

A landscape oasis to serve the urban pods and... allow people to get away and get out of urban context... and... to provide mitigation for all of the pollution that's going to be happening within these urban pods.

-Patrick Curran, SWA

Savin Hill Cove, MA

Savin Hill Cove, MA is a dynamic depression along the Boston shoreline. The mudflat and salt marsh areas in Savin Hill Cove provide ample room for the nurturing habitats of local marine organisms such as mussels, crabs, periwinkles, and worms. Marine vegetation can be found throughout this area including green and red algae and marsh grasses. These marshlands and mudflats are constantly affected by the flooding and pollutants on Morrissey Boulevard. It serves the University of Massachusetts Boston Harbor research vessel and the marine facilities. It is also serves as part of the docking area for the Savin Hill Yacht Club. The yacht club boats will pass through the cove to enter and exit the Club. Savin Hill Cove is subject to sediment deposition that can negatively affect the docking of the University of Massachusetts research boat as well as the boats of the Yacht Club.

Savin Hill Cove, MA is directly located next to the University of Massachusetts Boston. It is easily accessible from Morrissey Boulevard and the walkway along the exterior of the school. Because of these reasons it was the perfect location to try and remedy so that the students and community of Boston can take advantage of a beautiful, natural area so close to home. The proposal calls for a restoration of the surrounding salt marsh and mudflat areas. This proposal will solve a multitude of problems the Cove faces as well as provide a natural recreational area for nature lovers to enjoy in the busy city.

Currently the mudflats in the area are showing small signs of Salt marsh life despite the constant attack it receives from the Morrissey Boulevard. If we can encourage the growth of the salt marsh at the same time we can diminish the problems it encounters.

Background & History

The Boston Shoreline is composed entirely of made land and Columbia Point (Where University of Massachusetts, Boston lies) and Savin Hill Cove are no exception. The filling in of this land was done to create the Morrissey Boulevard and SouthEast Expressway or to add onto the land that extends into Dorchester Bay (Gaining Ground, Seasholes).

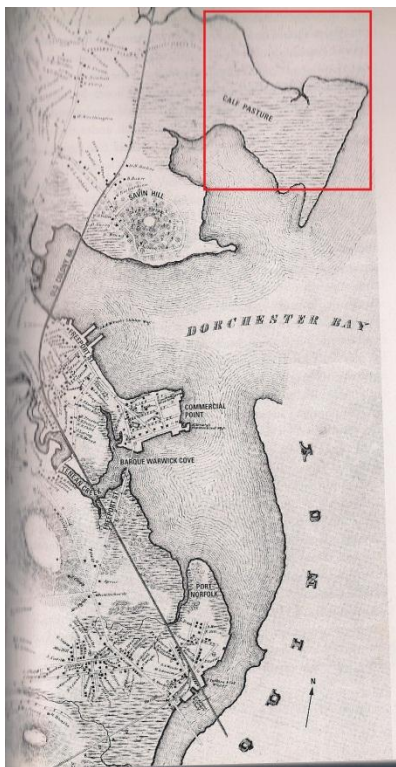


Figure 1: Gaining Ground by Nancy Seasholes: Calf Pasture and Dorchester Bay

Columbia Point, previously known as Calf Pasture, used to be a place to pasture calves and was known as a very marshy area already. This area was the first to be altered in some way with the proposal for a new sewage system in 1870-1880's. This was a first of the major problems to try and be remedied hoping it would lower Boston's high death rates (based on diseases). The sewage was thought to be fully carried out with the high tide. However with the incoming tides, came back the sewage (onto the beaches and mudflats) and it created an even bigger problem for the residents of Boston. This was remedied shortly after with a new pumping station at the end of Calf Pasture that was used until the mid 1900's. This picture is of the coastline of Dorchester Bay and outlined in Red is the location of Calf Pasture (Image: Gaining

Ground, Seasholes, Dorchester altered by Alyssa Hardiman).

Filling of Calf Pasture, Fox Point, and the SE tip of Savin Hill (near the Savin Hill yacht Club) continued throughout the early 1900's. Materials used were –anything- that could be bought, and bought cheaply. The main culprits were trash, coal, ashes and dirt from previous

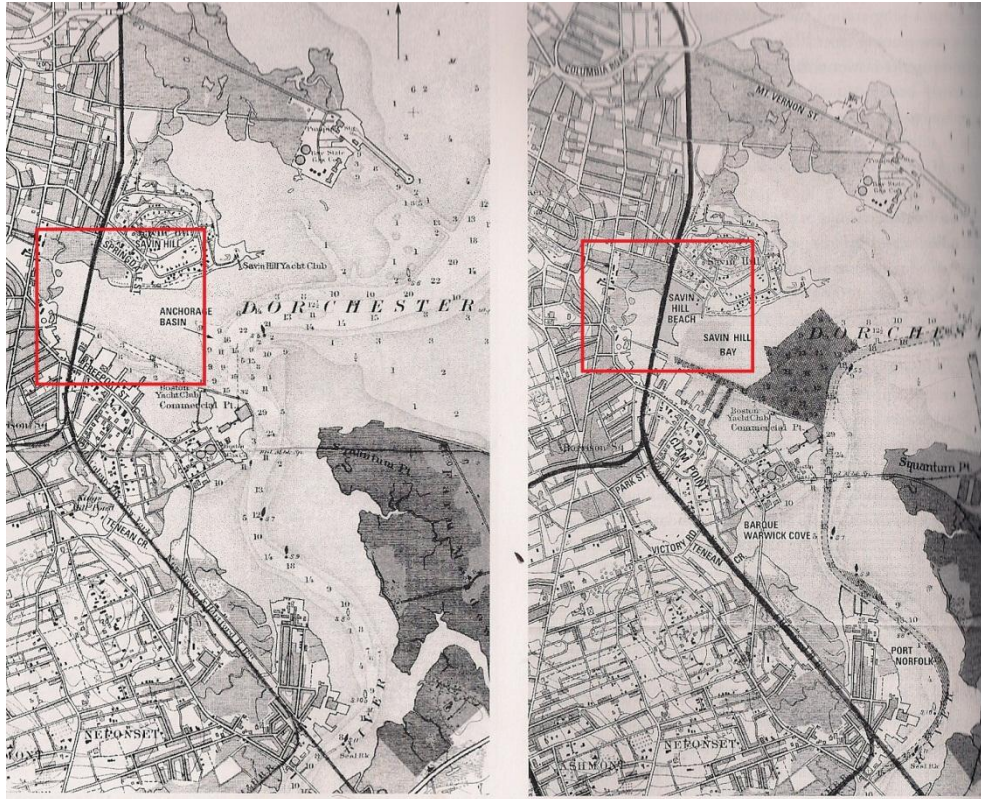


Figure 2: Gaining Ground by Nancy Seasholes: The before and after picture of Dorchester with the creation of land for Savin Hill Beach.

construction sites to create the level of “sub-grade”. Savin Hill Beach (formerly known as Rock Hill) was part of a movement to create parks all around Boston. In 1890 the commissioners formed a dike across the flats (on the south side of Savin Hill) in order to create Savin Hill Beach. In 1908 the salt marsh lands behind the beach were filled in completely (with dredged material from Dorchester Bay) to make a playground. The pictures are of the before and after of the filling of Savin Hill Beach. Outlined in red are the beach areas and areas where previous salt marsh was filled in (Picture: Gaining Ground, Seasholes, Dorchester altered by Alyssa Hardiman).

The commissioners of Boston were not just making land for Calf Pasture and beaches like Savin Hill Beach. They needed to construct major streets and highways to connect the city

and make it more accessible. In 1915 they received the permission to create Old Colony Parkway (which is now Morrissey Boulevard).

Pollution is not just a new problem for the area of Savin Hill Cove and Morrissey Boulevard. In 1928 (before the former Morrissey Boulevard was completed) testing was done to measure the levels of pollution in Savin Hill Bay. The tests came back positive with three major culprits: “raw sewage discharged during storms from overflow sewers on the west side of the railroad tracks carried by a culvert into the bay; shallow flats in the bay which can’t be flushed out well enough with the tides; and drainage from a dump west of the marsh that was carried by a culvert into the bay as well.” Solutions were proposed including a new sewage pipe to carry waste beyond the outflow sewers to avoid release into the Bay; filling in of the marsh areas; and dredging of Savin Hill Bay (Gaining Ground, Seasholes). These problems are obviously precursors to the ones experienced today and prove that Savin Hill Cove and Morrissey Boulevard is no stranger to pollution problems.

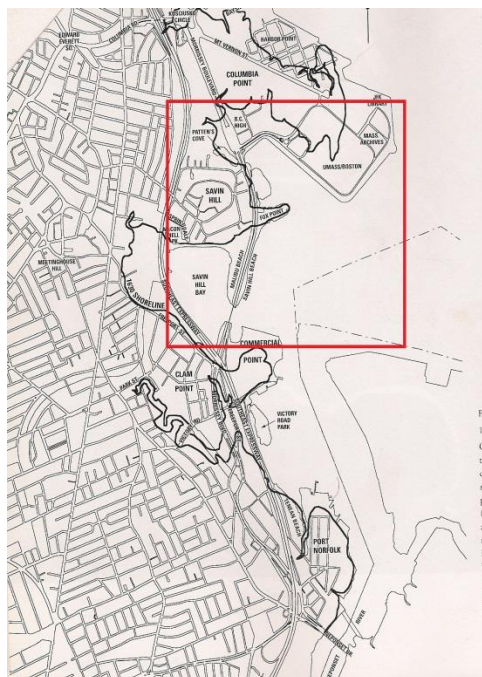


Figure 3: Gaining Ground by Nancy Seasholes: This picture is of the ‘before’ boundaries of Dorchester (thick black boundaries) and after the man-made land was done (everything extending beyond the thick black lines).

These problems did not deter major corporations from picking up the land surrounding the areas. In 1970 the University of Massachusetts bought the man-made land of Columbia Point (Calf Pasture) and began building at the top of the point. In 1974 they were done and the first classes were offered to students. Another corporation that decided the land was fit to own was the John F. Kennedy Library. They conveniently took up roots right next to the University of Massachusetts Boston in 1975 and remain

there to this day. The following picture is the before and after coastline after the man-made land was completed. The darker bold line shows the before coast, whereas all the land exceeding these lines are what was mad-made. The red highlighted box is where Columbia Point is located the sites of Umass Boston, the JFK Library as well as Savin Hill Cove and Savin Hill Beach). This picture puts the topics previously discussed into a locational perspective (Picture: Gaining Ground, Seasholes, Dorchester, altered by Alyssa Hardiman).

The significance of this unique man-made land history of Dorchester is that in all the situations discussed, salt marsh grounds were historically located and filled in. They were filled in for construction of the highways and extensions of land for commercial use. Their previous existence in these locations tells us that they historically are able to survive in these waters and have naturally been occurring here for at least a century. The implementation and restoration of salt marsh in Savin Hill Cove is a viable option that may in fact thrive there. A second thing this history tells us is that Boston Harbor is no stranger to pollution, especially when concerning the Morrissey Boulevard and Savin Hill. The sewage pollution problem as well as from the Morrissey Boulevard are decades in the making and will require a thoughtful and long awaited solution.

The Current Status of Savin Hill Cove

Currently Savin Hill Cove is a shallow area of mudflats that is subject to flooding with incoming and outgoing tides. When the site was visited there were many important factors to take note of. The Cove itself is a noisy place to visit. It is only a few feet away from the Morrissey Boulevard which experiences a high traffic flow at all hours of the day, especially during rush hour. It smells like a mixture of automobiles, urbanization, mud, and seawater. It is

not a very restful place to experience at first glance. The area itself seems as if it is man-made (and it is). The surrounding coast along the University of Massachusetts Boston has boulders along the shores edge complete with a seawall. You can see the areas of the research vessel and the yacht club which don't add to the feeling of a 'natural' ecosystem. The extent of the mudflats is the most natural component about Savin Hill Cove. The man-made boundaries of it are very distinct (especially with it being a 'cove'). The mudflats found in the middle of these boundaries are the only natural element and fall into the water level.

The flows of the sight seem constricted as well. The water can come in and out freely with the tides, but is stopped at the barrier before the Morrissey Boulevard. The wind flow is restricted from either side of the University and the Viet Nam War Memorial and the Yacht Club. Sunlight flow is able to reach the area well enough to promote the life and not be a major problem for the production of the area. The human interaction with this environment is very present. The University is right next to it along with the research vessel, the walkers along the path of the bay around the University, the Vietnam War Memorial right above the Cove area, and the yacht club directly alongside the area, and the constant buzzing of cars driving by on the Morrissey Boulevard. The human presence and activities seems to be more of a 'blocking' presence to the natural flows of the area.

When you take a first glance at low tide, you notice the mud and lots of it. But what does that mud mean? The mudflats are formed from constant sediment deposits brought in by the tides. So that shows that the Savin Hill Cove has a large amount of sediment exchange. Mudflats are also the precursors to Salt Marshes. Therefore if this mudflat was left as is for a few hundred years (time it takes to form a natural salt marsh) a salt marsh has the strong possibility of

formation. This is without the effects of the increasing pollution, flooding, impending sea level rise, and storm water runoff that Savin Hill experiences taken into account. And although the sediment deposits are a promising factor in the creation of a salt marsh, they cause other problems for the marine vessel traffic flow in and out of the cove.

This leads to a major problem Savin Hill Cove faces, dredging. Dredging needs to be done for the vessels to travel in and out, yet we are unsure of just how much this dredging effects the organisms that are surviving in the area, and also what the future dredging will do to the proposed salt marsh. Not to mention the issue of finances and the millions of dollars every few years invested in dredging projects of the cove.

When taking a closer look at the mud it is completely full of life. There are mud snails all



Figure 4: Alyssa Hardiman: Green Algae, periwinkles, mussels in the mudflats of Savin Hill Cove.

throughout it, periwinkles, tons of worms, an algae layer, and even some crabs walking about. All of this life present is an excellent sign of the current status of the cove and insurance for the future of it. Even though it faces larger problems like heavy pollution and flooding it

is still able to sustain a basic layer of life. This is good news for the future plans of the cove because with

improving conditions we can see even more life take hold and it can become a thriving, successful habitat. This picture shows the green algae, periwinkles, mussels and shells of the mudflats of Savin Hill Cove (Image:Alyssa Hardiman).

Methodology

To prepare for this project we pursued many different avenues. Our initial/basic plan was to meet at the site during a low tide event and a high tide event. This way we could get a good



Figure 5: Alyssa Hardiman: Grasses on the fringes of the mudflats in Savin Hill Cove.

depiction of the environment in both of its regularly experienced states. We took pictures of any organisms we saw and the flora and fauna that have sprung up there. This picture is of the marsh grasses that are already springing up in small sections along the outer edges of the mudflats (image: Alyssa Hardiman). We emailed several contacts right away and only got responses from a minimum of them. A difficulty we quickly realized was getting into contact with people who were willing to help, and making time to meet with everyone who did respond conveniently.

Constant email contact was a necessity. We contacted each other over everything, whether it was a new source we found or a contact had responded to one of our emails. There was no span of more than 3 days without some form of an update or email between each other. A huge influence on the project was the experience at the Boston Architectural College. The way the BAC students pursued their projects was enlightening and influenced the final presentation for this project immensely. They used visual depictions with a heavy amount of research of the area and local flora and fauna to ‘bulk’ up their projects and made them extremely interesting. We

wanted to do the same and chose to research everything, from the history of the land, the geological significance, the basic construction of a man-made salt marsh to the processes of a natural salt marsh. This preparation gave us a larger perspective of what we were working with and proposing, and made it all the more possible to imagine a salt marsh restoration project in Savin Hill Cove.

This methodology of just researching everything and anything revolving around Savin Hill Cove and a salt marsh restoration made it easy to identify and envision our goals. We needed to 1.) rid the area of the constant attack of pollutants it receives from Morrissey Boulevard 2.) try and limit the flooding of the Morrissey to a minimum which will decrease the pollutants 3.) Do all of this by creating a salt marsh that will act as a buffering zone for the coast and filter for the pollutants that are found in the area.

Dynamics of a Salt Marsh

Salt marshes take hundreds of years to form, yet can be destroyed in a fraction of the time. They are very sensitive environments that can be very beneficial to the surrounding area who gets to enjoy them. Salt marshes form when sediments are deposited along the shore from tides. These sediments form mudflats. The marsh grasses put their roots into the mudflats, stabilize and spread. Once the natural cycle of decay is experienced a layer of detritus is formed. This layer of detritus eventually forms marsh peat and creates a rich, natural environment.

Why is a salt marsh a good solution? Salt marshes have several amazing healing qualities. One of which is acting like a buffer system. Since Savin Hill Cove is a coastal area that is subject to constant flooding and coastal storm energy it is practically begging for a salt marsh.

A salt marsh would have loads of grasses located along the outer edges of the Cove. These grasses would absorb a great majority of the storms energy and erosional power and lessen the impact on the coastline. This means that erosion of the coastal features would lessen, and more importantly flooding of the Morrissey Boulevard will subside through the marshes buffering power. The diminishing possibility of flooding will mean less pollution as storm water runoff off of the Morrissey Boulevard (less automotive chemicals, trash, and oil coming in from off of the Morrissey Boulevard). This is because the marsh grasses, like cordgrass, acts like a filter for pollutants. So even if the Morrissey flooded the increasing presence of salt marsh grasses will act as its own personal filter. This will create healthier waters and a healthier overall environment for salt marsh organisms. Another is the simple reestablishment of the natural environment. Salt marshes are becoming highly endangered habitats. People are filling them in for new construction, factories, and roads. This is very true, and coincides with the history of Savin Hill



Figure 6: Alyssa Hardiman: Green Crab and Periwinkle of Savin Hill Cove.

and Columbia Point. A salt marsh would provide a natural environment and safe haven for several marsh species and encourage them to thrive in the area. Such animals could consist of marsh birds (like the Herring Gull), more green crabs and periwinkles. This picture is of a green crab and periwinkle found along the mudflat exterior

(Image: Alyssa Hardiman) This wildlife will help promote the healthy establishment of the salt marsh and create a full-fledged natural environment.

Every salt marsh has different zones based on height and exposure that are like separate ecosystems in and of themselves. The transitional zone of a marsh is that part that is in ‘transition’ between the ocean and coastal marsh. The lower marsh is usually submerged under salt water as well. Organisms that reside in this zone need to have a high tolerance to salinity levels and be able to survive in underwater, marine environments. These organisms consist of Cordgrass which can grow 8 feet tall and contain 8 inch spikelet’s. They bloom from July to September. The upper marsh receives salt water splashes with the waves and tides and is usually a drier area than the previous zones mentioned. In this zone the plants and organisms need to be able to handle varying salinity concentrations as well as water and air environments. The upper marsh has salt-meadow Cord Grass which can grow from one to three feet tall. It blooms with pale purple flowers. Also found in the Upper Marsh is Goldenrod which has tiny yellow flowers that bloom from August through October. The highest zone of the marsh is the upland zone. This level is almost always relatively dry, aside from extreme tide occurrences. Organisms and plants in this area are bushes and trees that don’t necessarily need to be able to handle salt water. In this zone you can find black grass, a two foot tall plant with tiny black flowers and dies in early summer (oceaninn.com/the-nature-preserve/248).

Please refer to the diagram in the Diagrams & Pictures section of a

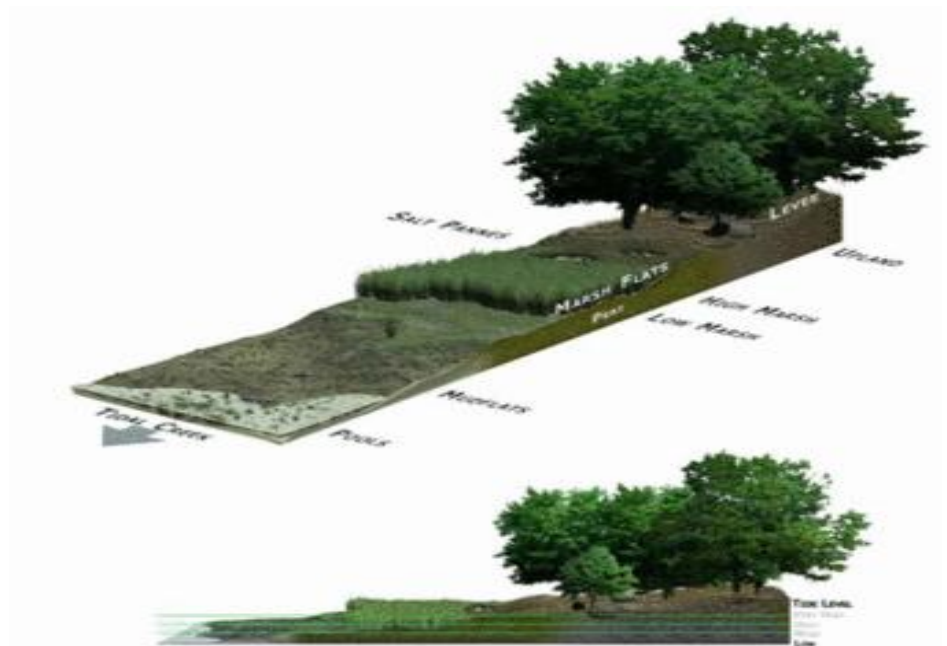


Figure 7: illustration of the different zonation of a typical salt marsh. Image: territorioscuola.com

typical marsh zonation versus the proposed one for Savin Hill Cove, MA. This image is an illustration of the different zonation of a typical salt marsh.

Image: territorioscuola.com

Natural salt marshes take hundreds of years to develop on their own. However a man-made salt marsh has proven to be just as effective in all of the 'salt marsh qualities' of a natural one. A study from researchers at University of New Hampshire and University of England focused on New Hampshire's Great Bay. They compared the progress of the 6 Man Made Salt Marshes (1-14 years old) to 11 natural reference marshes. The results showed differences in both, but none that would deter scientists from establishing a man-made option. The results from the study were as follows: "The natural marshes tended to have more production of plant biomass, soil richer in organic matter, and a greater variety of plant species. However once the data was compiled and compared, it showed that constructed environments do become increasingly similar to natural marshes. Characteristics such as soil deposition, plant production, and plants species, richness, all approach natural levels within a decade!(Taylor, 2003)".

These results are extremely encouraging and show that regardless of whether we implement a man-made or natural salt marsh ecosystem in Savin Hill Cove, it will competitively thrive with natural salt marshes with the proper monitoring and care. Studies like this are extremely necessary to reflect upon when considering a restoration project such as this because money that is used for a project of this extent needs to be justified to be granted. If studies had shown man-made salt marshes to be not as successful it would be much harder to get the support for local ecological projects such as these.

If we approach Savin Hill Cove as a man-made salt marsh and implement the grasses and ecosystem we need to allow it to grow and thrive naturally we need to approach this in stages. This will ensure the progress of each stage and be able to allow us to remedy any unexpected situations that may arise. This 4 step plan will go as follows:

STAGES of the Savin Hill Cove Salt Marsh Proposal

Please refer to the diagrams and pictures section for a Stage by Stage visual of the process.

- 1.) **The Marsh Boardwalk**-We will be implementing a walk through the marsh for educational purposes (elaborated on further in the writing). This walk will need to be the initial part of the stage to avoid any disruption to the environment once it is planted (for example if we waited for the marsh to grow and built a boardwalk afterwards). This will allow the natural growth of the boardwalk to ‘flow’ around it and provide a beautiful natural place for scenery.
- 2.) **Implementation**- Stage 2 consists of building the man-made marshlands. We will ‘border’ the Morrissey Boulevard with marsh grasses and healthy mud to encourage the further natural growth of the marsh outwards.
- 3.) **Growth**- This will be the monitoring stage. Once the man-made aspect of the marsh is implemented we will monitor its growth and ensure that nothing is negatively affecting its progress. Its growth will extend outwards towards the Harbor but be limited to Savin Hill Cove and the bordering Morrissey Boulevard sections. This will ensure that it does not disrupt the Umass Research Vessel or other boat traffic in the area.

- 4.) **Final**- This is the final stage that will take place once monitoring has ensured the marsh is growing healthy and steadily. This stage will consist of annual monitoring of the marsh and its growth rate and levels instead of the heavier monitoring called for in stage 3. It will be the stage in which the public and local community can enjoy the marsh to its fullest extent, taking advantage of the recreational opportunities it has given us, as well as the cleaner water and un-flooded streets!

Savin Hill Cove Restoration Proposal

Salt Marches are vital ecosystems. The proposed area of Savin Hill Cove would be the ideal location to restore a salt marsh. In this area there is a mixing of fresh water and salt water, and filtration of runoffs all takes place within the salt march. The area is also a great place for the building and planning of important community based actives, such as a marina (which is already located there), walking path, historic education, jogging and biking areas.

There are many different steps that need to be taken before deciding on the location of where to put the community activities. Each activity has different needs and need different areas and resources that need to be taken into consideration. To do this each location needs to be look at in detail and match them to the specific needs of the activities. In this case we focused on the location of Savin Hill Cove. When we were surveying the site, we had to take into many different aspects when planning what community activities will be selected for our site. We first took noticed to who was actually using the area and for what activities. We also thought of who would possibly want to use it and for what reasons after the salt march and proposed beatify scheme was put into place. We observed that there were a rather large number of communities

members that were using the area. There is a t stop nearby and many people use the small pathway along Morrissey Blvd. and Savin Hill Cove to commute to the t from their homes. Also there are two well-known schools across the way, which are Boston College High School and The University of Massachusetts Boston. The students in the area often walk, bike, jog along the water. There are also residents of Dorchester that walk along Morrissey Blvd. and who are a part of the Savin Hill Yacht Club. After understanding that will be using the area and for what reason, we than were able to construct a plan on what the community activities will be based on. This was we know that the community is getting the most enjoyment possible out of the space we provided and beautified.

Boston Harbor Walk is a well-known pathway that extends for 46.9 miles along the water, wharves, piers, bridges, beaches and shoreline from Chelsea Creek to the Neponset River. It is a network of walkways that invite the local residents as well as visitors to enjoy a safe area and learn the history of Boston along the way. The Boston Harbor Association worked very closely with the City of Boston's Environmental Department, the Boston Redevelopment Authority, the Massachusetts Department of Environmental Protection, and waterfront property owners to ensure environmental safety and community agreement in building the Boston Harbor Walk. The walkway currently extends around the University Of Massachusetts Boston campus, but stops when we reach the bridge that is located at the entrance to the school. We comprised a plan where, the walkway would be extended along Morrissey Blvd. this will provide a safe area for the current residents and students using this area to bike, jog, and walk. The extension of Boston Harbor Walk will be a great addition to the community. This will also enhance other objects that are already in place in the area.

One of these interests is the Vietnam Memorial. This Memorial is located right off of

Morrissey Blvd. Morrissey Blvd. is an extremely busy street that is used by the Dorchester community in their daily commute. But how many have stopped and enjoyed the Historical Memorial? As students for many years now, we both have to admit we have not once stopped to see the memorial. Many of our fellow students admitted that they were not aware it was even over in that area. By creating a walkway that includes the memorial, we are able to bring more attention to it and allow better access for people to visit the memorial.

We wanted to also provide a closer look of the Salt Marsh and better understanding of what a salt marsh is. To do this we devised a plan to have a pathway that attaches to the extended walkway. These pathways intertwine with each other and have educational signs throughout the area. We refer to this pathway as an interpretive pathway. The Savin Hill Salt Marsh interpretive pathway includes walkways along the outside of the salt marsh for bikers and walkers, as well as walkways through the salt march with interpretive stations that provide information and history about the salt marsh and how this unique ecosystems works. The information that will be found along the extended Boston Harbor walk and Savin Hill Cove area will provide useful information to the public and residents in the area. The information will also include the history of the area and its community, such as the Savin Hill Yacht Club. It will inform visitors of the development of the yacht club and how they were able to integrate with the restoration of the salt march. It will also help spark people's interest in their community and hopefully want them to get involved in projects such as these. It is our hope to put education as one of the main priorities of this project. More and more people want to get involved with what's going on in their neighborhoods. The public is interested in projects just like ours, they want a say on what's going to be done in their neighborhood communities. We notice this and intern want to involve

the students, teachers and other people in the community and educate them as much as possible.

The information signs will include such information such as:

Smooth Cordgrass (*Spartina alterniflora*)

“This type of marsh grass dominates the regularly flooded low marsh. It is responsible for much of the marsh's productivity. Spartina's successful adaptations enable it to live where few other plants could survive. It has narrow, tough blades and special glands that secrete excess salt, making it ideal to withstand the high heat and daily exposure to salt water. Few animals eat this plant, but many animals and plants live on it or on the marsh surface protected by its roots and stalks. Spartina stalks are thick and are very tough and well anchored by a root system.

The signs will include pictures and a pin points on a map as to where you are able to locate the species of vegetation or marine life in the Salt March itself. We hope to gather more History and older pictures of the area with the help of the Savin hill Yacht club. The Savin Hill Yacht Club is an important part of the community and has been around since the summer of 1875, there constitution was and still today is: "This Association is formed for the purpose of encouraging yachting, rowing and nautical science, for social meetings, **the preservation and improvement of the natural beauties of Savin Hill**, its beaches and surroundings, and otherwise advancing its interests for the benefit of all residents in every possible way." As you are able to see in bold, it say that they want to preserve and improve the natural beauties of the Savin Hill Cove. This brings great hope for the future and progress and the salt marsh and the cooperation of the Savin

Hill Yacht Club in maintaining the health of the salt marsh. The signs will be a great way to spread education to the community.

Lucky for us, we are extremely close to Umass Boston. We can have environmental professors from the Environmental, Earth and ocean sciences department and undergraduate/graduate students get involved by helping in outreach programs for the local community and the understanding and restoration of the Savin Hill Salt Marsh. We are lucky to have a school so close by that has such a rich background in EEOS. We talk to numerous proposers that are eager to get involved in outreach programs. Tours of the salt marsh that include taking samples and monitoring the health of the marsh would be great for classes to get involved in. As students at Umass Boston we feel that there are not enough classes that take us outside of the buildings. We talk to other fellow EEOS students that agree they would love more hands on learning programs. Having such a vital and complex ecosystem such as a salt marsh would provide an extremely education area to work in and learn about hands on. This is also a great opportunity for students to gain lab work and credits. Salt marshes especially newly restored ones need close monitoring and samples taken. The University of Massachusetts has the labs and ability to do this type is testing and research. The problem is that students want to get involved but don't always have the time to do so for free. It is not always feasible to pay those students. A way to get around these problems is to give those students credits.

With agreement of the Umass Boston EEOS department, we can offer credits and research studies for students who want to get involved. The EEOS department is not the only department to benefit by this though; we also integrated ways the other art students can get credits. We would love to take pictures and videos documenting the progress restoration of the marsh. Students from the art department could get involved by doing either one of these. We

would display these pictures in a timeline of the salt marsh restoration plan on a sign in the interpretive walkway. This would allow everyone to enjoy the progress that is being made.

The salt marsh is critical to the survival of a variety of marine life and vegetation. It also provides healthy ecosystems. The salt marsh will carry out a diverse array of process that provide both goods and service to humanity and the community. There can be an upwards to 177 species found in salt marshes. The area will provided a unique habitat for numerous species of aquatic organisms, birds, fish, and invertebrates. The marsh will provide food and a nursery breeding ground for marine animals such as horseshoe crabs, mussels, and small fish. There are currently mudflats that provide a home for some mussels and periwinkles. By adding the salt marsh we will increase the marine life by over 50% and vegetation as well. Some of the main environmental benefits that the salt marsh will provide for Savin Hill Cove area include:

- Gently sloping vegetation platform
- Network tidal creeks
- Range is Arctic-Sub-Tropic
- Halophytic wetland ecosystem
- Upper intertidal zone sheltered area
- **Transitional zone**
- **Key sediment exchange**
- High productivity
- decaying plant and organic matter "cdom"
- **Sediment sink/nutrient sink/carbon sink/wave energy sink**
- **filters toxins**
- **Natural buffering system**

- **Benthic community/nursery**

The environmental benefits that are in bold are the main ones that we focused on in Benefiting this particular site in large, noticeable ways. Most salt marshes are broken up into zonations. These zonation's include a tidal creek/mudflats, low marsh, high marsh (transitional zone), and upper land/marsh also called adjacent zone (this is going from sea to land). The lower marsh is made up of muddy sediments and *Spartina alterniflora*. As we move towards the high marsh it is made up of muddy sand and sandy mud and *Spartina* patterns. The low marsh area is flooded twice daily by high tides and as we move up towards the high marsh, it will only be flooded occasionally on a monthly basis during server storms and high tides. For our location, we only have enough area to restore the low marsh and a small portion of the in between area of the low to high marsh area. The type of sediment that is already in place at the site is muddy in composition. On the Wentworth grain size scale in mm, mud is referred to as being a mix of 0.008 silt and 0.004 clay. The sediment that is being deposited at a fast rate into the cove is silt in composition. Due to this fast rate the cove is dredged out.

We hope that the environmental benefit of key sediment exchange can help with this problem. The Savin Hill cove area has been impacted by the deposition of fill years ago. It also has been dredged many times. To restore the marsh which has been impacted by the fill and dredging. The intertidal elevations must be reestablished with earth-moving equipment to create the low/high marsh elevations. The criterion goes as follows: "Elevation criteria to be used in recontouring projects can be obtained by surveying nearby reference marshes located in similar geomorphic and landscape settings. This is critical to achieving the proper tidal flooding characteristics for the desired vegetation community type (e.g., *Spartina alterniflora* low marsh). Following the removal of dredged material or upland fill, new soils can be placed on the site and

graded to the proper elevations. Soil organic matter content and grain size should match that of reference marshes. In cases where organic matter content of new soil is low, restoration practitioners can add organic matter (usually terrestrial vegetation mulch) to enhance soil quality. However, this additional step can be expensive and time-consuming. Fortunately, *Spartinaspp.* is well-adapted to sandy, low-nutrient soils, and is relatively easy to propagate upon properly prepared restoration sites.” This is able to benefit us because we already have the silt/mud in our site that our marsh elevations thrive in.

In our case, the accumulation of the deposited sediment provides a rich, muddy area. The cohesiveness of this sediment helps make it harder for erosion to take place. A high energy area would be needed to cause heavy erosional damage. This is a cove and means that the area is protected from heavy wave action. This enables vegetation for the salt marsh such as the cord grass to be able to settle in with its root networking system. It will be able to form the root systems within the thick marsh peat that will be allowed to accumulate. Salt marshes help accrue sediment and stabilize coastlines, and acts as a filter for organic matter. This will hopefully be the answer to the dredging problem.

Another main issue is that Morrissey Blvd. often gets flooded. Recently this was reported on Seven News-“DORCHESTER -- A major road flooded and forced police to close it off to drivers on Sunday afternoon.” As stated before Morrissey Blvd. is an extremely busy road that is used by hundreds of commuters on a daily basis. It is a huge inconvenience for commuters when Morrissey Blvd. is shut down or has a lane closed down. It is not cost effective when that state has to provide a detail of police officers to carry out and enforce the closings. There are pot holes from the salt water damage that need to be constantly fix as well. Salt marshes are a transitional area between land and water. They provide a natural buffer system which will help with the

Constant flooding of Morrissey Blvd. By having a soft structure as a natural buffering system, there will be no need to build hard structures such as retaining walls. This allows for natural progression, instead of man made structures to take over. The salt marsh will also filter toxins. Since there is a storm water drain nearby, there are pollution problems within the area. There are also large amounts of boats in the area due to the moorings around the area and the Yacht club. Some activities such as jet skiing at nearby Malibu Beach also add to the pollution such as Possible oils, gas, and chemicals leaking from the boats. The salt march is an area were the toxins will get filtered out. Environmental Indicators such as Benthic biomass, sediment grain size, dissolved oxygen levels, sediment organic content, and pH levels should be taken into consideration when monitoring the marsh. These are not the only indicators that should be looked at though there are many more especially the water quality of the area.

In conclusion we have assessed the area and decided the best way to improve water quality, and sediment deposition, and recreational areas are to restore the salt marsh and add new and improved features such as the walkway. We feel that Savin hill cove in its present condition does not meet its true potential and what it can become one day. we were both extremely excited to have received this particular site to work on. Since we are both students at Umass Boston, we pass this site daily. We have both been influenced by EEOS classes we have taken and our teachers. They have helped us realize that we can make a difference. We understand what restoring such a vital ecosystem such as a salt march can do. We saw the potential in this site, and were waiting for an opportunity to show it, and Professor Frankic gave us the opportunity and resources too. The class and the planning of the site was an insightful and innovative way to take what we have learned from EEOS and put it into real life and restoring an

ecosystem for the local community. We were able to construct a plan and address the issues that we saw. We look at each major individual problem and found out what the best possibilities to solve the issues. We felt that in the end this is the possible plan for Savin hill cove. It addresses the main issues the cove has such as dredging, flooding of Morrissey Blvd., and lack of marine life in the mud flats. We also made it a place for the community to learn and get use out of as well for recreational purposes. We can only hope that one day this will come a reality and Savin hill cove will reach its full potential as a working salt marsh.

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