April 20, 2021

Ms. Kristin Kent, Conservation Commission Chairman
Nahant Conservation Commission
Town Hall
334 Nahant Road
Nahant, MA 01908 via email: conservation@nahant.org

Re: Response to Peer Review Comments, Peer Review Report # SSU-1
Northeastern University Marine Science Center
Proposed Seawater System Upgrade
DEP File Number: 047-0582

Dear Ms. Kent and Members of the Commission:

On behalf of Northeastern University Pare Corporation and Epsilon Associates offer the following responses to comments made by the Commission's peer reviewer for the Seawater System Upgrades at the Northeastern University Marine Science Center in Nahant.

Page 2 – NOI Form

Comment: …I note the following minor administrative issue with the NOI and recommend that the applicant amend the filing accordingly:

1. *The Nahant Wetlands Bylaw Regulations require that for a joint state-local NOI, below the heading on page 1 of the NOI Form 3, the following must be added: "And Nahant Wetlands Protection Bylaw and Regulations."*

Response: The NOI application form has been revised to include the reference to the Bylaw and is attached. This is the only change that has been made to the NOI Form.

Page 2 – Other Required Permits

Comment: I recommend that the applicant review the requirement with respect to other necessary permit filings and provide a summary to the NCC which addresses the potential need to file for other local permits.

Response: Review of local permitting requirements was conducted by Northeastern counsel and they concluded that no local permits, other than a building permit, is needed for the Replacement Seawater Intake project.

Comment: The applicant and NCC should verify that documentation of mailing has been provided.

Response: Copies of the abutter notification certified mail receipts and green cards are attached.

Page 3 – Plan Scale

Comment: The applicant should request a waiver of the [plan scale] provision and the Commission should consider if 1" =10' plans are necessary.

Response: A plan scale of 1" = 40' is standard practice for projects / parcels of this size. We respectfully request a waiver from the Bylaw regulations relative to plans scale requirements. Note the plan set prepared by Brierley Associates depicting the intake and discharge pipes profiles (Sheets C2 – C5) are at a scale of 1" = 10'.

Page 5 – Coastal Bank:

Comment: I recommend that if the Commission approves the project, such approval contain a clear finding that Coastal Bank delineation is not established by the Order of Conditions.

Response: The applicant requests that the Conservation Commission find, as part of the Order of Conditions for the project, that the seaward face of the top of the Bathing Beach seawall demarcates the top of Coastal Bank.

Page 7 – Inland Bank

Comment: The intermittent stream Bank [in the BVW], including the culvert to the seawall, should be identified on the plans and the 100-foot Buffer Zone revised accordingly.

Response: The Bank of the intermittent stream is now shown on the project plans, see Coastal Sustainability Institute Sheet C-1. Because this resource area is contained within the BVW the associated buffer zone is not shown.

Page 8 – Performance Standards LSCSF

Comment: I recommend that the applicant provide a detailed summary table that indicates the major categories of work proposed (e.g., driveway/parking, building, stormwater structures, utilities) and tabulates the size (sf) and condition (e.g., paved, type of vegetative cover, etc.) of each category under existing and proposed conditions.

Response: See Table 1, below. The Table reports both LSCSF and Buffer Zone impacts, and the responses to the second part of these comments are generally applicable to Buffer Zone as well. Table presents a breakdown of alteration in the buffer zone because of the overlaps.

Table 1. Proposed Disturbance in LSCSF and Buffer Zone

Proposed Impact	Area (SF)	Developed/ Undeveloped	Temporary/ Permanent	Current Surface Condition
LAND SUBJECT TO COASTAL STORM FLOW				
Ramp Access to New Building	70	Developed	Permanent	Access drive, packed gravel with grass
Utilities	3,175	Developed	Temporary	Packed gravel with grass
Utilities and Site Work around New Building	1,640	Developed	Temporary	Packed Gravel with Grass
Reconstruct Access Drive	400	Developed	Temporary	Access Drive
Sub-Total LSCSF	5,685	-	-	-
BUFFER ZONE				
Building	2,735	Developed	Permanent	Existing building, packed gravel with grass, access drives
Utilities, Demo and Site Work Around Building	7,080	Developed	Permanent	Existing building, packed gravel with grass, access drives
Utilities	5,135	Developed	Temporary	Existing building, packed gravel with grass, access drives
Sub-Total Buffer Zones	14,950	-	-	-
TOTAL Work in Jurisdiction	20,635	-	-	-

*Undifferentiated by resource area

Table 2. Buffer Zone Breakdown – (does not include areas within BVW Buffer and LSCSF impact area)

	Building impact area (perm): 2,735 total	Utilities, Demo and Site Work Around Building (perm): 7,080 total	Utilities (temp): 5,135 total
LSCSF Buffer Only	195	2,830	2,510
LSCSF and BVW Buffer Overlap	2,540	4,250	1,920
LSCSF, BVW, and Coastal Bank Buffer Overlap	N/A	N/A	705

Comment (Responses Imbedded): With the recommended table as a reference, the applicant should then provide an analysis of how the proposed project satisfies the Bylaw performance standards for work in LSCSF.

Following is a review of the eight bylaw performance standards for LSCSF.

1. *Reduction in the ability of the land to absorb and contain waters.*

   Response: As shown in Table 1 above, all permanent changes in LSCSF are occurring in

developed portions of the site. The proposed stormwater management system includes sub-surface infiltration as well as surface infiltration measures (bioretention) to compensate for diminished soil absorption within and outside of LSCSF (and LSCSF buffer zone). The Nitsch stormwater report and project plans submitted with the NOI demonstrate that the stormwater infiltration standard is met. Therefore, ability of the landform to absorb stormwater will not be diminished.

2. *Reduction in the ability of the land to buffer more inland areas from flooding and wave damage.*

   Response: The floodplain remains on the NEU site, extending north to south across the property from Canoe Beach to Bathing Beach. Due to this orientation, the on-site floodplain does not buffer off-property inland areas from flooding. No on-site buildings are located in the 100-year floodplain and the proposed pumphouse building will be located outside of the 100-year floodplain. With the exception of 70 square feet of permanent fill in the very upper limits of the floodplain (Zone AE), all work in LSCSF will be temporary and pre-existing conditions will be restored upon completion of that work.

3. *Displacement and diversion of flood waters to other areas.:*

   Response: As described above, the central portion of the NEU campus is mapped as LSCSF with floodwaters flowing across the site with no diversion of flood flows onto other adjacent properties. No above ground structures are proposed in LSCSF; thus, there are no structures proposed that might divert flood flows off the property. The only permanent fill in LSCSF is the 70 square feet of permanent fill in the upper reaches of the AE Zone which correlates to less than 5 cubic yards. Given that the floodplain on the site is coastal floodplain (infinitely large surface area), this small volume of fill will not result in a measurable increase in the vertical or horizontal extent of flooding.

4. *Damage to other structures or property*

   Response: Similar to response to #3 above. There are no on-site or off-site structures in LSCSF presently or proposed. Therefore, the replacement intake project will not result in any flood damages to existing or proposed structures.

5. *Pollution of groundwater, surface water, or saltwater:*

   Response: The purpose of the MassDEP Stormwater Management Standards is to control stormwater quantity and quality to avoid flooding and protect the quality of receiving waters. Compliance with the Stormwater Standards is presumed to adequately protect receiving water quality. As demonstrated in the Stormwater Report filed with the NOI, the Standards are met; therefore, the project is presumed to avoid pollution of ground water, surface water and salt water. As a practical matter, the NEU campus uses salt water from the cove for experiments and has a vested interest in protecting the quality of the waters off Nahant

and therefore they seek to meet all applicable pollution prevention standards to protect the integrity of salt water used in scientific research.

6. *Reduction of the ability of the resource to serve as a wildlife habitat and migration corridor through activities such as, but not limited to the removal of substantial vegetative cover and/or installation of fencing and other structures which prevent wildlife migration across property.*

   Response: See Table 1 above which shows that all alteration of LSCSF for the replacement seawater system is located in developed portions of LSCSF, thus the project is not located in a portion of LSCSF with significant ecological integrity. Installing the replacement system will not reduce the wildlife habitat capacity of LSCSF.

7. *Increase in elevation or velocity of flood waters:*

   Response: As described above in response to #3, and shown in Table, most of the activity in LSCSF is temporary with the surface conditions being restored to pre-construction conditions. The project will require filling less than 5 cubic yards in LSCSF, which will not result in a measurable horizontal or vertical extent of flooding. The project does not include any above ground structures in LSCSF which might channelize of alter flood flow velocities. Therefore, the project will not increase flood elevations or velocities across the site.

8. *Prevention of the migration of resource areas such as salt marshes due to sea level rise*.

   Response: Mr. McManus commented that, "…based on existing conditions including the presence of the vertical seawall, that salt marsh is not present or likely to occur. …" We concur with his assessment.

Page 9 – Performance Standards Land Under the Ocean ("LUO")

*Comment:*10.25(5*): Nearshore projects shall not cause adverse effects on beaches, banks, dunes or marshes: Pare states simply that no such adverse effects will occur. COMMENT: While this may be the case, I recommend that the applicant provide justification for this conclusion;*

Response: There are no dunes or marshes present; therefore, no adverse effects can occur to those resources. The use of HDD construction is proposed to avoid any adverse effects to the Coastal Bank (i.e., the seawall) or to Bathing Beach regulated as Coastal Beach. As shown on the project plans, the HDD will drill several feet below Coastal Bank and Coastal Beach, thus avoiding alterations to those resource areas (as the HDD technique will drill beneath these resources). During HDD operations, best management practices will be employed by the contractor to avoid construction period impacts to Coastal Beach from sedimentation. The presence of the seawall also serves as a physical barrier to contain sediment and prevent it from being transported to the beach. For the long-term, the existing seawater discharge will be removed from the beach which is considered a positive effect.

Page 9 – Performance Standards Land Under the Ocean ("LUO") (Responses Imbedded)

Comment:10.25(6): Water-dependent projects (in my opinion, the project is "water dependent") "shall be designed and constructed using best available measures, to minimize adverse effects" (emphasis added) caused by:

- *Alterations in water circulation. Pare concludes that no effects on water circulation will occur, and cites depth of intake and discharge, as well as project designs to minimize flow velocity at intake and discharge. COMMENT: In my opinion, this is a reasonable conclusion;*

Response: No response necessary.

- *Destruction of eelgrass or widgeon grass beds. Pare concludes that these resources are not present and cites a lack of mapping of the above species and a dive survey showing their absence. COMMENT: It is unclear whether the dive survey sample locations and precise influent and effluent locations match. I recommend that the applicant clarify;*

Response: Two pieces of information support our finding that eelgrass and other submerged aquatic vegetation (seagrass) is not present in the project area: (1.) MassGIS MORIS Data Layer for MassDEP Seagrass for Selected Embayments http://maps.massgis.state.ma.us/map_ol/moris.php shows seagrass to the west but not off Bathing Beach; (2.) The CLE bathymetric survey included as Section 7 of the NOI shows existing conditions throughout the bottom area off the beach; no seagrass was present, and a report titled "Analysis of Seafloor Photographic Survey" prepared by Woods Hole Group and Marine Imaging Technologies in September of 2020 (copy attached). That survey includes photo documentation of bathymetric conditions at the intake and outfall locations. The report notes higher biodiversity at the pipe sites in comparison to shallow and reference sites. No seagrass was observed and the report concludes that "disruption on the scale of the proposed construction in unlikely to have long-term or broad-scale impacts on the seafloor biota."

- *Alterations in the distribution and sediment grain size. Pare concludes that there will be no effect on sediment grain size. COMMENT: I note that the plans call for removal of sand substrate and placement of cobbles under the ballast blocks "to protect precast pads from scouring." This requirement would seem to suggest that scouring is possible and should be reconciled with the above statement.*

Response: Other than redistribution of gravel and placement of cobbles at ballast blocks during installation. As noticed in the underwater photos include in Section 7 of the NOI the substrate is comprised of gravel to cobble sized stones. The use of cobbles under the ballast blocks does not represent a significant change in substrate composition. The operation of the intake and discharge system will not alter grain size

distribution in the cove.

- *Alterations of shallow submerged lands with high densities of polychaetes, mollusks or macrophytic algae. Pare concludes that based on benthic survey of the proposed project area, it is unlikely that disruption of the benthic community as a result of the project will have long-term or broad-scale impact on seafloor biota. Comment: The Pare response does not address the prohibition of such alterations, however I note that the Regulations protect such areas because "Nearshore areas of land under the ocean also provide important food for birds. For example, waterfowl feed heavily on vegetation (such as eel grass, widgeon grass, and macrophytic algae) and invertebrates (such as polychaetes and mollusks) found in estuaries and other shallow submerged land under the ocean." Based upon the depth of the influent and effluent pipes, I do not believe that the LUO functions in the manner that the Regulations aim to protect by this provision.*

Response: We concur with Mr. MacManus' conclusion.

Page 11 – Buffer Zone Performance Standard: Bylaw Regulations

Comment: The Bylaw does not provide detailed regulatory performance standards for work in the 100-foot Buffer Zone; however, the applicant must demonstrate that the interests of the Bylaw are protected by all such work. I recommend that the applicant provide such an analysis that is modelled on the Bylaw LSCSF performance standards and considers all of the Bylaw Interests.

Response: Please see responses to LSCSF Performance Standards above.

Page 11 – Construction Phase and Erosion and Sediment Control (Responses Imbedded)

Comment: [T]he NOI should detail minimum requirements and methods of erosion and sediment control.

Response: These comments regarding stormwater correlate with Hardy + Man Design Group PC ("Hardy + Man") regarding stormwater and engineering issues. See responses to the Hardy + Man comments prepared by Nitsch dated April 15, 2021.

Page 11 – Comments Regarding Horizontal Directional Drilling (Responses Imbedded)

Comment: In my opinion, the methodology and control measures associated with the proposed HDD pipe installations should be more thoroughly developed, for regulatory review and commitment by the applicant. This should include, at a minimum information should be provided to allow the Commission to understand:

- *How the boring entry will be made and controlled through the overburden soils above bedrock – will some form of solid pipe be required to maintain and open bore hole?*

Response: See the memo prepared by Brierley Associates ("Brierly") dated April 11, 2021.

- *How drill cuttings and drilling mud will be managed at the entry holes; what is the volume and nature of the drill cuttings?*

Response: See the memo prepared by Brierley Associates ("Brierly") dated April 11, 2021.

- *How the borehole will be constructed as proposed without breakthrough at the seaward terminus until the remainder of the boring is completed;*

Response: See the memo prepared by Brierley Associates ("Brierly") dated April 11, 2021.

- *An understanding of how much (and of what nature) sediment (borehole cuttings and drilling mud) will be released at breakthrough on the seaward end of each bore hole;*

Response: See the memo prepared by Brierley Associates ("Brierly") dated April 11, 2021.

- *How will the sediments under the proposed ballast blocks be replaced as proposed?*

Response: Sediments under the ballast blocks will be replaced by divers.

Page 12 – Comments Regarding Long Term Operation

Comment: The applicant has provided analyses of the thermal effects of the proposed effluent, based upon a modelled discharge in excess of the average rate of discharge and temperature. MassDEP concluded that the project would be compliant with water quality standards for temperature. Notwithstanding, I recommend that the conservative modelling be compared to a realistic worst- case scenario (rather than average flows), considering both flow rate and temperature assuming anticipated increase in use under full buildout of the CSI project. …

Response: We refer you to NOI Section 8 CORMIX Modeling for details of thermal modeling.

MSC researchers tracked intake and discharge temperatures as well as ambient water temperatures throughout Bathing Beach Cove to Shag Rocks from March through November
2018. During this period, the average seawater flow rate was 248 gpm and the average temperature differential between ambient seawater at the intakes and seawater discharged onto Bathing Beach was 0.367 degrees F. Using these parameters, researchers utilized CORMIX Modeling software (an advanced information system that delivers a comprehensive analysis of regulatory mixing zones, including evaluation of critical ecological impacts) to attempt to model the effects of discharged seawater on the surrounding waters. Using the actual measured flowrates and temperatures the CORMIX program was unable to produce any measurable results based on the negligible thermal effects within the Near Field Region. To create any measurable thermal plume in the waters of

Bathing Beach Cove the modelers needed to insert a theoretical flow rate of 1,050 gpm (more than four times the observed average flow rate) and an anomalous 5.7° F temperature differential with the ambient Cove seawater temperature, into the CORMIX model. These values far exceed any intended use of the proposed seawater system, i.e., they far exceed the maximum delta T.

Utilizing a 3-Port subsea discharge diffuser configuration, NU ran the CORMIX model using a theoretical discharge flow rate of 1,050 gpm with temperature differential of +5.7 degrees F relative to the receiving ambient Bathing Beach Cove waters. These values were used because a viable model could not be produced with the proposed system using actual discharge water temperatures recorded during a 10-month study of the current system. Even with these artificially inflated temperature values, the model results showed an immediate dissipation of the temperature differential between the temperature of discharged seawater and the temperature of the seawater in the receiving Cove. Again, the maximum proposed flow rate will be 600 gpm, and the average calculated temperature differential over the 10-month study was 0.367 degree F. Based on these values, the proposed seawater discharge will not have an adverse thermal effect on the Cove waters.

See NOI Section 8 for the CORMICX model results.

Comment: … A limited two days of influent and effluent sampling data from 2019 were provided by the applicant. I recommend that these data be tabulated with a comparison of influent and effluent concentrations and reference to appropriate ecological benchmarks.

Response:

Table 2 tabulates the data from intake and discharge water quality testing on two days in May 2019 at low-, mid- and high-tide. There are water quality parameters established in 314 CMR 4.00 – Water Quality Standards for pH and dissolved oxygen only. Mahant harbor is classified as SA, with qualifiers restricting shell fishing and noting water quality is affected by CSO discharges.

The influent and effluent in all cases meets pH and DO standards for Class SA waters.

There are no numeric standards established for: oil & grease, biological oxygen demand (BOD), total suspended solids (TSS) or nutrients. Review of Table 1 shows that for all samples the oil & grease was below reportable limits which indicates that influent and effluent meet the non-numerical standard for Class SA waters which reads, "*These waters shall be free from oil and grease and petrochemicals.*" [314 CMR 4..05(4)(a.)7.]

There are no numerical standards for BOD, and review of Table 1 shows that for call cases the BOD was below reportable limits.

TSS was highly variable with concentrations ranging from below reportable limits to 28 mg/L (parts per million). An increase was observed for 5 of the 6 samples. This is not unexpected because the effluent is a mix of stormwater and spent seawater, and thus the increase may be more reflective ot surface water than seawater.

There are no numerical standards for nutrients, and water quality standards for nutrients when established are water body specific, and no nutrient standards were discovered for Nahant Bay. thus an increase for both influent and effluent was below reportable limits.

There are no numerical standards established for nutrients. In these cases one follows the practices of a risk assessment in which one compares the effluent to the receiving waters, which in this case in the intake sample. Of the 30 comparisons for nutrient concentrations presented in Table 2 one sees the following:

- 13 instances there was no difference effluent and receiving water for nitrogen – in 12 instances nitrogen results were below reportable concentrations in both effluent and receiving water for nitrogen (TKN and ammonia), and the 13th three was no change in total N;
- 9 instances the nitrogen results were lower in effluent than receiving waters;
- 2 instance phosphorus was lower in effluent than receiving waters;
- 2 instances the nitrogen increased (nitrate/nitrite and TN) and in both cases the increases was less than 10% (2.94% an 9.1%, respectively); and
- 4 instances phosphorus was higher in effluent than receiving waters with 3 of those increase 10% or less and only a single instance of a 33% increase.

Ocean waters are generally nitrogen limited, meaning that nitrogen control the primary productivity of the water body. The results presented in table 2 show that the sea water system concentrations will not influence receiving water nitrogen concentrations – due to nitrogen concentrations, the volume of the seawater discharge compared to the volume Nahant Bay and the tidal flushing that occurs two times per day.

Table 2. Compiled Water Quality Data

Analyte	Unit	Standard	Reportable Limit	Influent	Effluent	Delta	Influent	Effluent	Delta
				Day 1: April 8, 2019 – Low Tide			***Day 2: April 11, 2019 - Low Tide***		
BOD 5-Day	**mg/L**		2	BRL	BRL	-	BRL	BRL	-
TKN	**mg/L**		0.6	BRL	BRL	-	BRL	BRL	-
Ammonia-N	**mg/L**		0.5	BRL	BRL	-	BRL	BRL	-
Nitrate-N/Nitrite-N	**mg/L**		0.01	0.49	0.46	-0.03	0.49	0.56	0.06
Total Nitrogen	**mg/L**		NA	<1.1	<1.1	-	<1.1	<1.2	0.1
Oil & Grease Grab	**mg/L**		1	BRL	BRL	-	BRL	BRL	-
TSS	**mg/L**		1.5	6	28	22	BRL	BRL	-
Total Phosphorus	**mg/L**		0.005	0.022	0.024	0.002	0.018	0.024	0.006
Dissolved Oxygen	**mg/L**	≥ 6.0	1	9.2	9.1	-0.1	9.5	9.5	0
pH	**SU**	6.5-8.5	NA	7.69	7.63	-0.06	7.96	7.98	0.02
				Day 1: April 8, 2019 – Mid Tide			***Day 2: April 11, 2019 - Mid Tide***		
BOD 5-Day	**mg/L**		2	**BRL**	BRL	-	BRL	BRL	-
TKN	**mg/L**		0.6	BRL	BRL	-	BRL	BRL	-
Ammonia-N	**mg/L**		0.5	BRL	BRL	-	BRL	BRL	-
Nitrate-N/Nitrite-N	**mg/L**		0.01	0.42	0.33	-0.09	0.47	0.24	-0.23
Total Nitrogen	**mg/L**		NA	<1.1	<0.93	-0.17	<1.1	<0.84	-0.26
Oil & Grease Grab	**mg/L**		1	BRL	BRL	-	BRL	BRL	-
TSS	**mg/L**		1.5	8	18	10	3	5	2
Total Phosphorus	**mg/L**		0.005	0.021	0.015	-0.007	0.022	0.016	-0.005
Dissolved Oxygen	**mg/L**	≥ 6.0	1	9.2	9.2	0	10	10	0
pH	**SU**	6.5-8.5	NA	7.73	7.66	-0.07	8.05	8.04	-0.01
				Day 1: April 8, 2019 – High Tide			***Day 2: April 11, 2019 - High Tide***		
BOD 5-Day	**mg/L**		2	BRL	BRL	-	BRL	BRL	-
TKN	**mg/L**		0.6	BRL	BRL	-	BRL	BRL	-
Ammonia-N	**mg/L**		0.5	BRL	BRL	-	BRL	BRL	-
Nitrate-N/Nitrite-N	**mg/L**		0.01	0.31	0.16	-0.15	0.3	0.14	-0.16
Total Nitrogen	**mg/L**		NA	<0.91	<0.76	-0.15	<0.90	<0.74	-0.16
Oil & Grease Grab	**mg/L**		1	BRL	BRL	-	BRL	BRL	-
TSS	**mg/L**		1.5	6	10	4	BRL	14	+
Total Phosphorus	**mg/L**		0.005	0.02	0.022	0.002	0.022	0.024	0.002
Dissolved Oxygen	**mg/L**	≥ 6.0	1	9.5	9.5	0	8.9	9	0.1
pH	**SU**	6.5-8.5	NA	7.75	7.85	0.1	7.94	8	0.06

Comment: The NOI notes that the system will have the capacity to pump much more than the 600-gpm proposed as a maximum. The applicant's rationale for a lack of impacts from the long-term operation of the system with regard to entrainment of marine life at the intake and thermal or other pollution effects at the discharge is premised, at least in part, on this limitation. I recommend that the applicant describe how the flow rate will be managed, monitored, and documented to ensure that this limitation will be upheld in the long term, assuming the full buildout of the CSI project.

Response:
This replacement system is designed to accommodate and control biofouling so that consistent flows can be provided to the research tanks, during the research season – essentially April to October. A consistent and reliable flow of fresh seawater is needed for the research to yield reliable data. The research at Nahant is conducted explore native and natural systems of the region, therefore the system is a flow through system with short resident times to retain natural water quality parameters in the research tanks / microcosms. That is reflected in Table 2 above which shows little difference between discharge and intake parameters.

The replacement system is comprised of two 14-inch diameter intake pipes, an "A" line and a "B" line. The flows will be cycled between the two lines. See Figure 1 - Progression of Biofouling in Seawater intake Pipes. Review of that figure shows that the A Line will approximately be in operation from April to October. During that period blue mussel spat, released in the spring, will be drawn into the pipe and start to grow and foul the pipe. In October, the biofouling will start to interfere with flow and the intake will be switched to the B Line. Few blue mussel spat are released in the fall and therefore little biofouling will develop in the B Line throughout the later fall, winter, and early spring. Meanwhile in the A Line, with no water flow, the water in the intake will be become anoxic. This will cause die off of mussels and other life in the pipe. During the winter and spring, bacteria in the A Line will decompose the mussel's soft tissues (byssal threads) allowing the shells to release and slough off the sidewall. Before the A Line resumes operation the loose shells will be cleaned out. This system with two properly sized pipes will provide the consistent and reliable flows to the research facilities without resorting to chemical biofouling controls, or interrupting flows to mechanically clean the pipes during the research season.

The new intake structures will consist of fiberglass cylinders that include ½-inch plastic mesh around the intake cylinder. The cylinders will be mounted onto two separate 10-foot by 27-foot precast concrete pads, one for each intake line. The ½-inch mesh prevents larger suspended material from being drawn into seawater system. At the interior of the intake system is a series of slots cut into a round pipe. The quantity and open area of the slots is designed to reduce the slot entrance velocity below the capture velocity of small fish and crustaceans that pass through ½-inch mesh to avoid them being drawn into the intake system. The fish and crustacean species that can swim, such as early-stage lobster larvae, have a natural instinct to escape predators called the "escape" velocity. When sensing a predator, they have the ability to make a rapid acceleration with their tails to avoid being eaten. This escape velocity can apply when they pass near the intake slots feeling the pull of the capture velocity (similar to a predator) and accelerate to escape the perceived predator. It must be emphasized that the intake velocities are very slow. It is not like the end of a vacuum cleaner hose but a gentle draw of the seawater into the intakes to the benefit of both the seawater equipment and the marine environment.

The capture velocity at the mesh of the new fiberglass intakes will be 0.010 feet per second ("fps") which is 41 times slower than required by the EPA standard of 0.5 fps – well below

the EPA standard. This will allow nearly all marine life that has the capability to swim to escape the capture velocity at the mesh. It will also prevent passing debris and seaweed from being drawn in and impinged onto the intake mesh. Deeper inside the seawater intake screen are the intake slots, which have a slot capture velocity of 0.182 fps – well below the EPA standard of 0.5 fps.

Since 1985, Dr. Ken Sebens (former MSC Director and now a member of the faculty at Friday Harbor Laboratories) has been monitoring the abundance of lobster (and other species) at three locations around East Point (Dive Beach), and inside and outside of Shag Rocks. Each year, lobster abundance was counted by SCUBA divers along 25-meter by 1-meter transects, a common approach to sampling of mobile benthic animals. Analysis of the data indicates that lobster abundance has not changed significantly over time at these sites. These data also show that there is considerable variability in lobster abundance over this 33-year period, with boom and bust years for lobsters. There is, however, no evidence of sustained long-term lobster decline, and no evidence of decline since renovations to the MSC seawater system in 2011.

As described above, the intake pipes have been carefully designed to prevent entrainment of aquatic organisms. The intake velocity at the mesh screen has been calculated to be 0.011 feet per sec (fps) which is 41 times slower than the maximum allowable intake velocity of 0.5 fps established by the US EPA. As mitigation to offset the potential loss of five mature lobsters per year attributable to the new seawater system (NOI Project Narrative pages 10 & 11), NU proposes to construct an onsite lobster hatchery as part of the CSI Project to produce approximately 90,000 Stage IV larvae per year. NU will consult with the Massachusetts Department of Marine Fisheries (“DMF”) regarding the design of the lobster hatchery. The larvae will be released in Bathing Beach Cove or in nearby Nahant waters as recommended by lobstermen that are willing to collaborate on this effort and will result in the addition of an estimated 45 market sized lobsters per year.

Thank you for your consideration of these responses. We trust that they are sufficient for the Conservation Commission to issue an Order of Conditions allowing the project to proceed as proposed.

Sincerely,

Briscoe B. Lang, PWS
Principal Environmental Scientist – Pare Corporation

Dwight R. Dunk, LPD, PWS, BCES
Principal, Epsilon Associates

cc: DEP Northeast Regional Office
P. McManus, EcoTech, Inc.
T. MacKay, Northeastern
D. Linhart, Goulston & Storrs