

Carbon Sequestration Research Proposal for Restoring Vashon Island Center Forest Borrow Pit

Borrow Pit History

The borrow pit adjacent to Island Center Forest (ICF), the transfer station and closed landfill on Vashon Island, occupies land owned by King County (KC). During the years of landfill operations, soil was removed (borrowed) from the area and used as daily cover for the landfill, resulting in a bowl-shaped pit about 5 acres in size. Repeated attempts to revegetate the borrow site have been unsuccessful mainly because the removal of top-and sub-soil has left a “dead zone” that cannot support healthy vegetation. KC Parks and the Friends of ICF wish to reforest the borrow pit so that it blends in with the adjacent forestland, both aesthetically and ecologically.

Mitigating climate change with soil amendments

Despite mitigation efforts underway to reduce carbon emissions, projections suggest that emissions will continue to rise over the next 50 years to the point where atmospheric CO₂ targets are unlikely to be met with emission reductions (mitigation) alone. Scientific opinion now suggests that the CO₂ targets can only be reached by “scrubbing” CO₂ from the atmosphere and storing it for a lengthy period (more than 30 years) of time. Given that the atmospheric and oceanic carbon sinks are very nearly saturated, only two significant sinks remain: deep geologic formations and the soil/vegetation sink.

Soil/vegetation restoration affords the best and most accessible opportunity to store or “sequester” carbon. Because most of the soils that have been exposed to agriculture, forestry, and development have been degraded, their carbon stores tend to be very low. Soil restoration improves the ability of these soils to capture and store carbon but in order to recover soil structure and function, and “kick-start” the process of carbon storage, organic amendments must be used to rebuild the soil. When organic amendments are used to restore soils, there are rapid increases in carbon in soil and vegetation. The borrow pit provides an opportunity to contribute to carbon sequestration research and at the same time, improve soil health, water quality and rebuild resilience in forests on Vashon Island.

Restoration plan

In order for soils to effectively store carbon and for the establishment of trees and other native forest vegetation to be successful on the borrow pit site, enhancements to soil quality are necessary. Organic residuals (composts) are recommended for, and have been quite successful at, restoring such drastically disturbed land. Composts build soils by adding organic matter and plant nutrients, improving soil structure, reducing the potential for erosion and helping hold water for plants to use. Using compost for restoration of the borrow pit gives KC an opportunity to evaluate use of local organic residuals to enhance carbon sequestration. The plan for the borrow pit restoration begins with demonstration plots, where organic amendments can be compared, followed by development of a restoration plan for the entire site, making use of the information gleaned from the test plots.

The borrow pit restoration project has two phases:

- **Phase I - Soil improvement demonstration** plots - compost mixes using KC organic residuals will be used to restore plots and allow study of improvements to ecosystem function and acceleration of soil carbon accumulation. The research will compare different compost mixes and tree species to determine the most appropriate restoration of the entire site.
- **Phase II – Improve full site** — Using information and recommendations based on the demonstration plot results, and input from Friends of ICF, the plan is to re-contour the site, amend the soils with compost and plant trees and native vegetation to blend into the existing ICF

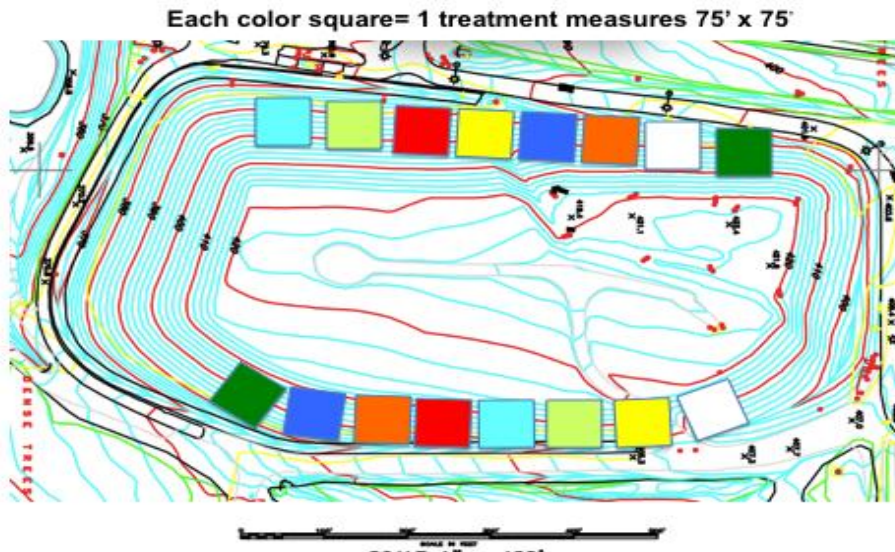
site as the site matures. This will transform unproductive land into useful habitat for the public and wildlife.

Research summary:

A research team from the University of Washington, College of Forest Resources, will conduct field trials at the Vashon borrow pit. The primary focus of the study will be to evaluate carbon storage potential and evaluate the potential for N₂O emissions when organic amendments are used. A secondary objective will be to evaluate vegetation establishment.

Large-scale plots with two replicates of each compost mix will be used. Plots will be 75 x 75 feet with a 10-foot border between each plot. Test plots will be located on opposite sides of the pit – one set of plots next to the forested area and another in the open exposure next to the transfer station fenceline. The mixes will be applied by spreading with a front-end loader and incorporated into the surface soil over half of each plot area.

For the first season, a sterile grass mixture will be seeded into the test plots. Following the first growing season, a variety of tree seedlings, including Douglas-fir, will be planted. Other species will be determined in cooperation with Friends of ICF. Growth rate, tree height and mortality will be the variables used to assess treatment success. Samples will be collected during plot establishment and tested for total carbon, total nitrogen and N₂O emissions. Grass yield, percent cover, changes in soil physical properties, soil bulk density and water infiltration rate will be measured from each half of each plot periodically after plant establishment.



Project Facts:

Are these compost mixtures safe? Yes, these mixtures will be composted to meet state requirements for unrestricted use as a soil conditioner. These composts can be purchased by homeowners and landscapers for all types of landscaping projects. A new, coarser-textured compost (using wood chips rather than sawdust) will be made for testing as a reclamation blend for use on very large or heavily degraded sites. The compost will be made by a local company with decades of composting experience.

Will there be noticeable odors? With stable composts there may be a slight earthy, musty odor after application but there should be no odor after a few days.

Will there be increased traffic? There will be additional truck traffic for a few days when the compost mixtures are being delivered to the borrow pit. Trucks will access the site through the Transfer Station.

How will public access to the site be affected? The existing trail along the rim of the borrow pit will remain open during normal hours. Signage will be used on the site to encourage appropriate site viewing.

Will groundwater be affected by this proposal? That is unlikely. Adding compost amendments to soil actually reduces runoff, erosion, and leaching by increasing the soil's water holding ability, acting much like a sponge. The high carbon to nitrogen ratio of composts acts to bind nutrients such as nitrogen and release them slowly for plant uptake. Furthermore, the borrow pit is bedded on Vashon till, a relatively impervious blend of clay, silt and gravel, and is not located within a groundwater alert area.

Who is sponsoring and supporting these projects? As part of King County's Climate Strategy a collaborative team has been formed to identify disturbed lands within King County that could benefit from reclamation efforts. The goal would be to amend these degraded soils and promote revegetation by using KC organic residuals to increase carbon storage and soil health. This team is composed of members from the Department of Natural Resources and Parks, Department of Transportation, Department of Development & Environmental Services and University of Washington researchers. Additionally each specific proposal will include local sponsors and community stakeholders.

Timeline:

- April 2009 – conduct public meetings, finalize research proposal, start compost mixes
- Aug 2009 – establish plots, apply compost mixes, sample plots
- Oct 2009 – plant grass seed
- Jan 2010 – plant trees, monitor growth
- Nov 2010 – submit first year research monitoring report, continuing monitoring site
- April 2012 – create site design for final restoration plan
- July 2012 – grade/contour site, apply compost
- Sept 2012 – submit final research monitoring report
- Nov 2012 – plant trees on entire site, continuing monitoring site

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