“On the long peninsula that separates New York Bay from Newark Bay, there is, among other things, a red house by an open field, in which lives the king of kite-flyers. Everyone in Bayonne, the town which covers this peninsula, knows the red house by the open field; for scarcely a day passes, winter or summer, that kites are not seen sailing above this spot—sometimes a solitary "hurricane flyer," when the wind is sweeping in strong from the ocean; sometimes a tandem string of seven or eight six-footers, each one fastened to the main line by its separate cord.”


This project draws its inspiration from the formless fabric of the “wind sock” that indexes the direction of a weather condition that is otherwise invisible to aviators. The idea of the wind sock shaped up and billowing is coupled with an age old obsession of humankind, to fly, to be air-borne and lately, to harvest the potent energy of the wind using high altitude kites. Given the fragile nature of the site, we decided to focus on the air as well as create ground structures that could float in-between the network of engineered systems and highlight the dramatic topography of the landfill/estuary.

SITE STATEMENT:

The Fresh Kills site, given its location and natural attributes provides us with an opportunity to design a new type of park. One that preserves the wetlands of Staten Island and also takes into consideration the cultural and economic challenges faced by the surrounding neighborhoods and the city at large.

The grassy mounds of the Park, constructed from the garbage of New York City, present both prosaic and ephemeral possibilities. Our project explores the “land art generator” vision of a destination renewable energy farm, but also values this land as an asset to the neighborhood. Following up on the report put together by Plan NYC, we would like to introduce a complementary program on this site- that of an indoor produce farm.

To make a connection with the commercial area, the Staten Island mall on the east, we choose to locate our project on the East Park peninsula. Based on the topography, the East Park will be split programmatically along its north-south ridge with two different types of activities and two types of energy parks planned along the east and west slopes. Our two part intervention will generate both solar and wind based energy.

Facing the urban edge, and cascading downhill towards Richmond Avenue, will be a series of large greenhouses that provide a year-round supply of fruits and vegetables. We call these the “Fresh Houses”.

The Fresh Houses are supported on spread footings and enclosed in a semi transparent PV glass structure. These constellations of Fresh Houses will generate enough electricity to power 1200 homes per year.

The second part of the project consists of wind harvesting Glider kites, spaced upon the site, at carefully calibrated distances. These kites move upward to a distance of a thousand feet and generate adequate energy to power the installation of the tandem sock kites as well as the Fresh-houses. These work horses form the focal point of a dynamic arrangement of the different components of this project as they weave their way through this intricate landfill site. Tethered to these main kites, are a radial array of smaller ‘sock’ kites that work in tandem to generate a moving, pulsating, canopy on the banks of Main Creek. This mobile canopy is both a moniker of the wind and the sun as it traces ever changing shadows on the ground. It also highlights the terrain of the mound, which is to be maintained as a natural meadow with meandering dirt paths.
ENERGY CONCEPT:

There are two sources of renewable energy being generated on this site. We used a fairly conservative analysis to show the amount of energy being generated overall. The first, and main source, is the solar energy being generated by deploying PV panels in the skin of the Fresh Houses. We have opted to use a semi-transparent glass PV technology where the cells are sandwiched between two pieces of glass and the areas between the cells are completely transparent.

18.6 W/sq ft (p.v. performance) X 38500 sq ft (p.v area) X 50% (inefficiency)  
= 358 MW (Total per house)

358 MW X 84 Fresh houses = 30072 MW ÷ 25 MW per home per year  
= 1200 homes per year

The second source is the wind-power, harnessed by a paraglider high altitude kite. This technology is being tested by a series of scientists around the world and has been shown to have great potential. Flying over 1 mile above the ground, these kites can run a generator up to 100KW. Unlike conventional wind turbines which are located typically at 350 ft elevations, the wind at these altitudes are relatively stable. We calculated a 50% efficiency that is 50KWH on average per kite.

50 KWH X 24 hrs. X 365 days = 438 W per year/ per kite

The tandem sock kites provide a certain momentum but also detract from the energy of the main kite. We estimate that the main kite powers the mobile sculpture of the tandem kites and also the energy to run the green houses. As the research on this technology advances, it will become possible to install new kites. This park can be seen as a testing ground for these air borne innovations.

SYSTEM COMPONENTS:

1. SUPER KITE
   A 500 sq foot Paraglider kite that generates energy during its ascent. The kite follows the direction of the wind and flies in a figure of eight pulsating motion. Following the rose diagram (which would need to be re-evaluated given the higher altitudes), the kite can reach up to a 1000 feet in altitude. It is then reeled back by the tether and this causes a partial loss of energy. The net-gain however, is enough to maintain a 100 Watt generator running at ground level.

2. MAIN TETHER CABLE
   Made of a high tension polyethylene rope, this transmits the kite’s motion to the ground level. It also holds the sub tandem kite cables and automated kite controls.

3. GENERATOR MOUND
   Ground station that houses the generator and the rotary winch. This 10’ high chamber at the center of the kite cavalcade is covered with earth and blended back into the terrain.

4. TANDEM WINCH
   Light metal infrastructure that supports the winch for each series of tandem kites. These are arrayed in the northwest and southern directions- in keeping with the main wind currents in the NYC area.

5. TANDEM ‘SOCK’ KITES
   Move up/ down and also radially, being pulled along by the central kite, from 20 feet to 200 feet in elevation.
6. “FRESH” HOUSE
A climate controlled greenhouse to grow fruit and vegetables. The current proposal allows for 30 acres of planting. The soil within these houses and their sloped profile allows for different types of plants and trees to be cultivated. The greenhouse sits directly upon the soil of the landfill- it has an open ground connection. The whole is engineered as a 180 foot long metal planter. The fresh houses are also the main source of energy generation on this project. Although we have chosen by the nature of the design scheme, not to optimize their orientation and profile, (they form rather an association with the circle of kites) with a selective placement of photovoltaic’s, each greenhouse can generate 358MW of power per year.

7. PHOTOVOLTAIC CELLS
These are sandwiched in clear panels in the solar array of Fresh house envelopes. The pvs are on the south sun facing side- the rest of the panels are glass. The semi-transparent PV’s allow for a maximum of sunlight to enter the interior while collecting solar energy year round.

8. COMPRESSED GARBAGE
All the structures, sit on shallow spread footings- there is a minimum fill up of earth to cover these footings. At no point do any of our structures penetrate the barrier protection.

9. GAS PIPES & VENTS
All our structures are carefully positioned between the network of gas outlets and vents. Our decision to follow the slope and work radially allowed us to navigate carefully between the multiple points of access required on this site.

10. CIRCULATION
Ties in to existing/proposed circulation with some new “meander” paths.