evaluated transits with / berthing in night / reduced visibility conditions; and extreme current conditions (up to 4 knots);
4. Transit from berth area from up river to the Marcus Hook Anchorage (emergency scenario).
5. Subsequent transit from Marcus Hook Anchorage to DCT berth.
6. Confirmed tug package (type, configuration, bollard pulls).

Note that the Delaware Pilots indicated that the larger ULCVs (399x54) are already transiting the Delaware River.

5.1 EXERCISE ENVIRONMENTAL SETUPS

- Wind Directions from 090, 270, and 315 degrees true.
- Wind Speeds: 0 to 25 knots.
- Currents: from zero to 4 knots (extreme).
- Visibility: Day; Night, and Reduced Visibility Conditions.

The conning pilot had up to four ASD assist tugs with up to 65 metric tonnes of bollard pull available. One live tug bridge was integrated with the FMB and operated by an experienced ASD assist tug captain. Up to three other assist tugs were operated from the simulator console using the simulator's "AutoTug" feature.

5.1.1 Recording of Data

Select screen shots summarizing each exercise were recorded for the report. In addition, the entire exercise sequence were recorded for future review with client. Select excerpts of runs can be converted into Window® Media Files.

A detailed test matrix was maintained summarizing the simulation exercise set-up conditions. After each run, the conning pilot filled out an individual run questionnaire. This information was compiled to support the report's findings, conclusions, and recommendations. In the interest of time, exercises were stopped if the purpose and objective had been achieved.

6 FINAL TEST MATRIX

Run	Date	Ship Model	Draft (Ft)	Initial Direction of Travel	Pilot	DCT Berthing	Wind		Wave (Same Dir as Wind)	Start Condition	Current	Daylight	Visibility	Tide (Ft above MLLW)	Tugs	Notes
							Speed (Knots)	Dir from from (deg N)								
<i>Single Model Runs</i>																
1	9/16/25	Container - ULCV(397m LOA, 56.4m Beam)	45	In	Bob	Bow South	15	315	0.1m	Max Flood	Typical	Day	Good	5	3 x 65T BP	Calibration & Familiarity Run
2	9/16/25	Container - ULCV(397m LOA, 56.4m Beam)	45	In	Dan	Bow South	25	90	0.1m	Max Flood	Typical	Day	Good	5	3 x 65T BP	Typical Conditions, Extreme Draft
3	9/16/25	Container - ULCV(397m LOA, 56.4m Beam)	45	In	Bob	Bow South	25	270	0.1m	Max Flood	Typical	Day	Good	5	3 x 65T BP	Typical Conditions, Extreme Draft
4	9/16/25	Container - ULCV(397m LOA, 56.4m Beam)	45	In	Dan	Bow South	25	315	0.1m	Max Flood	Typical	Day	Good	5	3 x 65T BP	Typical Conditions, Extreme Draft
5	9/16/25	Container - ULCV(397m LOA, 56.4m Beam)	45	Out	Bob	Bow South	25	315	0.1m	Max Ebb	Typical	Day	Good	5	3 x 65T BP	Typical Conditions, Extreme Draft
6	9/16/25	Container - ULCV(397m LOA, 56.4m Beam)	45	Out	Dan	Bow South	25	270	0.1m	Max Ebb	Typical	Day	Good	5	3 x 65T BP	Typical Conditions, Extreme Draft
7	9/16/25	Container - ULCV(397m LOA, 56.4m Beam)	45	Out	Bob	Bow South	25	90	0.1m	Max Ebb	Typical	Day	Good	5	3 x 65T BP	Typical Conditions, Extreme Draft

8	9/16/25	Container - ULCV(397m LOA, 56.4m Beam)	45	In	Dan	Bow South	25	270	0.1m	Max Flood	Extreme 4 Knots	Day	Good	5	4 x 65T BP	Typical Conditions, Extreme Currents
9	9/16/25	Container - ULCV(397m LOA, 56.4m Beam)	45	In	Bob	Bow South	25	270	0.1m	Max Flood	Typical	Day	0 nm	5	3 x 65T BP	Typical Conditions, Low Visibility
10	9/17/25	Container - ULCV(397m LOA, 56.4m Beam)	45	Out	Dan	Bow South	25	270	0.1m	Max Ebb	Typical	Day	0 nm	5	3 x 65T BP	Typical Conditions, Low Visibility
11	9/17/25	Container - ULCV(397m LOA, 56.4m Beam)	45	In	Bob	Bow South	25	270	0.1m	Max Flood	Typical	Night	Good	5	3 x 65T BP	Typical Conditions, Night Run
12	9/17/25	Container - ULCV(397m LOA, 56.4m Beam)	45	Out	Dan	Bow North	25	270	0.1m	Max Ebb	Typical	Night/Dark	Good	3	3 x 65T BP	Typical Conditions, Night Run
13	9/17/25	Container - ULCV(397m LOA, 56.4m Beam)	45	Out	Bob	Bow North	25	90	0.1m	Max Flood	Typical	Night/Dark	Good	3	3 x 65T BP	Typical Conditions, Night Run
14	9/17/25	Container - ULCV(397m LOA, 56.4m Beam)	45	In	Dan	Bow South	25 with squall	270	0.1m	Max Flood	Typical	Day	Good	3	3 x 65T BP	Typical Conditions, Squall event
15	9/17/25	Container - ULCV(397m LOA, 56.4m Beam)	45	In	Bob	Anchorage	25	315	0.1m	Max Flood	Typical	Day	Good	3	None	Bail Out to Anchorage
16	9/17/25	Container - ULCV(397m LOA, 56.4m Beam)	45	In	Dan	Bow South	25	315	0.1m	Max Flood	Typical	Day	Good	3	3 x 65T BP	Transited from North to berth
17	9/17/25	Container - ULCV(397m LOA, 56.4m Beam)	45	In	Bob	Bow South	0	0	0.1	Flood	Extreme 4 Knots	Day	Good	3	4 x 65T BP	Extreme currents
18	9/17/25	Container - ULCV(397m LOA, 56.4m Beam)	42	In	Dan	Bow North	25	270	0.1m	Max Ebb	Typical	Night	Good	3	4 x 65T BP	Typical Conditions, Night Run

Run	Date	Ship Model	Draft (ft)	Initial Direction of Travel	Pilot	DCT Berthing	Wind		Wave (Same Dir as Wind)	Start Condition	Current	Daylight	Visibility	Tide (Ft above MLLW)	Tugs	Notes
							Speed (Knots)	Dir from (deg N)								
Meeting Vessel Runs																
19	9/17/25	Container - ULCV(397m LOA, 56.4m Beam)	45	In	Dan	N/A	25	90	0.1m	Max Flood	Typical	Day	Good	3	N/A	Typical Conditions
		Container - ULCV(397m LOA, 56.4m Beam)	45	Out	Bob	N/A	25	315	0.1m	Max Ebb	Typical	Day	Good	5	N/A	
20	9/18/25	Container - ULCV(397m LOA, 56.4m Beam)	45	In	Dan	N/A	25	315	0.1m	Max Ebb	Typical	Day	Good	5	N/A	Typical Conditions
		Container - ULCV(397m LOA, 56.4m Beam)	45	Out	Bob	N/A	25	315	0.1m	Max Ebb	Typical	Night	Good	5	N/A	
21	9/18/25	Container - ULCV(397m LOA, 56.4m Beam)	45	In	Dan	N/A	25	315	0.1m	Max Ebb	Typical	Night	Good	5	N/A	Typical Conditions
		Container - ULCV(397m LOA, 56.4m Beam)	45	Out	Bob	N/A	25	315	0.1m	Max Ebb	Typical	Night	Good	5	N/A	
22	9/18/25	Container - ULCV(397m LOA, 56.4m Beam)	45	In	Dan	N/A	25	315	0.1m	Max Ebb	Typical	Night	Good	5	N/A	Typical Conditions/re-run due to nav lights

27	9/18/25	Container - ULCV(397m LOA, 56.4m Beam)	45	In	Dan	N/A	25	90	0.1m	Max Ebb	Extreme 4 Knots	Day	Good	5	N/A	Typical Conditions, extreme current
		Container - ULCV(397m LOA, 56.4m Beam)	45	Out	Bob	N/A					N/A	N/A				
28	9/18/25	Container - ULCV(397m LOA, 56.4m Beam)	45	In	Dan	N/A	25	315	0.1m	Max Ebb	Typical	Day	0 nm	5	N/A	Typical Conditions, low visibility
		Suezmax Tanker (275m LOA, 50.0m Beam)	42	Out	Bob	N/A					N/A					
29	9/18/25	Container - ULCV(397m LOA, 56.4m Beam)	45	In	Dan	N/A	25	90	0.1m	Max Flood	Typical	Day	0 nm	5	N/A	Typical Conditions, low visibility
		Suezmax Tanker (275m LOA, 50.0m Beam)	42	Out	Bob	N/A					N/A					
30	9/18/25	Container - ULCV(397m LOA, 56.4m Beam)	45	In	Dan	N/A	25	90	0.1m	Max Flood	Typical	Day	0 nm	5	N/A	Typical Conditions, low visibility
		Pure Car Carrier (235m LOA, 32.2m Beam)	29.5	Out	Bob	N/A					N/A					
31	9/18/25	Container - ULCV(397m LOA, 56.4m Beam)	45	In	Dan	N/A	25	270	0.1m	Max Ebb	Typical	Day	0 nm	5	N/A	Typical Conditions, low visibility
		Pure Car Carrier (235m)	29.5	Out	Bob	N/A					N/A					

7 SUMMARIES AND CONCLUSIONS

The purpose of this study was to further evaluate the design of the Delaware Container Terminal (aka Edgemoor Terminal) turning basin and berths in consideration of a larger design vessel and in specific response to certain public comments as part of the USACOE Permit Process. 35 Runs were completed including 12 inbound; 16 outbound vessels runs to / from the terminal, and an additional 17 passing vessel runs on the Federal Channel off the terminal. Of these, results are not considered from 3 runs as discussed below:

- Run 1 – Run 1 was a familiarity and model calibration run. No conclusions are drawn from this run.
- Run 23 – During Run 23, there was a malfunction in the model. No conclusions are drawn from this run
- Run 24 – During Run 24, the Pilots observed the vessel steering did not respond at dead-slow ahead speeds compared to vessels. Run 24 was repeated as Run 25 with measures taken to address vessel response.

In all of the remaining runs, the ships transited within the proposed channel and terminal berth limits except for runs number 8 and 27. These runs had 4 knot currents and 25 knot winds. MITAGS notes that this wind speed is outside of current environmental limitations stipulated in the MAC transit advisory. Further, Pilots have reported that they have not experienced a current of 4 knots on the river, and would not attempt these operations in the event currents approaching these velocities were observed.

Further, Pilots have indicated that, in the event extreme conditions were to develop, the DCT location provides an alternative to “bail-out”. Specifically, vessels could proceed to the Marcus Hook Anchorage, turn and return to DCT from the north side. This bail-out was modeled (Runs 15 and 16) and considered very safe. Pilots note this opportunity does not exist for other terminals upriver from Marcus Hook.

Passing Vessels

Other than Run 27 (discussed above), all passing vessel runs were successful transits, but with varying levels of difficulty. Consistent with the 2018 evaluation, MITAGS finds less adverse effects to passing vessels from the construction of DCT. The associated deepening reduces bank effect in the channel adjacent to the terminal making navigation safer.

The simulation results indicate the proposed DCT channel design provides sufficient consideration for vessel turning and berthing. The results further indicate that the DCT would have minimal impact on ships as the transit the navigation channel. This Study findings support the 2018 report conclusions and recommendations.

8 PILOTS AND TUG CAPTAINS EVALUATIONS

Run Number	Run setup	Pilot Name (Captain):	Were you able to successfully make the transit? Why or why not?	How many tugs did you use during the transit?	Was the tug power adequate?	Overall difficulty of maneuver	Overall safety of run	Additional comments:
1		Bob Bailey	No, current had no effect and depths not accurate based on channel line	3	Yes			Unexpected current and channel depths (Author Note: This was a calibration and familiarization run. Not used in the assessment.)
2		MacElrevey	Yes	3	Yes	3 = Difficulty of an average transit	5 = Very safe	Tug power & number was good for this transit. Never ended max power. Felt that it was very controlled.
3		Bob Bailey	Yes - Adequate tug speed thruster	3	Yes	4	5 = Very safe	Wind appeared to dissipate as approaching dock
4		MacElrevey	Yes	3	Yes	2	3 = Average safety	Wind was strong for 3 tugs. Would normally have 4 available in these conditions, but 3 were sufficient.
5		Bob Bailey	Yes - No concerns	3	Yes	5 = Not difficult	5 = Very safe	
6		D. MacElrevey	Yes	3 - 2 would have been fine	Yes	3 = Difficulty of an average transit	5 = Very safe	
7		Bob Bailey	Yes - adequate tug	3	Yes	5 = Not difficult	5 = Very safe	Normal situation

8	D. MacElrevey	No - too much current, VSL would not turn around	4	No	1 = Most difficult	1 = Unsafe	Transit was outside normal safety parameters - VSL would not have been allowed to proceed under these conditions <i>(Author Notes: This was an extreme currents for the record. Pilots advise that this condition has not been seen and, if it occurred, transit would not be attempted.)</i>
9	Bob Bailey	Yes	3	Yes	5 = Not difficult	5 = Very safe	Zero visibility - No issues
10	D. MacElrevey	Yes - easily cleared berth & kept vessel in channel	2 unberthing, 1 escort in channel	Yes	5 = Not difficult	5 = Very safe	Would not normally sail in poor visibility, but the exercise went smoothly.
11	Bob Bailey	Yes nighttime - No issues	3	Yes	5 = Not difficult	5 = Very safe	Normal docking - 3rd tug had issues - no issues docking
12	D. MacElrevey	Yes	3	Yes	3 = Difficulty of an average transit	3 = Average safety	
13	Bob Bailey	Yes - simulated swinging to port - unusual turning preference but wanted to show it's certainly possible Yes, tug & ship's engine were sufficient to counter effects of squall	3	Yes	5 = Not difficult	5 = Very safe	No issues - transit went as planned
14	D. MacElrevey	Yes	3	Yes	2	3 = Average safety	
15	Bob Bailey	Yes	0	N/A	5 = Not difficult	5 = Very safe	Normal use of bail out point at Marcus Hook

#16, outbound from Marcus Hook - Dock bow downriver (S) with flood current	D. MacElrevey	Yes	3	Yes - only used 2 going alongside	5 = Not difficult	5 = Very safe
Yes - Significant use of tugs with unrealistic 4-knot current						
17	Bob Bailey	Yes	4	Yes	4	3 = Average safety Despite unrealistic current of 4kn - Transit was safely and effectively done
18	D. MacElrevey	Yes	4 Avail - worked 2 tugs	Yes	5 = Not difficult	5 = Very safe
19	Meeting Bob Bailey	Yes	0	N/A	5 = Not difficult	5 = Very safe
19	D. MacElrevey	Yes	None	N/A	2	3 = Average safety Not normal to meet in a turn.
20	Meeting Bob Bailey ebb, day	Yes	0	N/A	3 = Difficulty of an average transit	3 = Average safety Making adjustments to simulation and faster speed maneuver
20	Meeting D. MacElrevey	Yes	0	N/A	3 = Difficulty of an average transit	3 = Average safety
21	Meeting night ebb	Yes	No	N/A	3 = Difficulty of an average transit	3 = Average safety Running lights were not on to begin, caused issues for me from beginning
21	Meeting D. MacElrevey	Yes	0	N/A	3 = Difficulty of an average transit	3 = Average safety

22	Nigh Ebb	Bob Bailey	Yes	0	N/A	3 = Difficulty of an average transit	3 = Average safety	Starting speeds & locations made for a different meeting - not meeting in turn
22		DMacElrevey	Yes	0	N/A	3 = Difficulty of an average transit	3 = Average safety	
23								No evaluation from pilot. Grounded
23		DMacElrevey	Yes	0	N/A	3 = Difficulty of an average transit	3 = Average safety	(Author Note: model malfunction. Run not included in the assessment.)
24		Bob Bailey	Yes	0	N/A	3 = Difficulty of an average transit	3 = Average safety	Models rudder seaman very slow to be effective on DSA. (Author Note: model malfunction. Run not included in the assessment.)
24		D. MacElrevey	Yes	0	N/A	3 = Difficulty of an average transit	3 = Average safety	Model does not steer as well in the simulator on dead slow compared to vessels experienced in real life. Need to use engine RPMs to get better vessel response. (Author Note: model malfunction. Run not included in the assessment.)
25		Bob Bailey	Yes - Use of kick ahead has solved all rudder concerns	0	n/a	3 = Difficulty of an average transit	3 = Average safety	Slow speeds are ideal - Use of rudder on DSA is minimal on model but very brief kicks to slow (3 seconds) immediately effective for steering

25	D. MacElrevey	Yes	0	N/A	3 = Difficulty of an average transit	3 = Average safety	Kicking engine RPMs up briefly made the model respond quickly without increasing vessel speed.
26	Bob Bailey	Yes - Slow speed - kicking engine option for rudder control	0	N/A	3 = Difficulty of an average transit	2	Excessive rudder used with minimal effect
26	DMacElrevey	Yes	0	N/A	2	3 = Average safety	Vessels met in a safe area of the turn - widest portion of the channel. 4 knots current unrealistic and effectively difficult to make safe maneuvers. <i>(Author Note: This was an extreme current for the record. Pilots advise that this condition has not been seen, and, if occurred, transit would not be attempted.)</i>
27	Bob Bailey	No - other ship speed sent me sideways outside channel	No	M/A	1 = Most difficult	1 = Unsafe	<i>(Author Note: This was an extreme current for the record. Pilots advise that this condition has not been seen, and, if occurred, transit would not be attempted.)</i>
27	DMacElrevey	No - unrealistic conditions- not ever going to experience 4 knots	0	N/A	1 = Most difficult	1 = Unsafe	<i>(Author Note: This was an extreme current for the record. Pilots advise that this condition has not been seen, and, if occurred, transit would not be attempted.)</i>
28	28, 0 vis, 315 degrees, flood Bob Bailey	Yes	0	N/A	2	1 = Unsafe	Challenging maneuver - with slow responding tanker
28	DMacElrevey	Yes	0	N/A	3 = Difficulty of an average transit	4	

29	Bob Bailey	Yes but extremely difficult to turn onto range and stop rate or turn astern on the range	0	N/A	1 = Most difficult	1 = Unsafe	Couldn't break flood current on STBD bow after turn
29	DMacEirevey	Yes	0	N/A	2	2	Poor visibility.
30	Bob Bailey	Yes - Car ship much more capable of this turn with conditions and meeting arrangement	0	N/A	3 = Difficulty of an average transit	3 = Average safety	Wind from 090 was as expected
30	DMacEirevey	Yes	0	N/A	3 = Difficulty of an average transit	2	Poor visibility. Meeting was successful. Both vessels met in the safest point of the turn.
31	Bob Bailey	Yes	0	N/A	2	2	Strong wind @ 270 degrees made car ship difficult to handle
31	DMacEirevey	Yes	0	N/A	3 = Difficulty of an average transit	2	Poor visibility. Vessels met in widest area of channel.
32	Bob Bailey	Yes	0	N/A	2	2	Slow speeds - kicks to steady and turn
32	DMacEirevey	Yes	0	N/A	2	2	Poor visibility. Vessels meet at a good spot-widest area of the turn.
33	Bob Bailey	Yes	0	N/A	2	2	
33	DMacEirevey	Yes	0	N/A	3 = Difficulty of an average transit	4	
34	Bob Bailey	Yes	0	N/A	1 = Most difficult	1 = Unsafe	Extreme challenge with 090 wind and ebb
34	DMacEirevey	Yes	0	N/A	2	2	Poor visibility
35	Bob Bailey	Yes	0	N/A	2	2	
35	DMacEirevey	Yes	0	N/A	3 = Difficulty of an average transit	2	Poor visibility. Meeting occurred in a good area of the channel.

9 RUN TRACK PLOTS



Figure 9-1: Run 1 (Calibration and familiarization run. Not included in the assessment.)

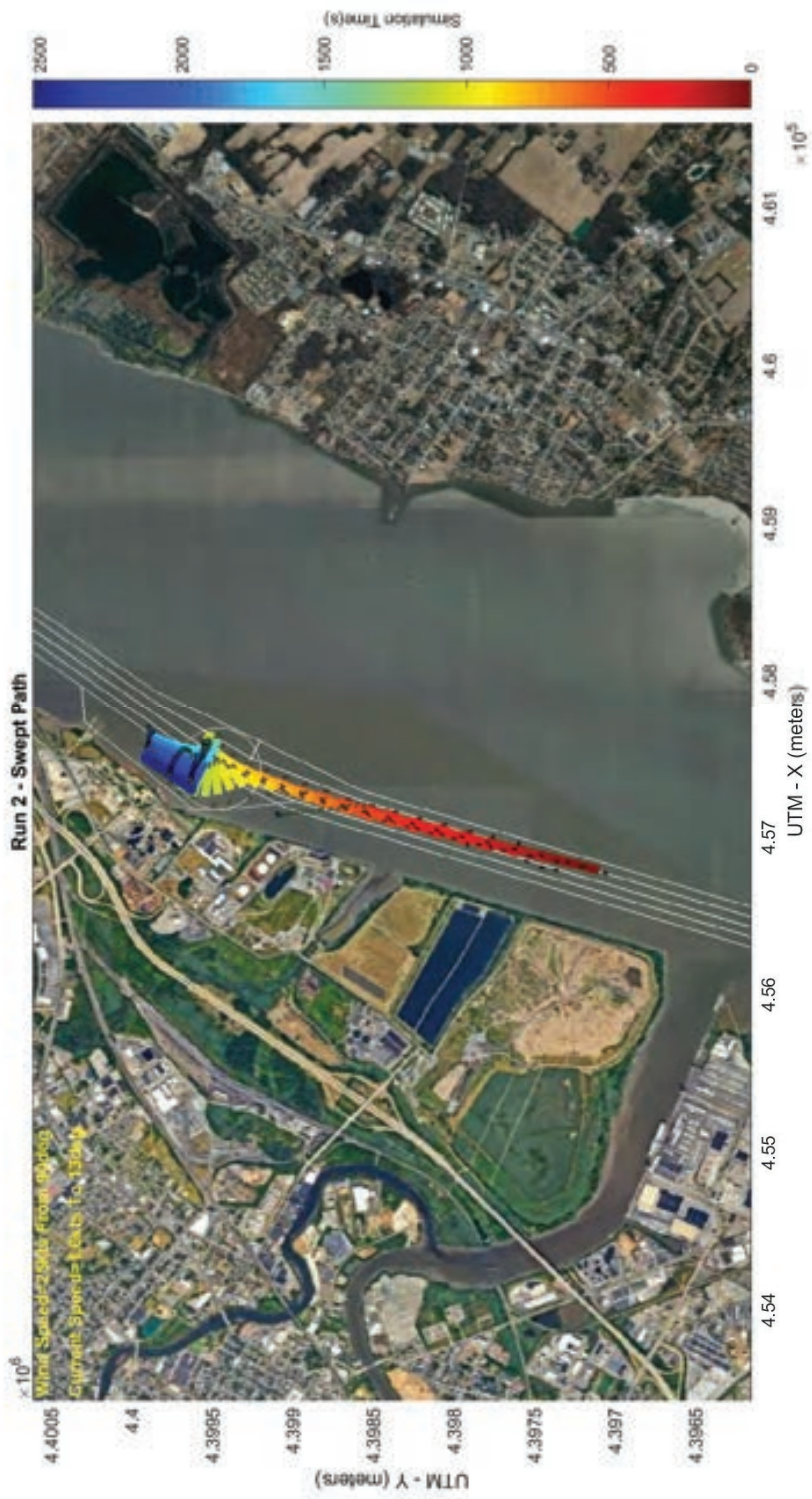


Figure 9-2: Run 2



Figure 9-3: Run 3

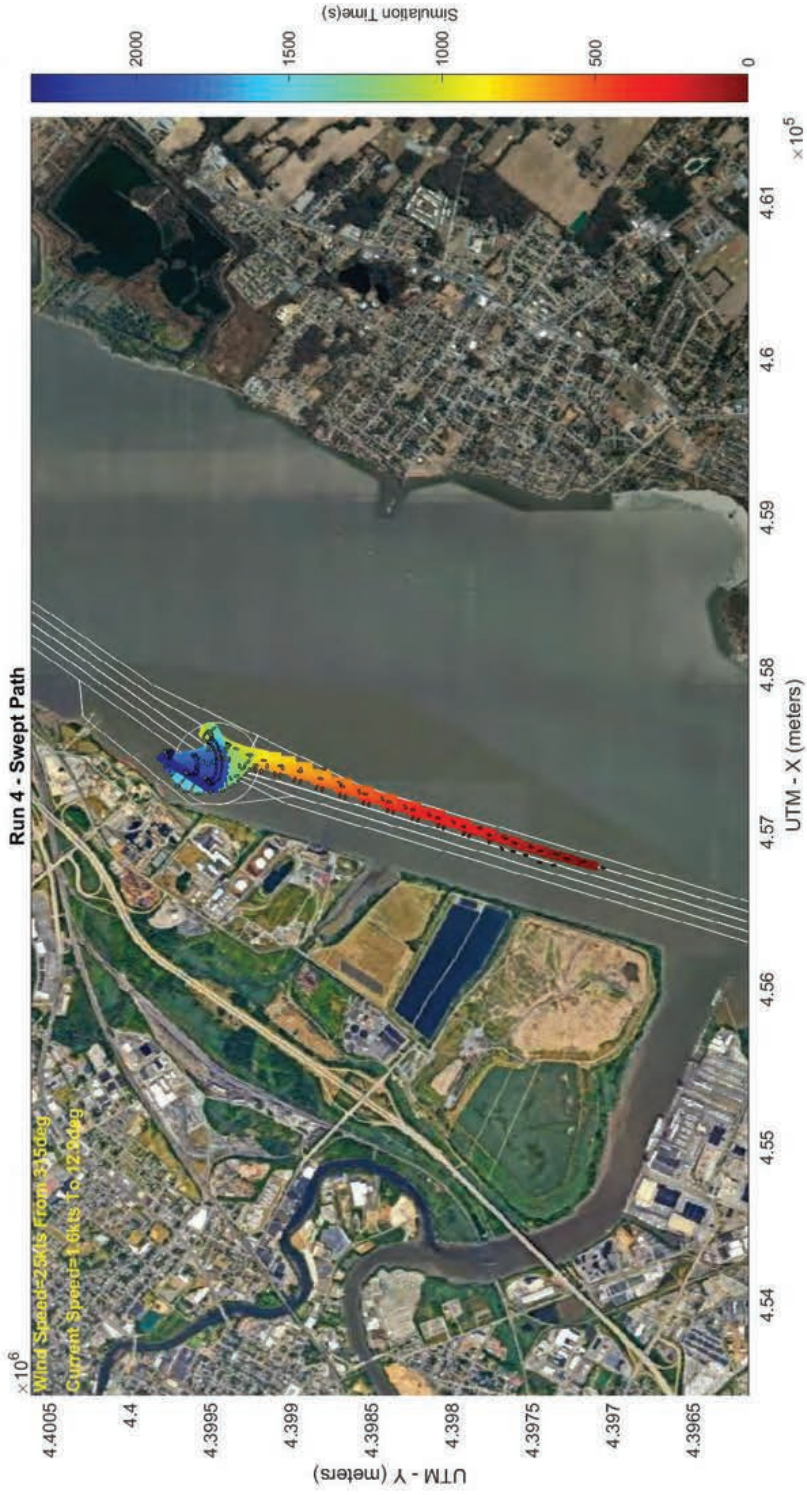


Figure 9-4: Run 4



Figure 9-5: Run 5



Figure 9-6: Run 6



Figure 9-7: Run 7

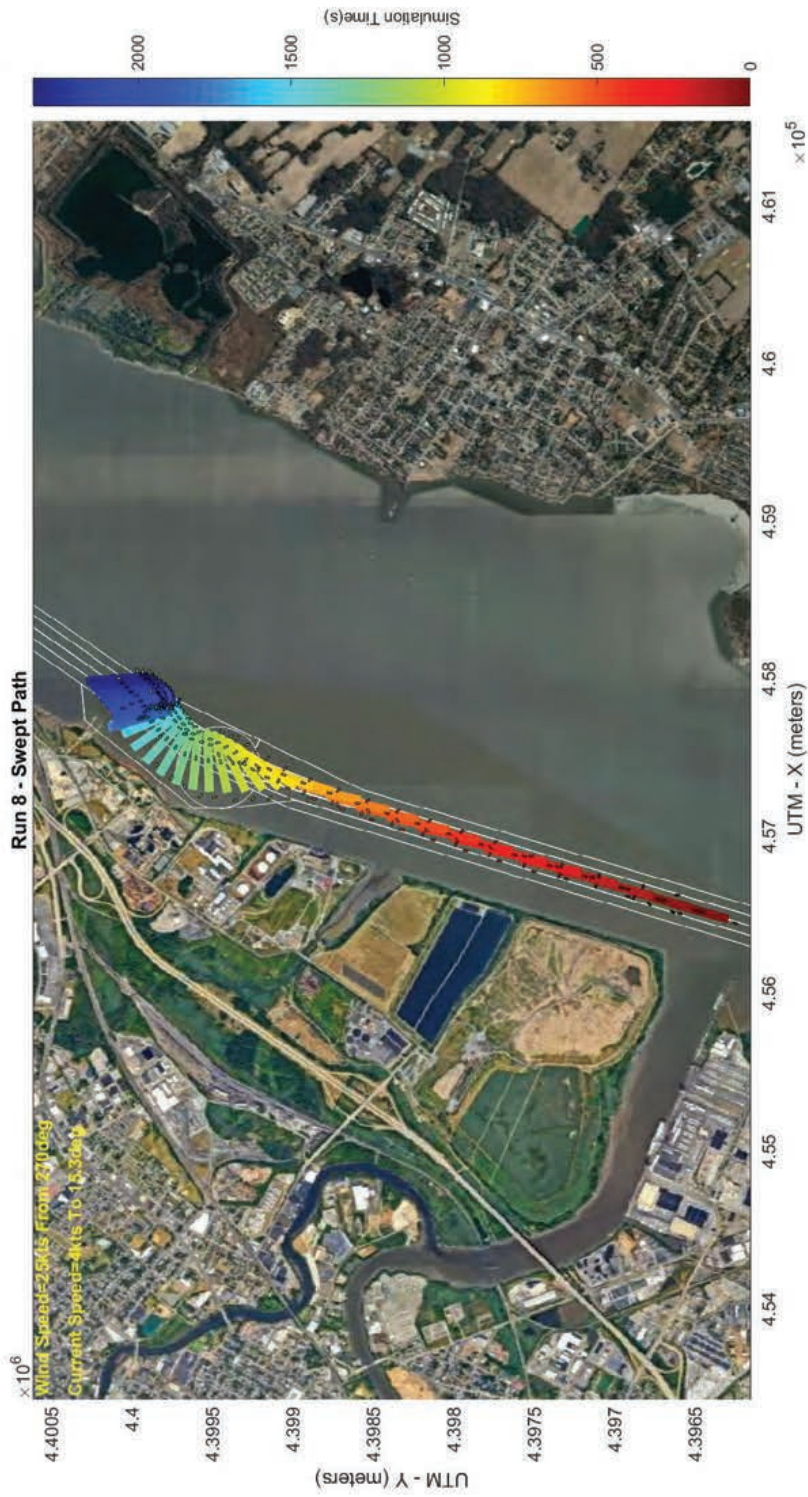


Figure 9-8: Run 8

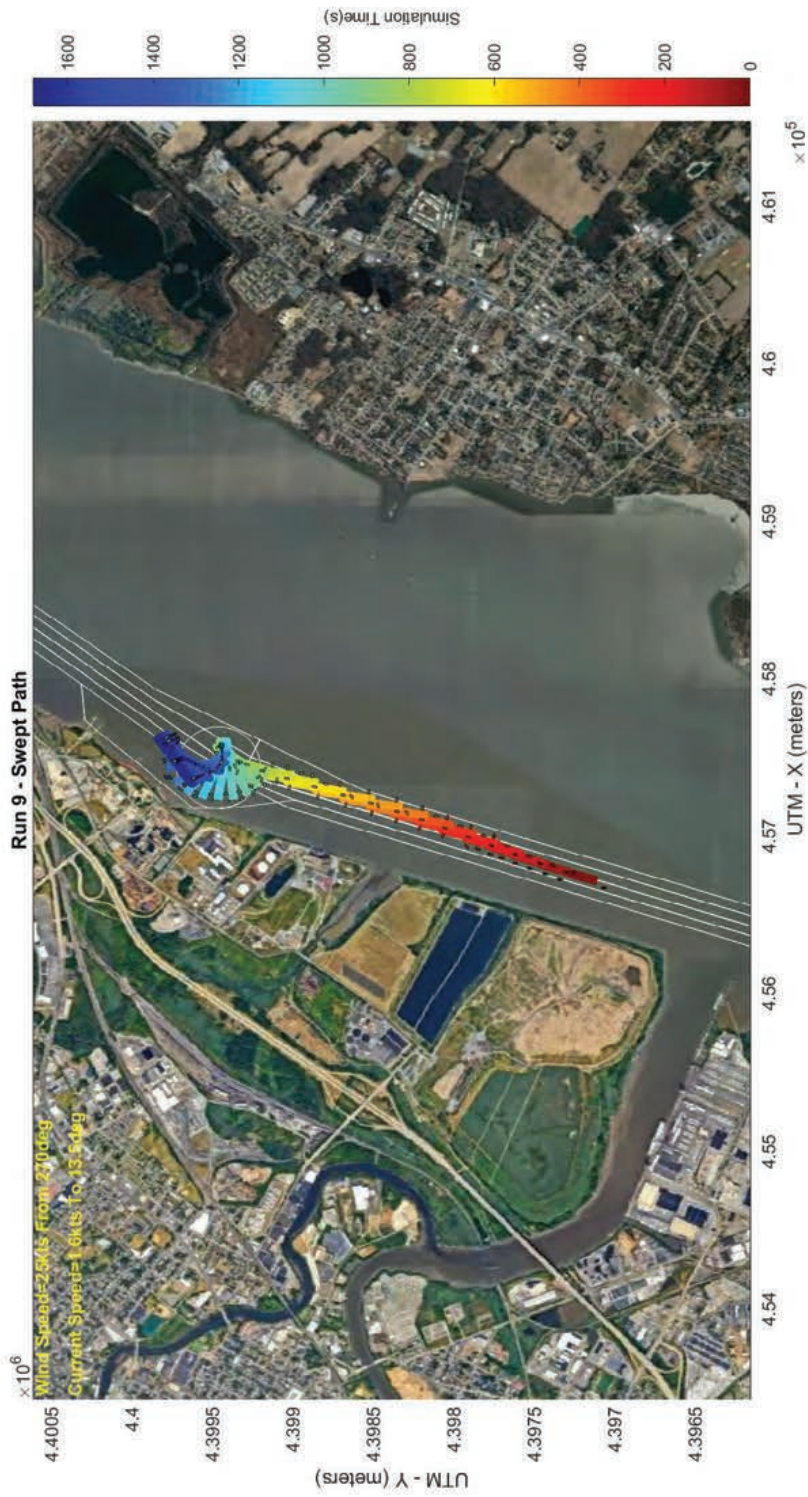


Figure 9-9: Run 9



Figure 9-10: Run 10

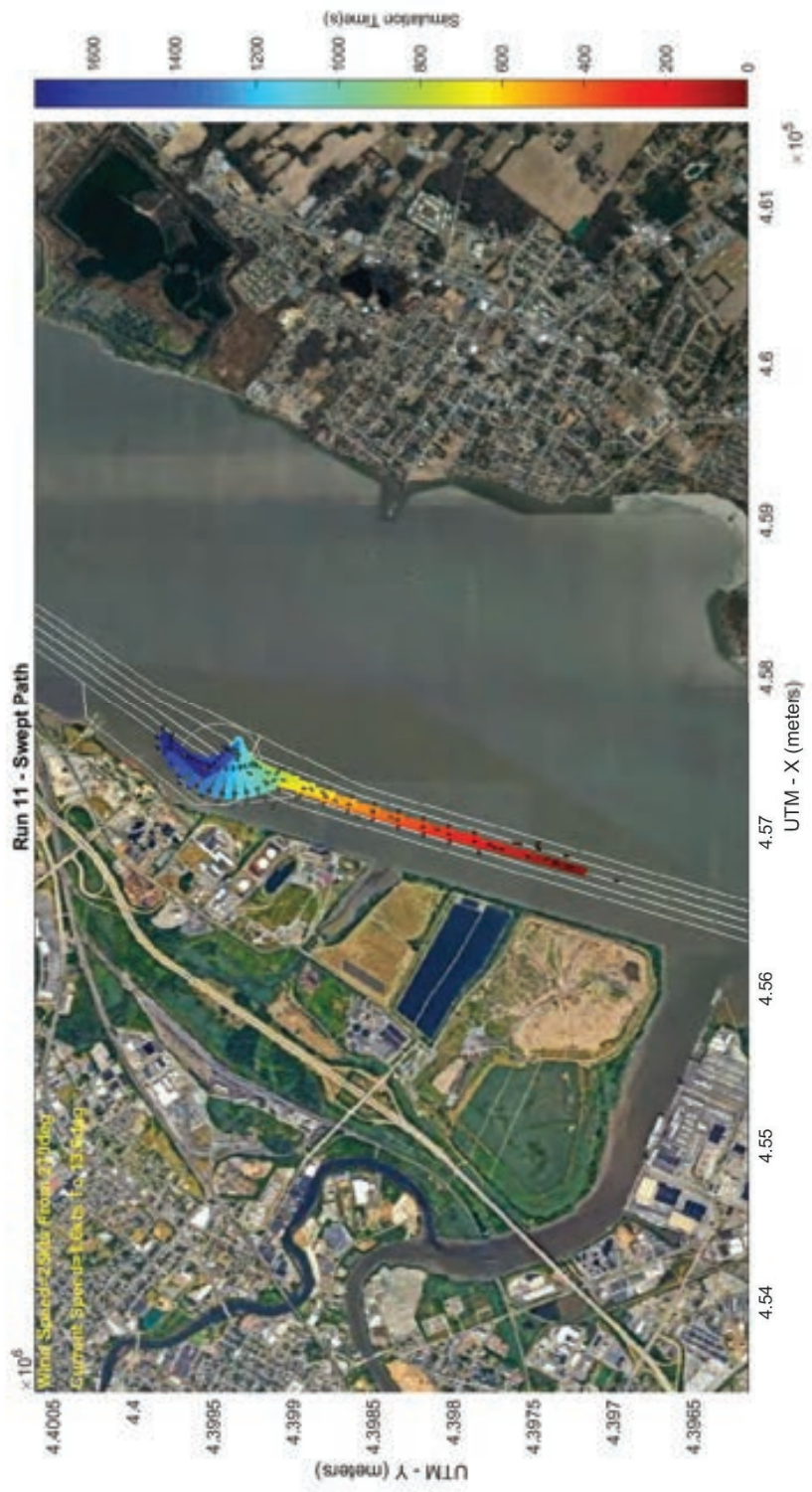


Figure 9-11: Run 11



Figure 9-12: Run 12



Figure 9-13: Run 13

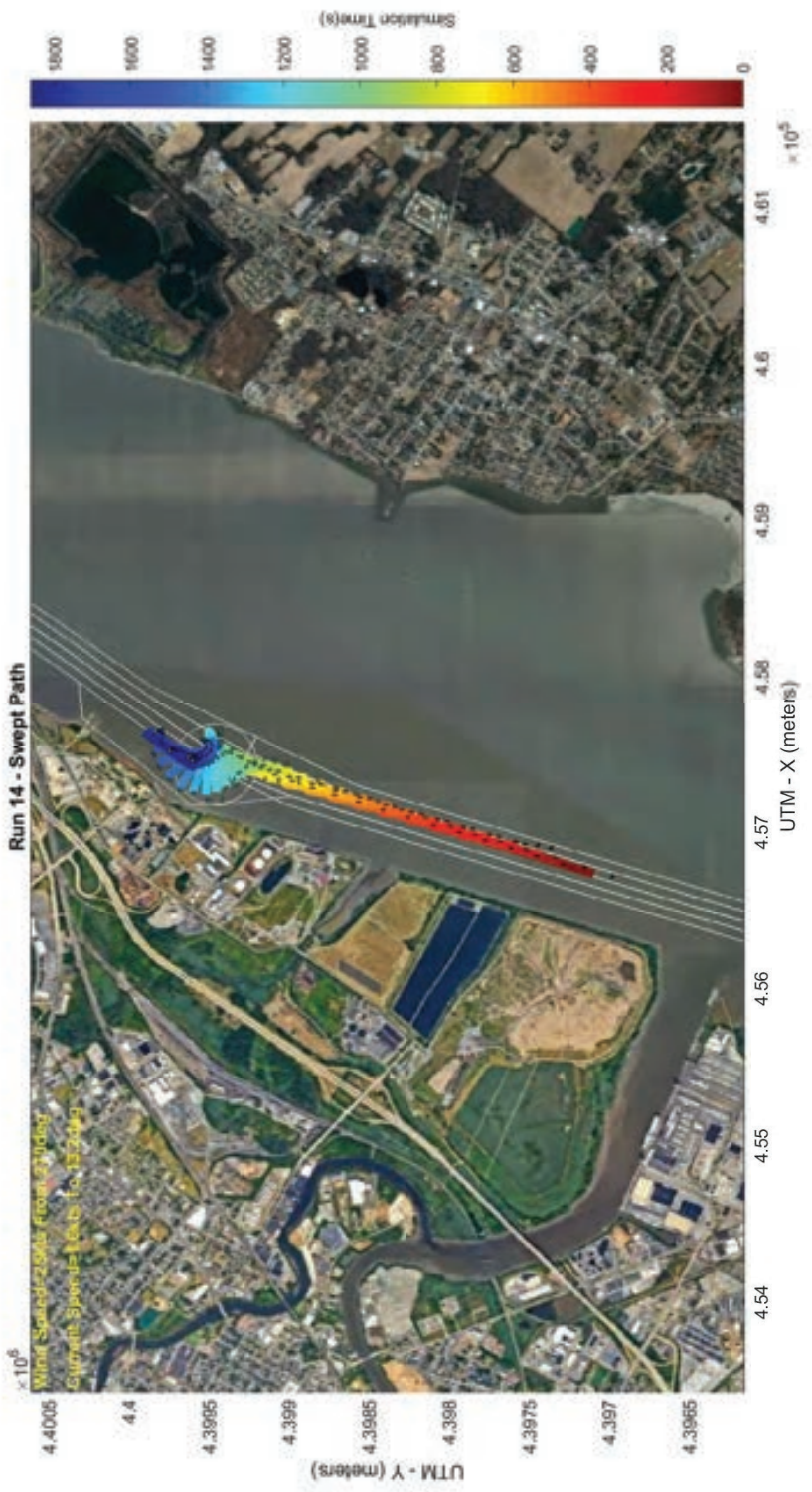


Figure 9-14: Run 14

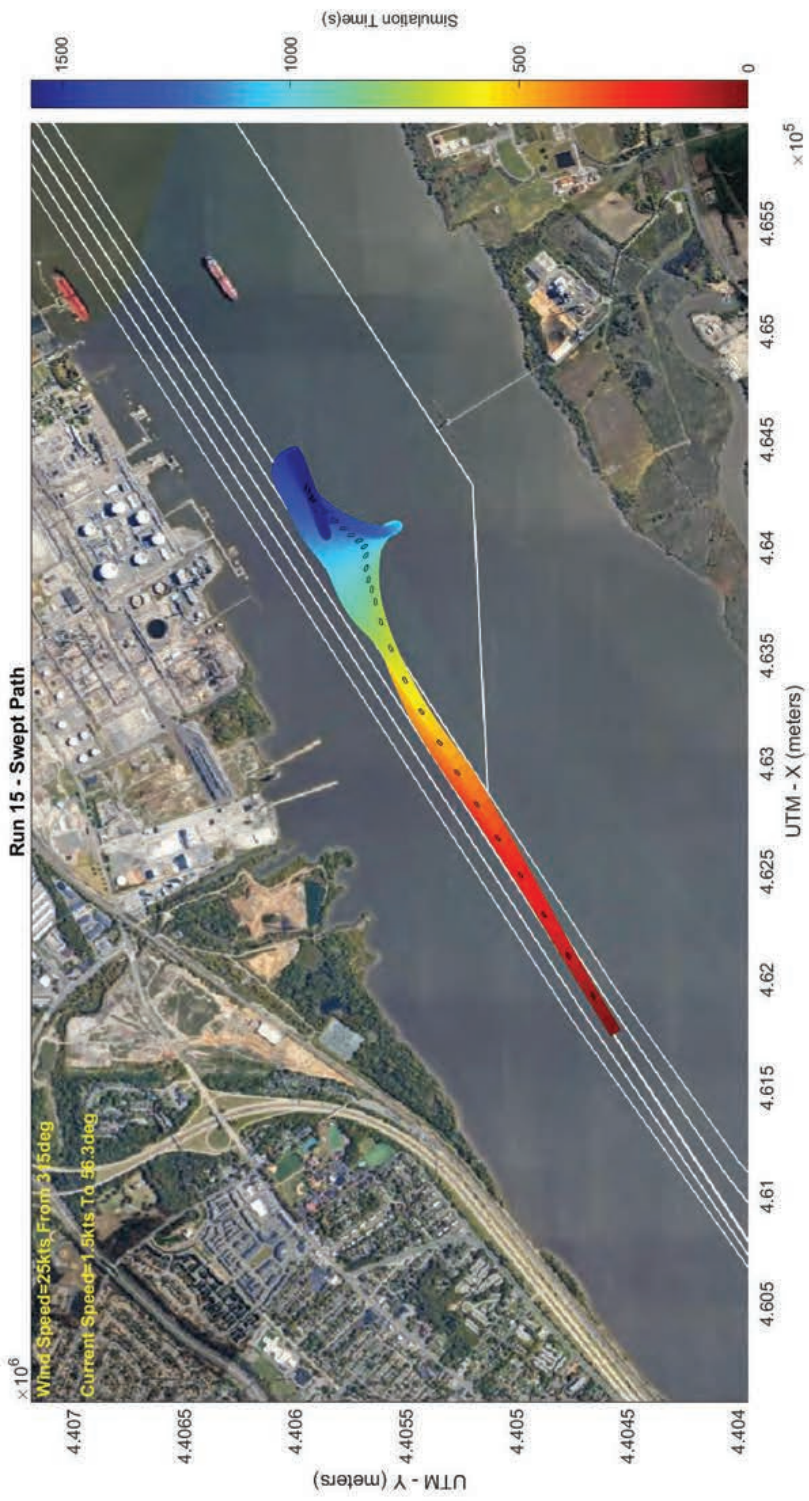


Figure 9-15: Run 15

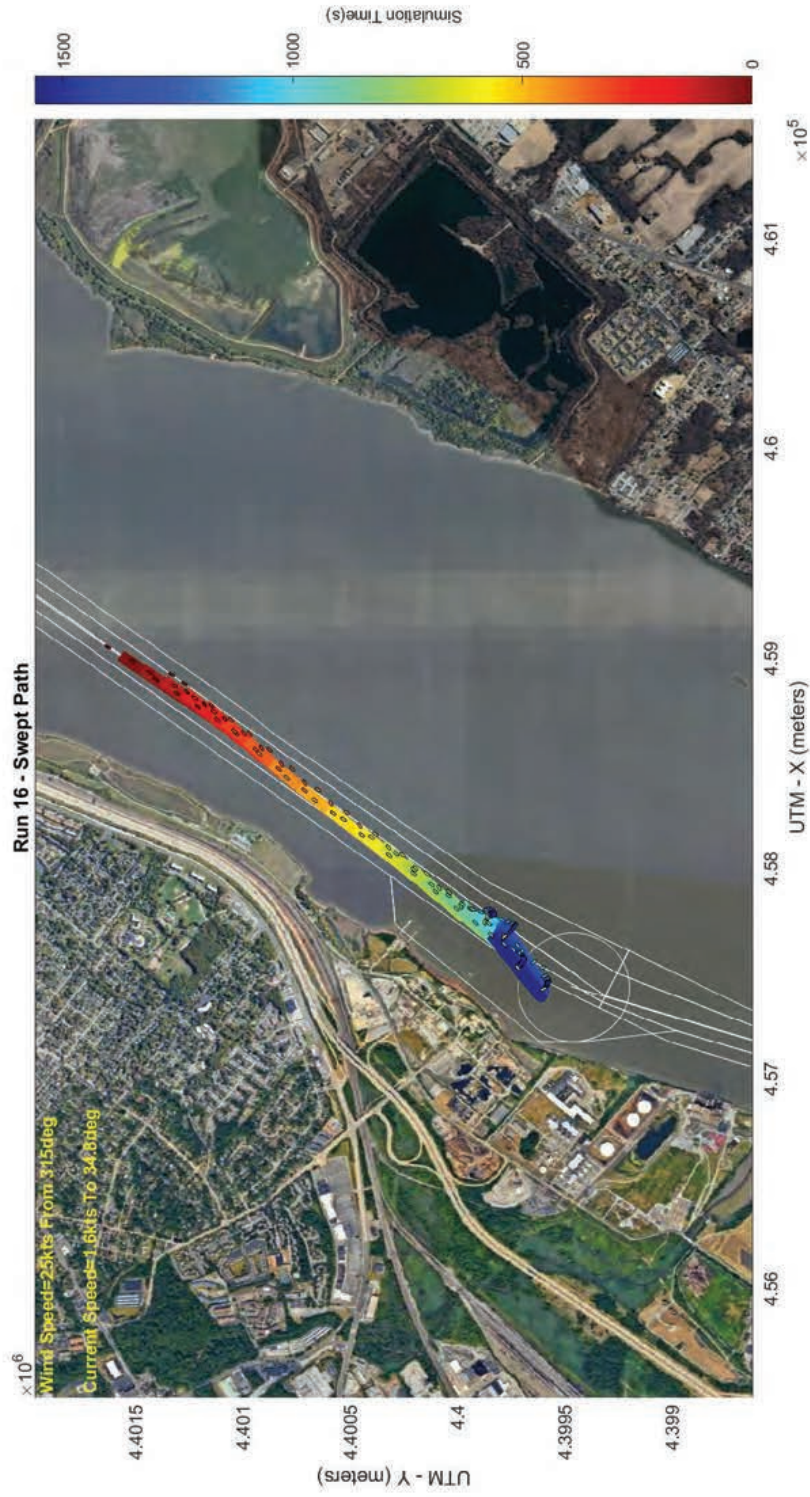


Figure 9-16: Run 16

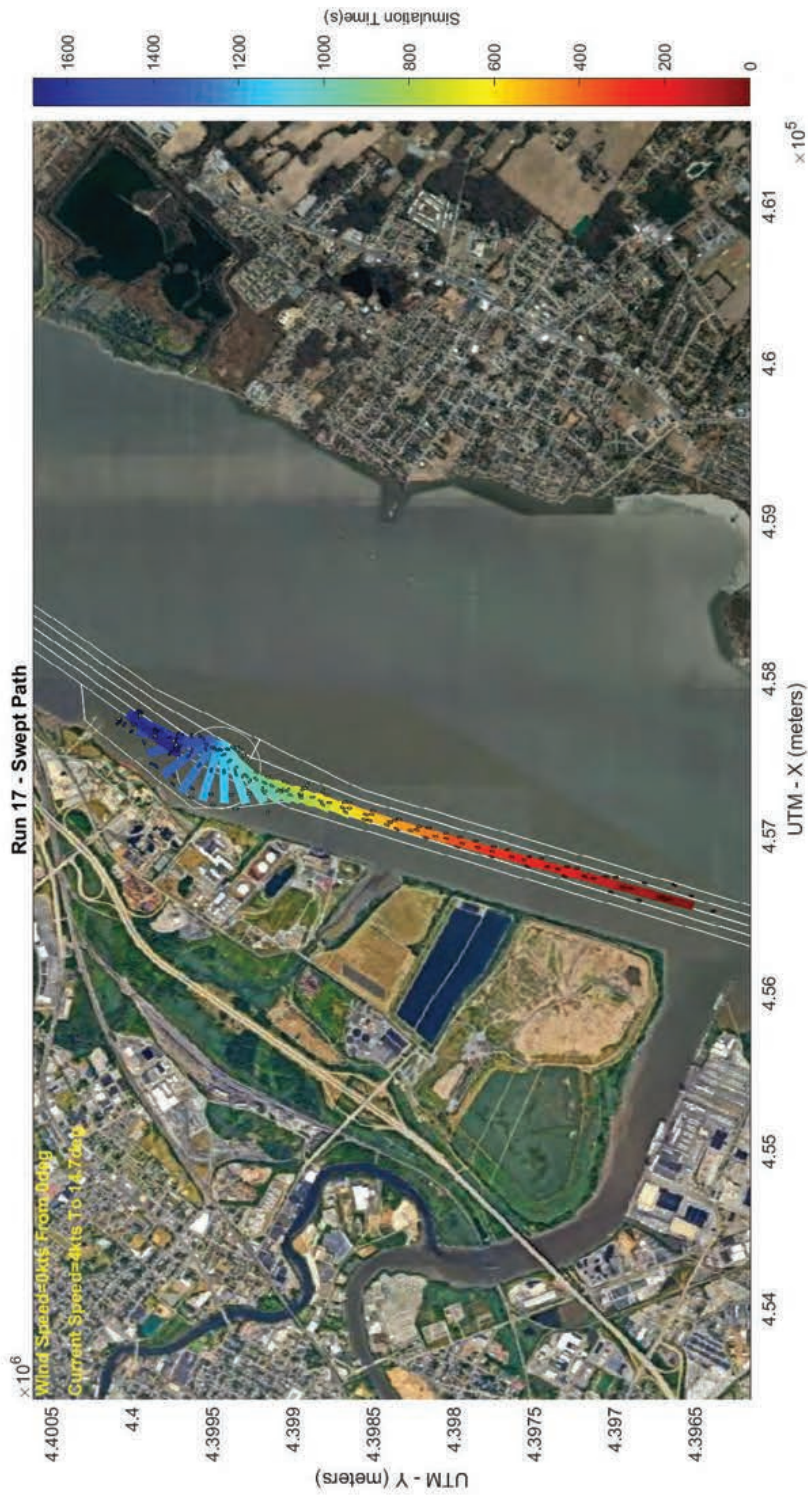


Figure 9-17: Run 17

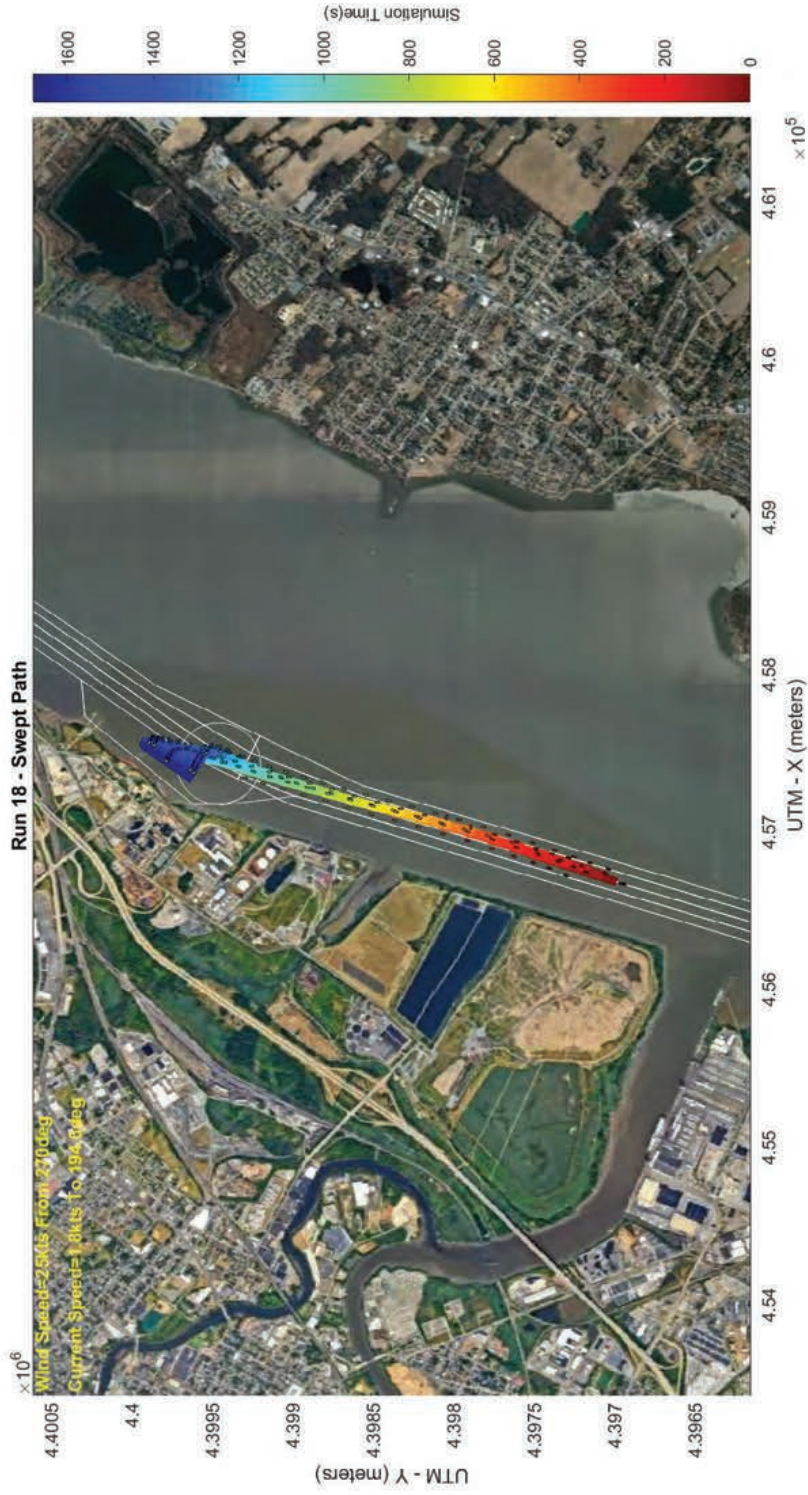


Figure 9-18: Run 18

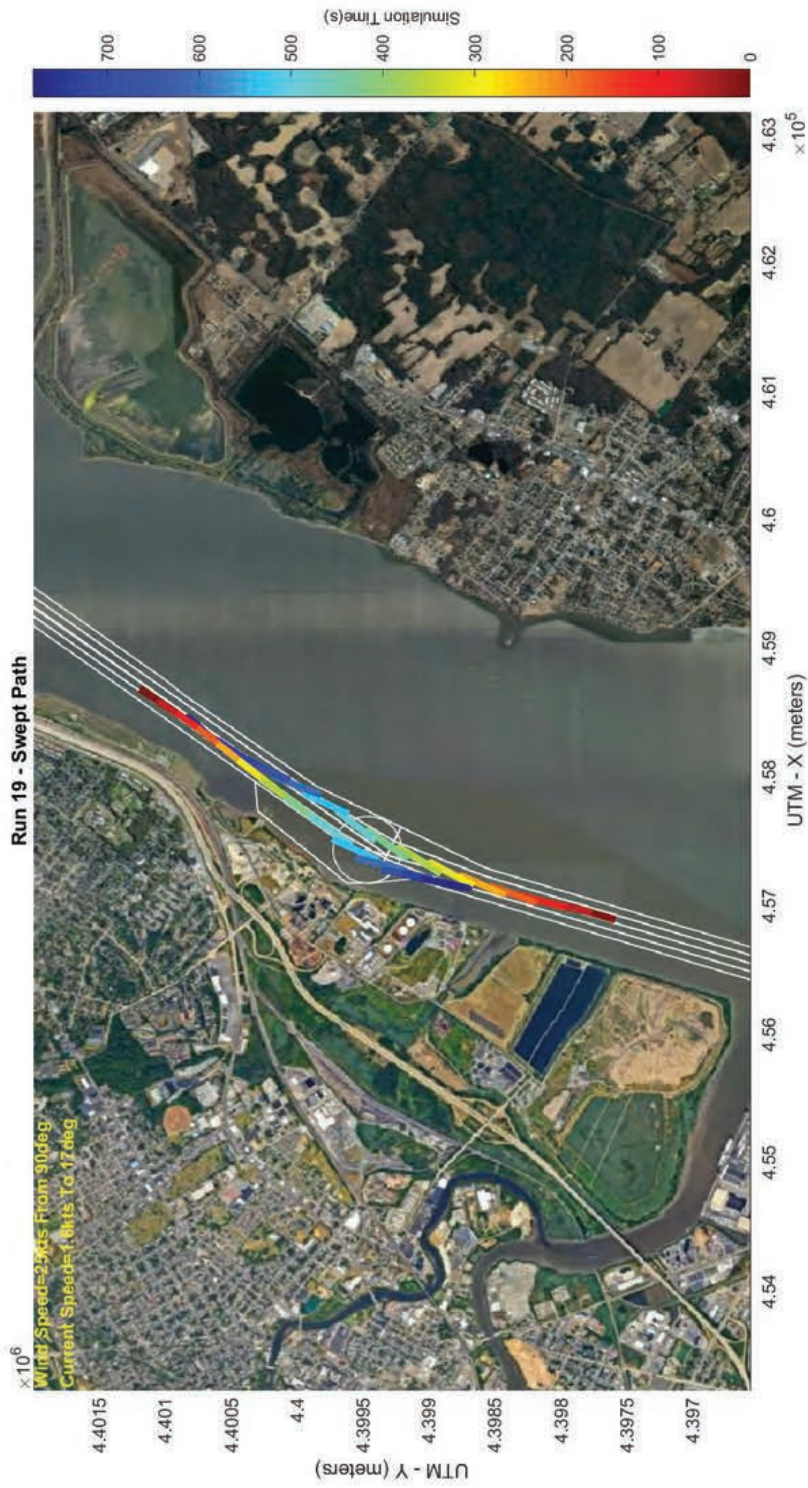


Figure 9-19: Run 19

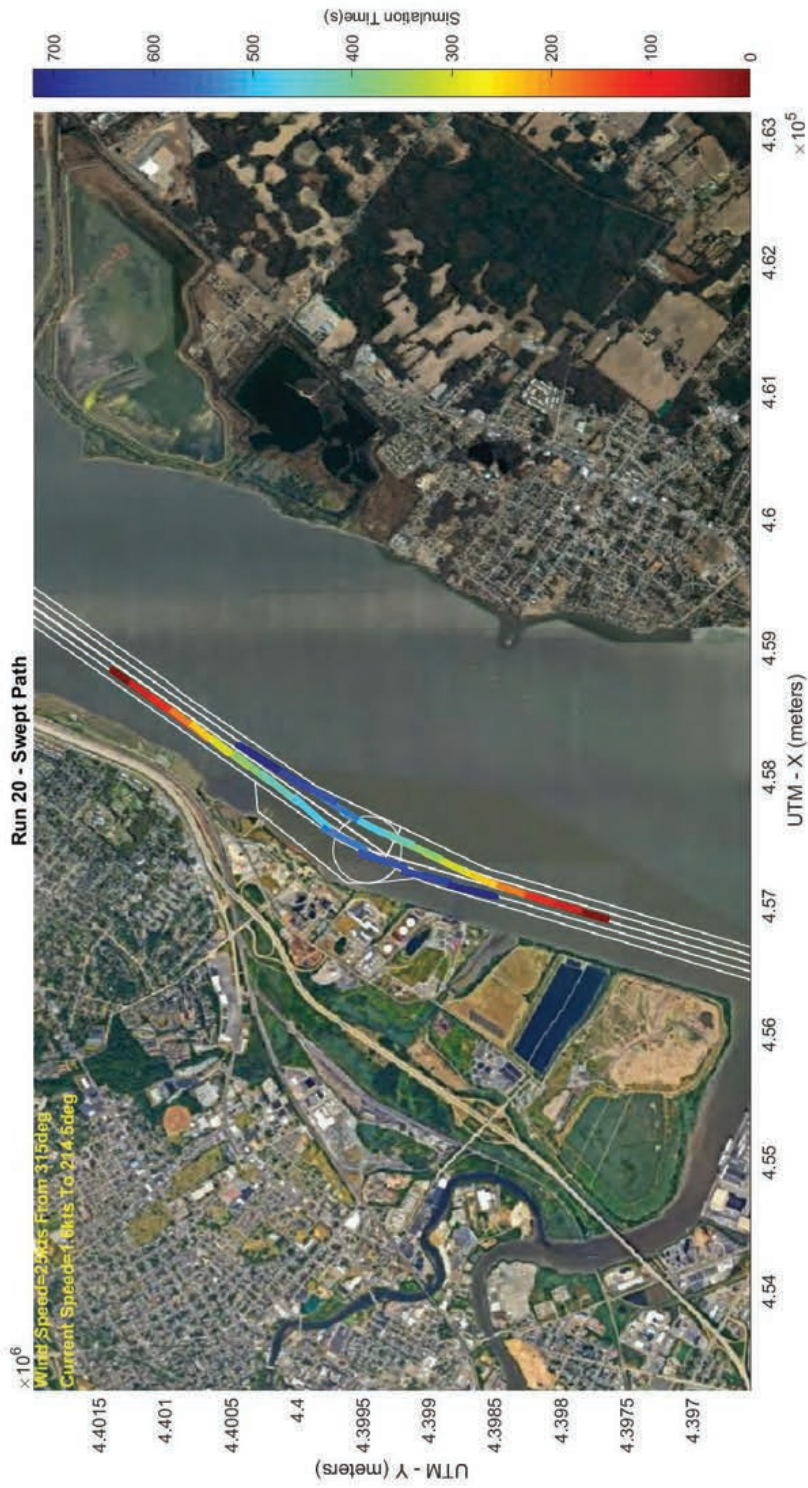


Figure 9-20: Run 20

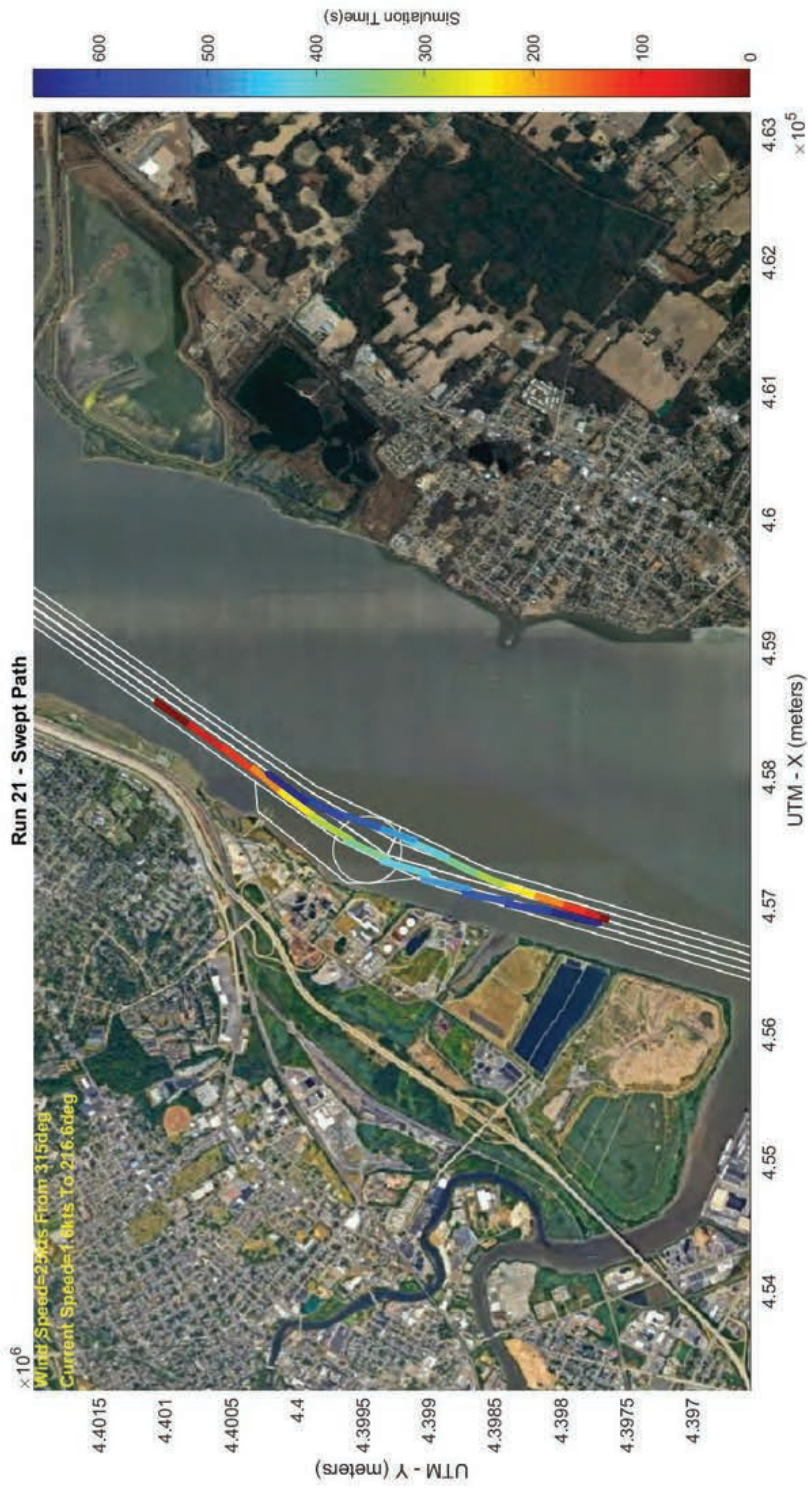


Figure 9-21: Run 21

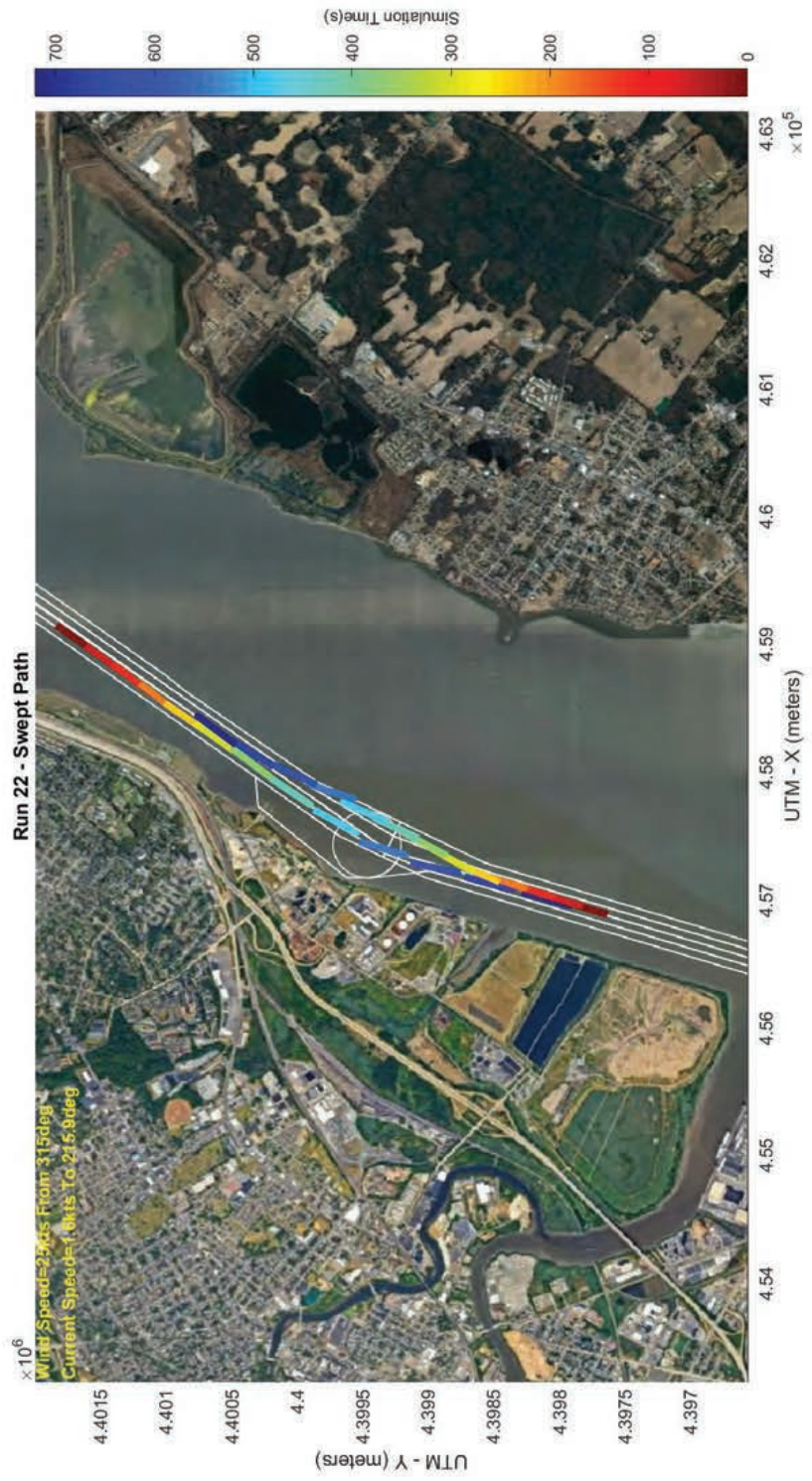


Figure 9-22: Run 22

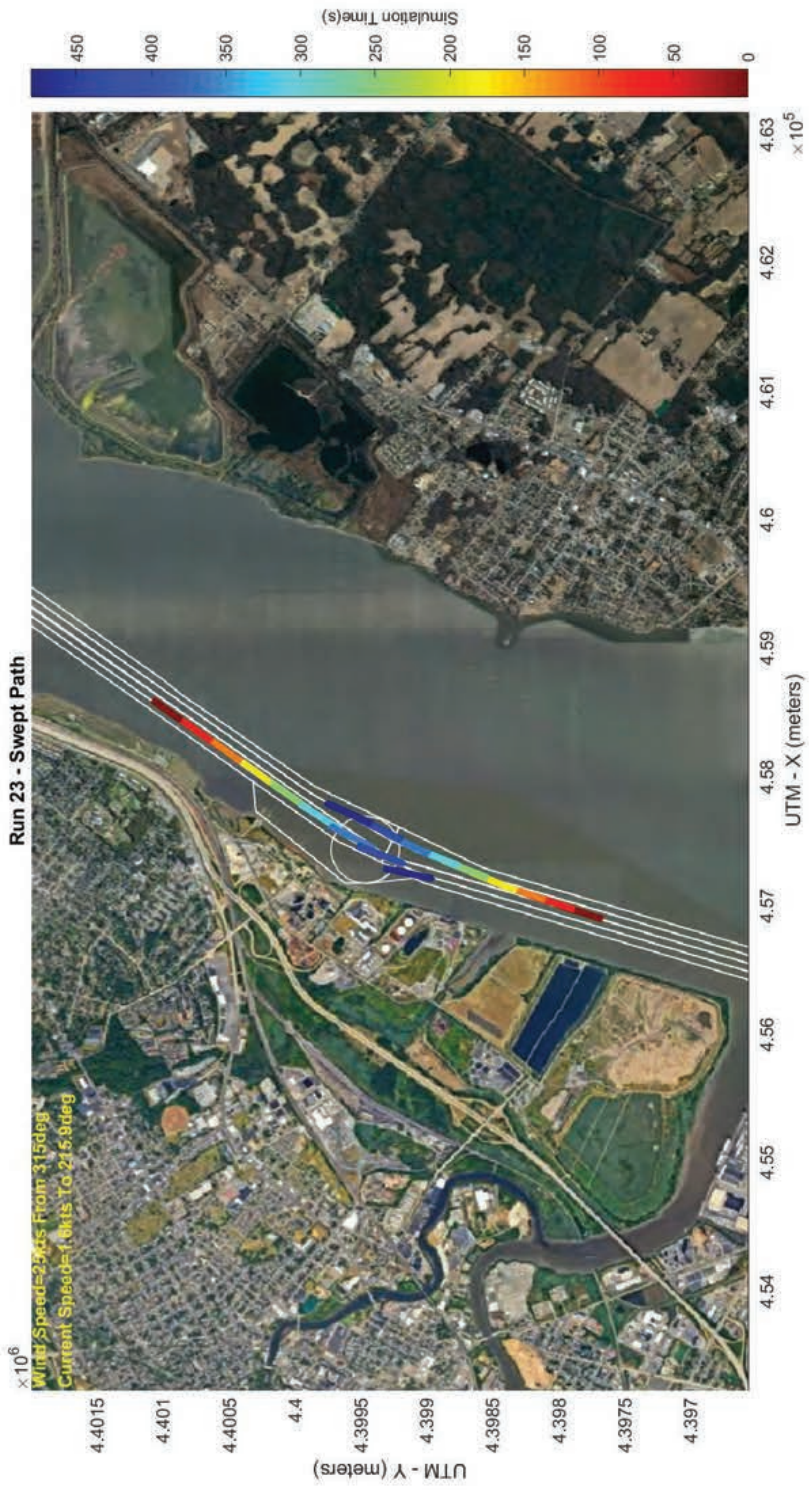


Figure 9-23: Run 23



Figure 9-24: Run 24



Figure 9-25: Run 25

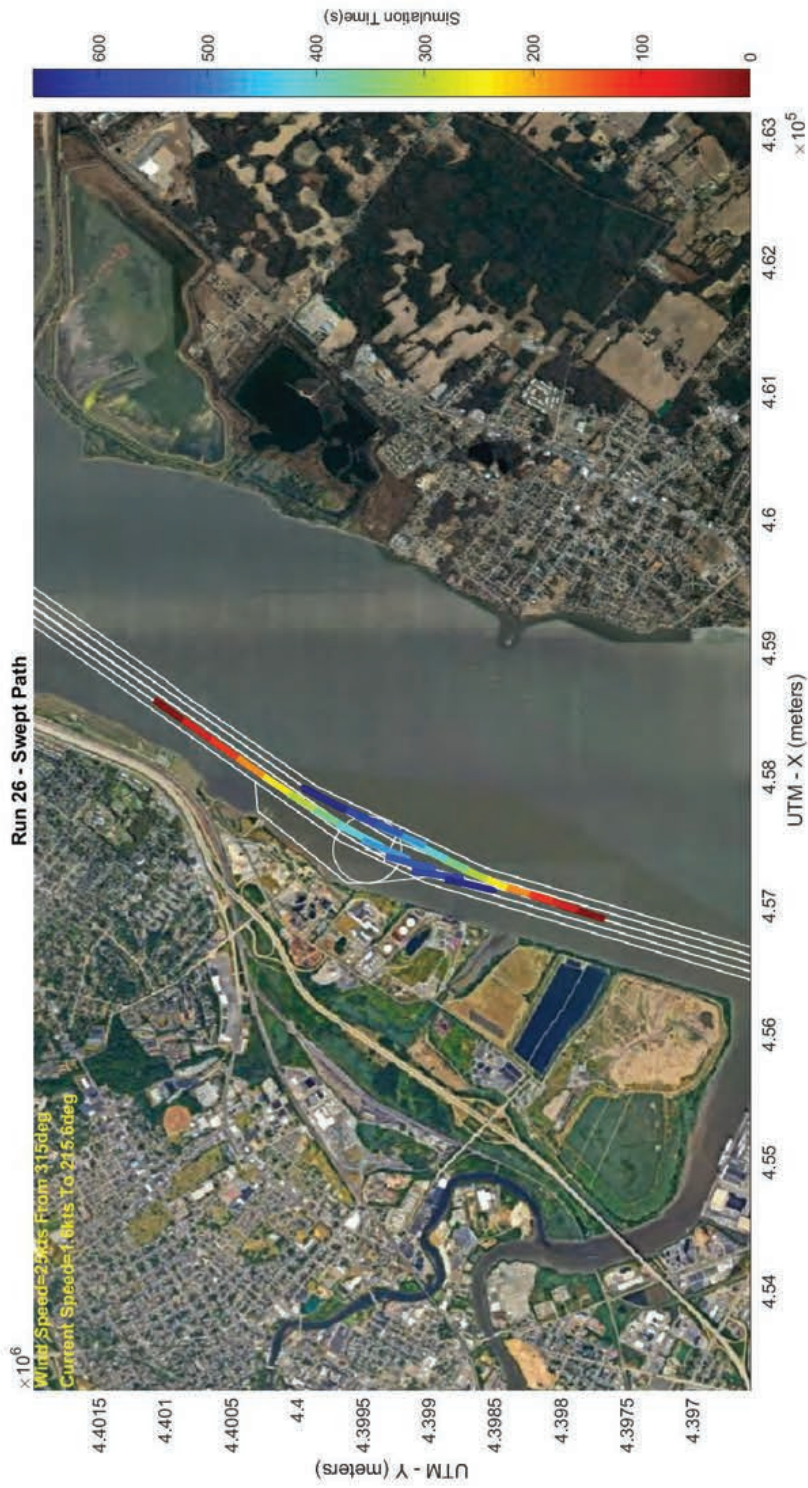


Figure 9-26: Run 26



Figure 9-27: Run 28

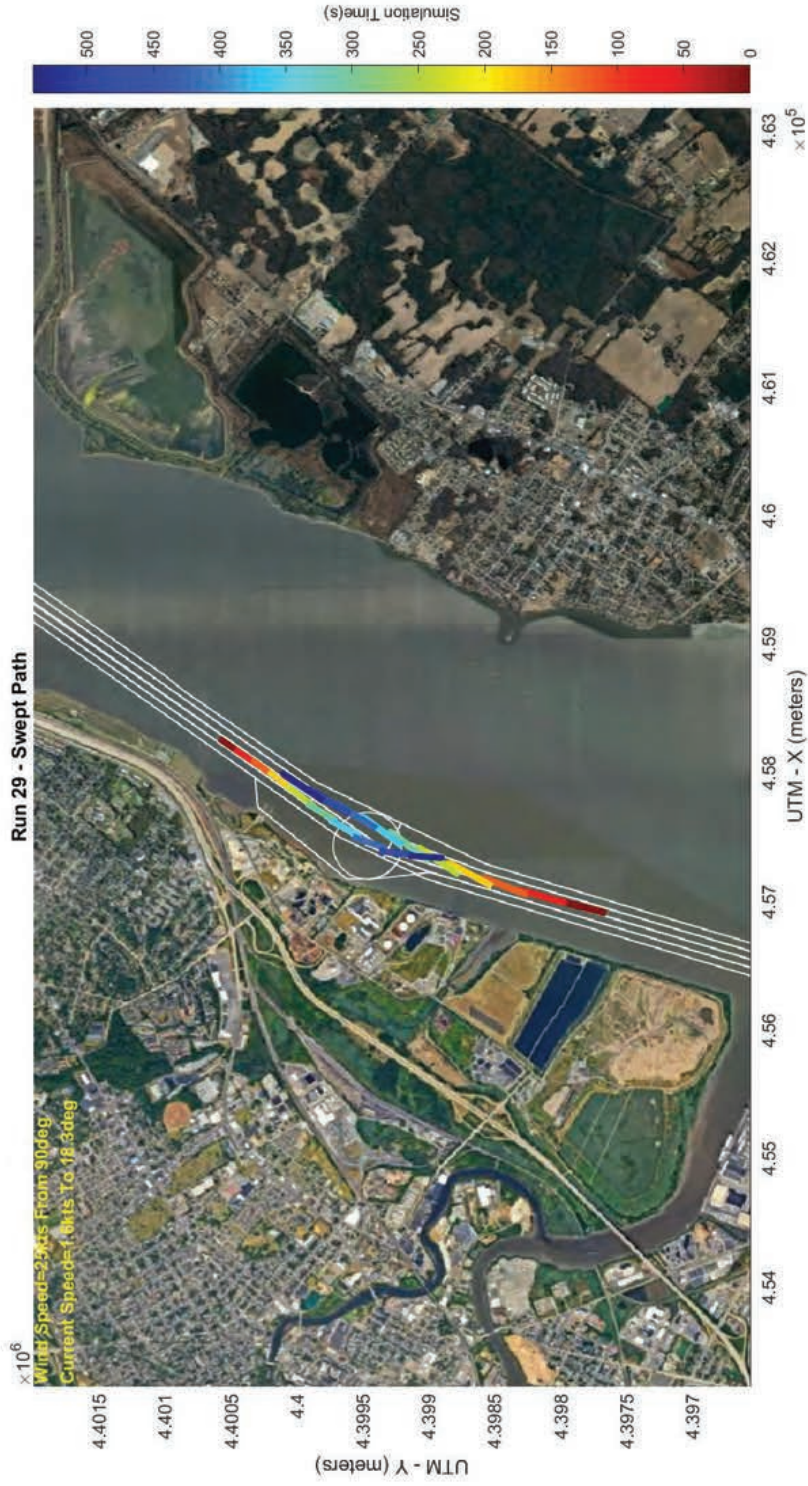


Figure 9-28: Run 29

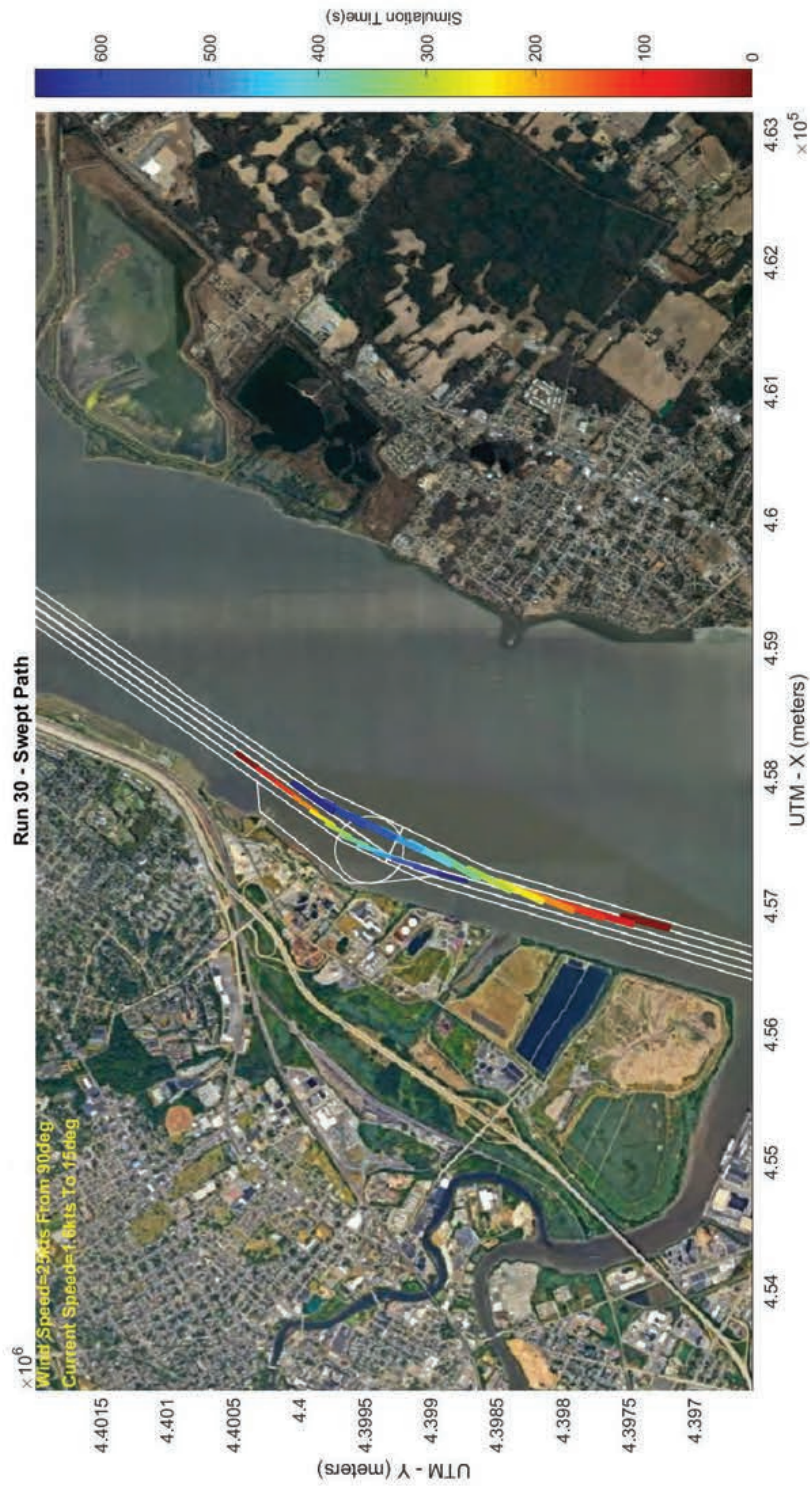


Figure 9-29: Run 30

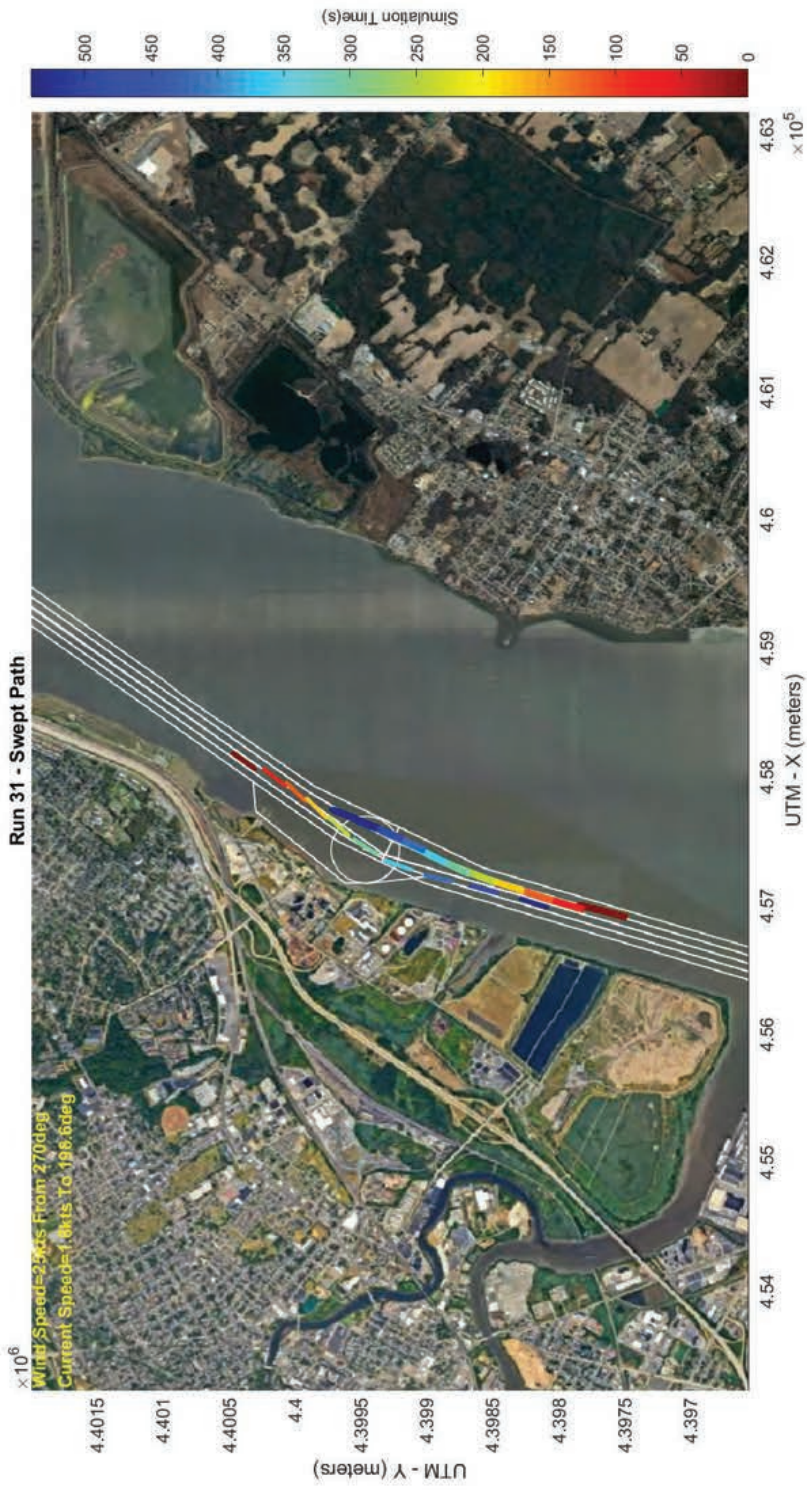


Figure 9-30: Run 31

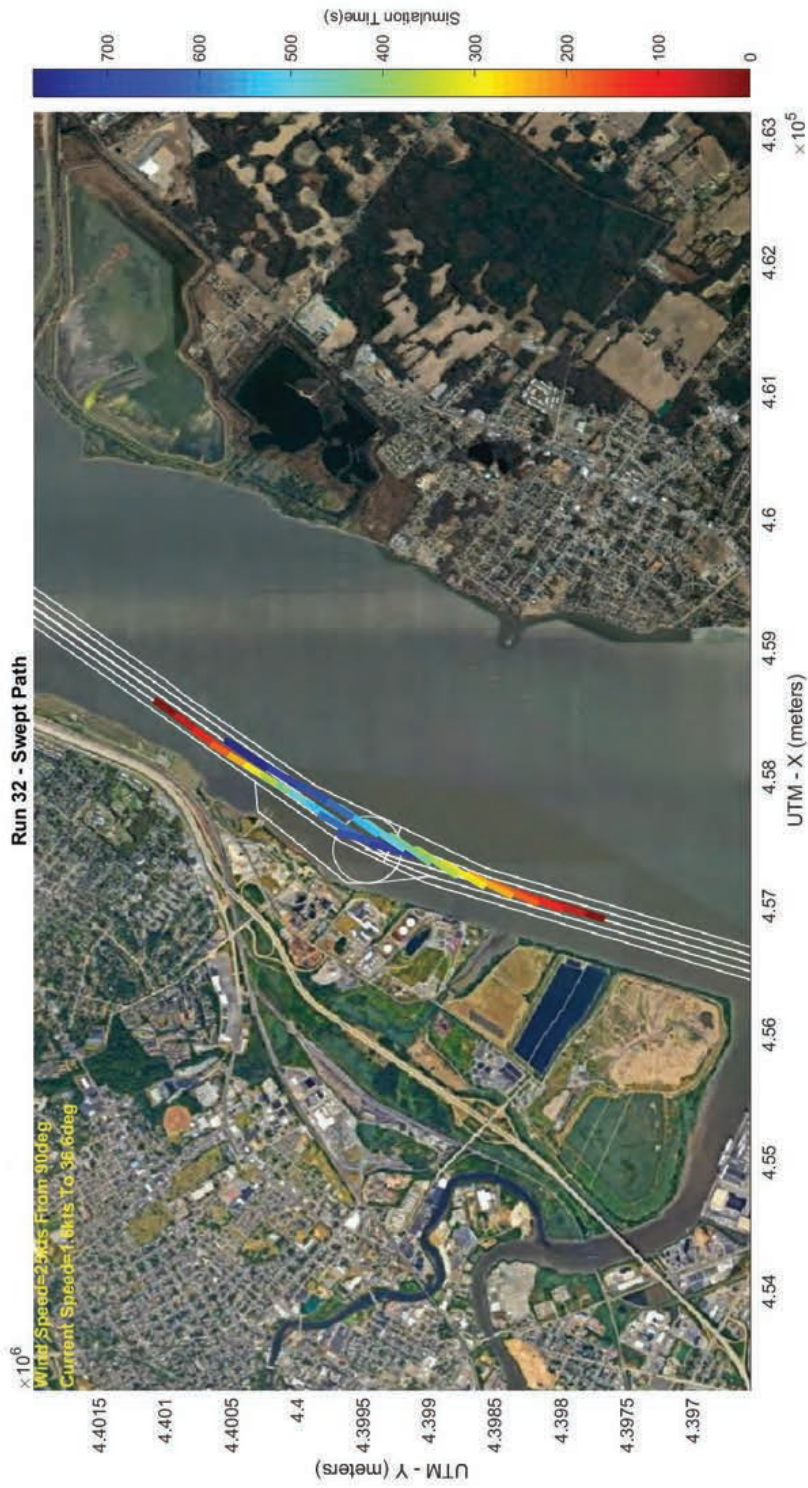


Figure 9-31: Run 32

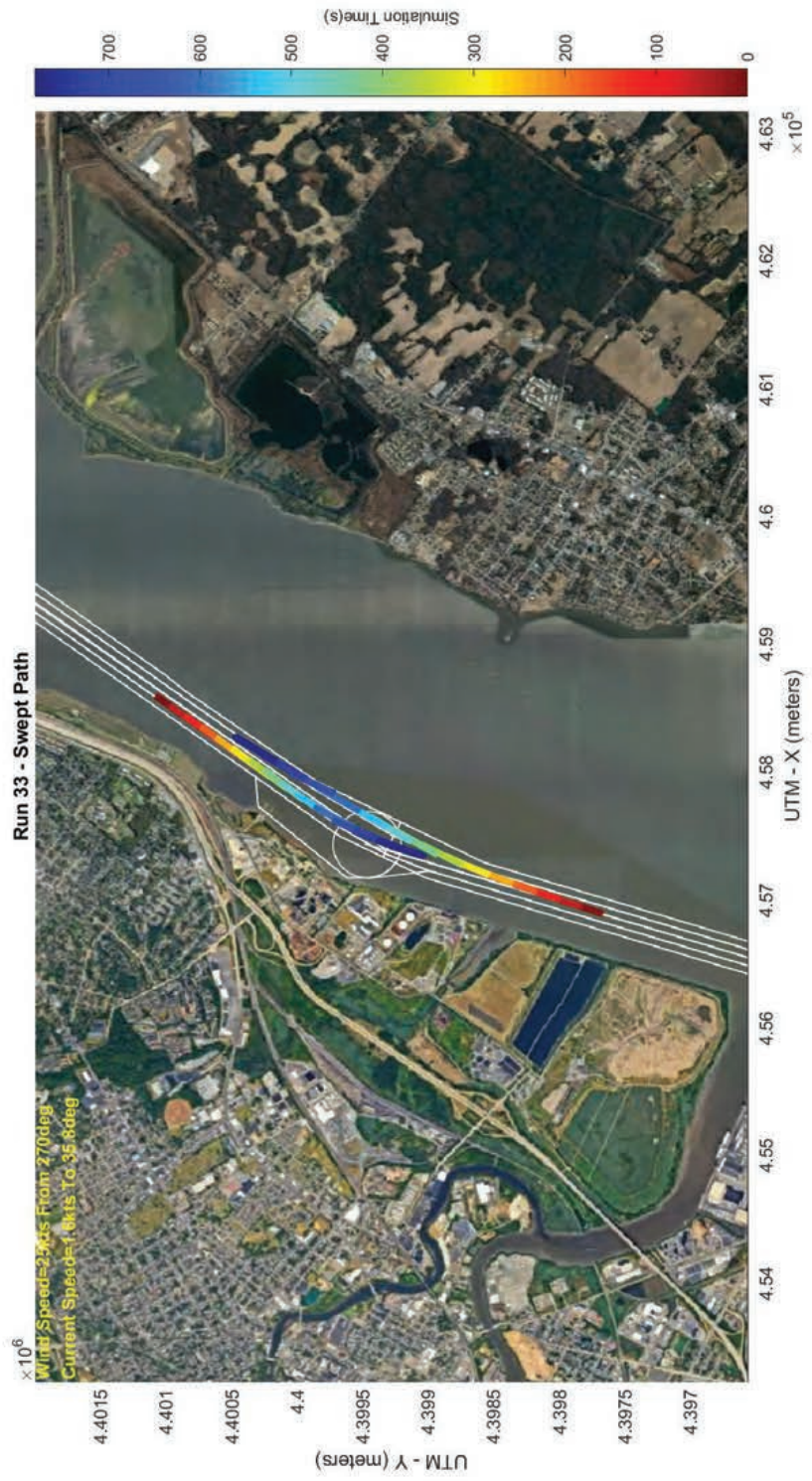


Figure 9-32: Run 33



Figure 9-33: Run 34

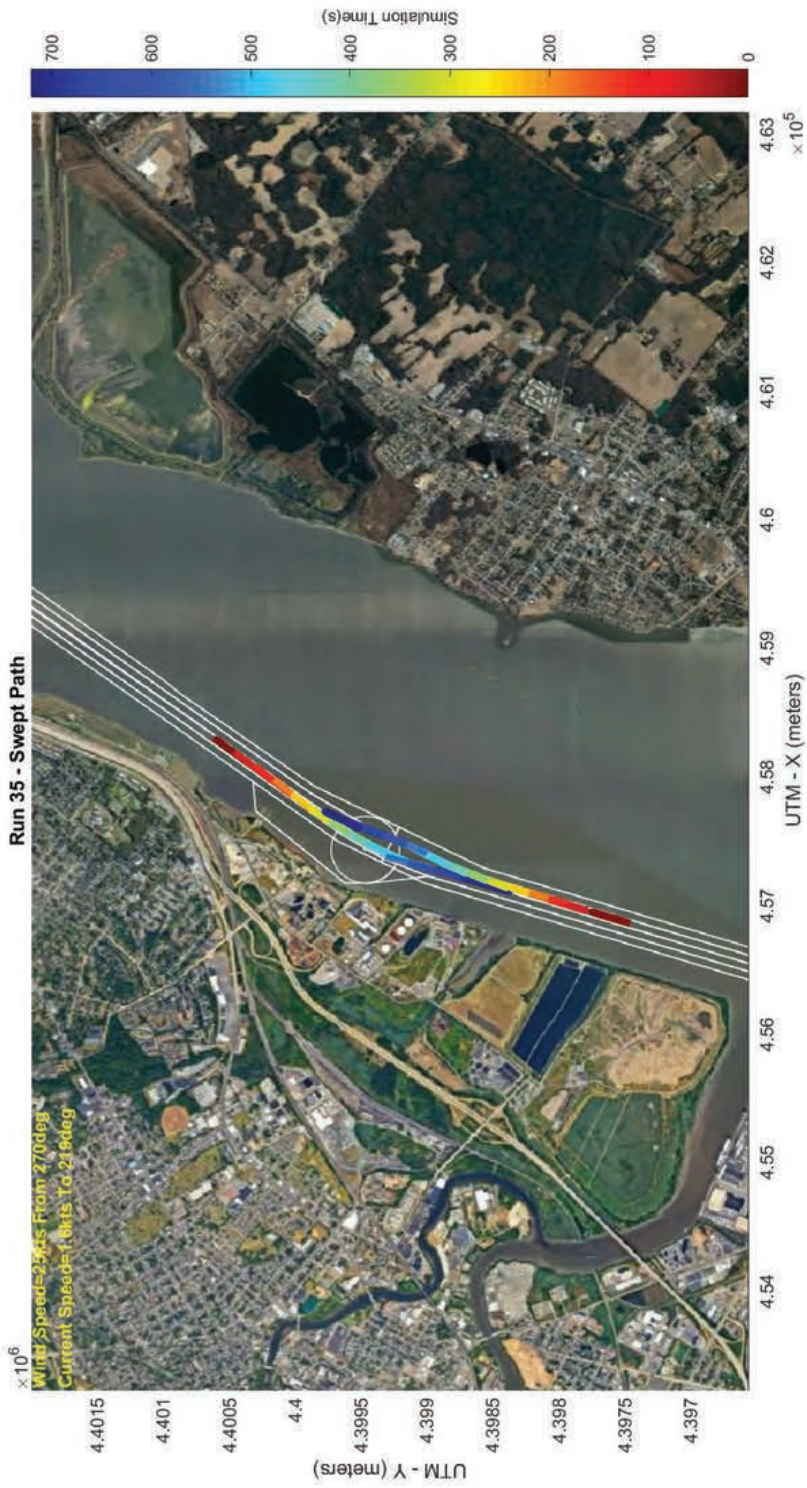


Figure 9-34: Run 35

A – APPENDIX – INTRODUCTION TO MITAGS

The Maritime Institute of Technology and Graduate Studies (MITAGS) East and West Coast Campuses are non-profit, continuing education centers for professional mariners. The Institutes provide training for both civilian and military mariners at every level of their career.

MITAGS LOCATIONS AND GENERAL FACILITY DESCRIPTIONS

EAST COAST CAMPUS LOCATION AND GENERAL FACILITY DESCRIPTION

MITAGS is located less than five (5) miles from the Baltimore-Washington International Thurgood Marshall Airport (BWI). Complimentary shuttle links the campus with the airport, BWI Amtrak Rail, Baltimore Light Rail, and regional bus services. It is also near major tourist destinations; including Baltimore, Annapolis, and Washington, DC.



The MITAGS campus encompasses over forty (40) acres. The 300,000 square-foot facilities include:

- On campus hotel with 232 hotel rooms (3-STAR equivalent).
- 500-seat dining facility, 250-seat auditorium, pub, and store.
- Indoor swimming pool, Jogging / walking trails, Nautilus® Fitness Room.
- Maritime Museum.
- ECDIS, Stability, LNG Cargo and Engine Room Training Software.
- Emergency Medical Lab.
- 16-station networked computer Lab.
- Two, 360° Wärtsilä® Full-Mission Shiphandling Simulator integrated with three 300° and one 120° Tug Bridge Simulators.
- 8-Ship Radar, Automatic Radar Plotting Aids (ARPA), and Electronic Chart Display and Information Systems (ECDIS) Simulators.
- Global Maritime Distress and Safety Systems (GMDSS) Communications Lab.
- Vessel Traffic System (VTS) Watchstander Training Lab.



WEST COAST CAMPUS LOCATION AND GENERAL FACILITY DESCRIPTION

The west coast subsidiary of MITAGS is located in Seattle, Washington, approximately twenty (20) minutes from Seattle Tacoma (SEA-TAC) International Airport. Their waterfront facility is positioned directly within the Maritime Technology and Career Center. MITAGS West offers the following onsite technology and training support facilities:

- 240° DNV Class A Full-Mission Bridge Simulator.
- Two 300° Full-Mission Tugboat Simulators.
- 6-Radar/Automatic Radar Plotting Aids (ARPA) Simulators.
- Two Electronic Chart Display and Information Systems (ECDIS)/Electronic Navigation Labs.
- Global Maritime Distress and Safety Systems (GMDSS) Communications Lab.
- 2-Simulation Debriefing Rooms and 12 conference / classrooms.
- Complimentary parking.





Appendix A-Figure 1: MITAGS East DNV Class A Full-Mission Ship Simulator #1



Appendix A-Figure 2: MITAGS East ASD Tug Bridges #1 and #2



Appendix A-Figure 3: MITAGS West Full Mission Simulator



Appendix A-Figure 4: MITAGS West Tug Bridge Simulator



Appendix A-Figure 5: Aerial Photograph of MITAGS East Coast Campus and Location Diagram

Appendix D

Monte Carlo (Conflict) Analysis Tables



Baseline (Utilization) or Threshold (Capacity)	Event Number	Event	Event Description	Mitigation Actions in Place	Notes	Source of Probability: Qualitative or Quantitative	Impact on Capacity: Increase or Decrease	Qualitative Frequency	Probability	Impact Probability			Vessel Number Impact		
										Min	Most Likely	Max	Min	Most Likely	Max
Threshold	1	Overestimation of channel capacity	Overestimation of channel capacity resulting in a lower capacity than calculated due to statistical nature of analyses. Covers other contributions that were not accounted for	Detailed, data-driven statistical analyses undertaken. See Report Section 2		Qualitative	Decrease	10 in 1 Year	1.414%	25 00%	37 50%	50 00%	2	3	4
Threshold	2	Adverse weather conditions	Ice formation affecting navigability, vessel speeds, and traffic patterns, among others	Operation OLAF outlined in the PAWSA is a procedure to remove ice and maintain a navigable channel in the event of significant ice cover	USCO's 2018 PAWSA identified this as "Low Risk" - "The ice season usually starts in early January and ends in mid-March. Normally shipping is affected most seriously in the northern Delaware River. Modern vessels experience little difficulty maneuvering through the ice, but may be slowed by other river traffic. In addition to the problem of getting through the ice, aids to navigation are covered or dragged off station by moving ice. Sector Delaware Bay and District 5 assets conduct Operation OLAF, designate to clear the waterway of ice and create a channel to maintain navigation."	Qualitative	Decrease	1 in 50 Years	0.003%	100 00%	100 00%	100 00%	8	8	8
Threshold	3	Adverse weather conditions	Squall conditions (high wind speeds over 25 knots) - Major Impact (Event longer than 3 hours)	Current MAC Transit Advisories in place limit transits to safe conditions; multiple "ball outs" exist should conditions change on River during a transit	Determined probability by reviewing 2024 measured wind data at NOAA Station 8537121 Ship John Shoal, NJ. Counted number of tides that had wind speeds over 25 knots for longer than 3 hours	Quantitative	Decrease	N/A	2.260%	100 00%	100 00%	100 00%	8	8	8
Threshold	4	Adverse weather conditions	Squall conditions (high wind speeds over 25 knots) - Minor Impact (Event shorter than 3 hours)	Current MAC Transit Advisories in place limit transits to safe conditions; multiple "ball outs" exist should conditions change on River during a transit	Determined probability by reviewing 2024 measured wind data at NOAA Station 8537121 Ship John Shoal, NJ. Counted number of tides that had wind speeds over 25 knots for shorter than 3 hours	Quantitative	Decrease	N/A	4.530%	25 00%	50 00%	75 00%	2	4	6
Threshold	5	Adverse weather conditions	Reduced visibility (fog, rain) - Current MAC Transit Advisory recommends no transits when visibility is less than 2 nautical miles - Major Impact (Event longer than 3 hours)	Current MAC Transit Advisories in place limit transits to safe conditions; multiple "ball outs" exist should conditions change on River during a transit	Determined probability by reviewing 2024 measured visibility data at NCEI Station 72418013781 Wilmington Airport. Counted number of tides that had visibility less than 2 nautical miles for longer than 3 hours	Quantitative	Decrease	N/A	3.250%	100 00%	100 00%	100 00%	8	8	8
Threshold	6	Adverse weather conditions	Reduced visibility (fog, rain) - Current MAC Transit Advisory recommends no transits when visibility is less than 2 nautical miles - Major Impact (Event shorter than 3 hours)	Current MAC Transit Advisories in place limit transits to safe conditions; multiple "ball outs" exist should conditions change on River during a transit	Determined probability by reviewing 2024 measured visibility data at NCEI Station 72418013781 Wilmington Airport. Counted number of tides that had visibility less than 2 nautical miles for shorter than 3 hours	Quantitative	Decrease	N/A	10.180%	25 00%	37 50%	75 00%	2	3	6
Threshold	7	Adverse weather conditions	High currents due to large river discharge events. Currents exceed 2.1 knots	Current MAC Transit Advisories in place limit transits to safe conditions; multiple "ball outs" exist should conditions change on River during a transit	Determined probability by reviewing 2024 measured current data at NOAA Station 060301 Philadelphia. Counted number of tides that had peak current speeds exceeding 2.1 knots	Quantitative	Decrease	N/A	2.260%	12 50%	25 00%	37 50%	1	2	3
Threshold	8	Adverse weather conditions	Less than full high tide, causing reduced effective channel depth and maneuverability	Current MAC Transit Advisories in place limit transits to safe tides; multiple unused tides; predictable tides	Determined probability by reviewing 2024 measured peak high tide level data at NOAA Station 855889 Brandywine Shoal Light, DE. Counted number of tides with peak high tide level less than 4.5 ft (1 ft below MHHW)	Quantitative	Decrease	N/A	8.500%	12 50%	25 00%	37 50%	1	2	3
Threshold	9	Favorable weather conditions	Higher than regular high tide that extends flood-tide transit window. High river discharge events that cause water levels to remain high for an extended period of time	May allow more high tide transits	Determined probability by reviewing 2024 measured peak high tide level data at NOAA Station 855889 Brandywine Shoal Light, DE. Counted number of tides with peak high tide level less than 5 ft (1 ft above MHHW)	Quantitative	Increase	N/A	18.100%	12 50%	25 00%	37 50%	1	2	3
Threshold	10	Debris or obstruction in River	Risk of debris blocking channel	Ships could go to ballouts or slow maneuvering speeds ahead of issue	USCO's 2018 PAWSA states - "The navigable channel within the Delaware Bay is generally clear of obstructions. Shoaling has been known to occur in bends and along the channel within the Delaware River. These areas have been identified by the ACOE and are included in annual maintenance dredging."	Qualitative	Decrease	1 in 1 Year	0.141%	0 00%	12 50%	25 00%	0	1	2
Threshold	11	Shoaling in River	Sediment buildup lowers channel depth (independent from DCT's development)	Routine USACE maintenance dredging	USCO's 2018 PAWSA states - "The navigable channel within the Delaware Bay is generally clear of obstructions. Shoaling has been known to occur in bends and along the channel within the Delaware River. These areas have been identified by the ACOE and are included in annual maintenance dredging."	Qualitative	Decrease	10 in 1 Year	1.414%	12 50%	25 00%	37 50%	1	2	3
Threshold	12	Lower Vessel Speeds	Slow vessel causing congestion	The Pilots schedule passing vessel movements in areas on River that allow safe passing		Qualitative	Decrease	10 in 1 Year	1.414%	12 50%	25 00%	37 50%	1	2	3
Threshold	13	DCT vessel maneuverability challenges during turning at DCT's turning basin	Can lead to grounding, blocking or collision and block channel upriver of DCT	DCT includes a wider turning basin than other basins on the River. Full Mission Bridge Simulations showed safe turning, and Pilot recommendations from Simulation were incorporated into design. See Report Section 3.3		Qualitative	Decrease	1 in 10 Years	0.014%	12 50%	25 00%	37 50%	1	2	3
Threshold	14	Vessel malfunction in main channel at confluence between Chesapeake & Delaware Canal and Delaware Bay	Loss of power, propulsion or steering control, resulting in channel closure or 1-way traffic restrictions. Prevents or limits access to terminals north of CD Canal	Emergency response plans in place and multiple tugs and tug companies on the River to assist. PAWSA states that "vessel inspection program has resulted in inspections deficiencies and vessel detentions rates trending downward over the last several years." "Oversight proficiency is also very good," the conditions of deep-draft ships are good, and "risks determined to be balanced by existing mitigations."	Determined probability by reviewing reportable marine casualty data recorded by the United States Coast Guard from 2010 to Present. Counted number incidents that were classified as "Loss/Reduction of Propulsion/Steering" or "Loss of Electrical Power" for cargo or tanker vessels only and only those incidents located near the main navigation channel. Divided the count by the number of years of data and then by the number of tides in a given year to get a per-tide probability	Quantitative	Decrease	N/A	0.377%	50 00%	50 00%	50 00%	4	4	4
Threshold	15	Vessel malfunction in main channel near Marcus Hook	Loss of power, propulsion or steering control, resulting in channel closure or 1-way traffic restrictions. Prevents or limits access to terminals north of Marcus Hook	Emergency response plans in place and multiple tugs and tug companies on the River to assist. PAWSA states that "vessel inspection program has resulted in inspections deficiencies and vessel detentions rates trending downward over the last several years." "Oversight proficiency is also very good," the conditions of deep-draft ships are good, and "risks determined to be balanced by existing mitigations."	Determined probability by reviewing reportable marine casualty data recorded by the United States Coast Guard from 2010 to Present. Counted number incidents that were classified as "Loss/Reduction of Propulsion/Steering" or "Loss of Electrical Power" for cargo or tanker vessels only and only those incidents located near the main navigation channel. Divided the count by the number of years of data and then by the number of tides in a given year to get a per-tide probability	Quantitative	Decrease	N/A	0.377%	37 50%	37 50%	37 50%	3	3	3
Threshold	16	Vessel malfunction in main channel near Packer Ave Marine Terminal	Loss of power, propulsion or steering control, resulting in channel closure or 1-way traffic restrictions. Prevents or limits access to terminals around PAMT	Emergency response plans in place and multiple tugs and tug companies on the River to assist. PAWSA states that "vessel inspection program has resulted in inspections deficiencies and vessel detentions rates trending downward over the last several years." "Oversight proficiency is also very good," the conditions of deep-draft ships are good, and "risks determined to be balanced by existing mitigations."	Determined probability by reviewing reportable marine casualty data recorded by the United States Coast Guard from 2010 to Present. Counted number incidents that were classified as "Loss/Reduction of Propulsion/Steering" or "Loss of Electrical Power" for cargo or tanker vessels only and only those incidents located near the main navigation channel. Divided the count by the number of years of data and then by the number of tides in a given year to get a per-tide probability	Quantitative	Decrease	N/A	0.377%	25 00%	25 00%	25 00%	2	2	2
Threshold	17	Vessel grounding in main channel at confluence between Chesapeake & Delaware Canal and Delaware Bay	Grounding resulting in channel closure or 1-way traffic restrictions. Prevents or limits access to terminals north of CD Canal	Emergency response plans in place and multiple tugs and tug companies on the River to assist. PAWSA states that "vessel inspection program has resulted in inspections deficiencies and vessel detentions rates trending downward over the last several years." "Oversight proficiency is also very good," the conditions of deep-draft ships are good, and "risks determined to be balanced by existing mitigations."	Determined probability by reviewing reportable marine casualty data recorded by the United States Coast Guard from 2010 to Present. Counted number incidents that were classified as "Grounding" for cargo or tanker vessels only and only those incidents located near the main navigation channel. Divided the count by the number of years of data and then by the number of tides in a given year to get a per-tide probability	Quantitative	Decrease	N/A	0.038%	100 00%	100 00%	100 00%	8	8	8
Threshold	18	Vessel grounding in main channel near Marcus Hook	Grounding resulting in channel closure or 1-way traffic restrictions. Prevents or limits access to terminals north of Marcus Hook	Emergency response plans in place and multiple tugs and tug companies on the River to assist. PAWSA states that "vessel inspection program has resulted in inspections deficiencies and vessel detentions rates trending downward over the last several years." "Oversight proficiency is also very good," the conditions of deep-draft ships are good, and "risks determined to be balanced by existing mitigations."	Determined probability by reviewing reportable marine casualty data recorded by the United States Coast Guard from 2010 to Present. Counted number incidents that were classified as "Grounding" for cargo or tanker vessels only and only those incidents located near the main navigation channel. Divided the count by the number of years of data and then by the number of tides in a given year to get a per-tide probability	Quantitative	Decrease	N/A	0.038%	50 00%	50 00%	50 00%	4	4	4

Baseline (Utilization) or Threshold (Capacity)	Event Number	Event	Event Description	Mitigation Actions in Place	Notes	Source of Probability: Qualitative or Quantitative	Impact on Capacity: Increase or Decrease	Qualitative Frequency	Probability	Impact Probability			Vessel Number Impact		
										Min	Most Likely	Max	Min	Most Likely	Max
Threshold	19	Vessel grounding in main channel near Packer Ave Marine Terminal	Grounding resulting in channel closure or 1-way traffic restrictions. Prevents or limits access to terminals around FAMT	Emergency response plans in place and multiple tugs and tug companies on the River to assist PAMSA states that "vessel inspection program has resulted in inspections deficiencies and vessel detentions rates trending downward over the last several years." "Crewmember proficiency is also very good." "the conditions of deep-draft ships are good, and "asks determined to be balanced by existing mitigations."	Determined probability be reviewing reportable marine casualty data recorded by the United States Coast Guard from 2010 to Present. Counted number incidents that were classified as "Grounding" for cargo or tanker vessels only and only those incidents located near the main navigation channel. Divided the count by the number of years of data and then by the number of tides in a given year to get a per-tide probability	Quantitative	Decrease	N/A	0.038%	25.00%	25.00%	25.00%	2	2	2
Threshold	20	Vessel collision in main channel at confluence between Chesapeake & Delaware Canal and Delaware Bay	Vessel collision resulting in channel closure or 1-way traffic restrictions. Prevents or limits access to terminals north of CD canal	Emergency response plans in place and multiple tugs and tug companies on the River to assist PAMSA states that "vessel inspection program has resulted in inspections deficiencies and vessel detentions rates trending downward over the last several years." "Crewmember proficiency is also very good." "the conditions of deep-draft ships are good, and "asks determined to be balanced by existing mitigations."	Determined probability be reviewing reportable marine casualty data recorded by the United States Coast Guard from 2010 to Present. Counted number incidents that were classified as "Collision" for cargo or tanker vessels only and only those incidents located near the main navigation channel. Divided the count by the number of years of data and then by the number of tides in a given year to get a per-tide probability	Quantitative	Decrease	N/A	0.038%	100.00%	100.00%	100.00%	8	8	8
Threshold	21	Vessel collision in main channel near Marcus Hook	Vessel collision resulting in channel closure or 1-way traffic restrictions. Prevents or limits access to terminals north of Marcus Hook	Pilots schedule and stage deep draft vessels as noted in the Report. All parties are focused on safety and communications procedures (communication, scheduling, tugs, etc.) are designed to prevent collisions	Determined probability be reviewing reportable marine casualty data recorded by the United States Coast Guard from 2010 to Present. Counted number incidents that were classified as "Collision" for cargo or tanker vessels only and only those incidents located near the main navigation channel. Divided the count by the number of years of data and then by the number of tides in a given year to get a per-tide probability	Quantitative	Decrease	N/A	0.038%	50.00%	50.00%	50.00%	4	4	4
Threshold	22	Vessel collision in main channel near Packer Ave Marine Terminal	Vessel collision resulting in channel closure or 1-way traffic restrictions. Prevents or limits access to terminals around FAMT	Would not impact channel, and risk to channel is no different than if a ship veered out of channel today. Other DCT-bound vessels would go to ballast or turn and go back down the river. DCT vessels at berth would remain at berth	Determined probability be reviewing reportable marine casualty data recorded by the United States Coast Guard from 2010 to Present. Counted number incidents that were classified as "Collision" for cargo or tanker vessels only and only those incidents located near the main navigation channel. Divided the count by the number of years of data and then by the number of tides in a given year to get a per-tide probability	Quantitative	Decrease	N/A	0.038%	25.00%	25.00%	25.00%	2	2	2
Threshold	23	Tugboat capacity	Tugs unavailable, or inadequate horsepower/tugs available	Tag companies consulted and committed to project. See Report Section X		Qualitative	Decrease	1 in 1 Year	0.141%	12.50%	25.00%	25.00%	1	2	2
Threshold	24	Inefficient vessel traffic management	Scheduling errors or communication failures result in more vessels on tide	Robust scheduling and communication plans in place. Strong collaboration today. See Report Sections 2, 3, and 4		Qualitative	Decrease	10 in 1 Year	1.414%	12.50%	25.00%	25.00%	1	2	2
Threshold	25	Hazardous cargo incidents (minor)	Spills, leaks or onboard accidents resulting in temporary 1-way traffic channel restrictions (not DCT-related)	Policies and procedures are already in place today with USCG, Pilots, vessels, terminals, and other stakeholders. See Report Section 5		Qualitative	Decrease	1 in 10 Years	0.014%	25.00%	37.50%	50.00%	2	3	4
Threshold	26	Hazardous cargo incidents (major)	Spills, leaks or onboard accidents resulting in temporary channel closure (not DCT-related)	Policies and procedures are already in place today with USCG, Pilots, vessels, terminals, and other stakeholders. See Report Section 5		Quantitative	Decrease	1 in 25 Years	0.006%	100.00%	100.00%	100.00%	8	8	8
Threshold	27	DCT's access channel widens Federal channel by DCT	Reduces risk of collision or grounding in front of DCT and provides additional room for passing vessels		Noted by Pilots	Qualitative	Increase	1 in 10 Years	0.014%	25.00%	37.50%	50.00%	2	3	4
Threshold	28	DCT Capital Dredging impacts on navigation	Capital dredging of berth pocket and access channel impacting Main Channel vessel traffic	All dredging to be outside Channel and disposal requires no pipeline crossings. See Report Section 6		Qualitative	Decrease	1 in 1 Year	0.141%	0.00%	12.50%	25.00%	0	1	2
Threshold	29	DCT Maintenance Dredging	Maintenance dredging of berth pocket and access channel impacting Main Channel vessel traffic	All dredging to be outside Channel. Disposal requires a pipeline crossings, but no different from Channel maintenance dredging today and likely use of same crossing for adjacent reach(es). See Report Section 6		Qualitative	Decrease	10 in 1 Year	1.414%	0.00%	12.50%	25.00%	0	1	2
Threshold	30	USACE Main Channel Maintenance Dredging	Main Channel maintenance dredging impacting vessel traffic, including laying channel crossing pipeline	No change from today's operations. See Report Section 6		Qualitative	Decrease	50 in 1 Year	7.072%	0.00%	12.50%	25.00%	0	1	2
Threshold	31	Ships transiting that require special accommodation (large, hazardous, disabled, military)	Larger ships than modeled could require larger clearances and/or slower speeds. Vessels that need very special accommodations so that fewer vessels need to be on the tide	Current ULCVs are already the maximum draft allowed. Deeper vessels would require further deepening of the Main Channel, and additional studies and simulations		Qualitative	Decrease	1 in 5 Years	0.028%	25.00%	25.00%	25.00%	2	2	2
Threshold	32	AIS, radio, or communication system failure	Failure of communication system(s) to communicate between vessels/Pilots	Cell phones are used for backup communications. Tugs also have communication systems		Qualitative	Decrease	1 in 5 Years	0.028%	75.00%	87.50%	100.00%	6	7	8
Threshold	33	Pilot availability	Insufficient number of pilots available to support all transits, delays between transferring pilots between jobs	Scheduling system and procedures are in place to and well known to prevent this		Qualitative	Decrease	1 in 1 Year	0.141%	12.50%	25.00%	37.50%	1	2	3
Threshold	34	Failure/lack of visibility of range lights	The Kichner report states that, given the facilities location near a bend in the river, vessels maneuvering in the Turning Basin could diminish the ability of a vessel (Pilot) to use the range (Marcus Hook Range and Bellview Range)	Pilots noted that range lights will be blocked, but it happens today without DCT. Vessels transiting the channel will obstruct the ranges. However, this occurs now as do blockages due to fog, precipitation, and other weather conditions. Pilots do not see an issue with ranges being blocked. Pilots also use several different tools - GPS, Loran, and other positioning systems on the ships. Their tending tugs have duplicate systems for further redundancy		Qualitative	Decrease	1 in 10 Years	0.014%	0.00%	12.50%	25.00%	0	1	2

Baseline (Utilization) or Threshold (Capacity)	Event Number	Event	Event Description	Mitigation Actions in Place / Notes	Source of Probability: Qualitative or Quantitative	Impact on Utilization: Increase or Decrease	Qualitative Frequency	Probability	Impact %			Vessel Number Impact		
									Min	Most Likely	Max	Min	Most Likely	Max
Baseline	1	Unanticipated short-term increase in vessel traffic volume due to other non-DCT projects	Increased vessel frequency or size of vessels, impacting channel utilization	Highly-scheduled and controlled transits already occurring	Qualitative	Increase	1 in 5 Years	20%	20%	25%	30%	107.60	134.50	161.40
Baseline	2	Unanticipated short-term increase in vessel traffic volume due to DCT	Increased vessel frequency or size of vessels, impacting channel utilization	Highly-scheduled and controlled transits already occurring	Qualitative	Increase	1 in 25 Years	4%	20%	25%	30%	107.60	134.50	161.40
Baseline	3	Unanticipated short-term decrease in vessel traffic volume due to other non-DCT projects	Increased vessel frequency or size of vessels, impacting channel utilization	Highly-scheduled and controlled transits already occurring	Qualitative	Decrease	1 in 5 Years	20%	20%	25%	30%	107.60	134.50	161.40
Baseline	4	Unanticipated short-term decrease in vessel traffic volume due to DCT	Increased vessel frequency or size of vessels, impacting channel utilization	Highly-scheduled and controlled transits already occurring	Qualitative	Decrease	1 in 25 Years	4%	20%	25%	30%	107.60	134.50	161.40
Baseline	5	Uncertainty in long-term traffic forecasts with potential increases in traffic	Under-estimation of vessel traffic in the future. Pertains to macro scale events that increase vessel traffic. Changing economic interests, politically driven policies.	Current traffic count is well below historical highs	Qualitative	Increase	1 in 10 Years	10%	20%	25%	30%	107.60	134.50	161.40
Baseline	6	Uncertainty in long-term traffic forecasts with potential decreases in traffic	Over-estimation of vessel traffic in the future. Pertains to macro scale events that decrease vessel traffic. Large economic recessions, similar in impact to 2008 Financial Crash and 2020 COVID-19 Pandemic.	Current traffic count is well below historical highs	Qualitative	Decrease	1 in 10 Years	10%	20%	25%	30%	107.60	134.50	161.40
Baseline	7	Reopening of oil refineries in the area	This results in a high increase of regular vessel traffic	Unlikely to happen	Qualitative	Increase	1 in 50 Years	2%	10%	15%	20%	53.80	80.70	107.60
Baseline	8	Short-term closure of or disruption at nearby port(s) not on Delaware River	This causes rerouting of traffic to, and increases vessels on the Delaware River.		Qualitative	Increase	1 in 25 Years	4%	10%	15%	20%	53.80	80.70	107.60
Baseline	9	Closure of or disruption at nearby port(s) on Delaware River	This causes rerouting of traffic away from, and decreases vessels on, the Delaware River.		Qualitative	Decrease	1 in 25 Years	4%	10%	15%	20%	53.80	80.70	107.60
Baseline	10	Cruise ships calling on the River	Introduction of cruise ships on the River could cause passing scenarios not seen or modeled.	Jacobs' fast time simulations (see Report Section 3) show safe passing and that cruise ships are not a critical case.	Qualitative	Increase	1 in 5 Years	20%	5%	8%	10%	26.90	40.35	53.80
Baseline	11	Vessels delayed beyond normal in transit to the Delaware Bay and missing arrival tide (only per tide)	Delays at sea or other ports causing inbound vessel to arrive after tide	Scheduling system and procedure in place to mitigate and capacity is available on multiple tides. Noted by Pilots. Normal delays are handled by Pilots' scheduling	Qualitative	Decrease	1 in 5 Years	20%	5%	8%	10%	26.90	40.35	53.80
Baseline	12	Departure delays beyond normal for vessels departing terminals on the River (only per tide)	Berths potentially unavailable due to delays with refueling, cargo transfer, etc.	Routine delays are handled by Pilots' scheduling	Qualitative	Decrease	1 in 5 Years	20%	5%	8%	10%	26.90	40.35	53.80
Baseline	13	Inefficient vessel traffic management	Scheduling errors or communication failures result in fewer vessels on tide	Robust scheduling and communication plans in place. Strong collaboration today. See Report Sections 2, 3, and 4.	Qualitative	Decrease	1 in 25 Years	4%	5%	8%	10%	26.90	40.35	53.80

ENCLOSURE 3

David K. Cuff, *President*
Drew J. Hodgens, *Vice President*
Kevin L. Barrow, *Secretary/Treasurer*
Jason Rowinski, *General Manager*

**The Pilots' Association
for the
Bay & River Delaware**
800 S. Columbus Boulevard
Philadelphia, PA. 19147

Philadelphia (215) 465-8340
Accounting (215) 465-8362

MEMORANDUM

From: Captain Drew Hodgens

To: United States Army Corps of Engineers

Re: Alleged Vessel Navigation Issues Pertaining to the Proposed Delaware Container Terminal

Date: 11/18/2025

Introduction

As Vice-President of the Pilots' Association for the Bay and River Delaware (the "Pilots Association") and as a state-licensed Pilot for the past 27 years, I serve as Chairman of the Mariners Advisory Committee for the Bay and River Delaware (the "MAC"). I have served as the MAC Chairman for 4 years.

The MAC is the preeminent stakeholder organization, established in 1964, concerned with safe navigation of vessels on the Delaware Bay and River. It was created many years ago as the local harbor safety committee by the US Coast Guard's Captain of the Port for Sector Delaware Bay (the "COTP"). The MAC is comprised of representatives of all relevant stakeholders such as tugboat companies, terminal operators, vessel owners and agents, the COTP and her staff, and the Commanding Officer of the Philadelphia District of the US Army Corps of Engineers. The MAC meets quarterly to discuss any and all existing or potential threats to navigation safety, to issue Transit Advisories for the safe navigation of all vessels, and to confer with the COTP and the Army Corps regarding the need for restrictions and improvements.

I am a member and officer of the Pilots' Association. It is made up of state-licensed river pilots who are exclusively authorized to go aboard and guide the navigation of vessels on the Delaware Bay and River. These vessels are all foreign-flagged vessels of greater than 100 gross tons, and also include any US-flagged vessels of such size engaged in foreign trade. The state laws of both Delaware and Pennsylvania require every such ship to take aboard and employ a member of the Pilots' Association. Each state strictly controls the training and licensure of our members. Foreign-flagged vessels constitute more than 95% of the vessels that visit ports or places on the Delaware Bay and River. Before any person is granted a license as a pilot, he or she must obtain a federal pilot's license issued by the US Coast Guard by passing rigorous examinations as to all of the navigational hazards and aids on the river. Finally, an applicant must be certified as qualified by a select group of First Class Pilots. Each state issues levels of pilot licenses graduated in terms of vessel draft beginning with a Sixth Class license such that it will take a minimum of 5 years for a licensed pilot to gain a license of First Class entitling them to pilot vessels of any practical draft or depth. It is no exaggeration to

say that as a Pilot of 27 years' experience, I have piloted several thousand ships of various types and sizes up and down the bay and river in all types of conditions. No one other than a fellow member of our Association can claim to have that level of training, experience and local knowledge.

I have personally been involved in the consideration of navigation safety issues allegedly presented by the proposed construction of container terminal at Edgemoor, DE north of Wilmington on the Delaware River, the so-called Delaware Container Terminal. I have been extensively interviewed by the principals at Jacobs Consulting and have reviewed their recently-issued report. I have also reviewed the report of the former Coast Guard Captain Jerzy Kichner, which had evidently been procured for use in litigation by certain opponents of the DCT project. I agree fully with the conclusions of the Jacobs Report and disagree completely with the opinions of Mr. Kichner. Not only does Mr. Kichner lack the necessary qualifications, training and expertise to evaluate navigation safety on the Delaware River, his opinions ignore the existence of systems, conditions and guidelines which will assure that vessels will be able to come and go from the DCT safely. As discussed at length in the Jacobs Report, the carefully and conservatively conducted navigation simulations performed under the guidance of Delaware River pilots and MAC members at the Baltimore based MITAGS facility completely contradict Mr. Kichner's opinions.

Comments

During my piloting career and my service on the MAC, we pilots have routinely handled many large vessels of various types. Such ships pass one another in the river and bay without difficulty. So-called Ultra Large Container Vessels, those in excess of 1,000 feet long, 200 feet wide, and drawing 38+ feet of water, meet and pass Suez-max tankers, large car carriers, LPG carriers, and other ULCVs in the river routinely. River traffic is controlled via the river pilots on board, who speak with one another constantly via VHF radio. Traffic is also controlled via scheduling methods employed by the Association's dispatchers and the Vessel Traffic Information System managed by our licensed pilot watchstanders at our control tower in Cape Henlopen, DE. The scheduling of vessel traffic is controlled in light of the sizes and drafts of the vessels given the tidal and weather conditions to minimize risk, using the services of local tugboat companies and guided by COTP directives and MAC advisories.

Every ship that travels in the Delaware River above the Chesapeake and Delaware Canal (the entrance of which is downriver of Wilmington) must be turned around near its berth. Either it can be turned before berthing or it can be turned upon departure. There are "turning basins" adjacent to many of the major ship terminals like that being proposed for the DCT. Ships are also turned in the federally-maintained ship channel. The turning basin being prescribed for the DCT is indeed larger than most others on the river. It is more than sufficient, per the MITAGS simulations, to turn ULCVs safely. Turning maneuvers will not obstruct the passage of other ships because they will be scheduled appropriately and will be controlled by the licensed pilot on board, who will know via radio when the turning maneuver will be conducted.

Mr. Kichner fails to mention in his report the fact that ULCVs have been calling at the Packer Avenue Marine Terminal in Philadelphia for several years now without incident. Those ships need to be turned in the adjacent turning basin which essentially spans the entire navigable channel just down-river from the Walt Whitman Bridge. The PAMT is located in what might be called the central Philadelphia Harbor which is the busiest portion of the river traffic-wise. Given the level of skill of the tug operators, docking pilots and river pilots and the careful scheduling of ship transits, there have been no traffic delays, obstruction problems, collision incidents or near-miss incidents when ULCVs have been turned adjacent to the PAMT.

The Pilots' Association has a dispatcher on duty 24 hours per day, 365 days per year. The Association also maintains a watchstander at a vessel traffic information tower located near the entrance to the Delaware Bay at Cape Henlopen, DE. Together, the dispatcher and watchstander work to coordinate the movement of commercial vessels, the vast majority of which are foreign-flagged and therefore require the services of a Pilots' Association member. Factors such as ultimate destination, vessel size and draft, tide conditions, availability of upriver anchorage and berth space, and weather conditions are all taken into consideration in the vessel scheduling process to avoid any unnecessary delays, bottlenecks and potentially hazardous overtaking or meeting situations.

The MAC periodically issues Transit Advisories, and the USCG's COTP occasionally issues Marine Safety Information Bulletins (the "MSIB") to handle situations such as waterfront construction, dredging operations, anchorage closures/limitations or unusual situations such as ice conditions or mechanical vessel breakdowns or groundings.

A look at the nautical charts for the vicinity of Edgemoor shows that there are several anchorages outside the navigable channel both up-river and down-river from the DCT into which vessels can be placed if for some reason the scheduling process and pilot-to-pilot communications do not avoid a close encounter during a turning maneuver at the proposed DCT. These are anchorages that can accommodate vessels of different lengths and drafts. For inbound vessels there are the anchorages below Edgemoor, Artificial Island Anchorage (#2), Reedy Point Anchorage (#3), along New Castle Range (#5), and Wilmington Anchorage (#6). For downbound vessels there are anchorages upriver of Edgemoor at Marcus Hook (#7) and Mantua Creek (#8).

As mentioned above, I personally participated in the discussions with Delaware Pilots referred to by the Jacobs Report's author. I can therefore verify as accurate the statements attributed to the Delaware Pilots in the body of the Jacobs Report, specifically at Parts 2.5, 3.7 and 4. The conclusions reached throughout the report are in my judgment appropriate and fully supported by experience and analysis of the simulations and data.

Sincerely,



Capt. Drew J. Hodgins

ENCLOSURE 4

U.S. Department of
Homeland Security

United States
Coast Guard



Commander
United States Coast Guard
Sector Delaware Bay

1 Washington Ave
Philadelphia, PA 19147-4395
Staff Symbol: s
Phone: (206) 815-6688, Option 3
Email: SecDelBayWWM@uscg.mil

16670
January 15, 2026

U. S. Army Corps of Engineers
Philadelphia District
Attn: Regulatory Branch
1650 Arch Street
Philadelphia, PA 19103-2004

Dear Mr. Todd Schaible,

We have reviewed the report titled "Delaware Container Terminal U.S. Army Corps Permit Additional Technical Support," dated October 14, 2025. The report determined that the development of the Delaware Container Terminal would not result in concerns related to vessel traffic, navigation, safety, communication, scheduling, or emergency response. Coast Guard Sector Delaware Bay met with the state pilots' association and federal pilots' agency to discuss the report and to identify any safety concerns with the development of Delaware Container Terminal.

In regard to safe use of the local waterway, we find the proposed development of Delaware Container Terminal consistent with existing safe use of the waterway and offer no additional comments on the findings from the report.

If you have any questions or comments regarding this matter, please contact the Waterways Management Division, at SecDelBayWWM@uscg.mil or by phone at (206) 815-6688, Option 3.

Sincerely,

A handwritten signature in cursive script that reads "Kate Higgins Bloom".

K. HIGGINS-BLOOM
Captain, U.S. Coast Guard
Captain of the Port, Sector Delaware Bay

Copy: USCG East District (dpw)

ENCLOSURE 5

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AN ENVIRONMENTAL AND ENERGY LAW PRACTICE

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A LIMITED LIABILITY PARTNERSHIP
FORMED IN PENNSYLVANIA

March 24, 2026

Via Email

Ryan A. Baum
Lieutenant Colonel, Corps of Engineers
District Commander
Department of the Army
U.S. Army Corps of Engineers
Philadelphia District
1650 Arch Street
Philadelphia PA 19103-2004

Via Email

Amanda G. Phily
Principal Assistant District Counsel for
Civil Works and Regulatory
U.S. Army Corps of Engineers
Philadelphia District
1650 Arch Street
Philadelphia, PA 19103

Partner responsible:
John F. Gullace (NJ)
Brenda H. Gotanda (HI)

RE: Comments on Jacobs Report Submitted on behalf of
Diamond State Port Corporation - Port of Wilmington,
Edgemoor Expansion Project, New Castle County, Delaware
Application for Section 404/10 Permit and Section 408 Permission

Dear. Lieutenant Colonel Baum and Ms. Phily:

As you may know, this firm represents Greenwich Terminals LLC and Gloucester Terminals LLC, operators of ports on the Delaware River. We recently learned from PhilaPort that, despite the United States District Court for the Eastern District of Pennsylvania's vacating the 404/10 permit and 408 approval granted to Diamond State Port Corporation ("DSPC") for the proposed new container port at Edgemoor in Delaware,¹ the Army Corps is not intending to require DSPC to submit a new application, nor does the Army Corps intend to solicit public comments on new material submitted by DSPC in support of their application. We also learned that DSPC has submitted to the Army Corps a report from Jacobs Engineering Group entitled "Delaware Container Terminal, U.S. Army Corps Permit, Additional Technical Support," (the "Jacobs Report")² to address the holding in the E.D. Pa Opinion that the Army Corps had not engaged in reasoned decision making and must reconsider the navigation and safety issues consistent with the problems and concerns identified in the Court's opinion.

¹ *Greenwich Terminals LLC, et al. v. U.S. Army Corp of Engineers, et al., and The Phila. Regional Port Authority, et al. v. U.S. Army Corp of Engineers, et al.*, Civil Action Nos. 23-4283 and 24-1008, (the "E.D. Pa Opinion").

² While we submitted Freedom of Information Act ("FOIA") requests to the Army Corps a couple of months ago, we still have not received any documents in response to them but have received a copy of the Jacobs Report from PhilaPort, which PhilaPort received in response to a FOIA request submitted by it.



Ryan A. Baum
Amanda G. Phily
March 24, 2026
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Previously, our clients had submitted to the Army Corps an expert report by Captain Jerzy Kichner regarding the navigational impacts of the proposed Edgemoor facility, which in part formed the basis of the E.D. Pa Opinion. Accordingly, we asked Captain Kichner to analyze and provide comments on the Jacobs Report. Captain Kichner's report, entitled "Analysis and Comments on Jacobs Engineering Report" (the "Kichner Comments") are included with this letter. As described in the Kichner Comments, while the Jacobs Report addresses some of Captain Kichner's previously expressed concerns, additional critical studies and analysis still need to be performed in keeping with the E.D. Pa Opinion, and certain inadequacies and inaccuracies need to be addressed. The Kichner Comments summarize Captain Kichner's observations, concerns and recommendations. Captain Kichner has confirmed that he is not asking for anything that is not expected at other significant ports and river systems.

Based upon the foregoing, we ask that the Army Corps consider these comments and address concerns and recommendations found in them before issuing any further permits or authorizations regarding the Edgemoor Expansion Project. After the Army Corps has had an opportunity to review the Kichner Comments, we suggest that a meeting with the Army Corps to further discuss our concerns and determine the best way to address them would be helpful, and also suggest that PhilaPort be included in such a meeting. We have no desire for this to be an adversarial situation and hope that we can work together to ensure that the addition of the Edgemoor/Delaware Container Terminal does not create navigation or safety issues for other ports and terminals on the Delaware River.

Sincerely,

A handwritten signature in black ink that reads "Jill Hyman Kaplan". The signature is fluid and cursive, with the first letters of each name being capitalized and prominent.

Jill Hyman Kaplan
Counsel for Greenwich Terminals LLC and
Gloucester Terminals LLC

FOR MANKO, GOLD, KATCHER & FOX, LLP

cc: Todd Schiable, Chief, Regulatory Branch, U.S. Army Corps
Dr. Juan Carlos Corona, U.S. Army Corps
Shoshana (Suzanne Ilene) Schiller, Esq.
Andrew S. Levine, Esq.

ENCLOSURE 6



KSEAS LLC

Analysis and Comments on Jacobs Engineering Report dated 19 December 2025

Prepared for:

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Prepared by:

Captain Jerzy J. Kichner, USCG (ret)

Kseas

2711 SW 43rd TER Cape Coral FL 33914

Project	Date	Status
MGK EDGEMOOR	24 March 2026	FINAL



**Analysis & Comments on Jacobs Engineering Report
Dated 19 December 2025**

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INTRODUCTION

This document presents an analysis of the Jacobs Engineering Report dated 19 December 2025 (“Jacobs Report”) regarding traffic, navigation, communication, emergency, and maintenance dredging plans related to the proposed Edgemoor port (referred to in the Jacobs Report as the Delaware Container Terminal, hereinafter “DCT”) and Turning Basin, focusing on their impact on ship traffic and safety on the Delaware River.

In the opinion issued by the U.S. District Court for the Eastern District of PA in *Greenwich Terminals LLC, et al. v. U.S. Army Corp of Engineers, et al.*, and *The Phila. Regional Port Authority, et al. v. U.S. Army Corp of Engineers, et al.*, Civil Action Nos. 23-4283 and 24-1008, the Court vacated the Section 404/10 permit and Section 408 authorization issued by the U.S. Army Corps of Engineers (“USACE”) for the proposed DCT. Among other things, the Court concluded that the USACE’s failure to require Diamond State Port Corp. (“DSPC”) to obtain a Statement of No Objection (“SONO”) from The Philadelphia Regional Port Authority (“PhilaPort”) was arbitrary and capricious and that the USACE had not engaged in reasoned decision making, requiring a reconsideration of navigation and safety issues consistent with the problems and concerns identified in the Court’s opinion. Subsequently, DSPC requested a SONO from PhilaPort, to which PhilaPort responded by letter dated 10 January 2025 (the “PhilaPort Letter”). In the PhilaPort Letter, PhilaPort identified additional studies that should be undertaken to address PhilaPort’s navigation and safety concerns. In my professional opinion, the additional studies identified in the PhilaPort Letter were appropriate and reasonable requests to address potential navigation and safety issues associated with the proposed DCT. As the Jacobs Report purports to address the matters identified in the PhilaPort Letter, my comments below evaluate the Jacobs Report against the PhilaPort Letter.

Overall, the Jacobs Report addresses some of the previous concerns identified in my prior report, dated 1 October 2020 (submitted to the USACE to support certain public comments on DSPC’s application), but still has significant gaps that necessitate further study and analysis consistent with the items identified in the PhilaPort letter. Accordingly, in each section below, I have first identified the scope, objectives and intended outcome of the studies requested in the PhilaPort Letter and then provide comments explaining what is inadequate or inaccurate in the Jacobs Report and suggestions about how these issues can be addressed.

1. Traffic Study:

The scope, objectives and intended outcome of the Traffic Study requested in the PhilaPort Letter were:

Scope: Conduct a comprehensive traffic study to evaluate the potential impact of the proposed Edgemoor port and Turning Basin and maintenance dredging on ship traffic.

Objectives: Determine the current number of ships impacted, project future conditions and ship numbers with the full build-out of both PhilaPort and Edgemoor and assess specific impacts and potential mitigation measures.

Outcome: Identify strategies to minimize disruptions and optimize vessel traffic management.

TRAFFIC STUDY REPORT ANALYSIS:

- Current Number of Ships – The Jacobs Report significantly underestimates the “current number of ships” which use the Main Navigational Channel¹ in and around the proposed DCT.
 - In estimating the current number of ships impacted by the proposed DCT, the Jacobs Report defines “visits” as a vessel entering and exiting the Delaware River system through the Delaware Bay or the Chesapeake & Delaware Canal. Because this definition excludes all traffic that starts and stops within the Delaware River system, the Jacobs Report underestimates the volume of traffic impacted by the proposed DCT.
 - In analyzing available data, the Jacobs Report included “only vessels classified as cargo or tanker ships that must use the deep-draft Federal Channel” and excluded smaller vessels with shallower drafts because, according to the Jacobs Report, they “can safely transit outside of the Federal Channel.” (Jacobs Report at 2-2.) However, because smaller vessels can traverse outside the Main Navigation Channel does not mean they do or will in fact travel outside the Channel. Commercially licensed mariners typically prefer to remain within the Main Channel to mitigate risk and potential adverse actions against their license should an incident occur. In fact, AIS data from 2024 shows that at least 24% of the commercial traffic within the Main Navigation Channel at Edgemoor is from vessels not classified as cargo or tanker ships, indicating that smaller vessels regularly do utilize the Federal Channel.
 - There are a considerable number of vessels that travel in the Main Navigation Channel that do not have AIS transponders and thus were left out of Jacobs’ calculations.
 - Jacobs’ description of the vessels included in its calculation of traffic volume also excludes barges that regularly transit using the Main Navigation Channel.

Accordingly, the manner in which Jacobs filtered the vessel data artificially and inappropriately limits the real number of vessels impacted by the proposed DCT.

- Projected Future Conditions - The Jacobs Report concluded that there is adequate capacity to support the additional vessel calls expected at DCT based on an analysis of historical ship visits on the River. However, the Jacobs Report’s method of analyzing projected future conditions was inadequate as it only relied on past data, which data is not representative of expected future conditions. Specifically, the Jacobs Report’s traffic analysis relies on data from the last 25 years, from a 6-year period from 2019-2024, and from 2024. This data set is not representative of expected traffic volume for a number of reasons:
 - Utilizing data from these periods is misleading when determining the percentage of draft restricted vessels expected. The Delaware River Main Navigation Channel Deepening Project was not completed until 2021. Thus, ultra large container vessels (“ULCVs”) have only recently been able to utilize the northern portions of the Delaware River. Available data shows that the number of ULCVs that must use the Main Navigation Channel during a flood-tide transit window (“FTTW”) are increasing. Thus, while the total number of ships could decrease, the number of FTTW ships competing for use of the Main Navigation Channel during high tide conditions will most certainly increase.

¹ These comments use the terms “Federal Channel,” “Main Navigation Channel” and “Main Channel” interchangeably.

- o In considering the reliability of past data to predict future traffic volumes, the Jacobs Report does not address that data affected by the pandemic is not a good indicator of future volume.
- o The Jacobs Report ignores expected increases in vessel traffic at other ports on the River. PhilaPort and NJ ports have shown continual year-to-year increases in volume. Understanding the expected number of vessels that will pass DCT, not merely those that will call at DCT, and that require a FTTW are crucial to understanding the impact of the proposed DCT on other vessels using the Delaware River.
- o Jacobs' methodology of only looking backwards to estimate future traffic volumes and percentage of deep draft vessels also ignores that cruise ships are expected to be calling regularly on Philadelphia ports in the near future, and that due to the recent acquisition of the Philly Shipyard by Hanwha, new commercial and defense-related shipbuilding is expected north of DCT on the Delaware River. The Shipyard's annual production is expected to increase tenfold and to include LNG carriers, medium range oil and chemical tankers, and naval vessels. (See *Hanwha announces \$5 billion Philly Shipyard investment as part of South Korea's commitment to US shipbuilding growth.*)² This shipbuilding activity will involve a range of types of vessels passing the DCT.
- o In connection with analyzing the FTTW and the capacity on the Delaware River, Jacobs does not consider any projections of future volume (other than the additional visits to DCT, discussed further below), failing to even extrapolate from past data to estimate future volume. Instead, Jacobs simply applies the highest annual number from the past as the basis for predicting what will be the volume going forward. This methodology is contrary to assertions made by DSPC that the DCT is necessary because of expected growth and limited capacity. Notably, DSPC's most recent Environmental Assessment Technical Document (Revised April 2022)("EATD"), includes projections of future container ship traffic on the Delaware River "in part attributable to the additional port capacity being developed in Philadelphia and New Jersey." (EATD at 155.) While the numbers in the EATD seem low, even these numbers were not used in the Jacobs Report to project future vessel traffic.

As a result of the above issues, the Jacobs Report does not properly account for future growth of traffic, particularly with regard to additional ULCVs and other large draft restricted and non-draft restricted vessels calling on ports upriver from the proposed DCT. The number of additional ULCV vessels calling on other ports along the Delaware River combined with DCT traffic and the vessels entirely filtered out of the Jacobs Report data, have the potential to stress the system due to the limited window available for draft restricted transits.

- Projected Vessels Calling on DCT - The only future traffic volume incorporated into Jacobs' analysis is an estimated number of vessels expected to call on DCT. However, the number of 118 vessels used by Jacobs does not appear to be a reliable one and is contradicted by other documents prepared by or on behalf of DSPC. The most recent document relied on by Jacobs is the revised Biological Assessment dated October 20, 2021. (Jacobs Report at 2-16.) However, the more recent EATD from June 2022 references larger numbers of 244 and 480 container vessels calling at the DCT. (EATD at 96-97, 155.)³ Even if one subtracts from these numbers to determine the expected

² <https://www.hanwha.com/newsroom/news/press-releases/hanwha-announces-5-billion-philly-shipyard-investment-as-part-of-south-koreas-commitment-to-us-shipbuilding-growth.do>

³ The discussions of volume in the EATD and Biological Assessment use the phrases "vessel traffic," "vessel calls" and "vessel trips" in an inconsistent manner and are different than how Jacobs has defined "vessel visits," which adds to the uncertainty of the numbers offered in the Jacobs Report.

increase from the vessels calling at the Port of Wilmington, the increase would be higher than the 118 used by Jacobs (at a minimum, it would be 188 (a 64% increase over 292) and possibly much higher).⁴ (EATD at 155.) The number relied on by Jacobs was calculated using numbers from 2017 which can and should be updated. Moreover, the Jacobs methodology of only considering the “increase” from the number that called on the Port of Wilmington years ago ignores that a significant percentage of the ships currently calling on Wilmington will likely move to DCT, thereby increasing the traffic in the vicinity of DCT more than indicated by Jacobs’ number in the report.

- Specific Impacts and Potential Mitigation Measures - To the extent these topics are included in the Jacobs Report, they are inadequately presented, and only generally and ambiguously summarized. Most importantly, anchorages were identified as a risk mitigation, however no analysis of the adequacy of available anchorages was done. For example, it is unclear if the anchorages near DCT, which are referenced multiple times as “bail out” options for transiting deep-draft vessels, are deep enough to accommodate deep-draft vessels during low tide periods (as the most recent MAC advisory suggests only one of the anchorages would be appropriate for ULCVs and is limited to only two vessels). Failing to analyze the availability and suitability of the anchorages is particularly troubling when combined with the underestimation of the number of vessels requiring high tide transit windows. Additional analysis of available anchorages, anchorage congestion, depths, draft restrictions and the ability to handle draft restricted ships over a number of tidal cycles needs to be undertaken.
- Strategies for Minimizing Disruptions and Optimizing Vessel Traffic Management - In order to formulate and enhance emergency and vessel management strategies, it is essential to have a reliable estimate of vessel traffic, differentiating between those vessels that require the high tide window and those that do not. The Jacobs Report does not accomplish this for the reasons stated above. Some of the data gaps identified could be addressed by obtaining reasonable projections from other ports on the Delaware River and/or extrapolating from recent data. Even if one were to rely on the traffic data provided in the Jacobs Report, additional planning and mitigation steps need to be taken including developing and analyzing specific incidents and potential adverse scenarios. At present, no potential commerce disruption or definitive worst-case scenarios have been identified, discussed and developed. Once identified, a gap analysis should be conducted identifying both current mitigation strategies, resources available and identification of additional resources not currently available to satisfactorily mitigate the risk.

2. Navigation Studies:

The scope, objectives and intended outcome of the Navigation Studies requested in the PhilaPort Letter were:

Scope: Perform additional navigation studies addressing concerns raised in Captain Kichner's report (submitted by Greenwich Terminals), including studies that assess the full impacts resulting from Panamax and Post-Panamax ships utilizing the Main Navigation Channel as a

⁴ The baseline number of vessel calls to the Port of Wilmington reported in the 2020 Biological Assessment was 157. The EATD moves its baseline number to 292. (EATD at 155.) In the 2021 Biological Assessment cited to by Jacobs, it estimates the number of vessel calls by looking at the annual 1,200,000 TEU capacity of the facility. It then divides that number by the cargo share that is expected per call, which can range from 2,000 TEU to 7,500 TEU per call. While dividing by 7,500 results in the low end of their estimate, the high end of their estimate should have been 600 calls per year (1,200,000/2,000). (2021 BA at 60.)

turning basin under a variety of weather, tide and other relevant conditions.

Objectives: Develop a Monte Carlo simulation to evaluate probabilistic scenarios such as collisions between vessels, groundings, collisions due to environmental conditions (winds, currents, visibility, mechanical casualty, loss of power), and inadequate tug availability and horsepower.

Outcome: Enhance navigation and safety by identifying potential risks and mitigation measures.

NAVIGATION STUDY REPORT ANALYSIS:

- Assessing Impact of DCT's Turning Basin - One of the chief concerns previously expressed concerning the prior navigation analysis is that none of the simulations addressed the impact of using the Turning Basin on other ships in the Main Navigation Channel. While the Jacobs Report addresses some of my prior comments regarding the potential range of conditions, none of the new simulations involve a ship turning in the Turning Basin while other ships use the Main Navigation Channel in close proximity to the DCT. Instead, the Jacobs Report attempts to address this concern in the Traffic Study portion of the Report by asserting that spacing ships at least 30 minutes apart provides sufficient time for ships to turn without affecting other ships in the Main Channel. However, even Jacobs' own analysis acknowledges that ships are sometimes spaced as close as 30 seconds to 1 minute apart, and that the minimum time between vessels would typically be in the range of 7.5 to 15 minutes. (Jacobs Report at 2-13.) This data contradicts Jacobs' claim that the Delaware River Pilots ("DRP") space vessels at least 2 miles apart to provide adequate room for safe operations and maneuvering (which equates to 10 - 17 minutes between vessels at the stated speed of 6 - 10 knots). (Jacobs Report at 3-54.) Further, Jacobs' analysis shows that the time between vessels is trending downwards over the last several years, indicating increasing traffic density and reduced channel capacity. (Jacobs Report at 2-13 - 2-16). Jacobs concludes that use of the Turning Basin is not a concern because "75% of passing vessels had 33 minutes or more between them." (Jacobs Report at 2-14.) However, this assertion suggests that 25% of the time there is less than 33 minutes between ships, which means that 25% of the time a turning ship could negatively affect other ships in the Main Navigation Channel. As traffic volume increases, if no mitigation strategies are employed, the percentage of situations with less than 33 minutes between ships will increase to more than 25%.
- Mitigation to Ensure Sufficient Window for Turning Ship - Jacobs' claims that DRP's existing procedures for vessel sequencing, transit windows, and safe following distances are reliable risk mitigation. These assertions are undercut by data in the Jacobs Report showing that these existing procedures are not reliably adhered to. (See, e.g., Jacobs Report at 2-21, 3-28.).
 - o Jacobs claims that DRP's procedures for sequencing vessels based on their destination will ensure that DCT-bound vessels will not impede vessels heading further upriver. However, even Jacobs' own data shows that vessels currently break this sequence by overtaking each other in the Main Channel, sometimes in the vicinity of DCT. (Jacobs Report at 3-28 and 3-29).
 - o To address the needed safe spacing between ships of at least 30 minutes, the Jacobs Report suggests that experienced pilots and future MAC Transit Advisories will address this.⁵ Yet,

⁵ It should be pointed out that it appears that Jacobs spoke informally with unidentified pilots who are members of the Pilots' Association for the Bay and River Delaware. (Jacobs Report at 1-3.) It does not appear that anyone was specifically authorized to

the Jacobs Report presents data showing that only 41% of outbound deep-draft vessels actually follow these advisories in practice regarding the specified exit window. (Jacobs Report at 2-21).⁶ To the extent Jacobs' conclusions are based on an expected future advisory, and the pilots' adherence to such advisory, the USACE should consider integrating these assumptions into the permitting process.

- Additional Simulations - Additional navigation studies and simulations were performed and are included in the Jacobs Report but these simulations are still insufficient to address some of the identified concerns:
 - o The additional simulations still just addressed a single ship berthing at the DCT or two ships passing in the Main Navigation Channel, and do not address concerns about the impact of the use of the Turning Basin on other ships in the Main Navigation Channel. An additional simulation that should have been done at MITAGS was can a ship be held in the Channel under adverse conditions, both upbound and downbound, if a ship turning at DCT was to block the waterway and delay transits.
 - o In describing the different runs, Jacobs acknowledges that certain runs were noted as “unsafe” but seems to have discounted them because “these situations represented vessels meeting on the River adjacent to DCT, and are independent of DCT’s development.” (Jacobs Report at 3-26.) This conclusion, however, ignores that meetings in the Channel in front of DCT will occur more frequently because of the number of vessels transiting to DCT and will be more complicated because of the Turning Basin. Because of Jacobs attributing these unsafe runs to existing conditions, no mitigation was considered.
 - o The observations regarding Runs 24 and 25 are troubling as they acknowledge that “vessel steering did not respond at dead-slow ahead speeds,” which is the type of situation that could occur if a vessel is turning in the Turning Basin when another vessel is approaching this area. These runs, as well as Run 26, with passing ships at a critical turn in the Channel, present situations where collisions could occur under the conditions specified for the simulations and should be addressed in future advisories.
 - o Runs 28, 29, and 34 were noted as “unsafe.” The Jacobs Report is not concerned about these runs being noted as “unsafe” because “these situations represented vessels meeting on the River adjacent to DCT, and are independent of DCT’s development. [and] The conditions for these runs were outside the MAC’s Transit Advisory, and the Delaware River Pilots noted that they would likely not have transited vessels in these conditions.” (Jacobs Report at 3-26). These runs should not have been dismissed so easily as they do not appear to be situations where transits would not be recommended under the current MAC Transit advisory, are not independent of DCT’s development as the modeling included the expected contours and other conditions that will exist once DCT is built, and identified potential incidents in the channel outside of DCT. If an incident could occur under the conditions modeled, a scenario with an upbound ship turning in the Turning Basin and a downbound ship, under the conditions of the runs, could involve even more risk.
 - o Runs 8 and 27 were not specifically discussed in the Jacobs Report, but a review of the December 2025 MITAGS Study included with the Jacobs Report as Appendix C reveals that these runs went outside the proposed channel and terminal berth limits. MITAGS dismisses concerns raised by these runs because they involved 4 knot currents and 25 knot

speak on behalf of the Pilots’ Association, and no names or documentation of those conversations have been provided. Yet, much of the Jacobs Report relies on purported assertions of the “Delaware River Pilots”.

⁶ The MAC Transit Advisories themselves note that they are “non-binding” recommendations.

winds. MITAGS indicates that this wind speed is outside of current environmental limitations specified in the MAC Transit advisory and that pilots report that they have not experienced a current of 4 knots on the river. Yet, a review of the MAC Transit advisory reveals that it does not recommend that vessels should not transit until winds are forecast to exceed 25 knots sustained and/or 30 knot gusts during the transit. (See 2024 MAC Advisory at 7.) With respect to currents experienced on the Delaware River, the 2018 PAWSA specifically states that “[s]ignificant rain events in the spring and snow melt run-off from the winter increases water flow movement and can increase current speeds from the normal 1-2 knots, to over 4 knots.” (2018 PAWSA at B-9.) Thus, it is not appropriate to dismiss the possibility of 4 knot currents because two pilots purportedly have not experienced them, while it is appropriate to consider conditions identified in the official PAWSA. Again, to the extent Jacobs’ conclusions are based on an expected future advisory and the pilots’ adherence to such advisory, the USACE should consider integrating these assumptions into the permitting process.

- Monte Carlo Simulation (MCS) - A MCS was done with data from historic use of the Delaware River system and incorporated the additional projection of DCT ship transits (although as noted above, the volume for DCT appears to be less than what was presented in the EATD). MCS was not used in future projection of additional ships, larger ships, and draft restricted transits due to port growth along the entire Delaware River. Figure 2-16 illustrates the restricted inbound and outbound traffic based on historical data. The construction of ULCVs worldwide and other large ships, including those to be built in the Philadelphia Shipyard, will increase the number of tide restricted ships significantly. An analysis of future projections of restricted traffic and channel capacity for the next 10 -20 years should be assessed. Appendix D provides a good summary of the Objectives outlined above but only with data for historical transits and the additional DCT traffic, but not for the concurrent future growth of the ports further north on the Delaware River. Therefore, the MSC does not address future impact to navigation on the river system. In other words, risk was identified and quantified based on historic ship traffic. It was not expanded to include future growth and impact on upriver Ports. As further discussed in the Maintenance Dredging Plan section below, the MCS failed to include scenarios involving possible incidents and accidents associated with dredging and with dredging equipment.
- Turning Basin - Jacobs references USACE’s 2006 Hydraulic Design of Deep Draft Navigation Projects as allowing turning basins to use the channel as part of turning basin area “where traffic conditions permit.” Jacobs provides several examples of vessels turning at existing deep draft terminals on the River to support that the proposed turning basin for DCT is acceptable. However, the majority of these other ports are further north on the Delaware River at the end of the Deepening Project and therefore ULCVs would not be expected to pass these areas. (Jacobs Report 3-33 to 3-41). Thus, the “traffic conditions” in these upriver ports are far different than the traffic found in the DCT portion of the Delaware River.
- Mitigation Measures - Although additional weather and adverse environmental conditions were evaluated, the Jacobs Report did not sufficiently address mitigation strategies aside from providing a general overview of options such as no-go decisions, diverting to an anchorage, or reducing ship speed as outlined by the pilots. While the professionalism and expertise of the Delaware River Pilots are not in question, the effectiveness of their actions is contingent upon several factors that have not been sufficiently analyzed or addressed.
 - o Anchorages – The Jacobs Report repeatedly asserts that if issues arise there are anchorages both upriver and downriver from the DCT site. Whether these anchorages are in fact

appropriate mitigation measures depends on the availability of anchorages, draft limitations within anchorages, congestion levels at anchorages, tidal impacts on draft-restricted vessels, and the duration required in anchorage. As previously mentioned, the MAC Transit Advisories do not support that all of the anchorages will be available for ULCVs or that the existing anchorages will be available in all situations. Thus, it is essential to determine the availability, capacity, and environmental conditions necessary to support this mitigation strategy. Since no study/analysis of the available anchorages was done as part of the Jacobs Report, Jacobs' assumption that DCT has more or even sufficient anchorages and "bail-out" points cannot be supported at this time. Further study/analysis of the anchorages, as described above, should be done.

- o Tugs – The Jacobs Report assumes the availability of a certain number of tugs with bollard pulls of 65 tons. The 2024 MAC Transit Advisory only specifies having tugs with a minimum of 50 ton bollard pull, which is less than the MITAGS Study indicates would be necessary. While tugs with 65 ton bollard pull may be available, whether there are enough high bollard pull tugs for the volume of traffic expected in the future is not addressed in the Jacobs Report.
- o Speed Reduction - The term "slow down" is frequently cited as a mitigation strategy. However, reducing speed on a vessel involves more than merely engaging "the brakes". Environmental factors such as tides, currents, and wind significantly influence the safe navigation of a ship especially in a restricted channel. Those factors determine minimum safe speed which can change drastically depending on the environmental factors encountered, and slower speeds may, in fact, be less safe due to maneuverability issues. This becomes particularly complex within restricted navigational areas. One envisions minimum safe speeds to be 3 – 5 knots. However, factoring in environmental conditions may dictate a minimum safe speed of 8 – 12 knots with tug escort to keep the ship within confines of the channel. Therefore, decreasing speed may not adequately mitigate the risk, and could exacerbate the situation as noted in MITAGS runs 24 and 25. As a result, mitigation strategies and emergency planning should be better defined and analyzed.

3. Communication and Scheduling Plan:

The scope, objectives and intended outcome of the Communication and Scheduling Plan requested in the PhilaPort Letter were:

Scope: Develop a detailed plan to manage communication and scheduling for multiple ships requiring access to the Main Channel during high-tide windows.

Objectives: Address potential conflicts and ensure smooth coordination of vessel movements.

Outcome: Reduce congestion and prevent delays through effective communication and scheduling protocols.

COMMUNICATIONS AND SCHEDULING REPORT ANALYSIS:

- Communications and Scheduling Plan – This topic is generally addressed in the Jacobs Report. However, some of the assertions on this topic are unsupported or contradict one another.
 - o Much of the Jacobs Report's assurance that use of the Turning Basin will not cause problems is based on the assertion that "the Delaware River Pilots would establish a 30-minute lead time for ships following DCT vessels, so the following ship does not approach the DCT ship until it is docked." (Jacobs Report at 4-5.) If this is the basis for the

conclusion that the Turning Basin will not be an issue, Jacobs should identify how this requirement will be communicated, and issuance of the requisite permit should be conditioned on this.

- As noted above, Jacobs' Historical Vessel Passing analysis shows that vessels regularly overtake each other, indicating that the sequencing is often incorrect and/or not adhered to. (Jacobs Report at 3-28 – 3-29.) The few examples in the Report show that this overtaking of other vessels occurs throughout the River with the one example occurring adjacent to the DCT area, and not in the deeper, wider portion of the Delaware Bay as suggested elsewhere in the Jacobs Report. (Compare Jacobs Report at 3-28 with 4-4.)
 - The Jacobs Report states that the Delaware River Pilots do not dictate the maximum number of ships that can transit a particular flood current, but then states that Delaware River Pilots would establish a 30-minute lead time (in other words, a delay) for ships following DCT vessels, so the following ship would not approach the DCT ship until it is docked. (Jacobs Report at 4-5.) To the extent Jacobs' conclusions are based on an expected future advisory, and the pilots' adherence to such advisory, the USACE should consider integrating these assumptions into the permitting process.
- Mitigation - The Jacobs Report states that when ULCVs are scheduled, the Delaware River Pilots, ship captains, and tug operators "make sure that there is space available in anchorages should ships need to head to an anchorage during transit." (Jacobs Report at 4-6.) The Report does not specify how this will be done or whether a vessel will start its transit if an anchorage is not available. It also does not address which anchorages are capable of accommodating ULCVs and which anchorages are not. As described in the previous sections, the availability and suitability of the anchorages as appropriate mitigation measures should be studied and addressed before the increased volume of vessels from DCT is permitted.
 - Coordination and Availability of Plan - If not already done with the MAC, the communications and scheduling plan should be part of a comprehensive and easily available written plan so that all procedures and policies are in one place outlining the process from end to end and available to all mariners using the waterway.

4. Emergency Procedures:

The scope, objectives and intended outcome of the Emergency Procedures requested in the PhilaPort Letter were:

Scope: Establish clear emergency procedures to handle incidents involving ships calling on the proposed Edgemoor port that may impact or block the Main Channel and impact ships calling on PhilaPort's terminal.

Objectives: Ensure quick and effective response to emergencies to minimize disruptions.

Outcome: Improve safety and operational resilience through well-defined emergency protocols.

EMERGENCY PROCEDURES REPORT ANALYSIS:

- Emergency Procedures - The Jacobs Report did not establish clear emergency procedures and does not point to where they can be found. The Report references generalized standard emergency response protocols and mitigation strategies as merely topics; however, it does not identify or address potential scenarios that may specifically impact other port and waterway users by DCT

operations. Although the Monte Carlo Analysis indicated low probabilities for specific incidents covered, it remains necessary to identify potential adverse scenarios both during construction (dredging) of the DCT port and normal operations thereafter. Only after identification of potential scenarios can the full impact on other shipping and ports be understood and detailed response strategies be developed.

- Mitigation - All incidents can be resolved, but the critical factor is time. How much time will an incident on the river due to a situation at DCT disrupt navigation on the River; this critical question was not answered. To address this issue, specific “most likely” and “worst-case scenarios” with regards to vessel movements involving grounding, allision, collision, loss of steerage and/or power need to be developed, analyzed and emergency plans updated or created dealing with each type of incident. Areas on the waterway system need to be identified as potential chokepoints/hotspots that may require additional management and/or resources to mitigate the risk. The analysis should include identifying the resources necessary to satisfactorily mitigate the incident, whether those resources are readily available, and how long it would take for those resources to respond. Specific impacts, long and short term, from the potential adverse scenarios developed should be addressed through planning and mitigation. Only then can true impact to users of the waterway be understood.
- Recommendation – A Ports and Waterways Safety Assessment (“PAWSA”) identifies major waterway safety hazards, estimates risk levels, evaluates potential mitigation measures, and sets the stage for the implementation of selected risk reduction strategies. While the Jacobs Report cites to aspects of the current PAWSA as support that certain mitigation measures are already in place, that document is now 8 years old and much has changed on the Delaware River during that time, including the completion of the Main Navigation Channel Deepening Project. An updated PAWSA would address many of the concerns identified in these comments, and thus it would be appropriate to have the U.S. Coast Guard undertake an updated PAWSA at this time and prior to the construction of the DCT. The PAWSA should specifically identify the burden DCT and the increased number of vessels will place on the Delaware River system.⁷
 - o In the past eight years since the last PAWSA, the Delaware River and other east coast ports have experienced loss of power incidents for which emergency planning was not sufficient, including the loss of power on the container ship *Dali* that led to it striking the Francis Scott Key Bridge and on the bulk carrier *Alogma Verity* that led to its running aground north of the Benjamin Franklin Bridge in the Delaware River. These incidents further suggest that an updated PAWSA and review of mitigation options and emergency procedures is warranted before further stressing the Delaware River system.

5. Maintenance Dredging Plan:

The scope, objectives and intended outcome of the Maintenance Dredging Plan requested in the PhilaPort Letter were:

Scope: Develop a comprehensive plan for maintenance dredging to minimize disruptions to ships using the Main Channel.

⁷ For example, as noted in my 2020 comments, the current PAWSA states that there are already visibility impediments from background shore side lighting, and it is difficult to see vessels berth alongside or tow vessels with barges as well as other smaller vessels that may be in the channel. The construction of DCT and any obstruction, such as a cargo ship in the Turning Basin, could diminish the ability of a vessel to use the range at the turn at the Edgemoor portion of the river as a visual navigation aid and impact safe navigation.

Objectives: Schedule dredging activities and include appropriate communication plan to reduce impacts on vessel traffic, ensuring navigational safety.

Outcome: Maintain optimal channel conditions while minimizing operational disruptions.

MAINTENANCE AND DREDGING REPORT ANALYSIS:

- Dredging operations need to be better defined. While the Jacobs Report states that dredging will not impact the vessel traffic and dredging equipment will not encroach on the Main Channel, such a statement cannot be relied upon to dismiss the dredging issue. The fact is that dredging and its associated equipment limits the area in which vessels can maneuver and navigate and routinely break free and obstruct or encroach on the adjacent channel.
- Environmental factors play a role just as they do in the navigation of a ship in restricted waters. Lighting of dredge pipes and the dredge itself can cause confusion to vessels passing or meeting in the area. Key risk factors include an increase in geometric probability due to dredging vessels and pipelines effectively or perceptively narrowing the channel increasing the likelihood of encounters and near misses.
- The simulation studies indicated ships passed close to one another and to the channel boundary due to the environmental conditions as well as vessel size. Changes in current patterns from dredging can cause vessel aberrancy, while speed dispersions in congested grids further elevate risk values. This is especially true since the DCT is being built in a turn in the federal channel. A ship losing power and steering can also cause it to allide with close proximity dredge equipment.
- At a minimum, additional Monte Carlo Simulations should be done that address possible emergency scenarios associated with the above-described repercussions from dredging and dredging equipment incidents.

SUMMARY OF KEY OBSERVATIONS AND RECOMMENDATIONS

- 1) The Jacobs Report is a “rear view mirror” analysis of the system and does not adequately analyze the expected growth and volume of vessels that will be potentially impacted by the proposed DCT and its Turning Basin. The Jacobs Report limits the types of vessels it includes in its analysis and thereby ignores other vessels that will be impacted or may contribute to impacts on ship transits. It utilizes in its analysis a low projected number of vessels that will call on DCT which is contradicted by reports submitted by DSPC and fails to consider any increase in the number of vessels expected to call on ports and terminals further north on the Delaware River. **As all of the Jacobs Report’s analysis is based on its assumptions regarding vessel traffic, a thorough analysis of vessel traffic expected at DCT and at locations further north should be performed.**
- 2) The Jacobs Report does not adequately address the impact of ships turning in the Turning Basin on other vessels in the Main Navigation Channel. None of the MITAGS simulations address this situation. Instead, the Jacobs Report relies on the assertion that there will be a 30-minute window between ships that will allow a vessel to turn and berth at DCT before another vessel is in the area of the Turning Basin and that vessels will be properly sequenced. But existing data shows that there is regularly much less than 30 minutes between ships and vessels regularly overtake other ships, deviating from the prescribed sequence. The Jacobs Report relies on the assertion that there will be a future MAC Transit Advisory and that pilots will strictly adhere to it, despite data that shows that pilots often do not adhere to current advisories

and there is no mechanism for ensuring either the issuance of a future advisory or compliance with it. **To the extent the Jacobs Report's conclusions are based on expected future advisories and pilots undertaking specific actions, the issuance of the USACE permits and authorization should be conditioned on these items.**

- 3) The Monte Carlo Simulations performed did not address the volume of traffic or type of large vessels expected in the future or the range of scenarios that could arise. Examples of additional scenarios that should be addressed include the impact of limited high tide transit windows and what happens if anchorages or additional tugs of adequate bollard pull are not available, as well as situations that arise as a result of dredging and dredging equipment incidents. **Additional simulations should be performed to include additional scenarios that may arise in the Channel.**
- 4) The Jacobs Report relies on mitigation measures that have not been analyzed, particularly the availability of anchorages. There are limited anchorages on the Delaware River, and the most recent MAC Transit Advisory indicates that few are appropriate for ULCVs (perhaps just one). **Additional analysis of available anchorages, anchorage congestion, depths, draft restrictions, tidal impacts on draft-restricted vessels and the ability to handle draft restricted ships over a number of tidal cycles should be undertaken.** Similarly, the assertion that vessels can simply slow down ignores that there are a number of situations where a vessel slowing down makes it less maneuverable and would involve additional risks. **The mitigation measures referenced in the Jacobs Report should be fully studied, analyzed, and a plan developed.**
- 5) **The USACE should ask the U.S. Coast Guard to undertake an updated PAWSA for the Delaware River which should include addressing the conditions that will be created by the proposed DCT.** An updated PAWSA would allow all stakeholders on the river to work together to address concerns, expected and possible scenarios, communications and mitigation plans and emergency procedures.

Signed: _____


J.J. Kichner, PE

Date: 24 March 2026 _____

ENCLOSURE 7



April 1, 2026

VIA E-MAIL

Robert Youhas, PWS
Regulatory Division
US Army Corps of Engineers, Philadelphia District
1650 Arch Street 5th Floor
Philadelphia, PA 19103-2004
Robert.youhas@usace.army.mil

RE: Re-Issuance of 404/1- Permit and Section 408 Authorization for Port of Wilmington Edgemoor Expansion (CENAP-OP-R-2019-00278-23)

Dear Mr. Youhas:

The Diamond State Port Corporation (“DSPC”) is in receipt of the letter submitted by Manko, Gold, Thatcher, & Fox, LLP (“Manko”) on behalf of Greenwich Terminals LLC (“Greenwich Terminals”) and Gloucester Terminals LLC (“Gloucester Terminals”) to the United States Army Corp of Engineers (“USACE”) on March 24, 2026 (“Manko Submission”). The Manko Submission concerns (a) DSPC’s proposal to construct a new marine container terminal facility along the Delaware River in Edgemoor, New Castle County, Delaware (“Delaware Container Terminal”), (b) DSPC’s pending request for the related re-issuance of permits related thereto, and (c) the Delaware Container Terminal U.S. Army Corps Permit Additional Technical Support Report, dated December 19, 2025 and authored by Jacobs Engineering Group, Inc. (“Jacobs”) as submitted to USACE (the “Jacobs Report”). DSPC appreciates the opportunity to respond to the Manko Submission, as it omits important context and procedural history, and contains analytical errors that warrant correction.

As an initial matter, it is important to recognize that Manko represents Greenwich Terminals and Gloucester Terminals, both Holt Logistics entities and for-profit operators of port facilities that compete directly with DSPC. Importantly, this competition will only intensify once the Delaware Container Terminal becomes operational. In an effort to block, or at the very least delay increased competition from

the Delaware Container Terminal, Holt Logistics retained Manko, which in turn hired Captain Jerzy Kichner’s firm in 2020, not to collaborate or conduct a peer review, but as a paid consultant and witness in anticipation of litigation. Indeed, Manko initiated litigation against DSPC in Delaware in 2021 that continues today, with Captain Kichner as its primary witness,¹ and later filed suit against the USACE in the United States Federal District Court for the Eastern District of Pennsylvania, again relying heavily on Captain Kichner.²

This context is critical. USACE is now being asked to consider and weigh the recent submission of Captain Kichner—a paid consultant retained by counsel on behalf of a direct for-profit competitor, engaged specifically to block this project since 2020—against the detailed and independent analyses provided to USACE by (a) Jacobs, a premier provider of consulting, planning and engineering services for maritime infrastructure projects, (b) the Delaware River Pilots Association (“Pilots Association”), which has no vested interest in this matter and is charged solely with ensuring the day-to-day navigational safety of the Delaware River, (c) the United States Coast Guard (“USCG”), and (d) the Marine Institute of Technology and Graduate Studies (“MITAGS”).³

More specifically as to the Jacob’s Report and Captain Kichner’s lack of experience and expertise with respect to navigating the Delaware River, on November 15, 2025, the Pilots Association submitted a letter in response to USACE’s request for a review of the Jacobs Report (“Pilots Association Letter”).

As Captain Drew Hodges stated in the Pilots Association Letter:

I have personally been involved in the consideration of navigation safety issues allegedly presented by the proposed construction of container terminal at Edgemoor, DE north of Wilmington on the Delaware River, the so-called Delaware Container Terminal. I have been extensively interviewed by the principals at Jacobs Consulting and have reviewed their recently-

¹ *Greenwich Terminals, et al. v. DNREC, et al*, No. N24A-06-002 (Del. Super. Ct.).

² *Greenwich Terminals LLC, et al. v. U.S. Army Corps of Engineers, et. al.*, Civil Action No. 23-4283.

³ The Environmental Appeals Board of the State of Delaware in a decision dated July 14, 2025 (“EAB Decision”), found Holt Logistics and Captain Kichner “were biased or prejudiced by their own business interests. Those biases, prejudices, and interests are given weight in the Board’s consideration of the evidence in the record before it.” EAB Decision at 29 (Copy Attached).

issued report. I have also reviewed the report of the former Coast Guard Captain Jerzy Kichner, which had evidently been procured for use in litigation by certain opponents of the DCT project. I agree fully with the conclusions of the Jacobs Report and disagree completely with the opinions of Mr. Kichner. Not only does Mr. Kichner lack the necessary qualifications, training and expertise to evaluate navigation safety on the Delaware River, his opinions ignore the existence of systems, conditions and guidelines which will assure that vessels will be able to come and go from the DCT safely. As discussed at length in the Jacobs Report, the carefully and conservatively conducted navigation simulations performed under the guidance of Delaware River pilots and MAC members at the Baltimore based MITAGS facility completely contradict Mr. Kichner's opinions.

Pilots Association Letter at 2 (emphasis added).

Similarly, Captain Kichner's former employer, the United States Coast Guard, responded to a similar request by USACE in a letter dated January 15, 2026 ("Coast Guard Letter"). The Coast Guard Letter reviewed the Jacobs Report, met with the Pilots Association, the federal pilots agency, and concluded:

In regard to safe use of the local waterway, we find the proposed development of Delaware Container Terminal consistent with existing safe use of the waterway and offer no additional comments on the findings from the report.

Coast Guard Letter at 1. In the end, while Captain Kichner is entitled to his opinions, he is not entitled to his own fabricated facts. On these critical matters, Captain Kichner stands alone, as his conclusions are contradicted by each of the independent authorities and critical stakeholders who bear actual responsibility for navigational safety and oversight on the Delaware River.

It is also important to note the Manko Submission overlooks important procedural steps DSPC took as part of the scoping process for the Jacobs Report. Specifically, as part of its long-standing and well-documented efforts to work cooperatively with the Philadelphia Regional Port Authority ("PhilaPort") to secure a Statement of No Objection, DSPC provided PhilaPort with a meaningful opportunity to contribute input on the scope of the Jacobs Report. PhilaPort took full advantage of that opportunity, including retaining an outside consultant for the specific purpose of providing such input. Indeed, a representative of Jacobs and I hosted a meeting with PhilaPort's Chief Engineer and their

consultant, Urban Engineers ([Urban Engineers](#)), wherein we discussed the scope of the Jacobs Report in detail and incorporated their feedback accordingly. The Manko Submission ignores this critical step entirely, instead referencing a PhilaPort letter dated January 10, 2025, that predates the above-referenced collaborative efforts by eight months. It is also worth noting that PhilaPort has not joined the Manko Submission, despite being an active participant in the prior federal litigation and is also no longer pursuing state litigation against DSPC.

The Manko Submission also summarily concludes that Captain Kichner is not requesting “anything that is not expected at other significant ports and river systems.” Manko Submission at 2. While every project has unique attributes, and DSPC is not in a position to opine on all projects under USACE’s jurisdiction, we question whether Manko or Captain Kichner is in a position to do so either. We also note that, upon information and belief, some of the very projects advanced by Holt Logistics where they operate on the Delaware River and referenced by Manko and Captain Kichner, did not include the studies and reports they now demand of DSPC in the Manko Submission. For example, Captain Kichner declares that this project should be put on hold while the USCG updates its Ports and Waterways Safety Assessment, yet no such requirement was imposed on Holt Logistics-controlled ports related to their expansion efforts.

It is also worth noting that much of Captain Kichner’s criticism of the capacity analysis in the Jacobs Report reflects a presumptuous and mistaken view that USACE must somehow anticipate and accommodate the ambitious growth plans of Holt Logistics before proceeding with potentially competing applications on file, as if Holt Logistics holds a veto right over any and all expansion on the Delaware River. Indeed, DSPC’s application for the Delaware Container Terminal was filed with USACE in 2020. Accordingly, future expansion plans by Holt Logistics or others on the Delaware River seek to effectuate

through the required permit approvals and those filings must account for the existing traffic volumes at Delaware Container Terminal, not the reverse.

Notwithstanding the above referenced contextual omission and procedural defects in the Manko Submission, Jacobs has reviewed Captain Kichner's submission and has provided its analysis of the substantive points raised therein, which we have included with this response. We believe that analysis sufficiently addresses Captain Kichner's objections, most of which are repetitive. In light of these substantive responses and the additional context and procedural history set forth herein, DSPC respectfully submits that the record amply supports the conclusion that the concerns raised by the United States District Court for the Eastern District of Pennsylvania on October 28, 2024 have been properly addressed and that the re-issuance of the Section 404/10 permit and Section 408 approval for the construction of the Delaware Container Terminal is appropriate. We again appreciate the opportunity to comment on the Manko Submission.

Sincerely,

A handwritten signature in blue ink, appearing to read "Brian Devine".

Brian Devine
Executive Director, DSPC

cc: Charuni Patibanda-Sanchez, Chair of Board for DSPC

Enclosures:

- Jacobs Engineering Memorandum Dated April 1, 2026
- State of Delaware Environmental Appeals Board Decision 2021-08-10

Response to KSEAS LLC Report Dated March 24, 2026

Date:	March 31, 2026	Two Commerce Square
Project name:	Delaware Container Terminal U.S. Army Corps Permit Additional Technical Support	2001 Market Street 9th Floor, Suite 900 Philadelphia, PA 19103
Project no:	T2484304	T +1.215.569.2900
Attention:	Brian J. Devine, P.E., DSPC Diego Lopez, Enstructure	F +1.215.569.5963
Prepared by:	Duncan Kopp	www.jacobs.com

Introduction

On August 4, 2022, the U.S. Army Corps of Engineers (USACE) issued an Individual Permit and Section 408 Permission (permit number CENAP-OPR-2019-00278-86) for a proposal from the Diamond State Port Corporation (DSPC) to construct a new containerized cargo port, now called the Delaware Container Terminal (DCT), in the unincorporated Edgemoor section of New Castle County, Delaware. The permit and permission authorized (1) construction of a new wharf and bulkhead, (2) undertaking capital dredging, and (3) creating a new berthing area and access channel adjacent to, but outside, the Federal Navigation Channel (Federal Channel).

On October 28, 2024, the U.S. District Court for the Eastern District of Pennsylvania vacated the previously issued permits, finding that USACE did not “engage in reasoned decision making” as it relates to the Section 404/10 permit and “departed from their own procedures” in issuing the Section 408 permit. DSPC and its partner, Enstructure DCT LLC, which are codeveloping DCT, previously engaged Jacobs Engineering Group, Inc. (Jacobs), to prepare a report titled “*Delaware Container Terminal U.S. Army Corps Permit Additional Technical Support*,” dated December 19, 2025 (Jacobs Report), that provided technical analysis and details to address items raised in the court’s ruling, items requested by USACE in subsequent follow-up, and comments made by public commenters, including Captain Jerzy J. Kichner who was retained by the Manko, Gold, Thatcher, & Fox, LLP (“Manko”) on behalf of Holt Logistics companies, Greenwich Terminals LLC (“Greenwich Terminals”) and Gloucester Terminals LLC (“Gloucester Terminals”). The report includes additional analysis of and commentary on vessel traffic, navigation, communication, emergency, and maintenance dredging plans related to the proposed DCT and its Turning Basin, focusing on the project’s potential impact on ship traffic and safety on the Delaware River (River).

In general, Jacobs’ Report was developed in accordance with general engineering practices, Federal navigation standards and best practices, and specific navigational practices, constraints, and conditions on the Delaware River. As noted in the Jacobs Report, Jacobs consulted a wide variety of stakeholders and users, all of whom are actively involved in vessel navigation and operations on the Delaware River, and are familiar with specific local conditions. Further, the Jacobs Report considered a wide variety of risks and conditions, including those specifically raised recently in the Kichner 2026 Report and the prior Kichner Report (2020).

On March 26, 2026, Manko submitted a report to USACE from KSEAS LLC titled *Analysis & Comments on Jacobs Engineering Report Dated 19 December 2025*, dated March 24, 2026, authored by Captain Jerzy J. Kichner, a retired USCG Captain (Kichner 2026 Report) that includes comments on and analysis of the Jacobs Report.

This Technical Memorandum provides responses to the technical comments and objections raised in the Summary of Key Observations and Recommendations in the Kichner 2026 Report.

Response to Summary of Key Observations and Findings

The Kichner 2026 Report makes five (5) "key observations and findings," which are included below. Jacobs' responses to the key findings follow each of the Kichner 2026 Report items.

1. **Kichner 2026 Report:** *"The Jacobs Report is a "rear view mirror" analysis of the system and does not adequately analyze the expected growth and volume of vessels that will be potentially impacted by the proposed DCT and its Turning Basin. The Jacobs Report limits the types of vessels it includes in its analysis and thereby ignores other vessels that will be impacted or may contribute to impacts on ship transits. It utilizes in its analysis a low projected number of vessels that will call on DCT which is contradicted by reports submitted by DSPC and fails to consider any increase in the number of vessels expected to call on ports and terminals further north on the Delaware River. As all of the Jacobs Report's analysis is based on its assumptions regarding vessel traffic, a thorough analysis of vessel traffic expected at DCT and at locations further north should be performed."*

Jacobs Response:

- a) The Monte Carlo Analysis performed as part of Jacobs' Report considered 34 events that could impact channel capacity and 13 events that could impact vessel traffic. Specifically, it included potential increases and/or decreases in vessel traffic on the Delaware River - '**Baseline Event Number 1**' is *"Unanticipated short-term increase in vessel traffic volume due to other non-DCT projects,"* which accounts for increased vessel frequency or size of vessels, impacting channel utilization, and '**Baseline Event Number 5**' is *"Uncertainty in long-term traffic forecasts with potential increases in traffic,"* which accounts for under-estimation of vessel traffic in the future pertaining to macro scale events that increase vessel traffic, such as changing economic interests and politically driven policies. Several other Baseline Events also include other increases in traffic, such as reopening of oil refineries and cruise ships calling on the Delaware River.

As indicated throughout the Jacobs Report, there remains significant additional capacity on the Delaware River following the development of DCT, for both draft-restricted and non-draft-restricted vessels. Specifically, Table 2-4 in Section 2.8.5 shows that when considering a multitude of events that may impact capacity and traffic, without DCT-related vessels, the Delaware River's channel has a 9.3% utilization for draft-restricted vessels. With the addition of DCT's vessels and associated events, the utilization increases to 12.0%. This shows that there is significant excess deep-draft capacity to support not only DCT, but growth at other terminals, existing and new. Further, as noted in Section 2.7.2.2 of the Jacobs Report, Jacobs considered the maximum number of vessels that could use a tidal window to be 8 vessels. Jacobs' analysis found one (1) instance where this maximum number of 8 vessels used a single flood-tide transit window out of 624 total valid tide transit windows. Only 20% of the valid flood-tide transit windows in 2024 had 4 or more vessels, meaning 80% of flood tide transits had 3 or fewer vessels. This analysis further proves there is significant excess channel capacity for deep-draft vessels.

Finally, while specific developments highlighted in the Kichner 2026 Report may occur and lead to increased vessel traffic, Jacobs' Report shows that when considering longer-term periods of time, overall vessel traffic has decreased, despite new developments and

projects. Terminals have closed and seen decreased traffic, and global industry trends, such as larger ship size, are materializing on the Delaware River. These larger ships carry more cargo, meaning that fewer vessel calls are required to carry the same, or increased, cargo volumes. Assessing the historical performance of the system provides valuable insight into the proven capacity of the system. Jacobs' report provided direct evidence of the system's ability to support higher volumes of vessel traffic, and more specifically, deep-draft vessel traffic as seen through the higher total number and proportion of vessels required to transit during high-tide during the 2000s (Section 2- Traffic Study, Figures 2-7 and 2-8).

- b) Jacobs' traffic analysis limited the types of vessels to those relevant and impactful to the analysis with a focus on capturing the draft-restricted vessels. Limiting the vessel traffic to cargo and tanker traffic captures the majority of vessels required to use the federal navigation channel. Any draft-restricted vessels required to transit during the flood-tide transit window not in those categories would be a minority and their exclusion will not meaningfully impact the analysis.

Although small commercial vessels may use the navigation channel, per the USCG Navigation Rules and Regulations Handbook Rule 9b states "*a vessel of less than 20 meters in length or a sailing vessel should not impede the passage of a vessel which can safely navigate only within a narrow channel or fairway*" and Rule 18a states "*a power-driven vessel underway shall keep out of the way of a (ii) a vessel restricted in her ability to maneuver.*" Therefore, these small vessels must accommodate the draft-restricted vessels in the channel and will not impact the overarching traffic behavior. Jacobs also notes that there is barge traffic on the Delaware River, however, barges are not draft restricted.

Additionally, the analysis made it abundantly clear that there is substantial unused capacity in the flood-tide transit windows. It is therefore self-evident that non-draft restricted vessels do not presently face capacity constraints.

- c) Jacobs' analyses considered a wide range of vessel traffic and types and did not limit to "a rear view mirror" set of assumptions. Specifically, Jacobs' simulations included vessels that are not currently transiting the Delaware River but are expected to in the future, including a 2,800 passenger cruise ship and an 18,000 TEU container ship. Further, as noted above, the Monte Carlo Analysis includes events that consider additional vessel traffic that the Delaware River could see.
- d) Jacobs' analyses included 118 new vessel calls due to the development of DCT. As noted in the Jacobs Report, this is consistent with the Biological Assessment (BA) dated October 20, 2021. We note that the more recent Environmental Assessment Technical Document (Revised April 2022) ("EATD") cited in the Kichner 2026 Report is consistent with the 118 new vessel calls number, which represents an increase in total vessel calls to the Port of Wilmington, which includes the existing facilities and DCT. The Kichner 2026 Report confuses the various historic, projected, and DCT-related vessel calls. The following table clarifies how the BA and EATD are consistent.

	2017 Calls to Port of Wilmington	"Without Project" Calls (a)	"Future Case" Calls	Additional Calls due to DCT (b)
BA	- (c)	362 (d)	480 (e)	118
EATD	292	- (f)	480	

(a) The "Without Project" scenario considers that without DCT, cargo volumes and vessel calls would increase at the existing Port of Wilmington facilities.

(b) "Future Case" minus "Without Project" calls quantified in BA

(c) The BA did not list a historical number of vessel calls

(d) 362 calls/year is the highest number of potential vessel calls in Project Year 20 according to the USACE DDNPOX

(e) 1,200,000 TEU annual capacity divided by 2500 TEU/ship = 480 calls. We note that the 2500 TEU/ship is at the low end of the vessel size range noted in the BA and recommended by the Kichner 2016 Report.

(f) The EATD does not include "with / without" number of calls

Additionally, the vessel calls to the Port of Wilmington are overwhelmingly non-draft restricted (>97% in 2024), therefore shifting these vessel calls to DCT does not impact the draft-restricted vessel analysis.

- e) Assumptions made for the traffic analysis were grounded in expert judgement, data, and information from engaged stakeholders. While Jacobs' Report does not specifically forecast traffic increases at other terminals, as noted above, longer term trends show relatively flat, or decreased, traffic volumes, and global trends or larger ships will be able to carry more cargo on fewer vessels. And most importantly, Jacobs' analysis showed that there is significant excess capacity on the Delaware River following the development of DCT, for both draft-restricted and non-draft-restricted vessels. A four-fold increase in draft-restricted vessel traffic on the Delaware River & Bay would not use even half of the total capacity identified with the Monte Carlo Analysis.
2. **Kichner 2026 Report:** *"The Jacobs Report does not adequately address the impact of ships turning in the Turning Basin on other vessels in the Main Navigation Channel. None of the MITAGS simulations address this situation. Instead, the Jacobs Report relies on the assertion that there will be a 30-minute window between ships that will allow a vessel to turn and berth at DCT before another vessel is in the area of the Turning Basin and that vessels will be properly sequenced. But existing data shows that there is regularly much less than 30 minutes between ships and vessels regularly overtake other ships, deviating from the prescribed sequence. The Jacobs Report relies on the assertion that there will be a future MAC Transit Advisory and that pilots will strictly adhere to it, despite data that shows that pilots often do not adhere to current advisories and there is no mechanism for ensuring either the issuance of a future advisory or compliance with it. To the extent the Jacobs Report's conclusions are based on expected future advisories and pilots undertaking specific actions, the issuance of the USACE permits and authorization should be conditioned on these items."*

Jacobs Response:

- a) As noted in Jacobs' Report (Section 2 – Traffic Study, Section 3 – Navigation Study, and Section 4 – Communications and Scheduling Plan), ships do not, and will not, pass a turning ship on the Delaware River. As noted in Section 3.5 of the Jacobs Report, "virtually all terminals at which large vessels call (other than Delaware City), the large vessels must

significantly encroach on the Federal Channel when turning to arrive or depart a berth...Accordingly, no significant vessel is able to pass a vessel that is actively berthing or departing from a Delaware River Terminal. The Delaware River Pilots are well versed in the practice of turning vessels in the Federal Channel and schedule vessel transits and movements to provide safe, unimpeded navigation (refer to Section 4). The Delaware River Pilots, through their experience handling the array of ships transiting the Delaware River and berthing at its terminals, know the total time required for a ship of a given size and maneuverability to complete its turning maneuver in the Federal Channel turning basin from arrival at its target terminal to when the ship has completely cleared the Federal Channel." Because the same will be true for DCT, a simulation was not performed. Further, as noted in Section 3.6 of the Jacobs Report, simulations are tools to help predict real life scenarios and how vessels will react, used in planning and design processes. The Delaware River Pilots are actively bringing ULCVs up and down the Delaware River today, and have a real life understanding of how turning ships (in turning basins that are smaller and less ideal than DCT's) impact vessel traffic. Scheduling, sequencing, and communication plans are in place that work, are safe, and will be utilized with DCT.

- b) The Kichner 2026 Report conflates the time between two ships while transiting the Delaware River, and time between a turning ship and a trailing ship. While Figure 2-10 in the Jacobs Report does identify that 25% of the time, there is a time of less than 33 minutes (in 2023 and 2024) between ships in front of DCT, this is for transiting ships and does not include the future time that would be allocated by Delaware River Pilots for turning in the new DCT turning basin. More notably, without specific coordination needed for berthing at DCT, Figure 2-10 highlights that 75% of the time passing vessels have more than 33 minutes between them. This shows that the majority of passing vessel traffic will not be disrupted by berthing maneuvers at DCT. Additionally, as stated in section 2.7.1, the extremely short times between passing vessels at Edgemoor can be attributed to *"vessels making passing maneuvers, which would create situations where the safe following distance is breached."* These passing maneuvers could have been identified and removed from the data, but Jacobs included them to provide a more conservative result and minimize data manipulation.

A spacing of less than 30 minutes does not mean that unsafe deviations are occurring, but rather that the communications, scheduling, and sequencing plans are allowing these occurrences. As stated in section 2.7.2.2 of the Jacobs Report, the **distances of less than 30 minutes are not in locations of turning ships:** *"Delaware River Pilots noted that because ships are sequenced so that vessels bound for terminals are ahead of vessels bound for downstream terminals, vessels are spaced as close as 2-5 minutes apart. However, a spacing closer to 30 minutes is required when the leading vessel turns for a terminal and the vessel following behind continues past the terminal. This 30-minute spacing allows the leading vessel to turn and clear the Federal Channel, and for the following vessel to maintain safe maneuvering speeds"* [emphasis added].

Regarding the Kichner 2026 Report's statement that *"vessels regularly overtake other ships, deviating from the prescribed sequence,"* as noted in the Jacobs Report Section 3.4, Jacobs' *"review of AIS data did not identify regular occurrences of vessels overtaking one another in the Federal Channel in proximity to DCT's proposed location. Vessel overtaking typically occurs in the lower Delaware Bay, further seaward of DCT, due to the lack of port facilities potentially requiring slower speeds required for berthing in this lower reach."* [emphasis added]. As detailed above, vessels cannot and do not overtake/pass

turning vessels on the Delaware River today. This will be true in the future, so there is no scenario of vessels overtaking/passing vessels turning in the new DCT turning basin.

Regarding deviation from the prescribed sequence, as noted in Section 4.2 of the Jacobs Report, "Vessels are not always stringently sequenced if there is sufficient time between the leading and following vessels such that the berthing maneuver of the leading vessel would not cause a significant delay for the trailing vessel. Vessel sequencing is enacted when vessels are queued near the mouth of the Bay waiting for the next flood tide to transit or for when vessels arrive to the Bay at the same time."

- c) The Jacobs Report does not say or show or otherwise indicate that the Delaware River Pilots do not adhere to the MAC's Transit Advisories. Pilot adherence to the MAC Transit Advisories is implicit throughout the report. As key contributors to the Transit Advisories, the Delaware River Pilots provide valuable insight and experience in preparing and publishing the MAC's non-binding recommendations, and ultimately, as the MAC states, the Delaware River Pilots are "entrusted by law and tradition with ensuring the safety of their vessels." While the Jacobs' analysis did not account for all possible environmental factors, and noted some discrepancies in vessel and transit particulars, such as transiting outside of the defined flood-tide transit window or having a short following distance, the Jacobs Report notes there is important context provided to explain these situations. For example, the short passing times (30 seconds to 1.5 minutes) between vessels shown in Figure 2-10 is not due to the Delaware River Pilots violating safety guidance, rather it is due to vessels undertaking passing maneuvers. Jacobs also used conservative assumptions when filtering and analyzing the data to account for any discrepancies.
 - d) Jacobs notes that the MAC routinely updates their Transit Advisories, and the Delaware River Pilots (MAC Participants) recognize that the Transit Advisory will be updated to incorporate DCT-related transits.
3. Kichner 2026 Report: "The Monte Carlo Simulations performed did not address the volume of traffic or type of large vessels expected in the future or the range of scenarios that could arise. Examples of additional scenarios that should be addressed include the impact of limited high tide transit windows and what happens if anchorages or additional tugs of adequate bollard pull are not available, as well as situations that arise as a result of dredging and dredging equipment incidents. **Additional simulations should be performed to include additional scenarios that may arise in the Channel.**"

Jacobs Response:

- a. Jacobs' Monte Carlo Analysis does address the future range of scenarios. As noted in #1 above, the Monte Carlo Analysis considered 34 events that could impact channel capacity and 13 events that could impact vessel traffic. Several of these events incorporated the risk of additional traffic and vessel types. 'Threshold' Event Number 1 is "Overestimation of channel capacity," which specifically addresses the limited number of high tide transit windows. 'Threshold' Event Number 23 is "Tugboat capacity" which allows for "Tugs unavailable, or inadequate horsepower tugs available." 'Threshold' Event Number 28 through 30 address dredging and dredging equipment (they are "DCT Capital Dredging impacts on navigation," "DCT Maintenance Dredging," and USACE Main Channel Maintenance Dredging.") The events considered in the Monte Carlo Analysis are wide ranging and consider a variety of scenarios that may arise in the Channel.

4. **Kichner 2026 Report:** *"The Jacobs Report relies on mitigation measures that have not been analyzed, particularly the availability of anchorages. There are limited anchorages on the Delaware River, and the most recent MAC Transit Advisory indicates that few are appropriate for ULCVs (perhaps just one). **Additional analysis of available anchorages, anchorage congestion, depths, draft restrictions, tidal impacts on draft-restricted vessels and the ability to handle draft restricted ships over a number of tidal cycles should be undertaken.** Similarly, the assertion that vessels can simply slow down ignores that there are a number of situations where a vessel slowing down makes it less maneuverable and would involve additional risks. The mitigation measures referenced in the Jacobs Report should be fully studied, analyzed, and a plan developed."*

Jacobs Response:

- a. The Jacobs Report (Section 3.3) included a Real Time simulation run that required a ship to divert to the nearby Marcus Hook Anchorage, the deepest anchorage upriver of the Delaware Memorial Bridge. The run was successfully completed, showing that there is a safe option should unsafe conditions arise during transit to/from DCT. It is again noted that none of the terminals further upriver have a deepwater anchorage as close as DCT. Conditions at DCT are therefore more favorable than any other current location on the Delaware River.
- b. As discussed in Section 3.6 of the Jacobs Report, vessels *"Delaware River Pilots will modify maneuvering speeds to ensure there is no conflict or congestion and can slow speeds farther downriver to speeds that allow for safe and adequate maneuverability. The Delaware River Pilots are in constant communication with each other, so every Pilot is aware of slowing, turning, and maneuvering vessels well before any potential conflict arises."* The Kichner 2026 Report correctly states that vessels slowing down can make it less maneuverable. However, these slowdowns occur farther downriver (as detailed in the Jacobs Report) and slowdowns are limited to speeds that allow for safe and adequate maneuverability.
5. **Kichner 2026 Report:** *"The USACE should ask the U.S. Coast Guard to undertake an updated PAWSA for the Delaware River which should include addressing the conditions that will be created by the proposed DCT. An updated PAWSA would allow all stakeholders on the river to work together to address concerns, expected and possible scenarios, communications and mitigation plans and emergency procedures."*

Jacobs Response:

- a) Jacobs notes that the U.S. Coast Guard (USCG) has reviewed the project and we understand that their opinions have been incorporated into the Record. Specifically, the USCG states:

We have reviewed the report titled "Delaware Container Terminal U.S. Army Corps Permit Additional Technical Support," dated October 14, 2025. The report determined that the development of the Delaware Container Terminal would not result in concerns related to vessel traffic, navigation, safety, communication, scheduling, or emergency response. Coast Guard Sector Delaware Bay met with the state pilots' association and federal pilots' agency to discuss the report and to identify any safety concerns with the development of Delaware Container Terminal.

In regard to safe use of the local waterway, we find the proposed development of Delaware Container Terminal consistent with existing safe use of the waterway and offer no additional comments on the findings from the report.

- b) Jacobs also understands that the USCG is in the midst of preparing an updated PAWSA, and recently held workshops. Jacobs notes that the updated PAWSA is beyond the scope of the US Army Corps and this technical review.

**BEFORE THE ENVIRONMENTAL APPEALS BOARD
OF THE STATE OF DELAWARE**

THE PHILADELPHIA REGIONAL PORT :
AUTHORITY, *Appellants*, :

v. : Appeal No. 2021-08

DEPARTMENT OF NATURAL RESOURCES :
AND ENVIRONMENTAL CONTROL, *Appellee*. :

GREENWICH TERMINALS LLC, *et al. Appellants*, :

v. : Appeal No. 2021-09

DEPARTMENT OF NATURAL RESOURCES :
AND ENVIRONMENTAL CONTROL, :
Appellee. :

WALTER F. CURRAN, *Appellant*, :

v. : Appeal No. 2021-10

DEPARTMENT OF NATURAL RESOURCES :
AND ENVIRONMENTAL CONTROL, :
Appellee. :

DECISION AND ORDER UPON REMAND

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PREAMBLE

The Environmental Appeals Board (the “Board”) issued a Final Decision and Order on May 10, 2024. After appeal by the Port Operators (defined herein) and Mr. Walter F. Curran (“Curran”), the Delaware Superior Court issued a Memorandum Opinion and Order directing the Board to clarify the standard of review it applied and provide a “written evaluation of the evidence and reasoning for its rulings” with respect to applicable regulations 4.6, 4.7, 4.11, and 3.1.3.¹

Appellant PhilaPort did not appeal to the Superior Court. As such, the issues specifically raised by PhilaPort concerning applicable regulation 4.8, and ruled upon in the Board’s May 10, 2024 Final Decision and Order are repeated herein, but not changed.²

As set forth below, the appeals are rejected by the Board. Appellants have not met their burden to show that the Secretary’s decision was “not supported by the record before the Board.”³ The Secretary’s corresponding Order is hereby affirmed.⁴

1 *Greenwich Terminals, et. al. v. DNREC, et. al.*, 2025 WL 1098975 (Del. Super., April 14, 2025) (the “Remand Opinion”).

2 The Remand Opinion upheld the Board’s order consolidating these appeals (the “Appeals” or the “Consolidated Appeals”). 2025 WL 1098975 at *14-15.

3 7 *Del. C.* §6008(b).

4 DNREC made a motion for a directed verdict during oral argument. The motion was mooted by the Board’s ruling.

INTRODUCTION

Pursuant to due and proper notice of the time and place of hearing served on all parties in interest, and to the public, the above-captioned appeals came before the Board on February 13, 2024. The hearing was convened in the Auditorium of the Richardson & Robbins Building, located at 89 Kings Highway, Dover, Delaware.

Members of the Board present and constituting a quorum were: Dean Holden (Chairperson); Michael Horsey; Robert Mulrooney; and Deborah Wicks.⁵ Deputy Attorney General A. Zachary Naylor represented the Board joined by the Board's administrative liaison, Tanesha Perry.

The parties were represented by counsel as follows:

- Delaware Department of Natural Resources and Environmental Control (“DNREC”): Deputy Attorneys General Devera Scott (argued) and Jameson Tweedie (argued);
- Diamond State Port Corporation (“Diamond State”)⁶: Wali

⁵ Board members Randall Horne, Guy Marcozzi, and then-Board member Michael Houghton were recused from considering the matter during various preliminary proceedings.

⁶ The Delaware General Assembly has declared the following purpose and policy for its creation of Diamond State:

- (1) That the continued economic viability of the Port of Wilmington and its related facilities, and improvements to these facilities and to the commerce involving these facilities, benefits the entire State;
- (2) That it is in the best interest of the State to create a corporate entity which shall assume, by agreement, operation of the Port of Wilmington and its related facilities and to assume certain obligations of the City of Wilmington;

Rushdan (argued) and William Burton (argued);⁷

- Philadelphia Regional Port Authority (“PhilaPort”): Joelle Polesky and Andrew Levine (argued);
- Greenwich Terminals, LLC, Gloucester Terminals, LLC, and GMT Realty, LLC (“Port Operators”): Thaddeus Weaver; Stephen D. Daly (argued); Shoshana Schiller, Jill Kaplan; and
- Walter Curran (“Curran”): Michelle M. Skjoldal, David A. Rockman (argued).⁸

(3) That, in that regard, the General Assembly shall, in its discretion, appropriate an amount to fund the initial capital and operating responsibilities of such corporation and shall consider the future appropriations as appropriate

(4) That this Corporation is intended to have all power and authority necessary to be exercised in accordance with the form of governance expressed herein, to operate the Port of Wilmington and related facilities so as to maintain and expand the business of these facilities.

29 *Del. C.* §8780.

7 Collectively, DNREC and Diamond State are referred to as “Appellees.”

8 PhilaPort, Port Operators, and Curran are referred collectively to as “Appellants.”

I. THE SECRETARY'S ORDER AND BASIS OF APPEALS

On September 30, 2021, DNREC, by and through its Secretary, issued an Order, Number 2021-W-0034 (the “Secretary’s Order”), permitting Diamond State, a public corporation with duties that include management of the Port of Wilmington, to use and develop subaqueous lands in the State of Delaware in connection with its plan to construct a new container port along the Delaware River at its Edgemoor property (the “Project”).

Appellants argue that the Secretary’s Order approving the permit for the Project should not have been issued because DNREC and Diamond State did not adhere to the applicable regulations in two main respects:

- that DNREC did not follow several of the factors required to be considered when approving such a permit, including requirements related to considering the effects of the proposed Project on environment and recreational factors and on river navigation; and
- that DNREC and Diamond State violated a procedural requirement to maintain the permit application for the Project in “a current state.”⁹

Appellees argue that all controlling statutes and regulations were followed procedurally and substantively in connection with the permit in question.

⁹ This argument was abandoned by Appellants. None of them addressed it at oral argument. Nevertheless, the Board addresses the argument briefly, *infra*.

II. PROCEDURAL HISTORY OF THESE APPEALS

The Board issued two Orders in response to preliminary motions in these consolidated appeals. The issues resolved by those Orders resulted in some narrowing of the Appeals.

- The Board's October 21, 2022 Order dismissed Curran's Amended Statement of Appeal because its challenge to the Water Quality Certificate was not timely, dismissed the appeals of certain individuals who failed to establish standing to pursue an appeal, and denied Appellants' motions for summary judgment.
- The Board's December 12, 2022 Order granted motions *in limine* to exclude testimony from the Secretary of DNREC or the Hearing Officer and to exclude testimony regarding the Water Quality Certificate. The Board denied all other motions *in limine* to exclude evidence in this appeal.¹⁰

¹⁰ In addition, the Board on April 25, 2022, dismissed a business organization as an appellant in EAB Appeal 2021-07 because the entity was not represented by legal counsel, which is not permitted by Delaware law. *Tigani v. Director*, 2020 WL 5237278, *4 (Del. Super. Sept 2, 2020) citing *Transpolymer Indus., Inc. v. Chapel Main Corp.*, 1990 WL 168276 (Del. Sept. 18, 1990).

III. EVIDENCE IN THE RECORD BEFORE THE BOARD

A. Summary of the Secretary's Order and Supporting Documents

The Secretary's Order sets forth the evidentiary record upon which the Secretary's Order was based. The Board does not restate the Secretary's Order in its entirety but draws upon the portions most relevant to the consideration of the issues raised in these consolidated appeals.¹¹

The Secretary's Order describes the property in question that will be rehabilitated by this Project. Most long-time Delawareans will know the property in question as DuPont's former Edgemoor facility. Edgemoor is located along the banks of the Delaware River between Fox Point State Park to the north and industrial operations to the south. The location has been historically operated under the Delaware Hazardous Waste Program. The operating facility that was previously located on the site was demolished in 2017, before Diamond State acquired it.

The Project will include the construction of a commercial wharf and the deepening of the Delaware River to accommodate the transit of the larger class of cargo ships that will, because of the Project, enjoy access to the expanded port facilities in the State of Delaware.

¹¹ The Secretary's Order incorporates the Recommendation of the Hearing Officer assigned and, in turn, the Technical Response Memorandum ("TRM"), which responded to technical matters raised during the public comment period.

The Project represents the culmination of years of coordinated efforts between and amongst DNREC and various other state and federal stakeholder agencies, each of whom have specialized responsibilities within the purview of the Project.

A well-attended public hearing (including the representation of Appellants' interests) was held on September 29, 2020. Because of the scope of the Project and the level of public interest and scrutiny, DNREC held open the period for public comment beyond that normally required. Such was the level of public interest that the hearing officer invited the preparation of the TRM to assist with the consideration of the various public concerns.¹²

In all, 12 primary areas of public concern were expressly addressed by the hearing officer and the TRM. Of these 12, 9 considered matters related to environmental, recreational, and navigational concerns.

Upon a review of the Hearing Officer's Report, the following sections directly address the necessary consideration given related to recreation, the environment, or navigation:

- Section III.2 – addressing concerns related to the subject that the “proposed shoaling fans pose a risk to aquatic life and water quality;”
- Section III.3 – addressing concerns related to the subject that the “proposed dredging activities will impact water quality;”

¹² The Hearing Officer found the TRM to be “comprehensive” in this regard. This Board agrees with that conclusion.

- Section III.4 - addressing concerns related to the subject that the “activities associated with the [P]roject will result in increased air emissions;”
- Section III.5 - addressing concerns related to the subject that the “proposed [P]roject represents a threat to public health, especially in Environmental Justice communities;”
- Section III.7 – addressing concerns related to the subject that the “proposed [P]roject is in violation of Delaware House Joint Resolution Ten;”
- Section III.9 – addressing concerns related to the subject that the “proposed [P]roject will result in a loss of recreational fishing and crabbing;”
- Section III.10 - addressing concerns related to the subject that there are “concerns regarding sediment and contaminants such as PCBs;”
- Section III.11 - addressing concerns related to the subject that “a hydrogeologic site investigation is needed;” and
- Section III.12 - addressing concerns related to the subject that “Incomplete/Insufficient navigational studies, particularly for emergency scenarios.”

The Secretary’s Order also cites extensive public comment in favor of the Project.¹³

The Secretary’s Order goes on to discuss the 3-phase environmental mitigation plan to be created to address concerns related to such matters. DNREC

13 See, e.g., 7 Del. Admin Code §7504-4.6.1-4.6.2 (requiring consideration of the relative value to the State and the public of the project); 7 Del. Admin Code §7504-Purposes.

has used the Project as leverage to: (1) reclaim a toxic waste site; (2) expand Fox Point State Park; and (3) improve the Environmental DNA Fisheries Monitoring Program.

The Secretary's Order concludes as follows:

The [r]ecord developed in this matter indicates that [DNREC's] experts ... have conducted a comprehensive review of the information provided by [Diamond State], considered all statutes and regulations that govern projects such as [Diamond State's] above proposed activities, reviewed the [m]itigation [p]lan as submitted to DNREC by [Diamond State], and determined that the [r]ecord provides adequate justification and detail to support the proposed [P]roject. Additionally, as noted in the TRM, DNREC obtained independent confirmation from external agencies ... where needed to thoroughly evaluate the public's concerns in areas beyond [DNREC's] standard regulatory purview. As a result of this comprehensive review of the [r]ecord developed in this matter, [DNREC's] experts have recommended issuance of the [permit to Diamond State].

B. Summary of Other Evidence Before the Board

The Board has been liberal throughout these Consolidated Appeals regarding the application of its evidentiary rules.¹⁴ *7 Del. Admin. Code* §105-5.3 limits the opportunity for parties who were not accused violators or permit applicants from expanding the record. Yet, *7 Del. C.* §6008(b) and *7 Del. Admin. Code* §105-5.4 provide the Board may consider any "competent evidence" submitted by the parties during the appeal. "Strict rules of evidence do not apply to the Board."¹⁵ All

14 *See* December 12, 2022 Board Order.

15 *7 Del. Admin. Code* §105-5.4.

evidence having probative value may be accepted. The statutory language grants to the Board broad discretionary power regarding the record it is to consider.¹⁶

Ultimately, the Board, in this case, permitted Appellants and Appellees to supplement the record for the purpose of considering these consolidated appeals. Rather than rely on live witnesses, the parties chose to submit briefs, oral argument, demonstrative PowerPoint presentations, and witness affidavits and/or declarations in support or in defense of the Appeals.

On February 13, 2024, counsel for each of the Appellants and Appellees presented their oral arguments to the members of the Board.

Prior to the February 13, 2024 hearing and in accordance with the Board's Regulations, DNREC provided the Board the chronology for each of the consolidated appeals consisting of the record before the Secretary.

In deciding these Appeals, in addition to considering the chronology, the Board considered:

- Voluminous written briefs submitted by every party to the Appeals;
- Oral argument from every party including demonstrative PowerPoint presentations submitted by each party to the Appeals; and
- Witness affidavits and declarations, as follow:

¹⁶ *Tulou v. Raytheon Serv. Co.*, 659 A.2d 796, 803 (Del. Super. Ct. 1995), *rev'd on other grounds by Delaware Solid Waste Authority v. DNREC*, 250 A.3d 94 (Del. 2021).

○ *John G. Cargill*

- Presented on behalf of DNREC. He works as a hydrologist for the Division of Watershed Stewardship within DNREC.
- His declaration provides a description and timeline of DNREC's environmental analyses in related to the Project.

○ *Steven M. Smailer*

- Presented on behalf of DNREC. He is the director of the Division of Water within DNREC.
- He provides testimony about how the permitting process works, generally. He also provides a timeline of specific events relevant to the timeline in this planning process.

○ *Laura Mensch*

- Presented on behalf of DNREC. She worked as principal planner with Delaware Coastal Programs within DNREC's Division of Climate, Coastal and Energy during the relevant times.
- She provides a timeline of events relevant to the permit. She provides specific testimony related to DNREC's coordination of permitting activities with other agencies at the federal and local level. She provides detail on coordination with Federal authorities when planning and permitting projects such as the one at issue.

○ *David Small*

- Presented on behalf of Diamond State. He works for Verdantas LLC ("Verdantas") (f/k/a Duffield Associates ("Duffield")) providing consulting services related to engineering, planning, environmental, etc. He was formerly Secretary of DNREC.

- He provides testimony regarding how the permitting process typically works and provides a list of materials that are required to be submitted with a subaqueous land permit application.
- He provides testimony about the difference between a new construction application and one for maintenance dredging.

○ *Brian J. Devine*

- Presented on behalf Diamond State. He is a consultant with Verdantas (f/k/a Duffield).
- He provides testimony about navigation in the Delaware River channel.
- He provides testimony about market changes in the shipping industry and Delaware's plans to participate in the changing seascape.
- He testifies about events specific to the application process for this project.

○ *Peter J. Innskeep*

- Presented on behalf of the Port Operators. He is employed as manager of operations for the appellant.
- He provides testimony regarding potential operational impacts of river delays and traffic on upriver port operations.

○ *David Whene*

- Presented on behalf of the Port Operators. He is employed as manager of operations for the appellant.
- He provides testimony regarding potential operational impacts of river delays and traffic on upriver port operations.

- *Craig Jones*
 - Presented on behalf of Port Operators and Curran. He is employed as an environmental consultant.
 - He provides expert testimony regarding the removal of the shoaling fans from the project design and the resulting need for maintenance dredging.

- *Jerzy J. Kichner*
 - Presented on behalf of Port Operators. He is a retired Coast Guard Captain.
 - He offers expert testimony on the navigational impacts of the project on boat traffic in the Delaware River and the potential shortcomings of the Full Mission Ship Simulation for Edgemoor Navigation Feasibility Study (“MITGAS”) to address those issues.

- *Walter Curran*
 - Mr. Curran testifies on behalf of his own appeal.
 - He testifies regarding his uses of the Delaware River for recreational purposes and testifies that the project will have impacts on his enjoyment of recreational fishing and environmental quality.

- *Damian V. Preziosi*
 - Presented on behalf of Curran. He offers expert testimony on environmental risk assessment.
 - His testimony concludes that Diamond State’s environmental assessments, approved by DNREC are flawed. He criticizes appellees for considering too small an area in assessing impact and not sufficiently providing for mitigation.

- *Theodore D. Tomasi*
 - Presented on behalf of Curran. He offers expert testimony on the sufficiency of the mitigation plan contemplated by Diamond State.
 - He focuses on providing an analytical framework by which to assess environmental impacts and create offsetting mitigation plans.

- *Charles Harman*
 - Presented on behalf of Philadelphia Port.
 - He provides testimony that MITGAS is incomplete regarding navigation in the Delaware River, in particular because of the ship-turning basin necessary to accommodate the project.

IV. THE STANDARD OF REVIEW

The Board was created by the Delaware General Assembly in 1973.¹⁷ The Board operates under the Environmental Appeals Board Regulations.¹⁸

The Board is a quasi-judicial review board that exists to hear appeals of decisions of the Secretary.¹⁹ The Board conducts public hearing for all appeals.²⁰ Deliberations of the Board may be conducted in executive session.²¹ The Board may affirm, reverse, or remand with instructions any appeal of a case decision of the Secretary.²²

In 2021, the Delaware Supreme Court issued an *en banc* opinion setting forth this Board's standard of review based upon the plain language of 7 *Del. C.* §6008. Pursuant to *Delaware Solid Waste Authority v. DNREC*,²³ the burden in the appeal rests upon Appellants to show the Secretary's decision is not supported by the

17 7 *Del. C.* §6007.

18 7 *Del. Admin. Code* §105.

19 7 *Del. C.* §6007(b).

20 *Id.* at §6008(a).

21 *Id.*

22 *Id.* at §6008(b).

23 250 A.3d 94, at 115 (Del. 2021).

evidence before this Board. The record before the Board consists of the entire record before the Secretary and any other “competent evidence” the parties produce during appeal.²⁴

The controlling statute provides a “clear instruction that the Board must defer to the Secretary’s decision unless the record before the Board – which can include evidence not before the Secretary – does not support that decision.”²⁵ “[T]he Board **must not overturn the Secretary’s decision unless the evidence before the Board does not support that decision.**”²⁶

The Supreme Court’s subsequent decision in *Delmarsh* holds that 7 Del. C. §6008(b) is a clear instruction that the Board must defer to the Secretary’s decision unless the record before the Board, which might include evidence not previously before the Secretary does not support the Secretary’s decision.²⁷

24 *Id.*

25 *Id.*

26 *Id.* (emphasis added).

27 *Delmarsh LLC v. EAB*, 277 A.3d 281, *292 (Del. 2022) (citing *Delaware Solid Waste Authority v. DNREC*). Absent an abuse of discretion, the agency decision must be affirmed. *Id.* citing *Public Water Supply Company v. DiPasquale*, 735 A.2d 381 (Del. 1999).

V. FINDINGS OF FACT AND CONCLUSIONS OF LAW

Following oral argument, the Board entered executive session as permitted by 7 Del. C. §6008(a) to deliberate and to receive legal advice.

After deliberation and careful review of the parties' respective arguments and evidence, the Board, because of the reasons that follow, by a vote of 4 to 0, affirms the Secretary's Order.

The Board concludes as a matter of law that the Project is governed by the Subaqueous Lands Act and related regulations. The Board finds as a matter of fact (as articulated in detail below) that the Secretary thoroughly vetted the Project pursuant to the governing law as demonstrated by the record before the Secretary and the record as supplemented before the Board.

It is the Board's conclusion that the evidence in the record before the Board supports the Secretary's Order. The Board finds from the evidence presented that Appellants have failed to carry their burden to demonstrate that the Secretary's decision is not supported by the evidence in the record before the Board. As such, the Board does not find that evidence submitted by the Appellants merits overturning the Secretary's Order.

A. Findings of Fact Generally Applicable to All Issues Presented

The Board makes the following findings of fact which are applicable to all aspects of the Consolidated Appeals.

1. The Economic Opportunities for the State of Delaware Created by the Project are Substantial and Not Challenged in the Record.

The Project's projected economic benefits for the State are established by the evidence before the Board and are not rebutted by any evidence presented by the Appellants.

Beginning in 2016, the Panama Canal began a project of expansion to enable a new class and size of ship to pass through it.²⁸ The larger ships -- called "New Panamax" -- are one and a half times the size of the previous class and can carry twice the cargo.²⁹ Currently, Delaware has no shipping cargo port facility capable of hosting the New Panamax class of ships due to limitations of the berthing depths at current facilities.³⁰ To take advantage of the economic opportunities presented by increased trade via New Panamax ships, Diamond State needed, on behalf of the citizens of Delaware and as required by its charter established by the Delaware General Assembly, to devise a plan to expand the Port of Wilmington's accessibility.³¹ Initial consideration was given to the possibility of expansion at the

28 The Affidavit of Brian J. Devine, Professional Engineer. (Devine Aff. ¶18). Mr. Devine provided engineering consulting services to Diamond State through his employment with Duffield Associates, which later became part of Verdantas LLC.

29 *Id.*

30 *Id.* at ¶¶20-21.

31 *Id.* at ¶¶19, 22.

Port of Wilmington’s existing facilities at the mouth of the Christina River, but that was deemed economically unfeasible due to the disruptions it would have caused with ongoing operations and because of environmental impacts that would have resulted should that area have been developed for the Project’s ultimate goals.³²

Diamond State developed a “Strategic Master Plan” to consider alternatives and scenarios to address the need for expansion of cargo port facilities in the State of Delaware.³³ In 2016, Diamond State held an “open house,” attended by over 100 individuals, during which Diamond State presented the various scenarios it was considering for port expansion, including economic and environmental impacts of the alternatives.³⁴ The open house generated 14 public comments which Diamond State incorporated into its evaluation process.³⁵

Ultimately, Diamond State selected the Edgemoor site as the best alternative.³⁶ The Board finds that the key factors supporting the selection of Edgemoor location were: it would reuse an existing, dilapidated industrial site; it

32 *Id.* at ¶¶23-26. This consideration included the impact to wetlands that would have been potentially destroyed from such an endeavor.

33 *Id.* at ¶¶27-32.

34 *Id.* at ¶¶33-36.

35 *Id.* at ¶¶37-38.

36 *Id.* at ¶¶39-40.

would avoid impact on wetlands that would have occurred at other potential locations; it would allow creation of a facility capable of accepting the New Panamax class ships; and the construction would result in removal of polluted sediment in the area from the site's previous use.³⁷ The Project was projected to create directly or indirectly 3,000 Delaware jobs.³⁸ The United States Army Corps of Engineers generated an economic model indicating benefits in the 10's of millions of dollars for the local Delaware economy and benefits in the 100's of millions of dollars for the national economy.³⁹

2. DNREC's Permitting Process, By and Through the Secretary, Followed Usual Protocols and Provided Extra Opportunity for Public Comment, Including from Appellants.

The process employed by DNREC to evaluate the subaqueous lands permit submitted by Diamond State followed the applicable code and regulations and provided for greater than usual opportunity for public comment, given the scope of the Project.

As a general matter, DNREC evaluates permit applications by engaging with subject-matter experts to assess whether the application meets requirements

37 *Id.* at ¶39.

38 *Id.* at ¶87.

39 *Id.* at ¶89.

established by federal and state law.⁴⁰ DNREC, as an agency, does not advocate for outcomes, rather the Secretary makes a final decision based on the accumulation of evidence drawn from subject-matter experts, information submitted by the applicant, comments from the public, and other information useful for rendering a decision.⁴¹ DNREC uses standard forms for permit applications including any appendices necessary for the particular type of permit sought.⁴² After submission of a permit application, DNREC will assess whether the application is administratively complete and publishes public notice of the application.⁴³ DNREC may then hold a public information session or hearing and gather public comment.⁴⁴ Those public comments are reviewed by subject-matter experts to generate a technical response memorandum for the Hearing Officer to incorporate into that Hearing Officer's

40 Affidavit of David Small (“Small Aff.” at ¶8). Mr. Small provided consulting services to Diamond State through his employment with Duffield Associates, which later became part of Verdantas LLC. Prior to his employment with Duffield, Mr. Small spent nearly 3 decades with DNREC, including as Secretary from 2014-2017 and as such provides valuable insight on DNREC’s standard operating procedures as well as the process employed in this Project. (*See* Small Aff. ¶6).

41 *Id.* at ¶9.

42 *Id.* at ¶¶11-15 (describing the permitting process, generally, and the specific requirements for applications for a subaqueous land permit, specifically).

43 *Id.* at ¶11.

44 *Id.*

Report to the Secretary.⁴⁵ The Secretary then makes a final decision regarding the permit application.⁴⁶

DNREC began its evaluation of Diamond State’s application for a subaqueous lands permit in March 2020 and the application was deemed administratively complete as of June 20, 2020.⁴⁷ DNREC gave notice (on August 23, 2020) and held a public hearing on the Project application on September 29, 2020.⁴⁸ The initial period of public comment was from August 23, 2020 through November 1, 2020, a total of 70 days, 50 days more than required.⁴⁹ The public comment period was then extended for an additional 31 days through December 1, 2020.⁵⁰

Notably, each of the Appellants participated in the public comment period. Appellants, the Port Operators, submitted a letter from counsel objecting to three aspects of the Project as then-proposed: the unprecedented use of shoaling fans to

45 *Id.*

46 *Id.*

47 Declaration of Steven M. Smailer, Director of DNREC’s Division of Water (“Smailer Decl.”) at ¶¶16-18. Mr. Smailer also provided testimony concerning DNREC’s standard application process for projects corroborating Mr. Small’s testimony on the subject. (Smailer Decl. at ¶¶5-14).

48 *Id.* at ¶¶19-21.

49 *Id.* at ¶22.

50 *Id.* at ¶23.

maintain construction dredging; the potential impact on navigation in the Delaware River; and the potential impact on aquatic life.⁵¹ The letter submitted on behalf of the Port Operators included a Memorandum from Craig Jones, Ph.D., Director Marine Science and Engineering at Integral Consulting.⁵² Dr. Jones' report was critical of the proposed use of shoaling fans in connection with the Project.⁵³

51 Oral Argument Tr. at 167:16-21. All public comments and submission made during the public comment period are archived on DNREC's website memorializing the September 29, 2020 public hearing. Available at <https://dnrec.delaware.gov/events/joint-public-hearing-diamond-state-port-corporation/>

The comments submitted by Port Operators was in the evidence before the Secretary and in the record before the Board on Appeal. Available at <https://documents.dnrec.delaware.gov/Admin/Documents/dnrec-hearings/2020-P-MULTI-0024/comments/Greenwich-Terminals-and-Gloucestter-Terminals.pdf>

52 Dr. Jones submitted an Affidavit in the Appeals which was called upon for its testimony by Appellants, the Port Operators and Mr. Curran.

53 Indeed, DNREC shared a concern regarding the proposed use of shoaling fans because of their potential effect upon the aquatic life in the area and required additional data on the subject. Declaration of Laura Mensch, former principal planner within DNREC's Division of Climate, Coastal, and Energy's Costal Management Program. (Mensch Decl. at ¶¶37-41; *see also* Smailer Decl. at ¶¶57-63). In March 2021, Diamond State requested to remove shoaling fans as part of the project. (Mensch Decl. at ¶42; Smailer Decl. at ¶64). While the removal of shoaling fans from the project alleviated certain environmental concerns, the decision regarding the shoaling fans remains relevant to other issues raised in these Appeals, as discussed in more detail below.

The Port Operators' public comment also included a report from retired U.S. Coast Guard Captain Jerzy Kichner, P.E., KSEAS Consulting.⁵⁴ Captain Kichner's report raised concerns over potential effects of the Project on Delaware River navigation.

Finally, the Port Operators' public comment included a memorandum from Damian V. Preziosi, Principal Ecologist at Integral Consulting.⁵⁵ Mr. Preziosi's memorandum raised concerns about the potential environmental impacts of the Project and lack of adequate mediation of those impacts.

Appellant PhilaPort also submitted public comment.⁵⁶ PhilaPort also stated its objections to various aspects of the Project, including the use of shoaling fans, environmental impact and remediation, and navigation concerns.

54 Captain Kichner submitted an Affidavit in the Appeals which was called upon for its testimony by Appellants, the Port Operators.

55 Mr. Preziosi submitted an Affidavit in the Appeals which was called upon for its testimony by Appellant Curran.

56 As with the comments from Port Operators, PhilaPort's submission was in the evidence before the Secretary and part of the Record in these Appeals to the Board. *See* Letter from Andrew Levine, Esq., available at <https://documents.dnrec.delaware.gov/Admin/Documents/dnrec-hearings/2020-P-MULTI-0024/comments/Levine-Revised-PhilaPort.pdf>

Appellant Curran also submitted a letter objecting to the Project. His stated concerns relate to environmental and navigation concerns as well as the need for future dredging operations to maintain the Project site.⁵⁷

As is its normal procedure, DNREC prepared the TRM for the purpose of addressing concerns raised during public comment.⁵⁸ The TRM was submitted to the Hearing Officer to assist the Hearing Officer's preparation of her Report to the Secretary regarding the advisability of the Project.⁵⁹ For those issues outside of DNREC's ordinary departmental scope, the TRM relied on input from those agencies with the necessary expertise.⁶⁰ For example, DNREC relied on the Delaware Department of Transportation with respect to issues related to over land traffic patterns and on the United States Coast Guard concerning Delaware River navigation.⁶¹

57 Mr. Curran's letter was in evidence before the Secretary and in the record on Appeal to the Board. Available at: <https://documents.dnrec.delaware.gov/Admin/Documents/dnrec-hearings/2020-P-MULTI-0024/comments/W-Curran.pdf>

58 Mensch Decl. at ¶28.

59 *Id.*

60 *Id.*

61 *Id.*

For these reasons the Board finds that DNREC's process in evaluating the Project permit request met or exceeded the requirements set forth by code and regulation.

3. The Permit Challenged in these Appeals was Part of a Coordinated Permitting Effort Across Multiple Federal and State Agencies.

With respect to the Project, DNREC's permitting scope is limited to the subaqueous lands involved in the application. As is typical, a Project like the one proposed by Diamond State requires multiple permits from federal and state agencies on a parallel track.⁶² The failure of one permit will not automatically doom all the remaining permits. Where, as here, multiple permitting assessments are required, DNREC coordinates with the applicant and other relevant agencies throughout the process, particularly when issues deviate from DNREC's departmental bailiwick, which here was limited to the application of the subaqueous lands act.⁶³

62 Small Aff. at ¶31.

63 *Id.* at ¶32-34.

In the case of the Port of Wilmington, DNREC engaged with and coordinated with several of the Divisions of subject-matter expertise under its own umbrella and with multiple federal and state agencies outside of DNREC, including:⁶⁴

- The United States Army Corps of Engineers;
- The Delaware River Basin Commission;
- The United States Environmental Protection Agency;
- The National Oceanic and Atmospheric Administration;
- The United States Coast Guard;
- The National Marine Fisheries Service;
- The United States Fish and Wildlife Service;
- The National Park Service; and
- The Delaware Department of Transportation.

When an application involves many agencies at a federal level, a lead agency is designated to coordinate with the other federal and state agencies involved.⁶⁵ Here, the United States Army Corps of Engineers was the designated lead federal agency.⁶⁶

64 Mensch Decl. at ¶¶18-25, 30-36; Smailer Decl. at ¶¶26-32; Declaration of John G. Cargill, IV, hydrologist within the DNREC Division of Watershed Stewardship (“Cargill Decl.”) at ¶¶34-45.

65 Smailer Decl. at ¶29.

66 *Id.* In the Remand Opinion, 2025 WL 1098975, at *18, the Superior Court notes that the United States District Court for the District of Delaware vacated the

With respect to those questions raised by the subaqueous lands permit, DNREC has fulfilled its responsibilities to the public as required by code and regulation. For questions beyond the scope of the subaqueous lands permit DNREC deferred to the responsible agencies.

4. Each Appellant is a Business Competitor, or Affiliated with a Business Competitor, of the Port of Wilmington.

The evidence before the Board establishes that each of the Appellants has an economic interest in opposing the Project.

Appellant PhilaPort is an agency of the Commonwealth of Pennsylvania and is an up-river competitor of the Port of Wilmington which is also engaged in a multi-billion-dollar expansion project.⁶⁷ PhilaPort is operated by Holt Logistics Company (“Holt”).⁶⁸ Holt also runs the operations of Appellants, the Port Operators, which

United States Army Corps of Engineers permit to allow the Project to move forward. *Citing Greenwich Terminals LLC v. US Army Corps of Engineers*, 2004 WL 4595590 (D. Del. Oct 28, 2024). That opinion, issued after the Board’s original decision in these Appeals supports the notion that the Project is subject to multiple federal and state permitting actions. It further demonstrates that different agencies, at the federal and state level, have different areas of expertise. That is why such applications, such as this Project, require a coordinated effort. No single agency has all the expertise or answers for a Project of this scale, nor should any single agency be expected to have such expertise. Diamond State will need to obtain all relevant permits to the satisfaction of the agencies involved and the tribunals with jurisdiction for review.

67 February 13, 2024 Oral Argument Transcript at 142:20-143:14.

68 *Id.* at 143:15-20.

are also up-river competitors of the Port of Wilmington.⁶⁹ In addition, individual Appellant Curran testified that he was an executive and operations director for Holt and the Holt-managed Port Operators from 1989 – 2011.⁷⁰

The Board finds that the Appellants and those of experts retained to support their arguments in these Consolidated Appeals were biased or prejudiced by their own business interests.⁷¹ Those biases, prejudices, and interests are given weight in the Board’s consideration of the evidence in the record before it. Ultimately, upon review of the entire record, the Secretary’s decision is supported by the evidence before the Board. The testimony and evidence advanced by Appellants does not alter the decision of the Board.

69 *Id.* at 143:15-23.

70 Affidavit of Walter F. Curran (“Curran Aff.”) at ¶5f-h. Mr. Curran testified by affidavit in support of his appeal.

71 A finder of fact, such as the Board in this matter “must assess the credibility of each witness and determine the weight given to the testimony.” *Buck v. Viking Holding Management Co LLC*, 2024 WL 4352368, *7 (Del. Super. Sept. 30, 2024) (quoting *Williams v. Bay City, Inc.*, 2009 WL 1886089, at *7 (Del. Super. July 29, 2024)). Among the factors the finder of fact may consider are “the witnesses’ biases, prejudices, or interests” and “all circumstances that according to evidence, could affect the credibility of the testimony.” *Id.* (quoting *Zenith Energy Terminals Joliet Hldgs LLC v. CenterPoint Props. TR.*, 2024 WL 3570165, at *3 (Del. Super 29, 2024)).

B. The Controlling Law Empowers DNREC’s Secretary to Protect the Public Interest

Title 7, Chapter 72 of the Delaware Code (the Subaqueous Land Act) applies to the development of subaqueous lands in the State of Delaware. The Chapter establishes the purpose of the law:

Subaqueous lands within the boundaries of Delaware constitute an important resource of the State and require protection against uses or changes which may impair the public interest in the use of tidal or nontidal waters. *The purposes of this chapter are to empower the Secretary to deal with or to dispose of interest in public subaqueous lands and to place reasonable limits on the use and development of private subaqueous lands, in order to protect the public interest by employing orderly procedures for granting interests in public subaqueous land and for issuing permits for uses of or changes in private subaqueous lands.* To this end, this chapter empowers the Secretary to adopt rules and regulations to effectuate the purposes of the chapter, to apply to the courts for aid in enforcing this statute and the rules and regulations adopted pursuant hereto, and to convey interests in subaqueous lands belonging to the State.⁷²

The Chapter protects the public interest by creating procedures for granting interests in public subaqueous lands and for issuing permits for uses of or changes in private subaqueous lands.⁷³

When an applicant seeks a permit to engage in acts controlled by Chapter 72, its application must be filed with the Secretary “stating in detail the type of lease,

72 7 Del. C. §7201 (emphasis added).

73 *Id.*

permit or grant desired, showing the location of the area and containing specifications for any proposed construction.”⁷⁴ Upon receipt of an application in “proper form,” the Secretary is required to give notice of its receipt, a description, and the opportunity for a public hearing.⁷⁵

To guide review of applications under Title 7, Ch. 72, DNREC’s Secretary has promulgated a set of regulations to “effectuate the policy and purposes of th[e] chapter.”⁷⁶ These regulations are set forth at *7 Del. Admin. Code* §7504, Regulations Governing the Use of Subaqueous Lands.

These Appeals concerns the application and interpretation of these regulations. Appellants’ challenges to the Order focus on the Secretary’s application of *7 Del. Admin. Code* §7504-4.0 in several respects.

Regulation 4.0 includes sets of criteria that DNREC must consider when making decisions on subaqueous land permit applications.

Essentially, section 4.0 of the regulation provides DNREC with a series of non-exclusive operational checklists applicable in various permitting scenarios. How DNREC goes about fulfilling those checklist requirements depends on the

74 *Id.* at §7207(a).

75 *Id.* at §7207(d)(1-3).

76 *Id.* at §7212.

nature of the application and is subject to review and analysis by DNREC's subject-matter experts.⁷⁷

Those subsections containing the imperative language "shall" must be followed for the Secretary's Order to be validly issued. Other subsections require the Secretary to weigh the benefits and value to Delaware and the people of Delaware against the factors that weigh against the project.

The Board finds that DNREC by and through its Secretary has met each of the regulatory requirements for assessing an application for a subaqueous lands permit. Each of the requirements are discussed individually next.

C. Findings of Fact and Conclusions of Law Specific to Each Regulation Subsection

Next, the Board makes findings of fact and conclusions of law specific to the various Regulations invoked by Appellants as having been incorrectly applied.

⁷⁷ Courts will generally give deference "to an administrative body's interpretation of its own rules unless that interpretation is clearly erroneous." *Garrison v. Red Clay Consol. School Dist.*, 3 A.3d 264, 268 (Del. 2010) *citing* *State Farm Mut. Auto. Ins. Co. v. Mundorf*, 659 A.2d 215, 220 (Del. 1995).

1. The Application of Regulation Subsection 4.6

Subsection 4.6 states that DNREC “shall consider the public interest” in proposed activities affecting subaqueous lands, including by the following provisions:

- 4.6.3 The *potential effect on the public* with respect to commerce, navigation, recreation, aesthetic enjoyment, natural resources, and other uses of the subaqueous lands. (emphasis added).
- 4.6.4 The extent to which any disruption of the public land use of such lands is temporary or permanent.
- 4.6.6 The extent to which the applicant’s primary purpose and objectives can be realized by alternatives, *i.e.*, minimize the scope or extent of an activity or project and its adverse impact.

These are far from the only factors DNREC is directed to consider in the public interest. No challenge is raised other than to the subsections discussed herein. For example, Subsections 4.6.1, 4.6.2, and 4.6.8 require that consideration be given to the value and benefits of the Project to the public and to the State. Here the evidence is that the economic benefits to State and public are potentially very significant.⁷⁸ Subsections 4.6.5 and 4.6.9 require consideration be given to whether the Project could be accomplished any other way or in a way that is not water

⁷⁸ Devine Aff. at ¶¶85-89 (testifying about the projected economic benefits to the State if the Diamond State expands port operations to allow for New Panamax ships).

dependent. Here the evidence is that expansion of the Port of Wilmington is the only way to achieve the goal of attracting New Panamax cargo ships to Delaware's shores.⁷⁹

The term "**Public Interest**" is defined to mean:

demonstrable environmental, social, and economic benefits which would accrue to the public at large as a result of a proposed action, and which would exceed all demonstrable environmental, social, and economic costs of the proposed action. In determining the public interest in a request for the use, sale, lease, or transfer of interest in subaqueous lands, [DNREC] shall consider the ultimate project purpose to be served by said use, sale, permit, lease, or transfer of lands or materials.

§7 *Del. Admin. Code* §7504-1.0.

The Secretary's Order indicates that the action was made under *7 Del. C.*, Chapter 72, which "empower[s] the Secretary to deal with or dispose of interest in public subaqueous lands...to protect the public interest by employing orderly procedures for granting interests in public subaqueous lands."⁸⁰ The Board finds that the Secretary employed orderly procedures for the granting of public subaqueous lands by: holding the public comment period far longer than is ordinary.⁸¹ Then,

79 Devine Aff. at ¶¶18-26 (testifying that Delaware currently lacks the opportunity for New Panamax ships to dock at existing port facilities, leaving the State at a competitive disadvantage to the neighboring states).

80 *7 Del. C.* §6201.

81 Secretary Order at 3-4. Of the approximately 200 comments received some supported the Project and some opposed.

as a result of the public comments received, the Hearing Officer requested subject matter experts at DNREC to do further analysis and present recommendations.⁸²

The Secretary's Order notes that the Project includes a mitigation plan inuring to the public's benefit requiring Diamond State to fund expansion of recreational facilities at nearby Fox Point State Park and to establish a eDNA fisheries monitoring program to be administered by DNREC to monitor species present in the waters immediately affected by the Project and then to be expanded to other rivers, creeks, and ponds.⁸³

With respect to matters outside DNREC's purview, the Secretary noted that independent confirmations concerning the Project's impact were obtained, including, for example from DelDOT and the United States Coast Guard.⁸⁴

The Board finds that the Secretary considered each of the required topics as demonstrated on the face of the Secretary's Order, which incorporates the hearing officer's report and the TRM. The Board finds further that the evidence relied upon by the Secretary is corroborated by evidence introduced to the Board by Appellees. As discussed in further detail in the following sections, the Board finds that testimony provided to the Board by David Small and Brian Devine on behalf of Diamond State and Laura Mensch, Steven Smailer and John Cargill on behalf of

82 *Id.* at 4.

83 *Id.* at 5-7.

84 *Id.* at 8.

DNREC confirms the conclusions made by the Hearing Officer and adopted by the Secretary that the Project is the culmination of a multi-year, multi-agency effort. During that multi-year, multi-agency effort, DNREC considered factors related to the “potential effect on the public with respect to commerce, navigation, recreation, aesthetic enjoyment, natural resources, and other uses of the subaqueous lands” as required by *7 Del. Admin. Code §7504-4.6*.

The evidence before the Board is that the subaqueous lands in question are adjacent to a defunct industrial site with limited current public use, if any. As such the concern about navigation within the existing subaqueous lands area is minimal. With respect to the Project’s overall impact on Delaware River navigation, the Board finds that DNREC reasonably relied upon the approval of the United States Army Corps of Engineers, the River Pilots Association, the United States Coast Guard, and Wilmington Tug – all agencies or organizations with responsibility to maintain the navigability of the main channel.

With respect to consideration of recreation, aesthetic enjoyment, natural resources, and other uses, the Board finds the evidence is convincing that redevelopment of the Edgemoor site will have a net positive effect on the environment and that impact on recreation and aesthetic enjoyment is minimal given the location and current state of the site. The evidence also demonstrates that, to the

extent recreation or natural resources are impaired, a mitigation program has been designed to offset any losses.

Appellants offer testimony that suggests that the Secretary and DNREC could have taken a different approach in considering those factors required to be considered when issuing a subaqueous lands use permit. However, the regulatory language at issue does not require the Secretary to employ the methodologies or come to the conclusions urged by Appellants.

a. Navigation

i. Findings of Fact Regarding the Secretary's Consideration of the Public Interest Regarding Navigation

DNREC's authority over navigational issues is limited to the public interest in the subaqueous lands effected by the construction permit.⁸⁵ The actual responsibility for maintaining the navigability of the main shipping channel and proposed turning basin in the Delaware River (which are each beyond the

⁸⁵ "Subaqueous lands" are defined to mean "submerged lands and tidelands." 7 *Del. C.* §7202(g-i). The Secretary's jurisdiction is "over any project involving ungranted subaqueous lands owned by the State." *Id.* at §7203(a). The Subaqueous Lands Permit allowed by the Secretary's Order, and subject to these Appeals pertains to the loss of just 5.5 acres of public subaqueous lands. Permit at 1. *See also* Mensch Decl. at ¶¶43-44; Smailer Decl. at ¶66 (discussing the scope of the DNREC's responsibility for navigation in permitting relating to the use of subaqueous lands).

subaqueous lands subject to the permit) falls to the United States Army Corps of Engineers.⁸⁶

In addition to the process for obtaining a subaqueous lands permit from DNREC, Diamond State also applied to the Army Corps of Engineers for permits related to dredging in the navigation channel and the suitability of the “turning basin” in which ships entering and exiting the proposed Edgemoor site, would temporarily block the flow of Delaware River traffic.⁸⁷

In connection with that parallel application, Diamond State commissioned the “Full Mission Ship Simulation for Edgemoor Navigation Feasibility Study” dated August 22-24, 2018 conducted by the Maritime Institute of Technology and Graduate Studies (the “MITAGS” report).⁸⁸ The Army Corps of Engineers reviewed the modelling employed in the MITAGS report and made recommendations to improve the model.⁸⁹ The modelling in the MITAGS report also included input from the Pilot’s Association for the Bay and River Delaware based on the expertise and

86 Smaier Decl. at ¶28; Devine Aff. at ¶10. Army Corps of Engineers guidance indicates that “[w]here traffic conditions permit, the turning basin should use the navigation channel as part of the basin area.” USACE Engineering Manual 1110-2-1613, Section 9-2.c.2.

87 Devine Aff. at ¶¶44-48.

88 *Id.* at ¶44.

89 *Id.* at ¶45.

experience of the pilots.⁹⁰ DNREC regulations do not require creation of a navigation study like MITAGS and do not contain any standards for evaluating or assessing such a study because these fall within the purview of the Army Corps of Engineers.⁹¹

With respect to navigational safety and operations on the Delaware River, responsibility falls to several agencies, including the United States Coast Guard, the Pilots Association for the Bay and River Delaware, and Wilmington Tug, Inc.⁹² Traffic in the Delaware River is carefully timed and coordinated by the professional river pilots who board large cargo vessels to guide them to their destinations.⁹³

DNREC conferred with these partner agencies to address concerns related to the public interest expressed during public comment that the Project's impact on navigation and safety had not been sufficiently addressed.⁹⁴ In particular, two issues raised during public comment about potential flaws in MITAGS (concerning emergency procedures and safety within the main navigation channel) were the

90 *Id.* at ¶¶46-47.

91 *Id.* at ¶48.

92 Mensch Decl. at ¶¶45-46; Smailer Decl. at ¶67.

93 Devine Aff. at ¶¶12-17.

94 Mensch Decl. at ¶¶47, 52-53; Smailer Decl. at ¶¶67-72.

subject of additional follow-up inquiries by DNREC prior to issuing the permit.⁹⁵ DNREC conferred with Lt. Commander Andrew Cooke of the United States Coast Guard who confirmed that the Project did not pose a risk to navigational safety.⁹⁶ Duffield also provided DNREC with additional navigation information upon DNREC's request.⁹⁷ Duffield provided DNREC with additional information from Mr. David Cuff, President of the River Pilot's Association of Bay and River Delaware, who corroborated that MITAGS represented typical navigation scenarios in the Delaware River and from Mr. Christopher Rowland, President of Wilmington Tug, Inc., who confirmed that MITAGS was consistent with his experience and expectations.⁹⁸

The Hearing Officer's Report explicitly addressed criticisms of MITAGS raised during the public comment period, including by Appellants:

The Application includes a report by the Maritime Institute of Technology and Graduate Studies ("MITAGS") that assesses typical expected navigational scenarios and, as the TRM notes, concludes that

95 Mensch Decl. at ¶48; Smailer Decl. at ¶¶68-69.

96 Mesnch Decl. at ¶¶25, 49, 51-52.

97 Mensch Decl. at ¶50. Duffield's memorandum in response dated March 1, 2021 estimated that the main navigation channel would typically be impeded by a turning vessel for approximately 10-15 minutes.

98 Smailer Decl. at ¶70. MITAGS acknowledges that any decision regarding conditions for navigation facing any unusual circumstances, for example, related to weather or traffic falls upon the ship's captain and the local river pilot assigned to the mission within the Delaware River and Bay. MITAGS at 2.

“[t]he simulation results indicated the proposed Edgemoor Terminal would have minimal impact on ships as they transit the existing navigation channel.” The Department received public comments that alleged that the proposed turning basin would negatively impact navigation of vessels on the main channel and that there would be impacts to shipping that may occur in non-typical emergency scenarios (i.e., ships losing power while turning). These concerns were passed on to the Applicant to be addressed.

In response, the Applicant’s consultant, Duffield Associates, provided additional information to DNREC on March 4, 2021. This additional information included a letter from David K. Cuff, President of The Pilots’ Association for the Bay & River Delaware (“Pilots’ Association”) to Mr. Eugene Bailey, Executive Director of the DSPC. The Pilots’ Association reviewed the Navigation Feasibility Study for the Port of Wilmington Edgemoor Expansion project produced by the MITAGS and concurred with the above-cited statement in the MITAGS report that the proposed Edgemoor Terminal would have minimal impacts on ships traveling on the existing navigation channel. Additionally, DNREC coordinated with Lieutenant Commander Andrew Cooke, USCG Sector Delaware Bay, to receive input from the USCG on the navigational components of this proposed project. On September 17, 2021, USCG Sector Delaware Bay stated that it does not see this project posing a risk to safe navigation. The TRM concludes that the Applicant’s proposed plans meet all appropriate setback and siting criteria pursuant to the Regulations Governing the Use of Subaqueous Lands, 7 DE Admin Code 7504, Section 4.9.

Additionally, the input that was received from the Pilots’ Association for the Bay & River Delaware and the USCG have also adequately addressed the expressed navigational concerns pursuant to the Regulations Governing the Use of Subaqueous Lands, 7 DE Admin Code 7504, Section 4.8.4.⁹⁹

99 Hearing Officer Report at 18.

With respect to navigation within the subaqueous lands in question, the subaqueous lands construction permit, as issued, includes 17 special conditions imposed by DNREC, which include to minimize impacts on navigation during dredging and construction within the subaqueous lands.¹⁰⁰ With respect to the navigation in the main channel, the Secretary’s Order and Hearing Officer’s report refer to DNREC having obtained independent verification from those agencies responsible for navigation in the main channel.¹⁰¹ Further, the Subaqueous Lands Permit specifically requires that any work on the Project is “subject to the terms and conditions of all appropriate [United States Army Corps of Engineers] authorization.”¹⁰²

The Board finds the evidence confirms that the Secretary reasonably gave consideration to the public interest in navigation both over the subaqueous lands within the Secretary’s jurisdiction and the impact of the Project on waters outside the Secretary’s jurisdiction by relying on the information provided by, among others, the United States Coast Guard, the United States Army Corps of Engineers, the River Pilots Association of Bay and River Delaware, and Wilmington Tug, Inc.

100 Subaqueous Lands Permit at 2-3.

101 Secretary’s Order at 8; Hearing Officer Report at 18; TRM at Comment 12.

102 Subaqueous Lands Permit at 3.

ii. The Board's Assessment of Evidence Presented by Appellants to the Contrary

Appellants, the Port Operators, call upon the testimony of Captain Jerzy J. Kichner to challenge the adequacy of DNREC's consideration of the public interest regarding navigation in connection with the Project.¹⁰³ Captain Kichner submitted a report to DNREC in connection with the public comment period raising similar concerns regarding the Project. Captain Kichner's testimony is consistent with his initial report, namely that the Project contemplates a turning basin that will interfere with navigation in the Delaware River and that MITAGS did not adequately assess emergency situations. Captain Kichner's testimony is well-received by the Board, however, as discussed below, it does not outweigh the quality of the testimony and the record submitted by the Appellees. Moreover, Captain Kichner's testimony is not specific to the subaqueous lands that are covered by the permit. Rather the testimony is focused on the main navigation channel, which, while certainly affected by the Project as a whole, is beyond the scope of DNREC's authority.

Appellants, the Port Operators, submit the testimony of two operations managers at facilities managed by Holt Industries up-river of the Port of Wilmington, in direct competition to the Port of Wilmington, and the expansion plans proposed

103 Affidavit of Captain Jerzy J. Kichner, U.S.G.C. (Ret.) in Support of Port Operators' Appeal of Secretary Order No. 2021-W/CCE-0026.

by Diamond State.¹⁰⁴ Both Mr. Inskip and Mr. Whene provide limited testimony on behalf of their employers regarding the possibility of navigational delays should the Project be permitted.¹⁰⁵ The testimony of these witnesses, warning of dire consequences for Delaware River traffic should the Project be allowed to move forward is not given weight in the Board's consideration of these Appeals. While Messrs. Inskip and Whene are undoubtedly experienced and knowledgeable regarding shipping on the Delaware River, the Board finds that their positions as employees of the Appellants undermines the value of their respective testimony.

b. Recreation, Aesthetic Enjoyment, Natural Resources, and Other Uses of the Subaqueous Lands

The second prong of Regulation 4.6.3 requires the Secretary to consider the recreation, aesthetic enjoyment, natural resources and other uses of subaqueous lands. The Secretary's decision is supported by this requirement and the Board finds that the decision is supported by substantial evidence on this point.

104 See Affidavit of Peter J. Inskip, Manager of Operations for Gloucester Marine Terminal and Paulsboro Marine Terminal in Support of Port Operators' Appeal of Secretary Order No. 2021-W/CCE-0026 and Affidavit of David N. Whene, President and Manager of Greenwich Terminals LLC, Operator of the Packer Avenue Marine Terminal at the Port of Philadelphia in Support of Port Operators' Appeal of Secretary Order No. 2021-W/CCE-0026.

105 *Id.*

i. Findings of Fact Regarding the Secretary’s Consideration of Recreation, Aesthetic Enjoyment, Natural Resources, and Other Uses of the Subaqueous Lands

Regulation Subsection 4.6 and 4.7 include several overlapping “considerations” related to environmental factors required for the DNREC permitting process. Whether addressed in this section or the next, the Board finds that DNREC’s consideration of the various factors related to the environment, including environmental quality, recreation, fishing, and enjoyment were all and each thoroughly vetted by DNREC over more than a half decade. In reaching this finding, the Board relies on the TRM, upon which the Hearing Officer relied, and the corroborating testimony provided by Laura Mensch, Steven Smailer, and John Cargill in their declarations.

In addition to the TRM, Duffield Associates, the consulting firm engaged by Diamond State (now known as Verdantas) prepared an Environmental Assessment Technical Document dated March 2020 and revised April 2022.¹⁰⁶ That document includes important factors that DNREC was required to consider. It concludes that “recreational uses of the [P]roject site are limited, and the current water quality of the portion of the Delaware River does not support fish and water ingestion.”¹⁰⁷

106 Exhibit C to Diamond State’s Answering Briefs for Oral Argument.

107 Environmental Technical Assessment Document at 63.

Further, the document indicates that recreational boating will face minimal impact as a result of the Project.¹⁰⁸ The Environmental Assessment Technical Document prepared by Duffield indicates that the Project is not expected to have any direct or indirect impacts on the species in the area, including herring, alewife, and striped bass.¹⁰⁹ The assessment document found that the Project does not present adverse recreational impact upon the public interest.¹¹⁰

The Board found Mr. Devine's testimony on behalf of Diamond State is compelling in this regard.¹¹¹ He states that the only impairment to subaqueous lands affected by the Project is within areas not practicably accessible for public recreation.¹¹² There are a total of 5.5 acres of subaqueous lands impacted by the Project, none of which are accessible from the shoreline.¹¹³ However, that access is

108 *Id.* at 144.

109 *Id.* at 175.

110 *Id.* at 177.

111 *See* Devine Aff. at ¶¶105-107.

112 Devine Aff. at ¶¶105-106.

113 *Id.* at ¶106.

extremely limited as a result of the presence of the “Cherry Island Reach of the Delaware River.”¹¹⁴

The Hearing Officer’s Report, incorporated by the Secretary’s Order, made the following statement, explicitly addressing the “consideration” of recreational impacts created by the Project. The Hearing Officer stated:¹¹⁵

The location of this project on the Delaware River is a known habitat of the Atlantic sturgeon (*Acipenser oxyrinchus*) and shortnose sturgeon (*Acipenser brevirostrum*), two species that are listed as endangered under the Endangered Species Act (“ESA”). In order to minimize impacts to sturgeon and other commercially and recreationally valuable species during their spawning periods, DNREC requires that no in-water work occurs from March 15th through June 30th. This “time-of-year restriction” will be observed for all in-water work including, but not limited to, pile driving, construction, installation of temporary bulkhead wall and sheet pile walls, and all dredging including maintenance dredging.

Additionally, DNREC requires a soft start on all pile driving activities. Cherry Island Flats is an important fish habitat and one of the major striped bass spawning areas of the Delaware River. Due to the proximity of the project to Cherry Island flats, DNREC also requires in-situ turbidity monitoring of the flats be conducted during dredging activities associated with the construction of the port to ensure that the activity is not adversely impacting sensitive species.

114 The Cherry Island area is a heavily industrialized with little opportunity for recreation within the vicinity. Mr. Preziosi insists that more than 5.5 acres of total area will be affected by the Project. Affidavit of Damian V. Preziosi at ¶18. That may be with respect to the entire Project and all the Federal and State agencies involved. However, only 5.5 acres of subaqueous lands are included in the permit issued by DNREC. Preziosi Aff. at ¶¶45-59.

115 Hearing Officer’s Report at 16.

The TRM notes that, if granting a permit will result in loss of a substantial resource to the public, then DNREC has the authority to require a permittee to take measures which will offset or mitigate the loss (7 Del.C. §7205, and the Regulations Governing the Use of Subaqueous Lands, 7 DE Admin. Code 7504, subsection 3.4). As noted previously, DNREC has required the Applicant to mitigate for the loss of 5.5 acres of subaqueous lands associated with the proposed project, and the details of DSPC's State of Delaware Compensatory Mitigation Plan will be addressed in greater detail further herein. The Department considers the proposed compensatory mitigation package to be adequate mitigation, pursuant to the Regulations Governing the Use of Subaqueous Lands, 7 DE Admin. Code 7504, Sections 4.7.1.4 and 4.7.4.

The TRM upon which the Hearing Officer, and subsequently the Secretary relied was prepared by, among others, Laura Mensch, Steven Smailer, and John Cargill.¹¹⁶ Mr. Cargill testified before the Board by declaration. His testimony confirmed the conclusions made in the Secretary's Order were based upon analysis provided by DNREC's subject matter experts.¹¹⁷

The Board finds the testimony from DNREC's subject-matter experts to be compelling in this respect and agrees with the Hearing Officer's conclusion, which was subsequently adopted by the Secretary's Order.

116 TRM at 1, Comment 9; Subaqueous Lands Permit at 2.

117 Cargill Decl. at ¶¶52, 54.

ii. The Board’s Assessment of Evidence Presented by Appellants to the Contrary

Mr. Curran testifies that he regularly enjoys recreation and enjoyment of the Delaware River and Bay but gives little in the way of specific testimony about the Edgemoor site and his “use” thereof.¹¹⁸ The Board finds that it would be irrational for DNREC to halt the Project based on the “public interest” meant to be considered by this subsection based upon Mr. Curran’s vague testimony regarding his sole recreational use. Mr. Curran lives in Ocean View, Sussex County.¹¹⁹ He provides no testimony specific to the subaqueous lands that are in question based on this Project or the Appeals.

In addition, his claims of fishing in the area are undermined, in the Board’s determination, by the environmental assessments cited by Appellants and which are obvious considering the industrial uses (both previous and current) of the Edgemoor site and surrounding areas. Simply stated, the Board finds Mr. Curran’s claims that he fishes in the area not credible and affords it no weight.

118 Curran Aff. at ¶¶15-42.

119 Curran Aff. at ¶3. Mr. Curran claims to use the “River” all the way from Philadelphia to Lewes, Delaware. *Id.* at ¶15. Of Course, by the time one reaches Lewes, the “River” has become bay and then ocean.

c. The Board's Conclusion of Law Regarding the Application of Regulation Subsection 4.6

The Secretary considered, as he was required to do by the regulation, these factors within the scope of the “public interest” in the whole Project, which includes a massive economic opportunity for the people of Delaware.

Regarding subsection 4.6.3, the Secretary's Order incorporated the Hearing Officer's Report, which is clear on its face as having considered navigational factors by conferring and coordinating with the appropriate agencies responsible for navigation on the Delaware River (*e.g.*, Delaware River Pilots and the United States Coast Guard).

While Captain Kichner is clearly an expert on the subject-matter of navigation along the entire Delaware River, DNREC reasonably gave greater weight to the input from the Army Corps of Engineers, the United States Coast Guard, the Pilot's Association of the Bay and River Delaware, and Wilmington Tug, Inc. As such, the Board cannot hold, based on the record before it, that DNREC failed to consider the “potential effect on the public with respect to ... navigation.”

DNREC's responsibility here is with respect to subaqueous lands, not the entire Delaware River. To suggest that DNREC would be expected to re-do or override the work of these agencies that are responsible, in fact, for the maintenance and safe navigational operations upon the Delaware River is unwarranted by

Appellants. Appellants read these subsections as requiring something beyond the scope of DNREC’s legal scope and subject-matter expertise.

Regarding subsections 4.6.4 and 4.6.6, the Project includes a 3-phase mitigation plan, which is discussed in detail below and which includes the opportunity for enhanced recreational opportunities at nearby Fox Point State Park, in addition to other environmental benefits.

2. The Application of Regulation Subsection 4.7

Subsection 4.7 dictates that DNREC “shall consider the impact on the environment,” including by the following provisions:

- 4.7.1.2 Any effect on shellfishing, finfishing, or other recreational activities, and existing or designated water uses.
- 4.7.1.3 Any harm to aquatic or tidal vegetation, benthic organisms or other flora and fauna and their habitats.
- 4.7.1.5 Any impairment of air quality, either temporarily or permanently, including noise, odors, and hazardous chemicals.
- 4.7.4 The Department shall consider whether any significant impacts or potential harm could be offset or mitigated by appropriate actions or changes to the proposed activity by the applicant. If so, the required mitigating measures may be included as conditions of the permit or lease.

a. Recreation

i. Findings of Fact Regarding the Secretary's Consideration of the Effects of the Project on Recreational Fishing

This factor and evidence adduced to the contrary by Appellants is discussed above. The Board finds no evidence in the record before it that the concerns about recreational fishing have any basis in fact beyond those advanced by Appellants and those affiliated with the business interests of the Appellants against the Port of Wilmington and its operations.

b. Other Possible Environmental Impacts

DNREC, by and through its Secretary's Order, considered myriad environmental issues. None are meaningfully contradicted by evidence submitted to the Board by Appellants.

i. Findings of Fact Regarding the Secretary's Consideration of the Effects of the Project on the Aquatic Habitat, Water, and Air Quality

Appellee, DNREC, submitted declarations from the individuals involved in DNREC's consideration of these issues.

Steven M. Smailer, Director of DNREC's Division of Water, provided testimony regarding DNREC's consideration of the environmental impact of the project and the plans to mitigate those impacts.¹²⁰ John G. Cargill, a hydrologist

120 Smailer Decl. ¶¶33-56.

within DNREC’s Division of Watershed Stewardship also provided testimony on the subject of environmental impact and mitigation.¹²¹

Beginning in 2016, Duffield requested and received authorization to conduct sample analyses of sediment and surface water at the site.¹²² Draft sampling analyses provided in 2018 prompted comments from DNREC and a recommendation by DNREC to Duffield to conduct more robust sampling and analyses.¹²³ Additional and expanded testing occurred during 2019 and 2020.¹²⁴ Through 2021, DNREC, Duffield, the U.S. Army Corps of Engineers, the Delaware River Basin Commission, and the Environmental Protection Agency worked together to draft and finalize a plan for monitoring construction dredging and disposition of dredged materials.¹²⁵

121 Cargill. Decl. ¶¶8-57.

122 Smailer Decl. at ¶¶34-35; Cargill Decl. at ¶¶9-11.

123 Smailer Decl. at ¶¶36-39; Cargill Decl. at ¶¶12-14.

124 Smailer Decl. at ¶¶40-41; Cargill Decl. at ¶¶15-29.

125 Smailer Decl. at ¶¶42-50; Cargill Decl. at ¶¶30-50. The dredging required for construction is expected to have a beneficial impact by removing contaminated sediment, leading to a “healthier, more diverse benthic community.” Environmental Assessment Technical Document at 79.

The initial permit application submitted by Diamond State included an unprecedented use of “shoaling fans” to assist with the maintenance of the dredged subaqueous lands.

Shoaling fans were removed from the project, primarily because DNREC was concerned about the environmental impact of their inclusion.¹²⁶ This concern was raised by Appellants during public comment and was specifically addressed by DNREC in the permitting process. Having achieved their goal, Appellants moved the goalposts to challenge the hypothetical concerns created by the alternative plan.

Regarding the originally proposed shoaling fans, the Hearing Officer’s Report states, and the Board finds the same to be supported by the evidence before it:¹²⁷

DSPC’s original WSLs Application and Certification for the Port of Wilmington Expansion Project submitted to DNREC on March 16 and 18, 2020 included the installation and operation of SedCon Technologies, Inc.’s Turbo System anti-sedimentation devices (“shoaling fans”) to minimize the need for maintenance dredging. DNREC’s Division of Fish and Wildlife - Fisheries Section (“DFW Fisheries”) reviewed the proposed project activities, including the use of shoaling fans. On December 14, 2020, DFW Fisheries provided comments on the project in relation to the proposed use of shoaling fans as an anti-sedimentation technique.

The DFW Fisheries commented that the installation and operation of the shoaling fans would increase fish mortality and degrade ecosystem function and aquatic habitat in the project area. Shoaling fans would have adverse impacts on fish directly through impingement and entrainment, and indirectly through increased

126 Mensch Decl. at ¶¶37-42.

127 Hearing Officer Report at 9-10.

sedimentation and potential resuspension of contaminants. Adult fishes impinged on the shoaling fans may also be killed. Fan intakes would entrain pelagic fish eggs and larvae.

In addition to the entrainment and impingement impacts, DFW Fisheries noted that spawning runs could be altered by the noise produced by the fan blades. All these concerns were passed on to the Applicant to be addressed. In response to the above concerns that shoaling fans may pose a risk to aquatic life and water quality, DSPC modified the scope of the project activities to remove the use of shoaling fans. On July 1, 2021, the consultant for the Applicant, Duffield Associates, submitted a revision to the project plans that reflects the removal of the shoaling fans from the project design. The removal of the shoaling fans from the Application, coupled with the Applicant's proposed compensatory mitigation package, (described in greater detail further herein), address the significant portions of concern the Department had regarding the potential impacts to aquatic resources in regard to Delaware's Regulations Governing the Use of Subaqueous Lands, 7 DE Admin. Code 7504, specifically, Sections 4.7.1.2, 4.7.1.3, 4.7.1.4, and 4.7.4.

The Board finds this aspect of the Hearing Officer's Report is supported by the evidence before the Board. Testimony before the Board from DNREC's subject-matter experts confirms that public comment regarding the installation of shoaling fans was instrumental in discussions between DNREC and Diamond State in altering the project to remove an environmentally questionable aspect of the Project.¹²⁸

128 Smailer Decl. at ¶¶57-65; Mensch Decl. at ¶¶37-42; Cargill Decl. at ¶27.

The Board also agrees with the conclusion in the Hearing Officer's Report addressing the concern that dredging could have a negative impact upon water quality:¹²⁹

The Department's TRM acknowledges that dredging activities have the potential to increase turbidity in the river around the cutterhead, causing sediment particles and associated contaminants to become suspended in the river water, and thus impact water quality. However, the impacts are expected to be limited in extent, and will be monitored during the entire course of dredging activities to ensure impacts do not extend beyond regulatory boundaries.

Per an approved monitoring plan, turbidity/total suspended solids, among other physical parameters, will be measured regularly behind the cutterhead, and at background locations upstream and downstream of the dredging activities. Water quality samples and sediment samples will be collected regularly to evaluate water/sediment chemistry and to compare results to modeled predictions. Those samples will be analyzed for pH, hardness, organic carbon content, inorganic compounds (metals), pesticides, polycyclic aromatic hydrocarbons ("PAHs"), dioxins and furans and PCBs. While previous studies indicate that most (approximately 98%) of the dredged sediments will be captured and retained in Confined Disposal Facilities ("CDFs"), a small amount may be released back into the water through elutriate discharge.

Per the approved monitoring plan, DSPC will be required to conduct monitoring of the CDF influent and effluent. During active dredging, dredge slurry (influent) will be sampled regularly and will be allowed to separate into water and sediment. Sediment and water samples will be analyzed for organic carbon content, inorganic compounds (metals), pesticides, PAHs, dioxins and furans and PCBs. Effluent water samples will be collected at the same frequency as influent samples and will be analyzed for the same chemical

129 Hearing Officer Report at 10-11. Similarly, the Duffield's March 1, 2001 Memorandum on Page 3 confirmed that the Project was unlikely to affect the quality of the water in the area.

parameters. When influent and effluent data is combined with measurements of flow rate, a mass balance calculation can be done to determine the overall retention of contaminants in the CDF.

If any data collected during the course of active dredging and active discharge from the CDF are outside of applicable Delaware River Basin Commission and DNREC water quality criteria, then corrective actions will be implemented to address non-compliant conditions. The TRM states that the proposed monitoring and responsive corrective actions address the significant portions of concern DNREC had regarding the potential impacts to water quality in regard to the Regulations Governing the Use of Subaqueous Lands, 7 DE Admin. Code 7504, Sections 4.7.1.1.

The Board finds this conclusion, adopted by the Secretary's Order, is supported by the evidence before the Board. Testimony before the Board from DNREC's subject-matter experts confirms that dredging's impact upon water quality was considered and incorporated into the TRM upon which the Hearing Officer relied.¹³⁰

The Board also finds that the Hearing Officer's Report regarding the effect of the Project on air emissions is supported by the evidence in the record before the Board.¹³¹

The DCMP coordinated with the Department's Division of Air Quality ("DAQ") for input on air quality concerns related to the

130 TRM at Comment Sections 3-5. Smailer Decl. at ¶¶34-50; Cargill Decl., *passim*.

131 Hearing Officer's Report at 11-12. "DCMP" is the Delaware Coastal Management Program. Also, in the evidence before the Secretary and the Board was detail regarding potential noise pollution from the Project. Duffield Environmental Technical Assessment at 146, 180.

proposed activities included in this project. DAQ supports efforts that preserve public health and safety and promote smart growth. Activities associated with the proposed project must comply with all Delaware Air Quality Regulations (Division of Air Quality, 7 DE Admin. Code 1100) to not exceed air quality emission thresholds.

To reduce emissions associated with the construction phase of the project, DAQ recommends that retrofitted on-road and non-road diesel engines be used. Existing DAQ Regulations require the use of dust suppressants and measures to prevent transport of dust offsite from material stockpile, material movement, and use of unpaved roads and the use of covers on trucks that transport material to and from a site to prevent visible emissions (Particulate Emissions from Construction and Materials Handling, 7 DE Admin. Code 1106).

Additionally, Delaware Air Quality Regulations require a conformity determination for each pollutant where the total of direct and indirect emissions would equal or exceed any of the de minimis levels (Conformity of General Federal Actions to the State Implementation Plans, 7 DE Admin. Code 1135). Delaware Air Quality Regulations also restrict idling time for trucks and buses having a gross vehicle weight of over 8,500 pounds to no more than three minutes (Excessive Idling of Heavy-Duty Vehicles, 7 DE Admin. Code 1145).

Compliance with the above referenced Air Quality Regulations and the incorporation of the DAQ recommendations address the concern the Department had regarding the potential impacts to water quality in regard to Regulations Governing the Use of Subaqueous Lands, 7 DE Admin. Code 7504, Sections 4.7.1.5.

Again, the Board finds that the Hearing Officer's conclusion, upon which the Secretary relied is supported by the evidence in the record before the Board. The TRM cites that DNREC's Division of Air Quality provided subject-matter expertise in this regard.¹³²

132 TRM at Comment Section 4.

The Board also finds that the Secretary's Order appropriately considered the concerns stated by citizens concerned with environmental justice and that the Hearing Officer's findings are supported by the evidence before the Board. The Hearing Officer explicitly addressed the concept of environmental justice raised by concerned stakeholders.¹³³

DNREC has placed great importance on understanding and addressing Environmental Justice concerns raised by communities in the vicinity of the proposed project site. As such, special consideration was taken to incorporate mitigation requirements that would result in improvements to the local environment and increase recreational opportunities for the residents of neighboring communities.

The Department's TRM notes that, as required under Delaware's Regulations Governing Hazardous Waste (7 DE Admin. Code 1302) and the Resource Conservation and Recovery Act (RCRA), a site Risk Assessment ("RA") was conducted which analyzed contaminant data from the upland (former DuPont/Chemours) property for potential risk to human health and the environment using appropriate guidelines and parameters. The RA considered all routes of potential exposure and determined that no unacceptable risk was posed to human health or the environment from contaminants at the site as long as the impacted media remains buried in place (thereby removing the potential pathway of exposure).

Based upon the RCRA Facility Investigation ("RFI") in conjunction with the RA, and in consideration of the site's future use, the presumptive site remedy of capping, construction management, groundwater monitoring and an environmental covenant, proposed in the Statement of Basis ("SB") and enforced by the conditions of the RCRA permit, issued April 29, 2021, work together to assure ongoing protection of both human health and the environment.

133 Hearing Officer Report at 12-13.

Furthermore, DNREC is requiring that the Applicant mitigate for potential negative impacts related to the proposed project, including the loss of 5.5 acres of subaqueous habitat. The DSPC, as a condition of the issuance of the WSLS Permit and DCMP Certification concurrence, must complete the State of Delaware Compensatory Mitigation Plan, which includes habitat and recreational enhancements that will benefit the residents of communities adjacent to the proposed project site. Some of these enhancements will occur at FPSP. FPSP, located on Lighthouse Road in Wilmington, Delaware, is in close proximity to the proposed project site. Communities located near the proposed project site have easy access to FPSP, therefore improvements to this park will also provide enhancements to the communities around the Edgemoor site. Additional information detailing the specific components of the State of Delaware Compensatory Mitigation Plan for the Applicant's proposed project will be discussed in detail further herein.

The presumptive remedy and enforcement of the RCRA requirements address the significant portions of concern the Department had regarding the potential impacts to water quality in regard to the Regulations Governing the Use of Subaqueous Lands, 7 DE Admin. Code 7504, Sections 4.7.1.6. Additionally, the proposed compensatory mitigation package, described in greater detail further herein, is considered adequate mitigation pursuant to the Regulations Governing the Use of Subaqueous Lands, 7 DE Admin. Code 7504, Sections 4.7.1.4 and 4.7.4.

The Board finds as a matter of fact that the Hearing Officer's conclusion, and thus the Secretary's Order, is supported by the record before the Board. The TRM cites the recovery of toxic subaqueous lands and the 3-part mitigation plan as offsetting any potential harm that could be caused by the Project.¹³⁴ These mitigation

134 TRM at Comment Section 5.

factors, applicable to those in the environmental justice community, are confirmed by the testimony before the Board from Steven Smailer and John Cargill.¹³⁵

The Board also finds that the Hearing Officer's Report, adopted by the Secretary's Order, included consideration of pollutants associated with the project, which is supported by the testimony before the Board from Steven Smailer and John Cargill:¹³⁶

As noted above, the portion of the Applicant's proposed project that fell under the permitting authority of the Department's DWHS-RS was previously approved with the execution of DNREC Secretary's Order No. 2021-WH-0014 and the issuance by DNREC of a RCRA CAP Renewal Permit to the DSPC (Effective Date: April 29, 2021). The Department's DWHS Corrective Action Section ("CAS") has been managing/overseeing the environmental cleanup of the upland portion of the former DuPont/Chemours Edgemoor site, where the new port will be constructed, in accordance with the federal RCRA program.

Critical to long term protection and improvement of human and ecological health from contaminants in the sediment will be proper management of the dredged material and associated CDF elutriate generated during dredging for port construction. A Monitoring Plan for Construction Dredging and Dredged Slurry has been developed by DSPC and approved by DNREC and USACE. The TRM concludes that the RCRA remedial actions, detailed sediment characterization, removal of the contaminated sediments during the dredging, associated risk assessment, and proposed monitoring and responsive corrective actions address the significant portions of concern DNREC had regarding the potential contaminated sediment transport in regard to the Regulations Governing the Use of Subaqueous Lands, 7 DE Admin. Code 7504, Sections 4.7.1.1, 4.7.1.6 and 4.7.2.

135 Smailer Decl. at ¶¶51-56; Cargill Decl. at ¶¶31-57.

136 Hearing Officer Report at 17.

* * *

A hydrogeologic site investigation is needed As noted above, a comprehensive hydrogeologic site investigation was performed as part of the sitewide RCRA Facility Investigation (“RFI”). The TRM states that the Department’s RCRA remedial actions, the detailed site characterization, sediment characterization, removal of the contaminated sediments during the dredging, associated risk assessment, and proposed monitoring and responsive corrective actions address the significant portions of concern DNREC had regarding the cumulative and secondary effects on the aquatic ecosystem, natural surface and groundwater hydrology in regard to the Regulations Governing the Use of Subaqueous Lands, 7 DE Admin Code 7504, Section 4.7.3.

The Board finds as a matter of fact that the testimony provided by the DNREC subject-matter experts regarding pollutants potentially involved in the Project supports the findings of the Hearing Officer, upon which the Secretary relied. The TRM discusses the consideration DNREC made regarding pollutants.¹³⁷ The TRM is corroborated by the Testimony of Steven Smailer and John Cargill.¹³⁸

In summation, the evidence in the record before the Board demonstrates that the subject-matter experts in several Divisions within DNREC were engaged in the multi-year process to assess the various benefits and concerns regarding the Project. The Secretary’s Order relies on the Hearing Officer’s Report in this regard. The Hearing Officer’s Report is based upon the work of the individual experts employed by the State of Delaware to assess potential environmental and recreational impacts

137 TRM at Comment Section 10.

138 Smailer Decl. at ¶¶34-50; Cargill Decl. at ¶13.

upon the State when subaqueous lands are developed. The Board finds, as a matter of fact, that the Secretary's Order was based upon substantial evidence and is supported by the evidentiary record now before the Board.

ii. The Board's Assessment of Evidence Presented by Appellants to the Contrary

The Board finds that Appellants' testimony is unconvincing about the supposed shortcomings of DNREC's assessment of environmental impacts of the Project. Mr. Curran calls upon the testimony of Mr. Damian V. Preziosi in support of his claims that the evaluation of environmental impact of the Project was not "considered" by DNREC.¹³⁹ Mr. Preziosi testifies that DNREC did not consider the habitat of Atlantic sturgeon that may be affected by the Project.¹⁴⁰ That testimony is belied by the record before the Board, which is replete with evidence of consideration of that very topic.

Mr. Curran also submits the testimony of Theodore D. Tomasi, Ph.D.¹⁴¹ Dr. Tomasi's Affidavit concludes that "DNREC failed to undertake any meaningful evaluation of the impacts and harm to recreation, fishing, boating and enjoyment of

139 Affidavit of Damial V. Preziosi.

140 Preziosi Aff. at ¶¶19-36.

141 Affidavit of Theodore D. Tomasi, Ph.D.

River [sic] that will result from the [Project].”¹⁴² Dr. Tomasi goes on to conclude that “DNREC failed to impose sufficient mitigation to address the harms caused to recreation, fishing, boating and enjoyment of the River.”¹⁴³ He testifies that DNREC should have approached the question of mitigation differently, including by considering an area stretching from the C&D Canal all the way to the Schuykill River.¹⁴⁴ He goes on to testify as to how he would have designed a mitigation plan based on the Project.¹⁴⁵

Dr. Tomasi is clearly a qualified expert in this area, however, the Board found that it was reasonable for the Appellees to rely on their own subject-matter experts who came to different conclusions, each of which are supported by their testimony and the evidence before the Board.

c. The Three-part Mitigation Plan

The Secretary’s Order is explicit regarding the three-phase mitigation plan contemplated to be imposed alongside the Project as a requirement by DNREC.¹⁴⁶

142 Tomasi Aff. at ¶11.

143 *Id.*

144 *Id.* at ¶¶32-44.

145 *Id.* at ¶¶45-69.

146 Secretary Order at 8-9.

ii. Findings of Fact Regarding the Mitigation Plan

For projects that involve the conversion of subaqueous lands to uplands, DNREC requires a plan for mitigating the effect of that process.¹⁴⁷ In early 2021, DNREC rejected Diamond State’s initial plan for mitigation for failing to sufficiently address mitigation.¹⁴⁸ As a result of DNREC’s initial rejection, several meetings ensued resulting in an expanded mitigation process based upon the economic model DNREC has applied in other subaqueous lands mitigation assessments.¹⁴⁹

The Board finds that the Mitigation Plan provides an adequate combination of direct in-kind replacement of lost habitat by:

- the creation of new intertidal wetland habitat in the immediate area of the project;¹⁵⁰
- the creation of the Environmental DNA monitoring program for the statewide fisheries program to be funded by Diamond State and administered by DNREC’s subject-matter experts;¹⁵¹ and

147 Smailer Decl. at ¶51.

148 Smailer Decl. at ¶¶52-53.

149 *Id.* at ¶¶54-56.

150 Cargill Decl. at ¶¶54-55.

151 *Id.* at ¶¶52, 54.

- the reconnection of the impacted local community to the Delaware River by means of enhancements to Fox Point State Park.¹⁵²

In reaching this finding of fact, the Board relies on the following: the Secretary’s Order (based upon the Hearing Officer’s Report and the TRM) and the testimony proffered by Appellees. Namely, the testimony of Steven Smailer,¹⁵³ John Cargill,¹⁵⁴ and Brian Devine.¹⁵⁵

For Phase One of the Mitigation Plan, Diamond State will construct approximately one acre of intertidal wetland along the Delaware River at the north end of Fox Point State Park as an “in-kind” component of habitat replacement to partially compensate for what is being lost through the proposed construction of the port.¹⁵⁶ Diamond State shall be financially responsible for all aspects of the project.¹⁵⁷ This will include obtaining any necessary authorizations, construction of

152 *Id.* at ¶¶54-55.

153 Smailer Decl. at ¶¶51-56.

154 Cargill Decl. at ¶¶8-57.

155 Devine Aff. at ¶¶90-104.

156 Secretary Order at 7.

157 *Id.*

the wetland, and three (3) years of monitoring, maintenance and reporting to ensure that the wetland habitat creation is a success.¹⁵⁸

In Phase Two of the Mitigation Plan, to provide additional compensatory mitigation, the Diamond State will provide funding to establish the Environmental DNA (“eDNA”) Fisheries Monitoring Program under the operation and management of DNREC.¹⁵⁹ The first project administered through that program will focus on monitoring around the proposed project area and the surrounding Christina River watershed before, during and after dredging.¹⁶⁰ Additionally, DNREC will expand the eDNA monitoring to other rivers, creeks and ponds in Delaware to monitor endangered species, invasive species, and other species of interest. The data collected will help DNREC to evaluate and understand potential impacts of the proposed project on both resident and transient fish species that utilize the Delaware River and will help to supplement traditional data collection methods used by DNREC fisheries managers in other water bodies throughout the State of Delaware.

Phase Three of the Mitigation Plan provides for increased public access at Fox Point State Park to the natural resources of the Delaware River.¹⁶¹ Diamond State

158 *Id.* at 7-8.

159 *Id.*

160 *Id.*

161 *Id.* at 8.

will consult with DNREC to produce landscape designs for an improved walking trail around the newly created intertidal wetland, a viewing/observation platform that will facilitate associated education opportunities, and substantial vegetation removal to restore the view of the Delaware River along the length of the park.¹⁶² Additional enhancements under consideration include roadway and lighting improvements, restroom repairs, and other amenities aimed at increasing public access to the natural resources of Fox Point State Park and the Delaware River.¹⁶³

Diamond State initially resisted DNREC's insistence on the environmental mitigation plans provided, but ultimately accepted the requirements imposed upon the Project.¹⁶⁴ The final mitigation plan was submitted on September 24, 2021.¹⁶⁵

iii. The Board's Assessment of Evidence Presented by Appellants to the Contrary

Appellants insist that the mitigation plans upon which DNREC insisted do not satisfy the regulation's requirements, despite the regulation including no specific manner of providing for mitigation. The Board finds that argument is not supported by the record before it.

162 *Id.*

163 *Id.*

164 Affidavit of Brian J. Devine at ¶¶90-104.

165 *Id.* at ¶56.

The Board does not find Mr. Preziosi’s testimony persuasive. First, Mr. Preziosi testifies that the compensatory mitigation plan is “grossly insufficient” and does not “meet compensatory mitigation requirements.”¹⁶⁶ His testimony provides no basis in law for his conclusions. Instead, Mr. Preziosi’s testimony consists of what DNREC “might have done” but does not indicate why what DNREC extracted from Diamond State regarding mitigation does not appropriately balance the public interest against the net benefits of the Project. Mr. Preziosi also testifies that the mitigation plan should have accounted for future maintenance dredging,¹⁶⁷ but that activity is not part of the application subject to the Secretary’s Order. Maintenance dredging, and any required mitigation will be addressed by future applications.¹⁶⁸ Mr. Preziosi also testifies that the mitigation plan should have been species-to-species specific.¹⁶⁹ The Board finds as a matter of fact that the regulations require no such thing.

166 Preziosi Aff. at ¶¶45-59.

167 *Id.* at ¶61.

168 Small Aff. at ¶¶39-40; Devine Aff. at ¶¶43, 108-114.

169 Preziosi Aff. at ¶60.

d. The Board's Conclusions of Law Regarding the Application of Regulation Subsection 4.7

The Board finds and the record before the Secretary indicates that the environmental factors identified by Appellants were indeed “considered” and accounted for as part of DNREC’s process.

DNREC and Diamond State considered each issue raised in the Appeals regarding environmental and recreational factors. These issues were extensively analyzed and thoroughly vetted by experts in the field and were subjected to countless public reviews and comments. The Project is the culmination of significant and exhaustive consideration, expert analysis, negotiations, discussions, meetings, public comments, and administrative critic and review that spanned over half a decade. Issues of environmental concern explicitly considered by DNREC included noise pollution, cloudy water, and the sturgeon population.

The findings that serve the basis for the Secretary’s Order meet the minimal standard that “a reasonable mind might accept [such facts] as adequate to support [the] conclusion[s].” *Smolka v. DaimlerChrysler*, 2004 WL 3958064, at *2 (Del. Super. July 13, 2004) (citation omitted). As discussed previously, the Project also includes a 3-phase environmental mitigation plan adopted because DNREC “considered” the required factors.

Although Appellants may believe a different result is warranted based on studies conducted by their own experts, this Board declines to replace the Secretary’s

Order, which is well-supported by the evidentiary record the Board, with its own judgment or judgment of expert witnesses proffered by Appellants.

3. The Application of Regulation Subsection 4.8¹⁷⁰

Appellant PhilaPort presses a challenge to the Secretary’s Order based upon the definition of the word “structure” as it is used in *7 Del. Admin. Code §7504-4.8*. Appellant PhilaPort suggests that DNREC did not follow subsection 4.8.4 (“structures shall not interfere with navigation, public or other rights”).

The argument advanced by PhilaPort, that the required turning basin (*i.e.*, the space in the open water that cargo ships entering and exiting the port will use to make turns) for the Edgemoor location is a “structure” has no reasonable basis in law or fact.

A “structure” is defined.¹⁷¹

170 This aspect of the Board’s May 10, 2024 Final Order was not appealed. The Section is unchanged. In addition, for the purpose of this Order Upon Remand, the testimony of Mr. Charles Harman, submitted on behalf of Appellant PhilaPort concerning the effect of the turning basin is not given weight by the Board in its decision on these Appeals because PhilaPort has not appealed. *See* Affidavit of Charles Harman.

171 *7 Del. Admin. Code §7504-1.0*. Pursuant to Regulation 1.0, the term structure “includes, but is not limited to, any boat ramp, slip, building, breakwater, bridge, bulkhead, culvert, dam, derrick, dock, gabion, groin, jetty, residence, launching facility, marina, mooring facility, pier, seawall, walkway, or wharf.” It does not include a “turning basin.”

A “turning basin” is included within a different category of non-structures:¹⁷²

Excavation, creation, or alteration of any channel, lagoon, turning basin, pond, embayment, or other navigable waterway on private subaqueous lands which will make connection with public subaqueous lands.

PhilaPort’s argument under regulation subsection 4.8 is rejected. A “turning basin” is not a “structure.” The Secretary would have no reason to consider this subsection in connection with the proposed turning basin.¹⁷³

4. The Application of Regulation Subsection 4.11

Appellants argue that DNREC has not followed Subsection 4.11 pertaining to activities involving dredging, filing, excavating, or extracting materials. The subsection provides that “projects shall be designed to meet the following objectives:”

- 4.11.1.1 Conform to the pertinent objectives, classification system, environmental considerations, and criteria of the "Inland Bays Dredging Study, Volumes I and II," dated April 1986, as adopted by the Department on July 18, 1986.
- 4.11.1.2 Maintain the navigability of channels.
- 4.11.1.3 Maintain or improve the environmental quality of the State's water resources, subaqueous lands and wetlands.

172 7 Del. Admin. Code §7504-2.3.3.1.4

173 Nevertheless, the Secretary did give consideration even to this. The hearing officer’s report indicates specific consideration given to the factors contemplated by subsection 4.8.4.

a. The Removal of Shoaling Fans from the Project Design and Potential Requirements for Future Maintenance Dredging

In connection with the Project, the initial construction will involve dredging the subaqueous lands subject to the permit issued by DNREC pursuant to the Secretary's Order. At one point, Diamond State had proposed to include a system of underwater shoaling fans to help reduce the need for future maintenance dredging. That part of the plan was abandoned, and Appellants argue that the Secretary's Order did not properly account for the need for future maintenance dredging. The dredging relevant to the DNREC permitting process is limited to the subaqueous lands in question.

i. Findings of Fact Regarding the Need for Future Dredging Operations

New construction dredging (like that allowed by the Secretary's Order) and maintenance dredging permits are distinct applications and require the submission of different information by a permit applicant.¹⁷⁴ Applications for initial construction permits requires broad amounts of environmental sampling and analysis.¹⁷⁵ An applicant may be asked if maintenance dredging will be required and whether and how such dredging can be minimized, but the application does not

174 Small Aff. at ¶¶35-37.

175 *Id.* at ¶38.

require it.¹⁷⁶ An application for maintenance dredging is far narrower because the area in question will have already been dredged in the construction process.¹⁷⁷

In designing the Project, Diamond State commissioned an assessment of regarding the amount of maintenance dredging anticipated to maintain the Edgemoor site.¹⁷⁸ The amount, estimated at 500,000 cubic yards per year is in line with what is required annually at the existing Port of Wilmington and the Delaware City refinery.¹⁷⁹ It is anticipated that such dredging would take 17 days per year.¹⁸⁰ Maintenance dredging will not affect recreational access to the River nor will it impact the navigational channel because it is limited to the berthing area.¹⁸¹

However, the amount of maintenance dredging anticipated did not take the proposed shoaling fan system into account because the efficacy of the shoaling fan proposal to reduce the need for maintenance dredging could not be guaranteed.¹⁸²

176 *Id.* at ¶¶40-41.

177 *Id.* at ¶39.

178 Devine Aff. at ¶108.

179 *Id.* at ¶109-110.

180 *Id.* at ¶111. Because the amount of maintenance dredging is variable year to year based on natural factors, Diamond State used a conservatively high estimate. *Id.* at ¶¶113-114, 120.

181 *Id.* at ¶112.

182 *Id.* at ¶116.

The inclusion of shoaling fans at a scale never before tested garnered public opposition, including from the Appellants during public comment.¹⁸³ DNREC also raised concerns about the potential impact, environmentally, of installing such shoaling fans at depth.¹⁸⁴ Diamond State found itself with a conundrum regarding the inclusion of shoaling fans in the project leading to their removal from the application.¹⁸⁵ It could not confirm their efficacy or determine the environmental impact without completion of the construction dredging, but the construction dredging could not proceed without a permit.¹⁸⁶

ii. The Board's Assessment of Evidence Presented by Appellants to the Contrary

Mr. Curran calls upon the expert testimony of Dr. Craig Jones in his objection to the consideration of dredging issues raised by the Project.¹⁸⁷ Dr. Jones believes that the need for maintenance dredging will exceed Diamond State's predictions.¹⁸⁸ Dr. Jones speculates about the nature of future maintenance dredging operations

183 *Id.* at ¶117.

184 *Id.* at ¶118. *See also* Mensch Decl. at ¶¶37-42; Smailer Decl. at ¶¶57-65.

185 Devine Aff. at ¶119.

186 *Id.*

187 Affidavit of Craig Jones, Ph.D.

188 *Id.* at ¶¶5-12.

required to be conducted by the Army Corps of Engineers in the main navigation channel of the Delaware River.¹⁸⁹

Mr. Preziosi testifies that the annual maintenance dredging contemplated by this project is unusual for the area.¹⁹⁰ In that regard, Mr. Preziosi's testimony is directly at odds with Mr. Devine regarding similar industrial sites on the Delaware River. In this regard, the Board finds the testimony of Mr. Devine to be more persuasive. Mr. Devine is a licensed Professional Engineer in the State of Delaware and has experience specific to subaqueous lands permitting related to the Delaware River.¹⁹¹

b. The Board's Conclusion of Law Regarding the Application of Regulation Subsection 4.11

Subsection 4.11 pertains to permits involving dredging operations. Here, the Project anticipates the need for future maintenance dredging. Indeed, even when the Project anticipated the use of shoaling fans, maintenance dredging was anticipated and accounted for. However, the Secretary's Order pertains to the construction permit application, not to future maintenance dredging operations, which will require future permitting action by DNREC and partner agencies at the federal and

189 *Id.* at ¶¶19-37.

190 Preziosi Aff. at ¶¶8-14.

191 Devine Aff. at ¶¶4-5.

state levels. Such permit applications will be subject to similar assessments regarding impact on factors such navigation in the effected subaqueous lands, the environment, and recreation. Any such permit issued will include such mitigation as deemed necessary by DNREC based on the scope of the work proposed. At this stage, the Board finds that the Secretary would be premature to opine regarding future dredging.

The evidence adduced by Appellant Curran from Dr. Jones does not compel a conclusion by this Board otherwise. Dr. Jones is clearly well-qualified, although he has not cited any work he previously has performed relevant to the Delaware River.¹⁹² On the other hand, the testimony from Mr. Devine is more persuasive to the Board.

In any event, the evidentiary record demonstrates that concerns for navigability of the channel for through-traffic was a serious consideration for DNREC, which coordinated its consideration of the matter with the other relevant agencies.¹⁹³ However, the evidence also demonstrates that maintenance dredging around the future wharf site will have no effect on navigation in the main channel. It appears to the Board that Appellants have, again, conflated DNREC's permitting

192 Jones Aff. at ¶1.

193 It is established by testimony from the witnesses presented by Appellees that this type of change to the permit application is typical. Smailer Decl. at ¶65.

responsibilities related to the subaqueous lands with the responsibility of other agencies to maintain the main navigation channel. The Board finds that there is no evidence that more or different procedures were required.

5. The Application of Regulation Subsection 3.1.3

In connection with Appellants' earlier motion for summary judgment, which was denied, the Board found as a matter of fact that Diamond State's removal of the shoaling fans from the Project was not substantial enough to require the permit process to restart.¹⁹⁴ The Board found instead that the rule of reason as well as a reading of the whole regulations led to the conclusion that some back and forth on the specifics of the Project is both normal and beneficial.¹⁹⁵ The Board further found that it has been the consistent practice of DNREC not to require resubmission of applications when the changes reduce the environmental impact of the Project as a whole.¹⁹⁶

194 Oct. 21, 2022 Board Order at 16.

195 *Id.*

196 *Id. citing McFaul, Sr. v. Secretary of DNREC et. al.*, EAB Appeal No. 2003-01 (Oct. 3, 2003); *Lampner v. DNREC*, EAB Appeal No. 2018-02 (Oct. 2, 2019).

During oral argument, Appellants did not address their argument that under 7 *Del. C. §7200-3.1.3* that the application was not properly maintained “in a current state.” The Board’s view of this issue remains unchanged.¹⁹⁷

The Board finds Mr. Small’s testimony to be convincing and not challenged in the record before the Board. Namely, Mr. Small testifies that applications are not necessarily approved in the form in which the application is submitted.¹⁹⁸ DNREC’s process is fluid by design to foster modifications based upon feedback during the permitting process.¹⁹⁹ Because of that, the permitting process may include modifications, such as the removal of shoaling fans in this Project, to address DNREC concerns based upon public comment.²⁰⁰ DNREC’s actions with respect to Diamond State’s application in this case have been consistent with DNREC’s historic actions regarding application amendments.²⁰¹

197 The Board’s position is supported by testimony of DNREC’s witnesses regarding the ordinary procedures regarding the manner in which DNREC considers and accepts revisions to subaqueous lands permits.

198 Small Aff. at ¶19.

199 *Id.* at ¶20.

200 *Id.* at ¶21.

201 *Id.* at ¶¶22-26.

VI. CONCLUSION

Upon consideration of the facts and law, the Board concluded that Appellants did not carry their burden to demonstrate that the Secretary's Order is not supported by the evidence in the record before the Board. Upon returning from executive session, Board member Mulrooney so moved, which motion was seconded by Board member Horsey. The Board voted unanimously, and the motion carried.

IT IS SO ORDERED this 14th day of July, 2025.

/s/ Dean Holden (e-singed pursuant to 6 Del. C. § 12A-107)
Dean Holden, Chairperson

The following 3 Board members concur in this Decision and Final Order:

Date: July 14, 2025 /s/ Robert Mulrooney (e-singed pursuant to 6 Del. C. § 12A-107)
Robert Mulrooney, Board Member

Date: July 14, 2025 /s/ Michael Horsey (e-singed pursuant to 6 Del. C. § 12A-107)
Michael Horsey, Board Member

Date: July 14, 2025 /s/ Deborah Wicks (e-singed pursuant to 6 Del. C. § 12A-107)
Deborah Wicks, Board Member