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Via email to: NYNJHarbor.TribStudy@usace.army.mil

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New York, NY 10279-0090

**Re: Comments on the Draft New York-New Jersey Harbor and
Tributaries Coastal Storm Risk Management Integrated Feasibility
Report and Tier 1 Environmental Impact Statement**

Dear Mr. Wisemiller and Ms. Alkemeyer:

Riverkeeper, Inc. (“Riverkeeper”) respectfully submits these comments on the United States Army Corps of Engineers’ (“Army Corps” or the “Corps”) New York-New Jersey Harbor and Tributaries Coastal Storm Risk Management Feasibility Study (“NYNJHATS” or the “Study”) Draft Integrated Feasibility Report and Tier 1 Environmental Impact Statement (“EIS”), released for public comment in September 2022. Riverkeeper is a member-supported watchdog organization dedicated to protecting and restoring the Hudson River from source to sea and safeguarding drinking water supplies through advocacy rooted in community partnerships, science and law. For more than 50 years, Riverkeeper has defended the Hudson River Estuary, its fishery, and the entire Hudson River ecosystem. We have stopped polluters, championed public access to the river, influenced land use decisions, worked with and advocated for communities, and restored habitat, benefiting the natural and human communities of the Hudson River and its watershed. Our members use, enjoy, and have significant aesthetic, recreational, cultural, and scientific interests in maintaining the environmental integrity of the Hudson River Estuary, its ecosystem, and those of the waterways that make up its watershed. Riverkeeper has decades of experience patrolling, sampling and protecting water up and down the Hudson River as well as on the East River and Harlem River, Bronx River, Newtown Creek, Flushing Bay and Creek, Gowanus Canal, and the New York-New Jersey Harbor. Riverkeeper has commented extensively on NYNJHATS three times, first in 2018 on the scope of the Study (the “Scoping Comments”)

again in 2019 on the Feasibility Study Interim Report (the “Interim Report Comments”), and most recently in 2021 on the implementation of the Water Resources Development Act of 2020 (“WRDA Implementation Comments”). All three sets of comments remain relevant to this analysis and are incorporated by reference herein.¹

Riverkeeper appreciates that the Army Corps has levied significant resources and staff expertise to address the intractable storm surge risks facing the region. The Study marks an important step toward climate resiliency on a region-wide basis. Riverkeeper applauds the magnitude of the proposed \$52.6 billion² shared federal and state investment in our region’s resilience under Alternative 3B (the “Tentatively Selected Plan”). Such an investment is direly needed: Superstorm Sandy alone caused roughly \$50 billion in damages.³ Moreover, the geographic scope of the Tentatively Selected Plan, which covers the five boroughs and heavily populated areas of New Jersey, is more appropriate than plans that focus almost solely on Manhattan and few other areas, though, as discussed below, the plan’s proposed storm surge protections are not equitably distributed throughout the region.

Despite the size of the investment, the Tentatively Selected Plan is plagued by the same flaws that have pervaded the Study since 2018, when Riverkeeper and others first warned of the potentially catastrophic impacts that the harbor-wide storm barriers contemplated in Alternatives 2 and 3A could have on the Hudson River Estuary. Alternative 3B proposes 12 storm surge barriers in the water across the mouths of Gowanus Canal, Newtown Creek, Flushing Creek and other waters surrounding New York Harbor, totalling 2.2 miles of in-water barriers.⁴ These barriers would have similar impacts on the respective tributary waters as the harbor-wide barriers

¹ Letter to Nancy J. Brighton, Watershed Section Chief, and Bryce W. Wisemiller, Project Manager, Programs and Project Mgmt. Div., U.S. Army Corps of Engineers, from Paul Galloway, President and Hudson Riverkeeper, John Lipscomb Vice President for Advocacy and Patrol Boat Captain, Riverkeeper, Inc. (Nov. 5, 2018) [hereinafter “Scoping Comments”] *available at* https://www.riverkeeper.org/wp-content/uploads/2018/07/Riverkeeper-NYNJHAT-Feasibility-Study-NEPA-scoping-comments_FINAL_with-attachments-1.pdf; Letter to Bryce W. Wisemiller, Project Manager, Programs and Project Mgmt Div., U.S. Army Corps of Engineers, from Paul Galloway, President and Hudson Riverkeeper, John Lipscomb Vice President for Advocacy and Patrol Boat Captain, and Erin E. Doran, Senior Attorney, Riverkeeper, Inc. (May 1, 2019) [hereinafter “Interim Report Comments”], *available at* https://www.riverkeeper.org/wp-content/uploads/2019/04/2019.05.01-Riverkeeper-Interim-Report-Comments_final.pdf; Letter to Michael Connor, Off. of Assistant Secretary U.S. Army Corps of Engineers, of the Army for Civil Works, and Amy Frantz, CEW-P, U.S. Army Corps of Engineers, from Paul Galloway, President and Hudson Riverkeeper, and Chris Bellovary, Staff Attorney, Riverkeeper, Inc. (May 7, 2021) [hereinafter “WRDA Implementation Comments”], *available at* https://www.riverkeeper.org/wp-content/uploads/2021/05/2021.05.07-Rvk-WRDA-2020-comment-letter_Final.pdf.

² United States Army Corps of Engineers, *New York-New Jersey Harbor and Tributaries Coastal Storm Risk Management Feasibility Study Draft Integrated Feasibility Report and Tier 1 Environmental Impact Statement* [hereinafter “Feasibility Study”] at iii (Sept. 2022), *available at* https://www.nan.usace.army.mil/Portals/37/NYNJHATS%20Draft%20Integrated%20Feasibility%20Report%20Tier%201%20EIS_3Oct2022.pdf.

³ *Id.* at 16.

⁴ United States Army Corps of Engineers, *January 2023 HATS Presentation*, slide 21, https://www.nan.usace.army.mil/Portals/37/NYNJHAT%20Presentation_Jan2023_for_upload_1.pdf.

would have on the Hudson, stymieing tidal energy, sediment transport, and fish migration, and flushing of combined sewer overflows (“CSOs”), etc. Along with storm barriers, the Tentatively Selected Plan proposes the construction of 50.6 miles of shoreline measures, such as floodwalls, levees, elevated promenades and deployable flood barriers,⁵ some of which would cut communities off from access to their waterfronts.

The fundamental flaws in the Tentatively Selected Plan have caused it to be erroneously biased in favor of in-water barriers and would result in the inequitable distribution of storm surge protections to protect mainly high-wealth neighborhoods. Among its other flaws, the Army Corps Tentatively Selected Plan does not comply with legislative mandates to:

- evaluate and address the impacts of precipitation, tidal flooding and sea-level rise on the study area⁶;
- incorporate the best available science on local sea level rise projections⁷;
- identify or evaluate natural and nature-based features in all project alternatives⁸;
- identify the extent of potential environmental impacts caused by storm surge barriers under likely operating conditions⁹; and
- take a holistic approach to benefit-cost analysis to incorporate environmental quality, environmental justice and other social effects, relying instead on old approaches that merely value structures and perpetuate historic inequities.¹⁰

The proposed storm barriers would expose certain areas to increased flood risk and greatly harm the environment, all without reducing—and perhaps worsening—flooding from sea level rise. The Tentatively Selected Plan would be the largest and most expensive endeavor ever undertaken by Army Corps, dwarfing the \$31 billion Ike Dike project recently approved by Congress to protect the Houston area from similar coastal flooding threats.¹¹ The sheer magnitude of this project necessitates that the Corps flexibly adapt its methodologies to determine the most

⁵ *Id.*

⁶ See Water Resources Development Act of 2020 (“WRDA 2020”) § 203(a)(4)(A), available at <https://www.congress.gov/bill/116th-congress/senate-bill/1811/text>.

⁷ See WRDA 2020 § 113.

⁸ See WRDA 2020 § 116(b).

⁹ See 42 U.S.C. § 4332(C).

¹⁰ Exec. Order No. 14008, 86 Fed. Reg. 7619 (Feb. 1, 2021); U.S. Army Corps of Engineers, *Policy Directive – Comprehensive Documentation of Benefits in Decision Document* (Jan. 5, 2021) [hereinafter “Army Corps Benefit-Cost Guidance”],

https://planning.erd.c.dren.mil/toolbox/library/MemosandLetters/ComprehensiveDocumentationofBenefitandinDecisionDocument_5January2021.pdf.

¹¹ See James. M. Inhofe National Defense Authorization Act of 2023, H.R. 7776 § 8222; see Erin Avery, *House Lawmakers Just Approved the Most Expensive Project Ever Recommended by the US Army Corps of Engineers*, US Today News (Dec. 10, 2022), <https://ustoday.news/house-lawmakers-just-approved-the-most-expensive-project-ever-recommended-by-the-us-army-corps-of-engineers/>.

efficient and effective way to protect the New York-New Jersey region from the full array of flooding risks it faces.

The only feasible path forward is for co-sponsors New Jersey and New York State, and partner New York City to exercise their rights under Section 8106 of Water Resources Development Act of 2022 (“WRDA 2022”) to request a more holistic multi-hazard flood risk analysis that evaluates and remedies the deficiencies described above.¹² A more expansive Alternative 5 that remedies the five deficiencies listed above, focuses on shore-based measures, and prioritizes environmental justice, low-income communities and those with low mobility throughout the Study area would provide the most benefit with the least amount of adverse impacts.

I. The study framework is unacceptably limited and must be broadened to address other flooding risks, including high-frequency tidal, pluvial flooding, and groundwater inundation.

Congress passed Section 203(a)(4)(A) of WRDA 2020 to broaden NYNJHATS to “evaluate and address the impacts of low-frequency precipitation and sea-level rise on the study area.”¹³ However, except for factoring in projected sea level rise into the design of the coastal storm surge risk reduction measures, the current plan ignores high frequency tidal flooding, groundwater inundation, and pluvial flooding. Due to the Army Corps’ narrow focus on storm surge, the Feasibility Draft overlooks risks from other types of flooding and does not comprehensively factor in all of the costs and potential adverse impacts of climate hazards that make the region vulnerable. As a result, the plan is skewed in favor of in-water storm barriers.

The Corps instead should develop a more holistic plan that addresses all sources of flooding. It must start by expanding the Problems and Objectives Statements, which underlie every aspect of the study. In the Study, Army Corps identifies the problems to be addressed in the Tentatively Selected Plan as only “coastal storm flooding . . .” and “threats to life safety.”¹⁴ Pursuant to Section 203(a)(4)(A) of the Water Resources Development Act of 2020 (“WRDA 2020”), the problems to be addressed must also include, at the very least, “low-frequency precipitation and sea-level rise.”¹⁵

Despite the manifest risks from sea level rise, the Tentatively Selected Plan relies on storm barriers that must be left “open in non-storm conditions to allow for navigation,”¹⁶ leaving

¹² See Water Resources Development Act of 2022 (“WRDA 2022”) § 8106, available at <https://www.congress.gov/117/bills/hr/7776/BILLS-117hr7776eah.pdf>.

¹³ WRDA 2020 § 203(a)(4)(A).

¹⁴ Feasibility Report, *supra* note 2, at 147.

¹⁵ WRDA 2020 § 203(a)(4)(A).

¹⁶ Feasibility Report, *supra* note 2, at 470.

tidal flooding to impact the region’s shorelines. While the data on the risks of daily tidal flooding are obvious, we highlight the impacts to the region identified by the New York City Department of City Planning:

The influence of climate change on sea level rise, storms and groundwater levels causes more frequent floods than in the past. Sea level rise appears as monthly or seasonal high tide flooding that is expected to reach further inland in coming decades. Some residents currently observe cyclical “sunny day” flooding in streets and yards from monthly high tides. Persistent inland ponding occurs in some areas due to a combination of geography, rainfall, high tides, a rising groundwater table and the limitations of street or sewer infrastructure that cannot drain adequately under conditions of increased rainfall and rising tides. Late summer, fall and winter storms present seasonal flooding risks, especially during hurricanes and nor’easters. During the most severe storms, some waterfront stretches are exposed to additional threats from the sheer physical force of wave action. Climate projections show that the frequency and intensity of each flooding source is increasing and will be exacerbated by rising global temperatures.¹⁷

Our region would suffer dire consequences from the failure of NYNJHATS to fully account for sea level rise, as the Tentatively Selected Plan would not address these known problems.

Closely tied to sea-level rise is groundwater inundation. New York City and the surrounding region have a high density of critical underground infrastructure, including train, subway and roadway tunnels, utilities that support the electric grid, aqueducts, sewers and interceptor that carry potable water and wastewater, and gas pipelines, etc. This infrastructure delivers indispensable services and must be considered as part of any flooding study. There is precedent for incorporating groundwater inundation into an Army Corps coastal storm risk study. Researchers at Florida International University Sea Level Solutions Center are undertaking a study on behalf of Miami Dade County and the Army Corps that incorporates “potential implications of climate change and sea level rise”¹⁸ to inform the Miami-Dade Back Bay Coastal Storm Risk Management Feasibility Study (the “Miami Back Bay Study”). Florida International University’s modeling includes “potential effects of the proposed floodwalls on groundwater

¹⁷ NYC Planning, *New York City Comprehensive Waterfront Plan* 65 (2021) [hereinafter “NYC Waterfront Plan”] https://www.nyc.gov/assets/planning/download/pdf/plans-studies/comprehensive-waterfront-plan/nyc_comprehensive_waterfront_plan_lo-res.pdf.

¹⁸ Florida International University Sea Level Solutions Center, *Miami-Dade County Back Bay Coastal Storm Risk Management Feasibility Study* 1 (July 1, 2021), https://drive.google.com/file/d/1NYlbcqZyPnAl9HA_opYoss7iFjr4i5oy/view.

levels and fluxes.”¹⁹ Similar modeling should be completed to protect the New York-New Jersey region.

Pluvial, or rain-related flooding, is also increasing due to climate change. During Post-Tropical Cyclone Ida, the region received 3.15 inches of rain per hour, far beyond the 1.5 to 2 inches per hour capacity of its sewer system.²⁰ The flooding from this intense precipitation caused roughly 45 deaths in New York and New Jersey.²¹ The New York City Panel on Climate Change models expect more frequent and more intense rainfall in the coming decades. These low-frequency precipitation events can exacerbate coastal flooding and cause back-flooding in waterways with storm barriers.

There is precedent for amending a Problem Statement to incorporate these other flooding risks. The Miami Back Bay Feasibility Study Problem Statement now includes:

- “[i]ncreasing high tides and king tides resulting from sea level rise in recurrent flooding to roads and properties”;
- “increasing groundwater elevations from sea level rise result[ing] in flood risks to inland areas”; and
- “[i]ncreasing flooding from rain events due to the higher groundwater elevations and higher tailwater elevations from sea level rise [that] threaten properties and infrastructure and exacerbate coastal storm risk.”²²

In conjunction with the plan’s non-Federal co-sponsors and partners, the Corps should conduct additional research to determine what impact multi-hazard flood risks would have and redesign the Study accordingly.²³

¹⁹ *Id.* at 3.

²⁰ See Barbara Goldberg & Nathan Layne, *Ida’s Record Rain Floods New York-Area Homes, Subways; At Least 44 Dead*, Reuters (Sept. 3, 2021), available at <https://www.reuters.com/world/us/new-york-city-mayor-declares-state-emergency-after-record-breaking-rain-2021-09-02/>; see also State of New York Governor’s Office of Storm Recovery, *Hurricane Ida Action Plan Executive Summary 2* (2022), <https://www.nyc.gov/assets/cdbgdr/documents/ida-executive-summary-english.pdf>.

²¹ Bobby Caina Calvan, David Porter, & Jennifer Peltz, *More Than 45 Dead After Ida’s Remnants Blindside Northeast*, AP News (Sept. 2, 2021), <https://apnews.com/article/northeast-us-new-york-new-jersey-weather-60327279197e14b9d17632ea0818f51c>.

²² U.S. Army Corps of Engineers, Miami Back Bay Feasibility Study Community Charrette Kickoff Handout: Problems, Opportunities, Objectives and Constraints (Nov. 14, 2022) (on file with author); see also U.S. Army Corps of Engineers, Poster: Miami-Dade Coastal Storm Risk Management Project (CSRM), Public Input During Scoping: Miami-Dade Back Bay Coastal Storm Risk Management Feasibility Study, <https://usace.contentdm.oclc.org/digital/collection/p16021coll7/id/8761>.

²³ See Department of the Army, *Implementation Guidance for Section 113(b) of the Water Resources Development Act of 2020, Review of Resiliency Assessments, Assessment of Benefits from Addressing Sea Level Rise and Inland Flooding Resiliency in Feasibility Reports* (Sept. 17, 2021), <https://usace.contentdm.oclc.org/utis/getfile/collection/p16021coll5/id/35889>.

II. The Army Corps must incorporate the most scientifically accurate relative sea level rise data from the New York City Panel on Climate Change.

Congress directed Army Corps in Section 113 of WRDA 2020 to “(A) coordinate the review with the Engineer Research and Development Center, other Federal and State agencies, and other relevant entities; and (B) to the maximum extent practicable and where appropriate, utilize data provided to the Secretary by such agencies.”²⁴ One of the most relevant “entities” for the sake of determining relative sea level rise in the region is the New York City Panel on Climate Change (“NYCPCC”).

The most recent sea level rise projections for New York City are higher than those used by the Corps in the Study. Specifically, NYCPCC projects that the City could experience a middle range of 1.83 to 4.17 feet of sea level rise by 2100.²⁵ NYCPCC’s high estimate for New York City is 6.25 feet by 2100.²⁶ The Corps, by comparison, projects much less sea level change with estimates that “range from an increase of +0.7 feet for the low scenario up to five feet for the high scenario through 2100.”²⁷ The Corps estimates a median sea level rise projection of 1.8 feet, which forms the basis for the Tentatively Selected Plan.

While the differences may seem modest, changes of just a few feet could result in the permanent tidal and groundwater flooding of thousands more buildings and significantly change the benefit-cost ratio of proposed alternatives. The design height of any constructed measures will also be sensitive to sea level change.²⁸ We appreciate that the Corps’ method of sea level rise analysis follows Army Corps guidance for estimating future sea level change.²⁹ However, the guidance documents were overruled by WRDA 2020 and are not themselves regulatory mandates. Moreover, the guidance document’s language is only suggestive, rather than mandatory. For example, the guidance suggests that “[a]lternatives *should* be evaluated using ‘low,’ ‘intermediate,’ and ‘high’ rates of future [sea level change]”;³⁰ and Army Corps “*should not* presume that the future will follow any one of the [sea level change] scenarios exactly.”³¹

²⁴ WRDA 2020 §§ 113(a)(2)(A)-(B).

²⁵ New York City Panel on Climate Change, *Advancing Tools and Methods for Flexible Adaptation Pathways and Science Policy Integration* 16 (2019), available at <https://www.nyas.org/annals/special-issue-advancing-tools-and-methods-for-flexible-adaptation-pathways-and-science-policy-integration-new-york-city-panel-on-climate-change-2019-report-vol-1439/>.

²⁶ *Id.* at 16.

²⁷ Feasibility Report, *supra* note 2, at 142.

²⁸ See Feasibility Report, *supra* note 2, at 172. If the presence of a storm barrier caused just a six-inch change in surface elevations for a 1% flood event, that change would be significant enough to require construction of additional induced flooding mitigation features. *Id.*

²⁹ See generally Department of the Army, *Incorporating Sea Level Change in Civil Works Programs*, ER 1100-2-8162 (2013) [hereinafter “Sea Level Analysis Guidance”], available at https://www.publications.usace.army.mil/Portals/76/Users/182/86/2486/ER_1100-2-8162.pdf?ver=2019-07-

³⁰ *Id.* at 2 (emphasis added).

³¹ *Id.* at 3 (emphasis added).

The Army Corps must approach the uncertainty of sea level change with multiple models and factor in additional projections of sea level rise based on NYCPCCC's most recent data.³² The latest Army Corps guidance on calculating sea level rise was written in 2013, and it states that the NRC committee recommended that "projections be updated approximately every decade to incorporate additional data."³³ The most accurate data must guide the Study.

III. Storm surge barriers will cause significant environmental impacts that have not been accounted for in the Tier 1 EIS.

a. Impacts on the tidal prism

Whether storm surge barriers are constructed across the harbor or at the mouths of tributaries, when the gates are closed to prevent flooding, they will stop the tidal cycles that support estuarine habitats, hamper fish migration and sediment transport and deposition, and allow for significant salinity intrusion and stratification.³⁴ Even when open, storm barriers would stymie critical estuarine functions. Riverkeeper commented extensively on these and other impacts and asked dozens of questions in our 2018 Scoping Comments, our 2019 Interim Report Comments, and our 2021 WRDA Implementation Comments.³⁵ Those questions have been left largely unanswered by the Army Corps. The Corps posits that when the barriers are open, there will be little or no impact on threatened or endangered species, marine mammals, sea turtles, wetlands and water resources, floodplains, Critical Environmental Areas, Marine Protected Areas, Coastal Zone Management Act Areas, commercial and recreational fishing, soils and sediments, tides, salinity, dissolved oxygen, turbidity, navigation, or noise. Army Corps states that when the gates are open, they would impose only "localized" impacts on bathymetry, sediment scour and deposition.³⁶ Army Corps acknowledges only some long-term impacts on tidal velocity, though does not identify what those impacts would be. These conclusions are incorrect.

Following the comments we submitted in 2018, 2019 and 2021, even more science has been published on the likely impacts of storm barriers, such as the report prepared by Dr. Phillip

³² The Army Corps states that if it relied on a high relative sea level change assumption, it would likely select Alternative 3A. Feasibility Report, *supra*, note 2, at 177. Due to the tremendous estuary-wide environmental impacts of Alternative 3A, it must not be selected as the preferred alternative, or defaulted to without meaningful analysis. As Army Corps remedies the many deficiencies in the Tentatively Selected Plan, it must reassess the benefit-cost analysis holistically, which is unlikely to lead to selection of Alternative 3A.

³³ Sea Level Analysis Guidance, *supra* note 29, at 15.

³⁴ NYSERDA, *Influence of Storm Surge Barrier Closures on Estuary Physical Conditions* 11 (2021) [hereinafter "NYSERDA Salinity Report"]. When this happens on an infrequent basis, there is time for the salinity intrusion to return to normal rates over an extended period of time. However, as sea levels rise, and the gates are closed with more frequency, there will not be an appropriate amount of time for estuaries to recover in between occurrences. *Id.* at 16.

³⁵ Riverkeeper, Scoping Comments, *supra* note 1, at 22-71; Riverkeeper, Interim Report Comments, *supra* note 1, at 16-20; Riverkeeper, WRDA Implementation Comments, *supra* note 1, at 4-9.

³⁶ Feasibility Report, *supra* note 2, at 270.

Orton and then Ph.D. Candidate Ziyu Chen, finding that closed storm barriers could significantly impact salinity: “. . . for the coastal flood event with no rain or low rain, gate closure has a more significant impact on the estuary salt and stratification.”³⁷ In addition, Dr. Orton and Dr. David Ralston jointly published a report that found storm barriers would likely have the following impacts:

More restrictive barriers lead to:

- Stronger tidal currents and mixing near the barrier gate openings
- Widespread reductions in tidal range, currents and mixing through the rest of the estuary
- Increased stratification in the estuary due to the reduction in tidally-driven mixing
- Greater salinity intrusion due to the stronger stratification and estuarine circulation
- More pronounced changes during spring tides than neap tides

These results are consistent with other studies of effects of barriers on estuaries and are consistent with basic processes in estuarine physics.³⁸

According to Ralston (2023), even with the gates open during non-storm periods, blockage of the cross-section causes locally accelerated velocities and associated drag results in decreased tidal amplitude within the affected waterbody.³⁹

Ralston (2022) predicts that tidal amplitude would decrease approximately six percent with a harbor-wide barrier. However, tidal water levels would be reduced during highly important spring tides up to 25 percent.⁴⁰ It is believed that strong tidal velocities through barrier openings enhance salinity mixing locally, but overall mixing in the estuary would decrease due to reduced tidal velocities, leading to greater stratification of the water more landward in the

³⁷ NYSERDA Salinity Report, *supra* note 34, at iii.

³⁸ Philip M. Orton & David K. Ralston, *Preliminary Evaluation of the Physical Influences of Storm Surge Barriers on the Hudson River Estuary* 10 (2018), available at https://www.hudsonriver.org/wp-content/uploads/2018/10/surge_barrier_report_V9.pdf; David K. Ralston, Presentation: *Evaluation of the Impacts of Storm Surge Barriers on Tides, Salinity, and Sediment Transport Processes in the Hudson River Estuary* (Jan 24, 2023), available at <https://www.hudsonriver.org/article/january-2023-ames-seminar>; Philip Orton et. al, *Surge Barrier Environmental Effects and Empirical Experience Workshop Report*, Stevens Institute of Technology (2019), available at https://www.sciencelaboratory.org/media/resources/science_workshop_report_final.pdf; see generally David K. Ralston, *Impacts of Storm Surge Barriers on Drag, Mixing, and Exchange Flow in a Partially Mixed Estuary*, 127 *J. Geophysical Research: Oceans* (2022) [hereinafter “Ralston (2022)”], available at https://www2.whoi.edu/staff/dralston/wp-content/uploads/sites/147/2022/11/Ralston_JGR_2022_surgeBarrierDragMix.pdf.

³⁹ David K. Ralston, *Changes in Estuarine Sediment Dynamics with a Storm Surge Barrier* (2023) [hereinafter “Ralston (2023)”].

⁴⁰ Ralston (2022), *supra* note 38.

estuary. The New York harbor area is likely the most anthropogenically compromised section of the estuary and the changing tidal velocities caused by the barriers would degrade water quality even further.

Sediment transfer is another area where the supporting structure of the open barriers would impact our embayments by creating a divergence in transport that results in a net deficit to the estuaries.⁴¹ Consequently, storm surge barriers may have a more substantial impact on sediment dynamics in estuaries with limited watershed inputs. Jamaica Bay is currently experiencing a net loss of sediment, and greater deficits could potentially hasten the loss of marshlands.⁴² In dead-end canals and waterways that experience little mixing, reduced tidal impulse compounded by increased residence time would conceivably compromise oxygen availability and greatly impair overall water quality. Most of these waterbodies are already highly degraded, and increased water quality impairments would lead to greater alienation by human society and faunal communities. The impacts we highlight are expected to occur from the physical structure of the storm barrier under normal conditions with the gates fully open. Closures would only exacerbate the compromised conditions. Models show that flow constriction and flow acceleration through open gates affects tidal propagation and subsequently impacts the tidal amplitude and circulation patterns in the landward regions of the respective waterbodies.⁴³

The Eastern Scheldt in the Netherlands provides the most extensive documentation of changes of this nature that occurred within an estuary after storm surge barrier construction.⁴⁴ The Dutch response to the storm surge of 1953 was to close off most of the inlets along the Delta coast. Initial phases of the Delta Plan consisted of constructing a number of back-barrier dams. These dams, located in the Grevelingen estuary and Volkerak channel cut off all river influence, and converted the Eastern Scheldt from a thriving estuary into a basin with an amplified tidal range.⁴⁵ The increase in tidal prism and flow velocities resulted in large-scale changes in sediment transport. Then in 1986, the Delta Plan was completed, resulting in an additional set of dams and construction of the storm surge barrier that have altered the ecology and hydrodynamics of the Eastern Scheldt. The estuarine system is still far from any form of physical or ecological equilibrium, as the basin is still adapting itself to a new hydraulic and hydrologic regime, complemented by reduced sediment transport capacities and increased salinity

⁴¹ Ralston (2023), *supra* note 39.

⁴² See, e.g., Ellen Kracauer Hartig et al., *Anthropogenic and Climate-Change Impacts on Salt Marshes of Jamaica Bay, New York City*, 22(1) *Wetlands* 71 (2002), available at https://www.dec.ny.gov/docs/fish_marine_pdf/accismjamnyc.pdf.

⁴³ Ralston (2022), *supra* note 38.

⁴⁴ Nikki Brand et al., (2016). *The Eastern Scheldt Survey. A concise overview of the estuary pre- and post barrier Part 2 Survey* (2016), available at https://pure.tudelft.nl/ws/files/4682731/2016_The_Eastern_Scheldt_Survey_Brand_Kothuis_Prooijen_final.pdf.

⁴⁵ Menno Eelkema et al., *Morphological Effects of the Eastern Scheldt Storm Surge Barrier on the Ebb-Tidal Delta*, 55 *Coastal Engineering Journal* 1 (2013).

intrusions. While the storm surge barriers were constructed in 1986, the former estuary has not fully resolved its response to human interventions.

The problems associated with a progressive sea level rise continue to plague the Eastern Scheldt. As sea levels rise faster and higher, sand volumes continue to nourish the the Dutch Coast may need to be 20 times larger, and storm surge barriers will need to close at increasing frequency until they are closed permanently and saltwater intrusion will reduce freshwater availability while the demand is rising.⁴⁶ The Eastern Scheldt provides valuable lessons in that human-induced modifications of the Eastern Scheldt have progressively increased with SLR and will continue to do so until it is completely walled off and ultimately ending the life of a former estuary. The outlook on the Thames River is not much different.

Restriction of flow velocity and the reduction of tidal amplitude are predicted to lead to changes in ambient salinity concentrations in the Hudson River Estuary water bodies affected by storm surge barriers. The process by which this occurs is caused by saline water moving into an estuary through the exchange flow driven by the density difference between fresh and saltwater. The heavier, saltier water moves landward lower in the water column, whereas lighter freshwater slides over the top. The tidal currents mix the water column vertically and reduce the exchange flow, so reducing the tidal amplitude with barriers increases the exchange flow. Accordingly, reducing the tidal amplitude as a result of the barriers increases the exchange flow and allows salt to move farther landward in the estuary. The increased salinity in brackish water environments will likely degrade ecosystem health. Furthermore, the intrusion of saltwater within the groundwater or aquifers poses risks for coastal drinking water infrastructure.

As discussed below in Section IV, if a constant water level is used as a trigger, sea level rise would prompt an increase in gate closure frequency and duration, which will ultimately lead to an increase in the probability of trapped river flooding.⁴⁷ Therein lies the problem; once the gates are built the estuary will suffer immediate physical and ecological impacts that will be compounded by increased frequency of gate closures that will strangle the life in them and compromise water quality. The exponential increase of the annual trapped river water would further cause problems with poor circulation and flushing of the estuary. Once humans enter a co-evolutionary struggle against rising sea levels, we will be locked into an ever increasing and costly contest.

It must be understood that the physical world is the foundation upon which the biological world exists. Thus, abiotic changes directly lead to biotic changes. A successional change was observed in the Eastern Scheldt, where the entire ecosystem was altered after construction of the

⁴⁶ M. Haasnoot et al., *Adaptation to Uncertain Sea-Level Rise; How Uncertainty in Antarctic Mass-Loss Impacts the Coastal Adaptation Strategy of the Netherlands*, 15 *Enviro. Res. Letters* 1 (2020), available at <https://iopscience.iop.org/article/10.1088/1748-9326/ab666c/pdf>.

⁴⁷ See *id.*

barrier. Decreased tidal amplitude occurring after barrier construction led to increased stratification, reduced suspended sediment concentration, and a shift in the plankton community.⁴⁸ Reductions in tidal levels and inundation frequency also changed the species assemblage of the marsh vegetation.⁴⁹ Another study showed tidal activity strongly influences viability of community composition and biomass of the phytoplankton community, with spring tides being the largest driver of these variables.⁵⁰ When read together, these studies suggest that the fortnightly flushing by spring tides that partially mitigates the eutrophication of the Hudson River Estuary would be dampened by storm barriers, which would potentially shift the patterns of stratification, suspended sediment concentration, and plankton community in a harmful direction.

Just as each estuary and embayment has a unique flow signature, each will have a different response to humans, but in nearly every case the result will be a loss of ecological integrity and a decline in the vitality of the waterbody. As the health of an environment becomes progressively more impaired, the ecosystem functions that sustain water quality and the vast abundance of life, including the furnishing of ecosystem services (human benefits such as filtering of water, carbon sequestration, aesthetics, recreational fishing, commercial fishing, leisure, boating, swimming, cultural and historical importance, nutrient regulation, natural storm surge attenuation), and ecosystem functionality (environmental benefits), which ultimately impacts our human economies, will subsequently decline. Moreover, estuaries are highly complex biomes, whose spatially and temporally dynamic ecosystems support a profusion of life. The heartbeat of every estuary is its tide, whose daily pulse sustains the life of the estuary to which human society is innately conjoined. Tidal intrusion and tidal movement rhythmically flush contaminants, promote accretion of marshlands, and provide conveyance for microbes, micro-organisms, mobile stages of sessile crustaceans, all of which are vitally important to the maintenance of a healthy ecosystem. Thus, keeping a tidal regime as natural as possible is not only a vital component of estuarine conservation, but an act of human self-preservation.

It is important to note that with the storm surge barriers deployed, and even in the open position, ecosystem functionality of the estuary will be altered and impaired. Estuaries represent some of the most productive ecosystems on the planet. Through millions of years of evolutionary

⁴⁸ C. Bakker et al., *Changes in Seasonal Succession of Phytoplankton Induced by the Storm-Surge Barrier in the Oosterschelde (SW Netherlands)* 12(5) *Journal of Plankton Research* 947 (1990) available at https://www.researchgate.net/publication/237091098_Changes_in_Seasonal_Succession_of_Phytoplankton_Induced_by_the_Storm-Surge_Barrier_in_the_Oosterschelde_S_W_Netherlands.

⁴⁹ J. de Leeuw et al., *The Response of Salt Marsh Vegetation to Tidal Reduction Caused by the Oosterschelde Storm-Surge Barrier*, 282-283 *Hydrobiologia* 335 (1994), available at https://www.researchgate.net/publication/227179449_The_response_of_salt_marsh_vegetation_to_tidal_reduction_caused_by_the_Oosterschelde_storm-surge_barrier.

⁵⁰ Rui Cereja et al., *Tidal and Physicochemical Effects on Phytoplankton Community Variability at Tagus Estuary (Portugal)*, 8 *Frontiers in Marine Science* 1 (2021), available at https://www.researchgate.net/publication/227179449_The_response_of_salt_marsh_vegetation_to_tidal_reduction_caused_by_the_Oosterschelde_storm-surge_barrier.

change, organisms have finely adapted their life history patterns and diel cycles to the variable dynamics associated with our respective estuaries including water chemistry (e.g. salinity, temperature, dissolved oxygen), as well as tidal impulse, all of which, represent and control the complex choreography of an infinitude of interactions within our estuaries. From copepods, to larval crustaceans, bivalves, and fishes, zooplankton and phytoplankton all are essentially governed by ageless patterns established in synchrony with diel cycles and tidal movements, and incorporated into the tapestry of their movement patterns and life cycles. Any alteration of tidal impulses and rhythmic cycling within the estuaries will ultimately impact the planktonic movement of a myriad of organisms. Movement is one of the key mechanisms shaping biodiversity, (e.g. the distribution of genes, individuals and species in space and time).⁵¹ The mobile stages of crustaceans and mollusks (e.g. mussels, barnacles, blue crabs, and myriads of fish larva) are often the most feeble swimmers with limited capacity for self-propulsion. These organisms are the foundation of the food-chains and are innately dependent upon these tidal impulses for conveyance, deposition, foraging, and flushing of toxins from the estuary. The estuary forms an ecotone lying between freshwater and marine ecosystems, representing critical habitat as spawning grounds, nurseries, stop-overs, and transition areas for a vast array of species that use our estuaries as transition zones to exploit the productive potential of these dynamic environments, often in ways we do not fully understand. Thus, highly important linkages exist between our estuarine ecosystems and our managed marine fisheries that support the health of our ocean ecosystems.

Our waterways are increasingly relied upon to support our growing human populations. The vast majority of our pristine wetlands and marshes have been altered or destroyed by development. Carrying capacities of managed marine fisheries are already struggling under pressure imposed by over-capitalisation and industrialization of fishing capacity to maintain healthy populations that accommodate both ecosystem health and human needs. Consequently, linkages between estuaries and ocean ecosystems need to be maintained and will be vitally important to sustain growing human populations. Habitat loss does not just impact species, it impacts entire networks of relationships and ecosystems. “What escapes the eye is often a much-mired, insidious form of extinction: the extinction of natural interaction.”⁵²

All recent studies and experiences with similar storm barriers must be incorporated into the Tier 1 EIS. Previous models created by the Corps have been incomplete simply because they do not have the ability to accurately capture the myriad complexities in the local waterways. Turbulence, increased velocities, and shear forces driven by hydrologic and hydraulic forces of water forced through constriction and around obstructions in the vicinity of barriers will generate conditions that, depending on tidal conditions, may create impediments to fish mobility and

⁵¹ Jeltsch et al., *Integrating Movement Ecology with Biodiversity Research - Exploring New Avenues to Address Spatiotemporal Biodiversity Dynamics*, 1 *Movement Ecology* 6, (2013), available at <https://movementecologyjournal.biomedcentral.com/articles/10.1186/2051-3933-1-6>.

⁵² D.H. Jantzen, (1974), *The Deflowering of Central America*, 83 *Natural History* 48, 49 (1974).

natural movement. The width and shape of channels in combination with various physical factors will generate the defining characteristics in and around each barrier. Every manmade structure that reforms the natural geomorphology and flow regimes of the estuaries will prompt an ecological response. It follows that the more the flow of water is altered from its natural or current state, the greater the impact. It is incumbent upon the Corps to ensure that hydrodynamics around any barriers remain suitable for fish passage, especially during peak flood or ebb tides.

The design and operation of barriers need to consider the impacts to an estuary's tidal range, salinity, stratification, sediment transport, and other physical factors, which in turn may affect water quality, wetlands, ecological processes, and living resources. The draining of estuarine wetlands began approximately two hundred years ago. Tidal marshes near urban centers have been particularly vulnerable to conversion, with losses of 90 percent or more. Further loss of wetlands and ecologically important marshes will have cascading ecological impacts. The storm surge barriers, if installed, need to be designed and operated in a way that allows for a maximum level of exchange between the estuary and the respective waterbody while open.

Direct impacts to essential fish habitat include all physical and environmental alterations to the usable habitat for each species. Construction of barriers and future maintenance will undoubtedly impact the tidal prism and rates of flushing. Pelagic species will be impacted to varying degrees depending upon size and life-history patterns, but anthropogenic alterations in water bodies will likely lead to significant impact to demersal fish species, including winter flounder, windowpane flounder, summer flounder, and red hake. Water quality impacts to essential fish habitat due to in-water construction activities will likely lead to changes in turbidity levels and suspended solids in the immediate construction areas and will restrict ingress and egress.

Additionally, fish are highly sensitive to anthropogenic noise, and construction will likely deter species from entering a waterbody. For instance, entrainment during dredging or physical injury to juvenile and adult winter flounder is possible. Clupeidae species are foundational on the trophic food-web, have the highest refined sense of hearing, and use their swim bladders as a tympanum.

b. Impacts of trapping combined sewer overflow ("CSO")

Despite widespread concern about the potential for storm barriers to trap CSO pollution in local waterways, the Army Corps has failed to acknowledge the potential significant impacts that the Tentatively Selected Plan could have. Instead the Corps merely points to placeholders for

proposed pump stations that might serve to mitigate some harms.⁵³ We note the potentially inequitable distribution of proposed storm protections and pump stations, with roughly 39 proposed pump stations on the Manhattan side of the Harlem River, and none on the Bronx side.

Optimizing flushing of tidal tributaries will be imperative for pathogen and nutrient compromised waterbodies. The tides throughout the estuary differ in duration, called asymmetric tides. These differences are a function of the hydromorphology of the estuary, which is controlled particularly by the bathymetry, bottom friction and the river inflow. What is certain is that the models show that even with open barriers the tidal prism will be altered, resulting in reduced flushing of the more landward areas and increased residence time of pollutants in the estuaries. These impacts will be compounded by the increased closure frequency and longer duration of closure in response to sea level rise. Accordingly, each waterbody will react to human induced changes differently. These differences must be appropriately modeled for each waterway slated to receive a storm barrier.

Menhaden are being more routinely exposed to flesh-eating bacteria of the *Vibrio* species. It is conceivable that storm barriers will exacerbate already impaired waters. Studies showing the effects of human sewage on *Vibrio* populations have shown that sewage and warm coastal waters could lead to an increased risk of *Vibrio* infections. In addition, increased nutrient conditions could further degrade local waterbodies by stimulating the growth of autochthonous bacteria including human pathogens such as the leading cause of seafood borne illness fatalities, *Vibrio vulnificus*.⁵⁴ The possibility that sewage promotes increased levels of autochthonous aquatic pathogens by providing nutrients has rarely been studied. Conrad and Harwood (2022) demonstrated a nexus exists between sewage levels and *Vibrio* density patterns.⁵⁵ Potential short-term impacts include increased turbidity and sediment re-suspension associated with dredging activities, the direct loss of eggs and larvae due to physical removal, exposure of eggs and larvae to suspended or deposited sediments due to re-suspension and transport of sediments. It is critical that Army Corps evaluate these impacts and determine how its actions will affect the water quality of saline waters in and around New York City.

c. Impacts to Federal Superfund remedies

Although Army Corps acknowledges the potential impact of the storm surge barrier on the Hackensack River and its known area of hazardous, toxic and radioactive waste (HTRW), Army Corps seems to have assumed the Tentatively Selected Plan will have no significant

⁵³ US Army Corps of Engineers, *Interior Drain Sub-Appendix B4: New York-New Jersey Harbor and Tributaries Coastal Storm Risk Management Feasibility Study* (2022), https://www.nan.usace.army.mil/Portals/37/HATS_InteriorDrainageApp_DRAFT_Sep2022.pdf.

⁵⁴ Paul A. Gulig et. al., *Molecular Pathogenesis of Vibrio Vulnificus*, 43 J. Microbiology 118 (2005).

⁵⁵ James W. Conrad & Valerie J. Harwood, *Sewage Promotes Vibrio vulnificus Growth and Alters Gene Transcription in Vibrio vulnificus CMCP6*, 10 Microbiology Spectrum 1913 (2005).

impacts on the Gowanus Canal and Newtown Creek Superfund remedies. Both Superfund sites have documented contamination in the areas in which they would host a storm surge barrier, and even after such barriers are constructed (around 2044), it is expected the waterways will continue to receive significant volumes of toxic pollutants from New York City's CSO outfalls. We recognize that Army Corps will not be responsible for removing any of the contamination, but the Tier 1 EIS must nevertheless determine the likely environmental impacts to the sites of constructing and maintaining storm barriers. The Study does acknowledge the presence of contamination in Gowanus Canal⁵⁶ but does not discuss the potential to disturb the contaminated area during construction or consider any modifications that might be necessary to the site remedy. Nor does Army Corps consider the long-term potential to exacerbate polluted sediment deposition by trapping CSO pollution during closure and while open, and causing scour and redeposition of toxins in the canal especially in the immediate vicinity of the barrier.

It is unclear why the Tier 1 EIS does not acknowledge Newtown Creek's status as a Superfund site.⁵⁷ While similar impacts can be expected at Newtown Creek as at Gowanus Canal, the sites must be evaluated individually. These impacts include trapping of CSO pollutants and corresponding sediment deposition, channel scour, and redeposition of toxics. The Environmental Protection Agency ("EPA") is evaluating the importance of the East River as a source of solids deposition in the creek and its impact on sediment contamination.

Army Corps stated that the project construction cannot move forward in locations where a toxic site is still awaiting full remediation: "[t]he costs and complexities of remediation will likely impact the local sponsors' ability to expedite plan features located within HTRW sites."⁵⁸ This calls into question the entire strategy and timeline of this project. The EPA has recently stated that the schedule for cleanup at Newtown Creek could run through 2043. How can Army Corps have a projected construction schedule of 2030 to 2044 if any of the Superfund sites slated for barriers are not fully remediated by 2040?

d. Impacts of induced development and population displacement

The perceived protections of storm barriers, even if they will not address tidal flooding, groundwater inundation, or pluvial flooding, will induce additional unsustainable development in high-flood risk areas. When currently dry areas begin to face routine nuisance flooding with sea level rise, it is likely they will be abandoned. Both of these reactions will have the result of changing "existing patterns of population concentration, distribution or growth, existing

⁵⁶ Feasibility Report, *supra* note 2, at 75.

⁵⁷ See U.S. Army Corps of Engineers New York District, *Appendix A9: Tier 1 Hazardous, Toxic, and Radioactive Waste Survey Report: New York & New Jersey Harbor & Tributaries Coastal Storm Risk Management Feasibility Report and Tier 1 Environmental Impact Statement* (2002), https://www.nan.usace.army.mil/Portals/37/Appendix%20A9_Tier%201%20HTRW_HATS.pdf.

⁵⁸ Feasibility Report, *supra* note 2, at 111.

community or neighborhood character, and human health" in and around the Study area.⁵⁹ These impacts must be accounted for in the Tier 1 EIS. We note that to the extent New York State agencies and local governments take actions pursuant to the Tier 1 EIS, they will be responsible for complying with the New York State Environmental Quality Review Act⁶⁰ prior to acting.

* * *

The Tier 1 EIS must acknowledge the potential estuary-wide impacts of storm barriers that would occur throughout the Hudson River Estuary if Alternatives 2 or 3A are selected. It must similarly acknowledge impacts to tidal tributary waters from storm barriers if Alternative 3B, the Tentatively Selected Plan, moves forward. The failure to acknowledge and address these significant environmental impacts, if left uncorrected, would be arbitrary and capricious.

IV. Army Corps is underestimating the storm surge barrier gate closure frequency and the associated increase in environmental impacts and maintenance costs.

It is certain that “[g]ate closure frequency and duration [will] both strongly influence the physical and environmental effects on enclosed estuaries.”⁶¹ And it is likely that sea level rise will prompt an “exponential increase of the gate closure frequency, a lengthening of the closure duration, and a rising probability of trapped river water flooding.”⁶² Army Corps acknowledges this likelihood and believes sea level rise “may result in more frequent operation of the storm surge barriers in the future.”⁶³

If any storm barrier alternatives are chosen, sea level rise will ultimately lead to increased storm barrier gate closure requests, straining the management and maintenance of the mechanical systems and costs associated with the operation of the barriers. As the barriers age, they will require more frequent and longer duration maintenance work to ensure reliability. From 1982 to 2000, the Thames River barriers in the United Kingdom closed 38 times, less than 0.5 closures annually. In the eight years from 2014 to 2022, the barriers closed 31 times, an average of more than 3.5 times per year.⁶⁴ The trend shows an increasing frequency of closure is expected to continue rising exponentially.

⁵⁹ 6 NYCRR § 617.2(l).

⁶⁰ 6 NYCRR § 617.15(a).

⁶¹ Ziyu Chen et. al., *Storm Surge Barrier Protection in an Era of Accelerating Sea-Level Rise: Quantifying Closure Frequency, Duration and Trapped River Flooding*, 8(9) J. Marine Sci. & Engineering 1 (2020) [hereinafter “Chen et al. (2020)”].

⁶² *Id.*

⁶³ Feasibility Report, *supra* note 2, at 213.

⁶⁴ United Kingdom Environment Agency, *The Thames Barrier*, <https://www.gov.uk/guidance/the-thames-barrier#thames-barrier-closures> (last accessed Mar. 10, 2023).

One of the responsibilities of maintaining the operational integrity of the storm surge barriers and the flood wall is the additional responsibility of monitoring for erosion and redistribution patterns of sediment depositions. Erosion can expose the foundations of fixed flood defenses leaving them vulnerable to further damage. Deposition of sediments, on the other hand, can obstruct the operation of active flood defenses. Areas of habitat can also be affected, with erosion reducing habitat in some areas and deposition creating habitat in others.

One of the key findings with respect to the Thames River barriers is that erosion is increasing throughout the estuary, with large-scale erosion occurring in the outer estuary. Monitoring of flood defenses is also critical. Flood walls and ramparts have to be visually inspected to ensure defense against flooding. All this monitoring is required in addition to barrier maintenance, with the cost falling on the non-Federal partners. In the Netherlands, researchers find that as sea levels rise faster and higher, sand nourishment volumes to maintain the Dutch coast may need to be up to 20 times larger in the next 70 years, and storm surge barriers will need to close at increasing frequency until they are closed permanently. Additionally, intensified saltwater intrusion will reduce freshwater availability from groundwater.⁶⁵

Other recent studies have shown that rain (or streamflow) and coastal surge are correlated at many coastal cities around the world, and there is evidence at some locations that their correlation is increasing, including for New York City. Climate change is expected to exacerbate rain intensity and streamflow, rendering it even more important to assess flood risk from the co-occurring trapped streamflow due to the closed storm surge barrier. As sea level rises, the combination of a higher water level starting point, and increased closure frequency and duration leads to increased trapped river water and a higher probability of trapped river water flooding. Therefore, probabilistic sea level rise scenarios are needed to quantify gate closure frequency and uncertainty in the future.⁶⁶

In the Study, the Corps analyzes the closure criteria of the storm surge barriers as +7 feet NAVD88.⁶⁷ Put more simply, the corps would close the gate once the sea level reaches seven feet above the North American Vertical Datum of 1988. How frequently this occurs will vary based on sea level rise. The Corps projects a sea level rise ranging anywhere from an increase of 0.7 feet to 5 feet through 2100.⁶⁸ However, other studies, such as the study conducted by NYCPCCC, estimates NYC could experience a middle range of sea level rise of 1.83 to 4.17 feet by 2100.⁶⁹

⁶⁵ Feasibility Study, *supra* note 2, at 158.

⁶⁶ See Chen et al. (2020), *supra* note 61.

⁶⁷ U.S. Army Corps of Engineers, *Appendix B, Engineering Appendix: New York-New Jersey Harbor and Tributaries Coastal Storm Risk Management Feasibility Study 8* (2022) [hereinafter “Engineering Appendix”], available at https://www.nan.usace.army.mil/Portals/37/Appendix%20B_Engineering%20Appendix_HATS.pdf.

⁶⁸ Feasibility Report, *supra* note 2, at 142.

⁶⁹ New York City Panel on Climate Change, *Advancing Tools and Methods for Flexible Adaptation Pathways and Science Policy Integration* 16 (2019), available at <https://www.nyas.org/annals/special-issue-advancing-tools-and-methods-for-flexible-adaptation-pathways-and-science-policy-integration-new-york-city-panel-on-climate-change-2019-report-vol-1439/>.

Following the Corps' conservative analysis of sea level rise, by 2100 it is assumed that the storm barriers would close between once every 3.5 years to more than once per year.⁷⁰ However, if following the NYCPCC's sea level rise estimates, on the low end we would expect the gates to close approximately once every 1.5 years, and on the high end multiple times a year.⁷¹ It is also likely that the storm barriers will need to be closed periodically for reasons unrelated to water level, such as general maintenance. For example, the Maeslantkering gate in the Netherlands closes once per year for maintenance and to ensure the gate works properly.⁷² Therefore, due to maintenance alone, it is likely the storm gates will need to be closed at least once per year. Those closures could last days, however a highly conservative assumption of one day of closure annually for maintenance, plus a flooding-related closure of one day every 1.5 years adds up to 34 days of gate closures in the first 20 years of operation.

Army Corps assumes that the "closure criterion [will be] adjusted up correspondingly for every foot" of sea level rise.⁷³ In other words, the Army Corps expects that as sea level rise occurs, local officials in New York State, New Jersey and New York City will relax the trigger conditions for barrier closure, allowing increasingly frequent and more severe tidal flooding to occur. To mitigate the impacts from high frequency tidal flooding and groundwater inundation allowed by open storm barriers, the Corps surmises that local officials will implement other additional resiliency measures and/or execute policy changes to respond, in lieu of operating the gates more frequently. Based on this series of unrealistic assumptions, the Corps believes there will be only low or moderate environmental impacts from storm barriers. These assumptions run contrary to all evidence showing existing storm barrier closures occurring more and more often due to climate change. Research shows that the Thames River barrier in London and the New Bedford, Connecticut storm barrier have been closed much more frequently than originally anticipated.⁷⁴

The Corps acknowledges that the uncertainty underlying its gate closure frequency assumptions requires further analysis:

Storm surge barrier closure is anticipated to primarily occur during a coastal storm (e.g. 1% storm event) as water elevations rise or

⁷⁰ Engineering Appendix, *supra* note 67, at 97.

⁷¹ *Id.*

⁷² Climate Adapt, *Storm Surge Gates/Flood Barriers*, <https://climate-adapt.eea.europa.eu/en/metadata/adaptation-options/storm-surge-gates-flood-barriers> (last accessed Mar. 10, 2023).

⁷³ *Id.* at 214.

⁷⁴ Bruce Mohl, *Rising Sea Levels Challenging New Bedford Hurricane Barrier*, *CommonWealth Magazine* (Sept. 19, 2022), <https://commonwealthmagazine.org/environment/rising-sea-levels-challenging-new-bedford-hurricane-barrier/>; Jim W. Hall et al., *Adaptation Thresholds and Pathways for Tidal Risk Management in London*, 24 *Climate Risk Management* 58 (2019), <https://www.sciencedirect.com/science/article/pii/S2212096318301487>.

during maintenance procedures to ensure the storm surge barrier gates are functioning properly in preparation for a coastal storm event. While additional analysis is necessary to assess closure frequency and duration of the storm surge barrier operations and maintenance criteria, this Tier 1 level assessment has assumed a duration and frequency of 1 full tidal cycle (24 hours; 2 high tides and 2 low tides) as a baseline to which to compare environmental consequences of storm surge barrier gate closure.⁷⁵

Contrary to Army Corps assumptions, it is clear that as sea level rises, gate closure will be triggered more and more often, and when flow to the Hudson River Estuary habitats stops with any frequency, there will be an environmental impact. Failure to include impacts in the Tier 1 EIS would mislead Congress and other decision-makers, causing them to underestimate the harms.

In the Tier 1 EIS, the Army Corps makes the same closure frequency assumption for both harbor-wide storm barriers (Alternatives 2 and 3A) and tidal tributary storm barriers (Alternative 3B). However, the Corps contradicts itself in the Study's Appendix B by stating that harbor storm barrier closures would be strictly "constrained" to allow for vessel navigation while the tidal tributary barriers would be only "moderately constrained." Army Corps expects the smaller tributary storm barriers in Alternative 3B to close more frequently than the harbor-wide storm barriers proposed in Alternatives 2 and 3A:

The residual flood risk for the coastal areas upstream of the [Alternative 3B] storm surge when closed is mitigated by a lower closure elevation, i.e., operation is only moderately constrained []. Therefore, *more frequent operation is assumed to be possible* for these storm surge barriers and no complementary [risk reduction features] are needed.⁷⁶

The contrary assumptions serve to allow Army Corps to overlook expected environmental impacts, but also keep its cost estimate artificially low for reduction of residual flooding risk under Alternative 3B.

There is no evidence that local governments will implement the necessary additional resiliency measures and/or execute policy changes necessary to respond to sea level rise, in lieu of operating the gate more frequently, in the coming decades. For its part, New York City has developed tens of thousands of residential units along its waterfronts throughout the past two

⁷⁵ Feasibility Report, *supra* note 2, at 367.

⁷⁶ Engineering Appendix *supra* note 67, at 46.

decades. Currently, approximately “1.3 million New York City residents live within or directly adjacent to the [coastal] floodplain. By 2100, this number could rise to 2.2 million.”⁷⁷ Nearly 56 percent of those within the floodplain today identify as non-white, and more than half are low-income.⁷⁸ City zoning rules, while designed to make structures more resilient to withstand flooding, do not prepare our communities for temporary, long-term, or repeated disruptions to local infrastructure, utilities, roads, emergency services, and building access. Nor do they prepare for what happens when currently dry areas begin to flood on a yearly or monthly basis. The city has not acted responsibly to factor sea level rise into decision making.

Given that the Army Corps has not reasonably estimated how often the 12 storm barriers of the Tentatively Selected Plan will be closed, the Army Corps must analyze a range of realistic scenarios and acknowledge the scientifically-proven expected impacts from those closures. The Corps must also factor these potential environmental harms into its benefit-cost analysis. For scenarios in which significant construction of local resilience measures and/or strategic retreat/realignment will be necessary, the impacts of constructing and maintaining those measures and/or displacement of populations must be accounted for.

V. Army Corps must specify plans for upriver adaptation measures.

The Corps leaves placeholders for plans in miles-long shorelines and major harbor tributaries. To the extent that these plans will be implemented as part of the Tentatively Selected Plan, Army Corps must fill in at least some details of the proposed plans in the Tier 1 EIS to comprehensively understand their impact in the context of the project overall. There are several upriver locations that were deemed to not be cost effective, but still considered vulnerable communities. In the current plan, they are slated for “further analysis for smaller scale shore-based measures.”⁷⁹ However, the proposed measures are clearly not only shoreline based measures, as Army Corps proposed Storm Surge Barriers across Bronx River, Westchester Creek and Pelham Bay, in addition to the shore-based measures in other areas:

1. Stony Point Perimeter shore-based measure
2. Stony Point Shore shore-based measure
3. Ossining shore-based measure
4. Tarrytown shore-based measure
5. Yonkers North shore-based measure
6. Yonkers South shore-based measure
7. Bronx River/Westchester Creek Storm Surge Barriers
8. Pelham Bay Storm Surge Barrier

⁷⁷ Rebuild by Design, *Who Lives in The Floodplain in the Year 2100?*, <http://rebuildbydesign.org/our-work/research/who-lives-in-nycs-floodplain>.

⁷⁸ *Id.*

⁷⁹ Feasibility Report, *supra* note 2, at 159-160.

9. Astoria shore-based measure
10. Long Island City shore-based measure.⁸⁰

Proposed adaptation measures for these waterways and communities must be factored in now and made available for public comment in order to ensure that the public has an opportunity to weigh in on the significant plans.

VI. The Corps must evaluate natural and nature-based features earlier in the planning and design process.

Natural and Nature-Based Features (“NNBFs”) should be at the center of the Corps’ plans, but the Study fails to include specific locations for, and selected types of, NNBF solutions. It is critical that the Army Corps takes a phased approach to evaluating alternatives that start with NNBFs. Only when NNBFs are incorporated into the modeling and cost-benefit analysis at the very start of planning can Army Corps assess the full extent to which they could be deployed.⁸¹ The Study must be reevaluated based on the robust consideration of NNBFs, with participation from Army Corps Engineer Research and Development Center (ERDC) Environmental Laboratory staff members.

While various types of NNBFs are named in the Study, none of them have been specifically chosen yet for Alternative 3B, and, according to Section 5.1.3, require further analysis:

Natural and nature-based features (NNBF) to be included in the [Tentatively Selected Plan] consist primarily of natural features such as wetlands and living shorelines that may provide both CSRM and ecological enhancement. Specific NNBF types and locations will be further refined for the Final Integrated FR/Tier 1 EIS. At this time, it is anticipated they will be located in areas that experience high frequency coastal flooding.⁸²

While the Corps says that it will investigate and implement NNBFs in a future study phase or “during Preconstruction Engineering and Design as more information is made available,”⁸³ Riverkeeper believes it is imperative that the Corps do so as early as possible in the process and include a robust array of site-specific NNBF solutions. The Study includes definitions of NNBFs

⁸⁰ *Id.* at 160.

⁸¹ See White House Council on Environmental Quality, White House Office of Science and Technology Policy, and White House Domestic Climate Policy Office, *Opportunities for Accelerating Nature-Based Solutions: A Roadmap for Climate Progress, Thriving Nature, Equity, and Prosperity* 18 (2022), available at <https://www.whitehouse.gov/wp-content/uploads/2022/11/Nature-Based-Solutions-Roadmap.pdf>.

⁸² Feasibility Report, *supra* note 2, at v.

⁸³ *Id.* at 208.

in Section 4.5.3 stating that they are “habitats or features that may reduce flood risk while providing ecosystem benefits . . . [and they] include dunes and beaches, vegetated features, oyster and coral reefs, barrier islands, and maritime forests/shrub communities.”⁸⁴ The Corps identifies wetlands and living shorelines as, in its opinion, the primary NNBFs that will further coastal storm risk management and provide ecological enhancement. The Corps, however, should consider the benefit of the full range of NNBFs, not just wetlands and living shorelines.

The Hudson-Raritan Estuary Ecosystem Restoration Feasibility Study Final Integrated Feasibility Report and Environmental Assessment⁸⁵ identified some areas that have possible coastal storm risk management benefits, and it is these areas, according to the Study, that will be among those considered for NNBFs. In implementing NNBFs, the Corps should, to the extent practicable, consider as many locations as possible beyond the Hudson-Raritan Estuary Ecosystem. The Study should incorporate NNBFs, where feasible, as a complement to all proposed alternatives in order to create multiple lines of defense against storm surge and sea-level rise.

While natural solutions alone may not fully protect against a 100-year flood event in all areas of the region, they would reduce wave action and, when used in a hybrid or multi-layered fashion with non-NNBF solutions, can be effective in reducing the height of surges and limit the need for and extent of non-NNBF solutions. Furthermore, NNBFs, like ecologically enhanced bulkheads, revetments, and breakwaters (also known as “living breakwaters”), can strengthen the non-NNBF measures by integrating natural features, supporting biodiversity, and providing a range of ecosystem benefits. Riverkeeper implores the Corps to seek out opportunities for leveraging NNBFs to the maximum extent practicable to reduce coastal flooding by tailoring them to the needs of local communities and the environment. The Corps should incorporate NNBFs as more than a small piece of the Tentatively Selected Plan, of which it assumes NNBFs will make up between 4% and 10% of the design.

WRDA 2020 places a strong value on the use of NNBFs, with no less than eleven sections of WRDA 2020 referencing them. Taken together, these WRDA 2020 sections call for the incorporation of NNBFs into the Tentatively Selected Plan, supported by benefit-cost analyses using appropriate methodologies.

⁸⁴ *Id.* at 156.

⁸⁵ U.S. Army Corps of Engineers, *Hudson-Raritan Estuary Ecosystem Restoration Feasibility Study* (2020), https://www.nan.usace.army.mil/Portals/37/docs/Environmental/Hudson%20River%20Habitat%20Rest/2020/HRE_Final%20Integrated%20Feasibility%20Report%20Environmental%20Assessment.pdf?ver=2020-03-19-101450-887.

a. WRDA 2020, Section 116(b) (Feasibility studies: review of natural and nature-based features)

Under Section 116(b), the Corps must “include in each feasibility report developed . . . a summary of the natural feature or nature-based feature alternatives, along with their long-term costs and benefits, . . . and, if such alternatives were not included in the recommended plan, an explanation of why such alternatives were not included in the recommended plan.”⁸⁶ This Section requires the Corps to evaluate the long-term benefits of natural or nature-based alternatives for projects such as the Tentatively Selected Plan that contain a flood risk management or hurricane and storm damage risk reduction element.

As mentioned, the Army Corps has included a general list of types of NNBFs but has not identified or evaluated any particular site-specific NNBFs in the context of this Tentatively Selected Plan. Nor has the Corps provided any explanation about their long-term costs and benefits. In the Study, the Corps explained that it did not go into further detail regarding NNBFs because it had not yet picked any out. Riverkeeper urges the Corps to provide long-term cost and benefits analysis of NNBFs as soon as possible in the process in order to give transparency as to why the Corps did, or did not, select a particular NNBF, and to use appropriate methodology. For example, the benefits to water quality and other climate-related benefits associated with NNBFs are often unacknowledged in benefit-cost analyses, leading to natural or nature-based alternatives being undervalued in feasibility reports. Riverkeeper requests that the Corps properly consider such environmental and societal benefits. In sum, Section 116(b) of WRDA 2020, requires the Corps to consider and include NNBFs in its alternatives analyses, together with corresponding cost and benefits.

Numerous community groups, elected officials and other stakeholders are already working on local, shoreline-based measures designed to prevent flooding—and which also provide concurrent social benefits, such as open space and parkland. Many proposed plans with NNBFs are identified in the appendix to the letter from the NYC and NJ Urban Tributaries Working Group.⁸⁷ Coastal protection reliant on shoreline-based floodwalls and levees, including NNBFs such as beaches, dunes, and waterfront parks, combined with strategic retreat/realignment from some low lying areas, would best protect low-lying communities from storm surge, flooding from tides, sea-level rise, and rainstorms like Irene and Lee, while leaving rivers free to flow and thrive.

It is important to note that the Corps has not elaborated on what consideration of NNBFs would entail and has not shared the results of any studies or analyses conducted regarding them. As stated, WRDA 2020 requires the Corps to consider NNBFs in terms of long-term costs and

⁸⁶ WRDA 2020 § 116(b).

⁸⁷ Letter to U.S. Army Corps of Engineers, NYNJHAT Study Team, Planning Division, from NYC and NJ Urban Tributaries Working Group (Feb. 23, 2023), available at <https://www.guardiansofflushingbay.org/usace-hats>.

benefits and requires explanations for why specific features have not been included in each alternative.

If the Corps claims that the costs outweigh the benefits as its reason for not including an NNBF in an alternative, it will need to engage in a detailed analysis of the NNBF in order to have a legitimate reason for its exclusion. And those cost and benefit analyses should include social and environmental co-benefits. While the Corps' methods value NNBFs against how well they can achieve the same purposes as man-made physical structures, the Corps' current valuation methodology does not take into account how many ecosystem services NNBFs provide in addition to their core function. Those values should be recognized, particularly now, as climate change places increasing pressure and uncertainty upon the ecosystems that surround us.

b. WRDA 2020, Section 119 (Permanent measures to reduce emergency flood fighting needs for communities subject to repetitive flooding)

Section 119 of WRDA 2020 further emphasizes the importance of NNBFs. Subsection (b)(1) specifically authorizes the Army Corps Secretary to “carry out a program to study, design, and construct water resources development projects through measures . . . incorporating natural features, nature-based features, or nonstructural features, as appropriate to provide flood and coastal storm risk management to affected communities.”⁸⁸ Subsection (b)(2) goes on to say that:

[t]he Secretary shall, to the maximum extent practical, review and, where appropriate, incorporate natural features or nature based features, or a combination of such features and nonstructural features, that avoid or reduce at least 50 percent of flood or storm damages in one or more of the alternatives included in the final alternatives evaluated.⁸⁹

While it is not yet determined whether NNBFs and non-structural features to be proposed would meet the 50 percent threshold with respect to the NYNJHATS project, the value of NNBFs to the project is quite clear.

c. WRDA 2020, Section 124 (Sense of Congress on multipurpose projects)

In Section 124 of WRDA 2020, Congress requested that the Corps use the provisions of WRDA to “maximize the development, evaluation, and recommendation of project alternatives for future water resources development projects that produce multiple project benefits, such as navigation, flood risk management, and ecosystem restoration benefits, including through the use

⁸⁸ WRDA 2020 § 119(b)(1).

⁸⁹ *Id.* § 119(b)(2).

of natural or nature-based features and the beneficial use of dredged material.”⁹⁰ Prior to WRDA 2020, the Corps was neither analyzing NNBFs to the extent deserved nor to the extent that would be compliant with new requirements under WRDA 2020. The specific language in WRDA 2020 requires the Corps to consider alternatives with more NNBFs and less in-water barriers, as well as encourages the Corps to reevaluate the importance of NNBFs in the ecosystem.

d. WRDA 2020, Section 203(a)(4) (Expedited modifications of existing feasibility studies)

When read in conjunction with the provisions described above, Section 203(a)(4) of WRDA 2020 also directs the Corps to incorporate NNBFs to the maximum extent practicable. Projects incorporating NNBFs tend to better mitigate sea level rise and low-frequency precipitation events, while being less expensive to build and maintain, and, when properly designed, produce dynamic systems that have the potential to adapt with climate change. By contrast, gray infrastructure or artificial structures like in-water barriers, groins, berms, and pumps must be consistently maintained. Many types of NNBFs can be self-sustaining when developed properly; for example, planting appropriate and native vegetation on dunes can prevent erosion and maintain dune structure in the face of storms, while reducing the need for future beach nourishment.

e. Executive Order 14072 and pursuant agency guidance also direct Army Corps to consider NNBFs in its Tentatively Selected Plan.

Issued in April 2022, Section 4 of Executive Order 14072 identifies NNBFs as a priority in climate change adaptation and mitigation, directing federal agencies to “enlist nature to address the climate crisis with comprehensive efforts to deploy nature-based solutions that reduce emissions and build resilience.”⁹¹ The Order directs a group of federal agencies, including the Army Corps, to “submit a report to the National Climate Task Force to identify key opportunities for greater deployment of nature-based solutions across the Federal Government.”⁹² That report⁹³ recommends that federal agencies should:

- Update policies and prioritize research, innovation, knowledge, and adaptive learning to identify gaps in understanding the effectiveness of nature-based solutions;⁹⁴

⁹⁰ *Id.* § 124.

⁹¹ The White House, Press Release: Fact Sheet: President Biden Signs Executive Order to Strengthen America’s Forests, Boost Wildfire Resilience, and Combat Global Deforestation (Apr. 22, 2022), available at <https://www.whitehouse.gov/briefing-room/statements-releases/2022/04/22/fact-sheet-president-biden-signs-executive-order-to-strengthen-americas-forests-boost-wildfire-resilience-and-combat-global-deforestation/>.

⁹² *Id.*

⁹³ White House Council on Environmental Quality, White House Office of Science and Technology Policy, White House Domestic Climate Policy Office, 2022, *Opportunities for Accelerating Nature-Based Solutions: A Roadmap for Climate Progress, Thriving Nature, Equity, and Prosperity* (2022).

⁹⁴ *Id.* at 8.

- “Start with nature-based solutions. Evidence shows that nature-based solutions can help to address multiple, critical societal challenges simultaneously and often do so in a cost-effective way. Agencies should use their authorities to promote and integrate nature-based solutions wherever possible, unless alternatives are demonstrated to be more beneficial when the full range of benefits are considered.”⁹⁵
- Consider nature-based solution alternatives. “Agencies should consider whether nature-based solutions, alone or combined with other options, would make appropriate alternatives to particular actions”,⁹⁶
- “Review and update, as appropriate, agency-specific policies, guidance and procedures to ensure that nature-based solutions are being substantively considered and incorporated.”⁹⁷

Drawing on a research previously sponsored by Army Corps,⁹⁸ the report guides Army Corps to start with NNBFs and determine how they might benefit from other alternatives or render flood mitigation measures wholly unnecessary, rather than start with gray infrastructure and fit NNBFs around the proposed project, as the Corps is doing with the Tentatively Selected Plan. Riverkeeper expects Army Corps will follow the guidelines laid out in these documents to incorporate NNBFs into the NYNJHATS alternatives analyses.

f. Channel shallowing, a potential alternative for Jamaica Bay, warrants consideration in the Tier 1 EIS.

During the Teach-In hosted by Rebuild by Design,⁹⁹ Dr. Phillip Orton described an alternative idea to constructing a storm barrier in Jamaica Bay. The alternative plan, called “shallowing,” would add fill to the Jamaica Bay inlet to reduce its depth and mitigate storm surges in the waterbody.¹⁰⁰ As the Bay has previously been dredged for navigation, refilling some of those channels might restore the Bay closer to its natural condition. Of course, such a major modification to the channel would also cause impacts, but it seems possible that the plan could cause substantially less harm and pose less risk of failure than the proposed storm barrier.

Shallowing of Jamaica Bay warrants further study and careful consideration by the Army Corps. We highlight this as one example of how NNBFs could meaningfully avoid or reduce the need for structural measures. A full site-specific review of the suite of NNBFs must be

⁹⁵ *Id.* at 18.

⁹⁶ *Id.* at 21.

⁹⁷ *Id.* at 22.

⁹⁸ U.S. Army Engineer Research and Development Center, *International Guidelines on Natural and Nature-Based Features for Flood Risk Management* (2021), available at https://ewn.erd.cdrn.mil/?page_id=5630.

⁹⁹ Rebuild by Design, Building Community Expertise: The NY/NJ USACE HATS Teach-In (Jan. 25, 2023), available at <https://rebuildbydesign.org/usace-hats/>.

¹⁰⁰ Philip M. Orton et. al., *Channel Shallowing as Mitigation of Coastal Flooding*, 3 J. Marine Sci. & Engineering 654 (2015), <https://www.mdpi.com/2077-1312/3/3/654>.

conducted by Army Corps, including how shallowing could work in conjunction with other NNBFs in Jamaica Bay. As no other NNBFs have been proposed, the modeling is not yet reflecting the extent to which the full extent of natural solutions could work in combination to manage flood and storm surge risk throughout the region.

VII. The Corps must consider non-structural measures, including policies to limit development in flood prone areas, flood buy-outs, and managed realignment.

Section 2031(a) of the Water Resources Development Act of 2007 sets forth the policy of the United States to avoid unsustainable development in floodplains:

[i]t is the policy of the United States that all water resources projects should reflect national priorities, encourage economic development, and protect the environment by—

- (1) seeking to maximize sustainable economic development;
- (2) seeking to avoid the unwise use of floodplains and flood-prone areas and minimizing adverse impacts and vulnerabilities in any case in which a floodplain or flood-prone area must be used; and
- (3) protecting and restoring the functions of natural systems and mitigating any unavoidable damage to natural systems.¹⁰¹

This directive is implemented through interagency guidance describing the Principles, Requirements and Guidelines (“PR&G”) for project review.¹⁰² The PR&G require Army Corps to avoid direct and indirect support of floodplain development:

When evaluating potential activities impacting a floodplain, agencies should work to avoid, to the extent possible, the long and short-term adverse impacts associated with the occupancy and modification of flood-plains. Also, as stated in Executive Order 11988, Floodplain Management, agencies should work to avoid direct and indirect support of floodplain development wherever there is a practicable alternative.¹⁰³

¹⁰¹ Water Resources Development Act of 2007 § 2031(a).

¹⁰² Council on Environmental Quality, Updated Principles, Requirements and Guidelines for Water and Land Related Resources Implementation Studies - Chapter III Interagency Guidelines (2014), https://obamawhitehouse.archives.gov/sites/default/files/docs/prg_interagency_guidelines_12_2014.pdf.

¹⁰³ *Id.* at 13.

The Army Corps guidance for WRDA 2020 Section 115, Flood Protection Projects, also requires the Corps to consider non-structural measures including floodplain regulation and acquisition of floodplain land for recreational, fish and wildlife and other public purposes, and relocation, among other things.¹⁰⁴

The Tentatively Selected Plan, however, has not yet identified potential non-structural measures for community review. Army Corps plans to evaluate these measures only after the public has commented on the Tier 1 EIS: “. . . nonstructural measures and locations will be further refined for the Final Integrated FR/Tier 1 EIS.”¹⁰⁵ It is impossible for the public to meaningfully comment on a plan that hasn’t been published. Army Corps has named only two potential nonstructural measures (structure elevations and floodproofing), but it has not fulfilled its duty to evaluate land use regulations, voluntary buy-out programs, or managed realignment, a measure of allowing an area that had previously been protected from flooding to become flooded.¹⁰⁶ Through managed realignment, flooding creates intertidal habitats, which can be effective in absorbing wave energy and reducing erosion.¹⁰⁷

The surge barriers proposed in the Tentatively Selected Plan would allow New York City and New York State, at least, to continue issuing permits and approvals for development without slowing down. Though the business-as-usual path would continue to increase multi-hazard flooding risk in New York City, that additional development has neither been identified nor considered in the benefit-cost analysis. It is likely that the development of storm surge barriers will induce additional development, exacerbating the ongoing unsustainable floodplain use.

Army Corps must consider the potential to hold new developers in the floodplains and other high risk areas financially responsible for the new risks they create. Otherwise, the Tentatively Selected Plan will serve to subsidize unsustainable development. One way to incorporate non-structural measures into the Study would be to propose implementation of New York City’s Coastal Management Framework, outlined in its 2021 Comprehensive Waterfront Plan, which would, among other things, limit new development in areas with high flood risk:

Limit future residential densities in highly vulnerable or isolated waterfront areas where coastal flood risk through the 2050s presents neighborhood-scale risks that cannot be managed through building-scale improvements and anticipated public investments, including in areas where residential populations do not exist today

¹⁰⁴ Department of the Army, Memorandum for Commanding General, U.S. Army Corps of Engineers, Implementation Guidance for Section 115 of the Water Resources Development Act of 2020, Flood Protection Projects (2021), <https://usace.contentdm.oclc.org/utis/getfile/collection/p16021coll5/id/35887>.

¹⁰⁵ Feasibility Report, *supra* note 2, at v.

¹⁰⁶ Geographical Association, Managed Realignment, <https://www.geography.org.uk/teaching-resources/flooding/realignment>.

¹⁰⁷ *Id.*

and where support for a new population would require infrastructure to be extended and maintained at significant public cost.¹⁰⁸

As the proposed limitation on high risk development in the floodplain has already been made by one of the non-Federal partners to this Study, Army Corps must consider it as a standalone alternative and in conjunction with other alternatives.

VIII. The Corps must adjust its benefit-cost analysis to account for environmental quality, human life, community cohesion, nature-based features, and other non-structural equity considerations.

The Tentatively Selected Plan seems to focus almost solely on the protection of property values and infrastructure to the exclusion of other important metrics such as environmental quality, natural and nature based features, and environmental justice, which skews the analysis in a way that perpetuates historic inequities. A 2021 directive instructs the Corps to broaden its benefit-cost analysis in feasibility studies like NYNJHATS to incorporate economic, environmental and social categories.¹⁰⁹ The policies contained in this directive became immediately effective and fully applicable to the Tentatively Selected Plan.¹¹⁰ A second directive, issued just two months later, reiterated this directive:

The Assistant Secretary of the Army for Civil Works (ASA(CW)) memorandum reiterates the importance of meeting a variety of planning objectives, and directs USACE to comprehensively evaluate, analyze, and document project effects across all benefit categories – economic, social, and environmental for all decision documents, including feasibility studies and post-authorization change reports.¹¹¹

We acknowledge the brief description in the Tentatively Selected Plan of Regional Economic Development, Environmental Quality, and Other Social Effects, in addition to the National Economic Development analysis.¹¹² However, the Environmental Quality analysis is deficient in that it focuses primarily on the impact within the construction footprint of the proposed flood

¹⁰⁸ NYC Waterfront Plan, *supra* note 17, at 69.

¹⁰⁹ U.S. Army Corps of Engineers, Planning Guidance Notebook, Engineer Regulation 1105-2-100 (Apr. 22, 2000) [hereinafter the “Planning Guidance Notebook”], https://www.publications.usace.army.mil/portals/76/publications/engineerregulations/er_1105-2-100.pdf.

¹¹⁰ Army Corps Benefit-Cost Guidance, *supra* note 10, at 1.

¹¹¹ U.S. Army Corps of Engineers, Memo for Major Subordinate Commands: Comprehensive Documentation of Benefits in Decision Documents 1 (Mar. 6, 2021), https://planning.ercd.dren.mil/toolbox/library/MemosandLetters/DCWMemo_CompBenefits_20210304.pdf.

¹¹² Feasibility Report, *supra* note 2, at 173-182.

risk reduction measures, ignoring the potential widespread harm to the region’s water resources from construction and operation of storm barriers, and it fails to account for the potential benefits of NNBFs. As described above and in our Scoping Comments, Interim Report Comments, and WRDA Implementation Comments, the environmental costs of storm barriers are far greater than those only within the construction footprint.

In addition, as NNBFs have not been identified for any project alternative, their potential beneficial economic impacts cannot be factored in. The Corps is currently leading the way in evaluating and incorporating NNBFs in its economic analyses, with a final report on “Comprehensive Benefits Evaluation for Nature-Based Solutions” expected to be completed early this year.¹¹³ The Corps should integrate these new methodologies as it performs a site-specific NNBF analysis in the context of the NYNJHATS study. The Other Social Effects category also overlooks important considerations, such as life, health and safety; displacement; and long-term productivity. Meaningful incorporation of these accounts into the benefit-cost analysis is paramount.

IX. The Corps must factor environmental justice into its benefit-cost analysis.

Pursuant to Executive Order 14008, environmental justice must be factored into assumptions and calculations in the cost-benefit analysis. President Biden announced the policy of his Administration “to secure environmental justice and spur economic opportunity for disadvantaged communities that have been historically marginalized and overburdened by pollution and underinvestment in housing, transportation, water and wastewater infrastructure, and health care.”¹¹⁴ Section 219 of Executive Order 14008 states:

Agencies shall make achieving environmental justice part of their missions by developing programs, policies, and activities to address the disproportionately high and adverse human health, environmental, climate-related and other cumulative impacts on disadvantaged communities, as well as the accompanying economic challenges of such impacts.¹¹⁵

The Justice40 Initiative also suggests that the Corps should take a holistic approach to its cost-benefit analysis when projects will affect environmental justice communities. The memorandum providing interim guidance on Justice40 states the Corps will take a more proactive approach for projects in the planning stages. This proactive approach includes focusing

¹¹³ Engineering with Nature, *Comprehensive Benefits Evaluation for Nature-Based Solutions* (Apr. 15, 2022), <https://ewn.ercd.dren.mil/?p=7841>.

¹¹⁴ Exec. Order No. 14008, 86 Fed. Reg. 7,619, 7,629 (Feb. 1, 2021).

¹¹⁵ *Id.* § 219.

on a comprehensive evaluation of the total benefits of each plan.¹¹⁶ Executive Order 14008 and the Justice40 Program were established to put the climate crisis at the center of policymaking, and to ensure that underserved and marginalized communities affected by pollution and climate change are brought into the conversation. Justice40's goal is to ensure that 40% of certain federal funding streams benefit marginalized communities that are overburdened by pollution and the results of climate change.¹¹⁷

The comprehensive evaluation in NYNJHATS should include evaluations of economic, environmental, and social impacts for environmental justice communities. The Army Corps has stated that the Study is in accordance with Justice40 because of the presence of storm surge protections in environmental justice communities. However, due to the inequities of the benefit-cost analysis, many environmental justice communities are likely to receive less or no protection in the Tentatively Selected Plan.

The Army Corps has explained that it has not properly factored environmental and climate justice into its cost-benefit analysis, at least in part because “[e]nvironmental justice . . . was not a major theme of public comment.”¹¹⁸ Army Corps mistakenly attributes the lack of focus of public comment to a lack of concern for the issue. More likely, it was the result of a failure to appropriately engage environmental justice communities in the NYNJHATS process. Certain environmental justice communities facing tremendous flooding risks seem to have been left on the sidelines of the alternative plans. Some of the unaccounted for, or under-planned, neighborhoods with significant flood risk include Mott Haven, Port Morris, and Hunts Point in the South Bronx, the western Bronx along the Harlem River, and Sunset Park, Brooklyn. As a result of the Army Corps' failure to appropriately engage environmental justice communities in designing the Tentatively Selected Plan, these areas would receive fewer flood risk reduction measures than communities elsewhere.

For instance, the Manhattan shoreline along the Harlem River up to 163rd Street is slated to receive elevated promenades, sea walls, or other shoreline based measures. The Bronx shoreline, by contrast, would be left unprotected. Some community amenities in the Bronx are located along the waterfront, including Mill Pond Park, where the Hip Hop Museum and the Bronx Children's Museum are located, and Roberto Clemente State Park. Those parks and structures would be inundated during a coastal storm, and the flooding likely would be worsened by the shoreline based measures on the Manhattan side of the river. The risk reduction features,

¹¹⁶ Department of the Army, *Interim Implementation Guidance for the Justice40 Initiative*, M-21-28 at 7-8 (2022), <https://www.whitehouse.gov/wp-content/uploads/2021/07/M-21-28.pdf>

¹¹⁷ The White House, *Justice40* (2022), <https://www.whitehouse.gov/environmentaljustice/justice40/>.

¹¹⁸ U.S. Army Corps of Engineers, *Appendix A12: Tier 1 Other Social Effects/Environmental Justice Analysis: New York-New Jersey Harbor and Tributaries Coastal Storm Risk Management Feasibility Study* 57 (Sept. 2022), https://www.nan.usace.army.mil/Portals/37/Appendix%20A12_Tier%201%20OSE_EJ_HATS.pdf.

consisting mostly of flood walls, would be set back from the waterfront and located under the FDR Drive.

The net economic development (“NED”) cost-benefit analysis places determinative value on structures and infrastructure, exacerbating existing racial, economic and social inequities. Under the current methods for evaluating costs and benefits, because houses in wealthier neighborhoods cost more than houses in other neighborhoods and have more supportive infrastructure, wealthier neighborhoods receive greater protection, and greater benefits from each dollar spent. This is an inequitable result, even before considering that less wealthy neighborhoods are often at greater risk of flooding. Neighborhoods with less wealth are disproportionately communities of color and others who have been historically underserved, marginalized, and adversely affected by persistent inequality. As a result, the Corps’ current methods for evaluating projects may result in sacrifice zones—areas where historically marginalized communities are undervalued and unprotected from environmental hazards, such as coastal flooding and sea-level rise.

The Corps’ NED benefit-cost analysis fails low-income communities and Black, Indigenous and People of Color communities in two critical ways. First, the Corps does not evenly—or equitably—distribute benefits, such as protection against storm surge, and burdens, like impact of flooding and habitat loss. This approach puts already vulnerable communities at greater risk of displacement than affluent neighborhoods. Some development in the project area will have to be relocated regardless of the surge barriers because they do not address daily tides and high waters with added sea level rise. As the storm barriers do not account for tidal risks, and provide no or little protection for some low income communities, the analysis must incorporate the costs of displacement. The Corps should use a multi-criteria analysis that factors in race, income, and housing stability as indicators of equity when considering burden distribution. Second, the cost of the project does not take into account historical patterns of federal actions that have consolidated vulnerable communities in flood-prone areas or the cost of displacement risk for marginalized populations when considered alongside more affluent communities.

* * *

Riverkeeper requests that the Corps modify its benefit-cost analysis to incorporate principles of environmental justice; avoid putting the people with the least resources at greatest risk of flooding; value communities over property; use a multi-criteria analysis that would account for race, income and housing stability as indicators of measuring equity; and integrate metrics that account for the environmental harms of storm barriers, as well as ecological and economic benefits of NNBFs.

X. Army Corps' public outreach is not serving all affected communities.

Much more needs to be done to build the base of public awareness of flooding and storm surge risk and options for addressing it so that communities are well-informed, engaged, and empowered in shaping the future of our region for generations to come. Parts of New York City are being left out of resilience strategies and are being turned into sacrificial zones. The under-planned communities identified above and other similar communities must be the primary focus of Army Corps outreach. Army Corps should pursue a public participation process that incorporates Jemez Principles for Democratic Organizing¹¹⁹ in order to engage and build relationships with disadvantaged and environmental justice communities. The Army Corps must host a broad range of community meetings and other organized community-level opportunities in order to engage the public and listen to their needs for community resilience. Riverkeeper appreciates Army Corps's staff efforts to respond to many invitations to present the Tentatively Selected Plan. Yet these invitations come from community members who already have at least some knowledge of the plan. Army Corps must take a more proactive approach to reaching new individuals.

The following sections of WRDA 2020 require that Army Corps take a much more proactive approach to engaging all communities affected by the Study. Given the requirements to lead the planning process with NNBFs and the underrepresentation of NNBFs at public meetings, someone from the Army Corps ERDC Environmental Laboratory should be included at all public meetings to inform communities of the potential role of NNBFs in plan alternatives and ways in which NNBFs may benefit them.

a. WRDA 2020, Section 203(a)(4)(B) (Expedited modifications of existing feasibility studies)

Pursuant to WRDA Section 203(a)(4)(B), the Corps is now specifically required to increase stakeholder engagement by consulting with affected communities within the context of the Study. In fact, the Study is the only project where Congress added an explicit requirement to consult with affected communities. However, the New York District Office asserted in January 2021 that WRDA 2020 did not impose additional requirements on the Corps.

Prior to WRDA 2020, the Corps notified the public that it would hold public meetings to discuss NYNJHATS. However, the Corps was several months late in actually holding these meetings. Even then, the public was not notified of this delay through the Federal Register, in which these plans were originally announced, nor through the newspaper. The Corps only informed the public through email, which was unavailable to many because the Corps also failed

¹¹⁹ Southwest Network for Environmental and Economic Justice, *Jemez Principles for Democratic Organizing* (1996), <https://www.ejnet.org/ej/jemez.pdf>.

to add many members of the public to its email list. This lack of communication resulted in a dearth of necessary information needed for the public to thoughtfully and meaningfully comment on the Corps' plans and displayed the Corps' lack of effort in communicating with affected communities. The specific language of WRDA 2020 notes the importance of actual communication that can result in meaningful community engagement and involvement.

It is apparent that Section 203(a)(4)(B) exists because Congress viewed the Corps' prior outreach and engagement efforts on the Study to be insufficient. Riverkeeper urges the Corps pursuant to Section 203(a)(4)(B) to expand its communication and outreach efforts by conducting authentic outreach and engagement with affected communities throughout the area within or affected by the Study in meaningful dialogue, particularly environmental justice communities and groups that may be most affected by flooding from storm surge, stationary storms, and sea-level rise; consult with Federal and State recognized tribes in those same areas; require open and transparent sharing of information with the public on its progress (e.g., which studies the Corps plans to evaluate and rely upon, details and timelines for studies the Corps is planning to undertake); and publicizing meetings, deadlines, updates, and information with more than updates to the NYNJHATS Webpage. We also urge the Army Corps to convene a Climate and Environmental Justice Working Group for the Study and provide technical assistance resources for the group to meaningfully engage in the Study.

b. WRDA 2020, Section 112(c) (Project consultation)

According to Section 112(c) of WRDA 2020, the Secretary of the Army is required to engage with the local communities where there are water resources development projects. The text of the Section reads:

In carrying out a water resources development project, the Secretary shall, to the extent practicable (1) promote the meaningful involvement of minority communities, low-income communities, and Indian Tribes; (2) provide guidance and technical assistance to such communities or Tribes to increase understanding of the project development and implementation activities, regulations, and policies of the Corps of Engineers; and (3) cooperate with State, Tribal, and local governments with respect to activities carried out pursuant to this subsection.¹²⁰

In reports the Corps has released with respect to Tentatively Selected Plan, the Corps has mentioned disadvantaged communities that will be affected by the Study, even indicating that “roughly 62% of the census tracts in the Study Area met the criteria for an environmental justice

¹²⁰ WRDA 2020 § 112(c).

community.”¹²¹ In the reports, the Corps has given an explanation, a future intention to, or a vague plan to meet with these communities and incorporate them into the process. The Corps has stated that it is planning to accomplish this requirement by working with local non-governmental organizations in the communities as representatives and as a means to having community voices heard in the decision-making process. The Corps said it has identified a few non-governmental organizations that it is planning to work with. However, there are no specifications on how or when the Secretary intends to accomplish the requirements of Section 112(c), despite it being critical to incorporate these communities into the planning process as early as possible.

c. WRDA 2020, Section 118(a) (Pilot programs on the formulation of Corps of Engineers projects in rural communities and economically disadvantaged communities)

WRDA 2020 further details the importance of communicating and collaborating with affected communities, especially rural communities, economically disadvantaged communities, and indigenous groups. Section 118(a) of WRDA 2020 details the Corps’ responsibility to conduct two pilot programs to find proposals for feasibility studies specific to rural and economically disadvantaged communities. Though both programs focus on storm damage and flooding risks in rural and economically disadvantaged communities, the program dealing with non-Federal interests also examines whether there is a disproportionate effect on these underrepresented communities. Section 118(a)(b)(3)(D) states: “In selecting a feasibility study . . . the Secretary shall consider whether . . . the project is addressing flooding or hurricane or storm damage effects that have a disproportionate impact on a rural community, a minority community, or an Indian Tribe.”¹²² Prior to WRDA 2020, the Corps was considering multiple factors in its risk analysis and placed a high emphasis on infrastructure and building value, and a relatively low emphasis on social vulnerability and cultural resources. Considering the factors in this way led the Corps to assess risk with a disproportionate emphasis on protecting wealthier neighborhoods because there is greater infrastructure and building value in these communities. Section 118 of WRDA 2020 specifically addresses rural and economically disadvantaged communities and therefore should encourage the Corps to reconsider how its risk assessment factors affect those communities in all feasibility studies.

XI. New York and New Jersey must exercise their rights under WRDA 2022 and WRDA 2020 to demand a holistic study of flooding risks before the Tentatively Selected Plan is approved.

Given the numerous deficiencies in the Study listed above and in Riverkeeper’s and partners’ prior comment letters, it has become clear that the only realistic path forward is for the States of New York and New Jersey and the City of New York to step forward and fulfill their

¹²¹ Feasibility Report, *supra* note 2, at 119.

¹²² WRDA 2020 § 118(a)(b)(3)(D).

duties to their constituents by co-leading the Study. Under WRDA 2022 Section 8106,¹²³ both states have the right to demand the Army Corps broaden the purpose of the Study to address flood risks holistically, rather than myopically focus on coastal storm surge risk:

In carrying out a feasibility study for a project for flood risk management or hurricane and storm damage risk reduction, the [Army Corps], at the request of the non-Federal interest for the study, shall formulate alternatives to maximize the net benefits from the reduction of the comprehensive flood risk within the geographic scope of the study from the isolated and compound effects of—

- (1) a riverine discharge of any magnitude or frequency;
- (2) inundation, wave attack, and erosion coinciding with a hurricane or coastal storm;
- (3) flooding associated with tidally influenced portions of rivers, bays, and estuaries that are hydrologically connected to the coastal water body;
- (4) a rainfall event of any magnitude or frequency;
- (5) a tide of any magnitude or frequency;
- (6) seasonal variation in water levels;
- (7) groundwater emergence;
- (8) sea level rise;
- (9) subsidence; or
- (10) any other driver of flood risk affecting the area within the geographic scope of the study.¹²⁴

Riverkeeper calls on the non-Federal co-sponsors and the non-Federal partners of the Study to formally request Army Corps undertake the holistic multi-hazard flood risk analysis required by Section 8106. Pursuant to this new legislation, Army Corps must factor these new flooding risks into its benefit-cost analysis and environmental impact review. In order for New York State agencies and New York City officials to take action based on the Tier 1 EIS, such an analysis is required, pursuant to state law.¹²⁵

Such analysis would not be the same as a “Locally Preferred Plan.” Pursuing the procedure laid out in section 8106 would broaden the purpose of the Study to account for

¹²³ WRDA 2022 § 8106.

¹²⁴ *Id.*

¹²⁵ 6 NYCRR § 617.15(a); *id.* § 617.9(b)(5)(iii)(i) (requiring New York State agencies to consider in decision making “measures to avoid or reduce both an action’s impacts on climate change and associated impacts due to the effects of climate change such as sea level rise and flooding”).

flooding risks other than coastal storm surge, addressing the most fundamental flaw in the Study which has led to the selection of the Tentatively Selected Plan under consideration. Each resulting identified alternative would be an Army Corps-proposed alternative, which would prevent the financial burden from falling solely on local partners. This new legislation builds on and is more comprehensive than Section 113(b) of the of WRDA 2020, which directed the Army Corps, when conducting a study for coastal storm risk management, “to consider, upon the request of the non-Federal interest for the study, whether the need for a project is predicated upon or exacerbated by conditions related to sea level rise or inland flooding.”¹²⁶

A holistic approach to flooding risk reduction, co-facilitated by the local partners, would ask the correct questions and address the multiple flooding sources and compound flooding. Facilitation by local partners could also better promote community engagement.

The non-Federal co-sponsors should not wait to exercise their rights under WRDA 2022. Based on the Army Corps’ stated position, it is important to act now, before a Tentatively Selected Plan becomes final. According to Army Corps, “[o]nce the study arrives at a tentatively selected plan, the non-Federal study sponsors, which includes New York State acting through the Department of Environmental Conservation, have the ability to put forth a Locally Preferred Plan (LPP) as the alternate recommendation, which can provide latitude when balancing priorities between state and federal objectives.”¹²⁷ It’s possible that requesting a Locally Preferred Plan after the Tentatively Selected Plan is finalized could result in an additional cost-share burden to implement the selected plan falling on New York and New Jersey, as outlined in Section 2-3(f)(4) of Army Corps’s Planning Guidance Notebook.¹²⁸ Waiting to request a Locally Preferred Plan would also further delay the project. In a letter dated August 24, 2021, Miami-Dade County submitted such a Locally Preferred Plan request,¹²⁹ asking that Army Corps extend the “study timeline to allow Miami-Dade County and [Army Corps] to develop a Locally Preferred Plan” for the Miami Back Bay Feasibility in order to integrate measures that have received broad support while modifying other measures that have raised local concern. The Corps agreed to take another look at the plan and is convening a series of community charrettes to address those issues.¹³⁰

¹²⁶ Department of the Army, *Memorandum for Commanding General: Implementation Guidance for Section 113(b) of the Water Resource Development Act of 2020, Review of Resiliency Assessments, Assessment of Benefits from Addressing Sea Level Rise and Inland Flooding Resiliency in Feasibility Reports* 1 (2021).

¹²⁷ U.S. Army Corps of Engineers, *Appendix G, Agency and Public Coordination: New York-New Jersey Harbor and Tributaries Coastal Storm Risk Management Feasibility Study* 28 (2022), https://www.nan.usace.army.mil/Portals/37/Appendix%20G_Tier%201%20Agency%20and%20Public%20Coordination_HATS.pdf.

¹²⁸ Planning Guidance Notebook, *supra* note 109, at § 2-3(f)(4).

¹²⁹ Letter from James F. Murly, Chief Resilience Officer, Miami Dade County, to Norfolk District, U.S. Army Corps of Engineers, (Aug. 24, 2021).

¹³⁰ Miami Waterkeeper, *Miami-Dade Said No to Coastal Wall- Feds Agree to Look at New Hurricane Protection Options* (2022), https://www.miamiwaterkeeper.org/miami_dade_said_no_to_coastal_wall_feds_agree_to_look_at_new_hurricane_protection_options_read_more_at_https_www_miamiherald_com_article265388996_html_storylink_cpy.

Riverkeeper calls on the Corps and the Study’s non-Federal co-sponsors and local partners to pursue a new plan under Section 8106 of WRDA 2022 that allows for the local communities to have an equal place at the table to evaluate the local concerns about the Tentatively Selected Plan. Without the proper involvement and input of local communities, it will be nearly impossible for the Corps to come up with an effective plan that can address the many issues and sources of flooding for each community. Locally led processes can allow for the space for the appropriate questions to be asked, in order for effective solutions to be created.

Of course, we realize that “the Corps can not relinquish its legislated decision making responsibility.”¹³¹ But in the end, Congress and the state partners will all have to approve the Corps’ proposal. Creating a plan that can garner community buy-in from the beginning is the only path forward, and that will require a tremendous amount of up-front coordination. We implore the Corps and the non-Federal co-sponsors and partners to take action now to fix the deficiencies in the Study and set it up for success.

XII. Conclusion

It became clear following Superstorm Sandy and Post-Tropical Depression Ida that the New York-New Jersey region must take immediate and decisive action to achieve climate resilience and climate justice. As NYNJHATS is the largest and most complex of all of the Army Corps coastal resiliency plans, the Army Corps must continue to play a key role in building regional resiliency against a multitude of climate change-related flooding risks. Corresponding co-leadership from the non-Federal co-sponsors and partners is crucial if we are to arrive at a plan that truly meets the needs of our region, its communities and ecosystems.

We ask that Army Corps staff actively implement the Congressional mandates, executive order directives, and Corps guidance to broaden the study to:

- Holistically address multiple flood hazards, rather than focus only on storm surge;
- Incorporate the most informed sea level rise projections;
- Build its alternatives beginning with natural and nature-based features and non-structural measures first, designing structural measures around those;
- Avoid storm surge barriers to the maximum extent possible, and follow the best science to meaningfully identify the myriad significant impacts of such barriers before selecting them as an option; and

¹³¹ Planning Guidance Notebook, *supra* note 109, at § 2-5(b)(1).

- Incorporate quantitative values of equity, environmental justice, and ecological and nature into the benefit-cost analysis.

We also call on the non-Federal co-sponsors and partners to exercise their rights under WRDA 2022 to request the multiple flood hazard analysis for our region and create a path for this process to succeed. If these actions are taken, Riverkeeper is confident that a meaningful climate change flood hazard plan can be devised that will protect residents of the New York-New Jersey region for years to come. We look forward to working with the Corps, its Study co-sponsors, partners, and fellow members of the public to protect our region from these threats.

Respectfully Submitted,

A handwritten signature in black ink, appearing to read "Tracy Brown", is written over a light gray rectangular background.

Tracy Brown
President and Hudson Riverkeeper

Ccs (all via email):

Shawn M. LaTourette, Commissioner, NJDEP

Basil Seggos, Commissioner, NYDEC

Rohit Aggarwala, Commissioner, NYCDEP