DESIGN NARRATIVE: THE OMEGA CHAIN

The Omega Chain is a resilient network system surrounding the Columbia Point peninsula. Connecting disparate areas with holistic mechanisms that transcend simple solutions, the Omega Chain elevates the quality of life for citizens. The Omega Chain consists of a scalable halo infrastructure capable of climate change adaptation, and organic growth to encompass adjacent neighborhoods and beyond.

As changes in climate, technology and economy may accelerate or decelerate, timely responses are required. Scalable is the ability to increase or decrease proportionally the quality, quantity, time horizon or cost of affected areas. In concert with these forces, we envision working with a team of local community members, government officials and agencies in a series of public forums to monitor, respond and adapt to related conditions as they arise.

Our proposal offers a range of resilient and scalable design solutions tailored to specific areas of the site with interconnectivity at its core. The design concept considers two future diametrically opposed forces at the site location. One force represents the external water pressure generated by the rising sea level and storm surge arrival; the other force generated by internal water pressure created from increased precipitation falling on the land surface. The rainstorm runoff flowing outward toward the coast meets the incoming rising tide and storm surge at the perimeter of the shoreline. The location and mixture of these opposing water forces creates an interstitial zone. This zone is defined by the provision of a wetland. The wetland system serves as a mediating device that balances the extreme effects generated by incoming water pressure from the aquatic surface and outgoing water pressure from the terrestrial surface.

PERIMETER FLOOD MANAGEMENT SYSTEM

The wetland concept forms a protective halo around the Columbus Point peninsula creating a Perimeter Flood Management System (PFMS)

Morrissey Parkway

PFMS is defined by the gradual conversion of Morrissey Boulevard into a landscaped civic park linking existing Pattens Cove on the south with the existing Joe Moakley Park on the north, and designed to accept, store, and discharge water from floods, storm surges and the rising tide. A new elevated Morrissey Boulevard is located adjacent to the park and curved to calm fast moving traffic. The new Morrissey Parkway system performs "quadruple duty":

1. **Multi-modal path*:*** Provision of safe vehicular, pedestrian, bicycle and jogging paths interspersed with landscaping features.
2. **Social and Cultural Armature:** Four-season recreation areas; playgrounds, community gardens and education/exhibition areas of local plants and wildlife habitat.
3. **Heatsink:** Energy generation is provided by a geothermal system within the wetland core that assists in reducing the electrical loads and demands on building HVAC systems in select areas of the site.

Performance Standards

Geothermal System:
A solar heat pump is used in the summer to remove heat from the building, then transfer this heat to shallow wading pools with fountains. These shallow “program ponds” perform as a recreational center, but also work to dissipate heat through evaporation. Semi-cooled water then travels to the wetland Halo “hot marsh”, where moist soils pull heat from the geothermal system, releasing the heat through evapotranspiration within high marsh plantings and into the tidal waters as they rise. The warmed water retreats with the tide to the deeper open water areas and to the sea. Cooler water later returns to absorb more heat in a never-ending natural heat dispersion cycle powered by the Earth and the Moon. In the winter months, the solar heat pump pulls warmth from the "program pond" and ground below to reduce heating needs of the buildings, freezing the shallow pool into a public ice skating rink.

4. **Wetland:** Resilient hydrology featuring integrated saltwater and freshwater systems with zones for managing future tidal swings and conservation activities. A variety of systems are provided for mosquito mitigation as mosquito vector propagation is a consequence of increased temperatures, precipitation and world population.

Performance Standards

Hot Pond:
Located at the top of the geothermal gradient, the Hot Pond facilitates the stripping of heat from the systems. Solar bubblers and fountains increase the interaction between the water and the air further contributing to the dispersal of heat in the system. The addition of moisture and heat in the soil and in the atmosphere allows for the creation of a lush and near tropical looking environment that is created by vegetation types that withstand the colder climate when needed, but are also responsive atypical conditions that are present because of the geothermal system.

Program Pond:
The program pond utilizes the byproduct as well as the infrastructure while also creating program opportunities depending on the season. When used as heat sink during the cooling cycle, the pond water is heated to comfortable temperature ideal for the integrated Olympic-size natural swimming pool. During the winter the heat pump infrastructure can be co-opted and used to circulate coolant that will allow for the creation of a community skating rink.

Bio Filter:
The Bio Filter captures stormwater from the adjacent development. Depending on the relationship to the hot pond and the heat pump system it may also serve as a heat sink on the upper fresh water end of the gradient. Fresh water riparian edge planting strip out nutrients and sediment as water flows into the upper pool. Emergent and submergent plants also convert excess nutrients out of the water. An intermediate berm planted with the distinct bald cypress and other salt tolerant plants serve as a threshold

between the fresh and saline environments that lets water seep through the soil and ultimately into the salt mash channel.

Salt Marsh Channel:
The salt marsh channel allows for the polished and cooled water from the upper portions of the hydrological system to flow into the harbor. The salt marsh channel also creates an enriched habitat and a resilient landscape that helps to absorb energy from the water side. The terraced landscape system not only cleans the water from the landward side but also cleans the water brought onto the side via tidal flow.

Crib Works Field:
In order to enrich the current condition of the mud flats and provide habitat we are proposing a series of crib works that will alter the hydrological gradient causing sediment to drop out of the water column and form a series of tidal landforms. As sea level changes the cribs can be expanded further to keep up with the change in the water surface elevation. The structures and forms work to dissipate wave energy during coastal storm events adding an additional level of protection for the point.

Breaking the Mosquito Vector:
Current engineering practices as well the evolution and subsequent outbreak of mosquito born illnesses have required that people consider how to live with water and control the reproductive vector or the mosquito. There are three major ways in which the cycle can be broken: Biological, Mechanical, and Chemical. While it is anticipated that all three mechanism will get utilized in the future, this design allows for the co-opting of mechanical mechanisms used for cooling like solar bubblers and solar fountains for the destruction of egg flotillas early on in the mosquito life cycle.
The creation of the habit that supports predatory behavior is also a critical component from the larval phase through the mature and breeding phases. Fish, frogs, birds and bats can all consume large portions of the mosquito stock thus dramatically reducing interactions between birds, horses and humans that can cause the outbreak of such illnesses as Eastern Equine Encephalitis and West Nile Virus. During the transitional period or during abnormal outbreaks, targeted use of species and specific pesticides could also be uses to control the vector. Given the ecological benefit to the newly design living environment, it would be more beneficial to weight the approach toward mechanical and biological control mechanisms.

Hybridized Hydrology
The hydrological system of the Morrissey Corridor is multifaceted. The system integrates district heating and cooling, community programming, stormwater polishing and habitat enhancement. The Hot Pond and the Program pools strip heat from the geothermal system, while the bio filters clean the district stormwater and create a buffer between fresh and saltwater environs while allowing the cooled water seep into the salt marsh system. The daily tides reinforce the salt marsh regime that serves to protect the land at that zone and clean the harbor.

Coastal Perimeter Edges

Thematic Zones consisting of: Health & Fitness Park; Relaxation and Meditation Park; Energy Garden; and Knowledge Park.

INTERNAL ECO-SYSTEM

The interior zones of the Columbia Point peninsula features resilient linkages connected to the PFMS. A Central Food Production Axis contains a Community Greenhouse, Emergency Shelter, and Aquaculture Park.

Mixed-Use Zone Energy and Water

The EcOlympic Village explores concepts of water and energy together to create efficiencies and new ways of using these resources. Rooftop photovoltaic generates power supply for individual building heat pumps, which use the earth to source heating and cooling needs within the "Urban Core" context. Collected district stormwater "wets" the surrounding soil to increase thermal conductivity, improving heating and cooling while minimizing energy from fossil fuel sources. Roof water and treated "grey" water from sinks and showers is captured before it is wasted to underground sewers. This captured water is used to supply irrigation and increase the park vegetation's ability to cool through evapotranspiration. Rainwater is used to supply water to toilets, and heat is absorbed from the internal holding tanks through the greywater capture process. This minimizes water heating needs in the summer, and is used to heat sidewalks in the winter, reducing salt needs to improve quality of runoff. These actions together reduce water pollution, water consumption, and energy use.

RESILIENCE DIVIDEND

To ensure cities comprehend, conceptualize, finance and plan the infrastructure needs of tomorrow, a change in mind-set is required. The following steps serve as a preliminary guide to attaining these goals.

1. Avoid reacting only to the last disaster, and instead anticipate future threats and changes. However, it is important to recognize that no matter how much we plan and predict major disruptions, infrastructure failure is sometimes unavoidable given the increasing severity of stresses and pressures to our systems.
2. Move from failsafe to failing safely. Build a mechanism for infrastructure to fail safely in order to minimize disruption that can ripple across systems. Resilient systems can be layered with redundant fortification and absorption systems to counter future sea level rise and storm surge. Another method is by controlling regional electrical failure. By utilizing smart-grid technology, it can decouple and delink parts of the electrical grid during future outages. In addition, local utility companies can install smart-switch technology which can isolate areas where disruption occurs and limit widespread failure.

3. Expand expectations of the sources of funding for infrastructure. Traditionally, infrastructure has been often viewed as government's responsibility. However, the resilience of local business is also intertwined with the resilience of the community, so the private sector has a clear interest and responsibility to participate in this endeavor.

To attract more private-sector capital, consider developing initiatives such as those used in Chicago, Washington, Oregon and British Columbia that established 'Infrastructure Banks' and 'Infrastructure Exchange' to implement a partnership of government, community, business and non-profit groups. To better integrate infrastructure projects for public good with the needs of the private sector, a new form of public-private partnership can be created to help package portfolios of investments. With these methods, infrastructure investments can achieve multiple wins, defining the 'Resiliency Dividend'.

With a team supported by leading architecture, engineering, legal and financing firms, cities will be able to use public resources more efficiently to leverage private investments in resilient infrastructure. Thus, financing, planning and implementing solutions that help people city and neighborhood systems rebound more quickly from disaster, can help spur economic development, job creation, environmental sustainability, and social cohesion between adverse climate change events.

TRANSIT SYSTEMS

MBTA Railway, Vehicular and Pedestrian System

By transforming energy to move people, the Massachusetts Skyway presents a bold infrastructure solution to power new methods of transit. The Skyway is composed three levels of transportation and three levels of energy generation: a refurbished commuter rail system, an inbound and outbound elevated light rail, and an inbound and outbound high-occupancy vehicle / zero-emissions tollway. These transportation systems are supported both structurally and electrically by textured solar panels along the tollway, wind turbines and their spire supports, and trains retrofitted with regenerative braking systems. The commuter rail follows similar pathways as today's route, but is elevated above the surface, allowing for new connections to Morrissey Boulevard and protecting the new systems from high water and snowfall conditions in the future.

The new elevated light rail eliminates track flooding concerns and creates a reliable, resilient connection between Boston's South Station and the bourgeoning new communities at the Seaport and South Boston waterfront. The new light rail begins at Braintree Station and replaces red line service with express service to the new Savin Hill Skypark Station, which also receives local red line service from Ashmont/Mattapan and Quincy Adams, transforming the existing Savin Hill Station, JFK/UMASS Station and ground level tracks between these two stations to an exciting destination retail and commuter hub. This new retail zone creates opportunities for non-fare revenue for the MBTA both at the Savin Hill Skypark and JFK/UMASS stations, along with the existing land previously occupied by at-grade track, pairing long-term lease revenue along with electrical generation and toll collection from the new HOV lanes to fund the project's capital expenses.

Redesigned as a Tollway, the elevated passenger vehicle HOV route replaces the existing HOV lane with tolls applied on a graduated scale: 2+ HOV passenger vehicles pay a standard fare, 3+ HOV passenger vehicles a reduced fare, and 4+ passenger vehicles "free to ride". RMV-registered zero-emissions vehicles, powered by electricity or alternative fuels, are also "free to ride".

By 2030, only zero-emissions traffic is allowed, with the previous gas-powered graduated HOV toll fares applied for 2+ and 3+ zero-emissions vehicles. By 2050, the Skyway HOV transforms into a designated "safe driverless route", where technology of the future evolves existing driverless technologies into coordinated mass transit caravans with controlled access points. This vision leverages the advantage of driverless car's reaction-time traffic reducing abilities, with controlled, and safe access ramps at I-93 near Exit 6, Route 3 near Exit 17, JFK/UMASS station, Boston Conference and Exhibition Center. This allows drivers to change over from driver control to technology control for the remainder of their trip.

Morrissey Boulevard, once a sea of pavement and dangerous intersections, further supports alternative methods of transportation by providing local bus and trolley connections, as well as new bicycle and pedestrian throughways. Together, the Skyway and reinvented Morrissey Boulevard work to change traditional infrastructure in tiered, multifaceted ways to conquer our collective transportation and energy challenges of the future.

If recent disasters, from Hurricanes to Nor'easters has a lining, it's not silver, but gray, green and blue, the colors of new infrastructure that must be anticipated, built and maintained in order to withstand future end-of -century sea level rise and storm surge.