
Environmental Enhancement Projects for Delaware's Coastal Zone



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Proceedings of the Delaware Coastal Zone Environmental Enhancement Project Identification Workshop

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Introduction

This document contains initial descriptions for 67 potential Environmental Enhancement projects that may be considered by applicants for Delaware Coastal Zone permits. These descriptions were developed by a broad group of stakeholders during a one-day workshop held in Newark, DE on April 12, 2000. The highly structured workshop was designed to maximize the input from stakeholders and to document their input for use in the Coastal Zone Permit process.

These Coastal Zone Enhancement Project descriptions are intended for use by Coastal Zone Permit applicants. They provide insight into the range of potential “offsets” that would be expectable to many of the stakeholders in the wise use of Delaware’s Coastal Zone. This catalog of potential projects should serve as a useful tool to help applicants identify project that improve the health of the coastal zone or may simply provide “food for thought” regarding the range and types of projects that should be considered.

These Enhancement Project descriptions are only conceptual descriptions that CZA applicants may desire to develop into detailed “offsets” at their discretion. They are in no way intended to limit the range of projects that applicants may consider for improving the quality of the coastal zone. It is hoped that many more innovative ideas regarding the improvement of Delaware’s Coastal Zone will continue to be developed to augment this initial set over time.

Getting to the Workshop

For many years the Coastal Zone Act of 1972 went without regulations to aid in its implementation. After many attempts to have regulations adopted, the efforts of a broad-based stakeholder group were finally successful in May of 1999. This stakeholder group worked many long months to develop a consensus position that formed the foundation of the newly adopted regulations.

One of the cornerstones of this consensus effort was the idea of “more than offsetting” any negative environmental impacts that Coastal Zone projects may have. These “environmental enhancement” projects should relate back to the Goals for the Coastal Zone adopted by DNREC in January of 2000. Preferably, enhancement projects will be directly related to the nature of the negative impact. In all cases, the project must demonstratively improve environmental conditions.

At the request of Coastal Zone permit applicants and others, there developed a need to have a collection of ideas for potential enhancement projects. Because the regulations would be a change in the normal operations and the idea of “offsetting” was new to the permitting process, it was felt this would be a help to all involved. A committee of staff from various Divisions in DNREC undertook an initial effort. This first round of work was necessary because the regulations were in place and applications were being received. The permits could not wait for a larger workshop.

Building on this initial effort a large workshop that included members of the original consensus group, potential permit applicants, state and federal environmental and land management agencies, non-government environmental groups, environmental consultants, and academia. This wide-ranging group would develop descriptions of potential enhancement projects based on the four environmental goals for the Coastal Zone.

Workshop Process

Building on the work of the Environmental Indicators Technical Advisory Committee (EITAC), workshop participants began by reviewing the descriptions of Issues for the Coastal Zone. Once reviewed, the development of development potential solutions to these issues was the goal for the day.

An initial plenary session reviewed the work of the EITAC and DNREC's progress in implementing their recommendations. DNREC's progress on implementing the Regulations was also reviewed. The group then split into breakouts by the four Coastal Zone environmental goals:

***Air Quality:** Improve air quality, which directly or indirectly affects all forms of life within the Coastal Zone.*

***Water Quality:** Improve water quality and quantity, which directly or indirectly affects all forms of life within the Coastal Zone.*

***Habitat/Land Cover:** Protect the mosaic of land cover in the Coastal Zone, including upland, wetland, shoreline, and aquatic areas, to ensure a healthy ecosystem. Encourage appropriate land use and land cover.*

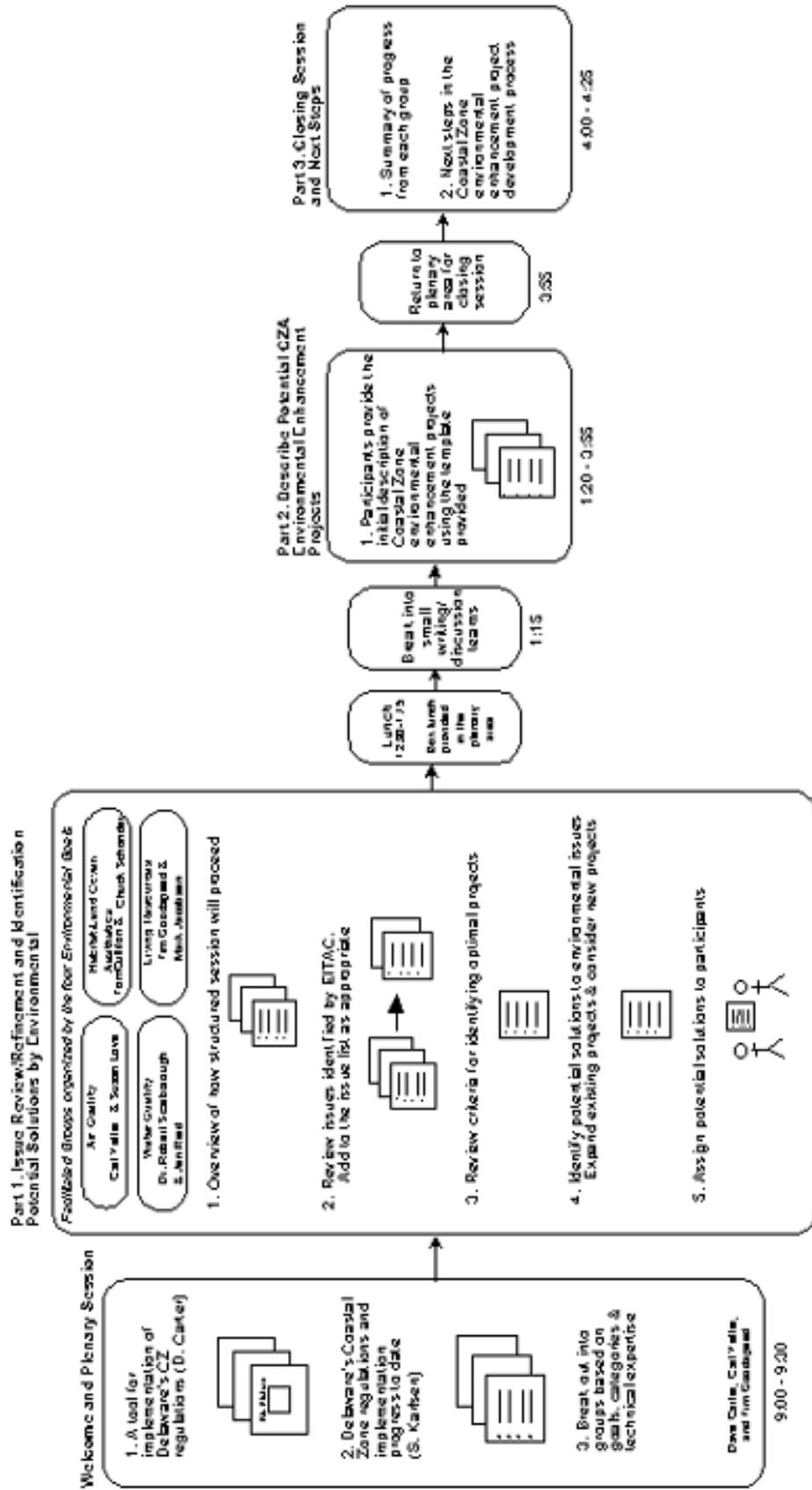
***Living Resources:** Preserve and maintain healthy native animal and plant populations, or biodiversity, in the Coastal Zone. Preserve and improve the ability of native populations to live and thrive in the Coastal Zone.*

In the breakouts, each group reviewed the issues that were developed by the EITAC for that Goal. Issues are considered those things that may keep the goal from being met. Participants looked over a packet of potential enhancement projects that were developed by a group within DNREC. The final activity before lunch was to have the groups brainstorm their own ideas for potential enhancements.

Many groups chose to take a short break and bring their lunch back to the workroom and proceed to the next phase of the workshop. Members of the groups, in pairs or individually, picked from the list of potential projects those that they felt able to provide more detail about. Participants were given a 4-page worksheet to help them structure their thoughts and ideas.

An edited collection of those ideas is presented in the following section.

Delaware Coastal Zone Environmental Enhancement: Identification Workshop



DE06 1412000

About these “potential” projects

The following Coastal Zone Act (CZA) Enhancement Proposals are nothing more than basic concepts. These concepts are designed to demonstrate to the affected or regulated facility managers what options they have in designing enhancement proposals as part of a CZA Permit application. These concepts are designed mainly for relatively small enhancement project needs.

Most of the enhancement proposal are intentionally not equated, or linked to any amount of new emissions to the Coastal Zone. It is the responsibility of the applicant to “clearly and demonstrably more than offset” their new emissions to the Coastal Zone. The applicant should first try to use “in-the-box” emission reductions. For example, reduce their present, or some other facility’s present stack emissions, more than the applicant’s new emissions. Such reductions are very quantifiable and therefore defensible by the applicant.

However, DNREC will also recognize these “out-of-the-box” enhancement proposal options. The applicant must make one or more of these enhancement projects more than commensurate (more than just offsetting) to their new pollution. Using just one concept to an extreme degree (reforestation of 200 acres instead of just 50) could do this; or using a set of several “out-of-the-box” concepts as a package.

In addition, the concepts are just that, *concepts*. The applicant will need to work out the details of designing the formal proposal and best defining how it will improve the environment more than

the new emissions are harming the environment. *The burden is totally on the applicant.* The use of these enhancement concepts does not automatically imply or infer DNREC’s acceptance of the Enhancement Proposal. If the Secretary accepts the Enhancement Proposal, and later grants the Permit to the applicant, the Enhancement Proposal will be a special condition to the CZA Permit. Failing to conduct the Permit Enhancement Project by the applicant or subsequent owners of the facility may be grounds for revoking the CZA Permit.

Project Number	Potential Enhancement Projects	Coastal Zone Goals			
		Air Quality	Water Quality	Habitat/Land Cover	Living Resources
1	Sponsorship of Incentive Program for Clean Burning Fuels	*			
2	Trash Districts	*	*		
3	Implement Atmospheric Nitrogen Disposition Controls on Feedlots	*	*		
4	Community Plant-a-Tree Project	*	*	*	
5	Additional Treatment of Existing Sources	*	*		
6	Convert Brownfield(s) to Open Space	*		*	
7	Develop an Environmental Project Clearinghouse	*	*	*	*
8	Environmental Indicator Data Acquisitions	*	*	*	*
9	Trading Emissions with Sources Outside the Coastal Zone (example: Midwest)	*			
10	Small Engine/Boat Motor Replacement Incentive Program	*			
11	Targeted Landowner Contact Program			*	
12	Assistance to Local Governments (Counties and Municipalities)			*	
13	Wildlife Habitat Restoration along with Species Reintroduction			*	*
14	Subaqueous Habitat Restoration		*	*	*
15	Farmland BMP Work		*	*	*
16	Shoreline Restoration		*	*	*
17	Sub-Division Redesign Assistance			*	
18	Brownfields Preliminary Assessments and Trading		*	*	
19	Riparian Buffers in Upland Areas		*	*	*
20	Habitat Restoration			*	

Project Number	Potential Enhancement Projects	Coastal Zone Goals			
		Air Quality	Water Quality	Habitat/Land Cover	Living Resources
21	Baseline Studies re: Habitat Indicators			*	*
22	Wetlands Mitigation Ranking - Preservation, Enhancement, Restoration, Creation		*	*	*
23	Phragmites Control/Management			*	*
24	Purchase of Development Rights / Conservation Easements		*	*	*
25	Oyster reef restoration		*	*	*
26	Fish Passage				*
27	Expand forest cover			*	*
28	Impoundment enhancements			*	*
29	Noxious weed control			*	*
30	Restore Submerged Aquatic Vegetation		*	*	*
31	Reduce/Eliminate Combined sewer overflows		*		*
32	Restore habitat for or populations of Rare, Threatened, and Endangered Species.			*	*
33	Animal invasive species control.				*
34	Funding alternative dredged material disposal practices.		*	*	*
35	Remediation of contaminated sediment		*	*	*
36	Public access to natural areas.			*	*
37	Increase Public Education Outreach				*
38	Reestablish/Create Additional Potential Heronry			*	*
39	Septic Maintenance Program		*		
40	Providing Additional Treatment Levels for Existing Wastewater Treatment Facilities		*		

Project Number	Potential Enhancement Projects	Coastal Zone Goals			
		Air Quality	Water Quality	Habitat/Land Cover	Living Resources
41	Regional Wastewater to Replace Domestic and Failing Septic Systems		*		
42	Converting impervious lands to pervious		*	*	*
43	Funding for Accidental Release Cleanup Resources		*		
44	Remediate Hazardous Waste Sites		*	*	
45	Reforestation of Uplands		*	*	
46	Dredge Spoil Dewatering, Collection and Treatment		*		
47	Remediation of Ag sites		*		
48	Ocean Outfall of Wastewater in Coastal Towns and Cities		*		*
49	Water Conservation Landscaping (SMARTYARDS)		*		
50	Combined Sewer Overflow Abatement		*		
51	Removal of Abandoned Dams		*	*	
52	Artificial Reef Construction		*	*	*
53	Stormwater Management		*		
54	Nutrient Management Planning and Implementation Cost-Share		*		
55	State Assistance for Environmental Audits for Small Companies	*	*	*	*
56	Reduce Cooling Water Flow		*		*
57	Reclaim abandoned property in New Castle, DE		*	*	
58	Land Application of Wastewater		*		
59	Added Value Products of Poultry Manure		*		
60	Shellfish Hatchery		*		*

Project Number	Potential Enhancement Projects	Coastal Zone Goals			
		Air Quality	Water Quality	Habitat/Land Cover	Living Resources
61	Alternative fuel vehicles	*			
62	Construction of in-line passive nutrient treatment systems		*	*	
63	Corporate mentoring	*	*	*	*
64	Installing water conservation systems, rehab.		*		
65	Mandatory employee vanpooling	*			
66	Solid waste recycling center		*	*	

Potential Environmental Enhancement Projects

PROJECT NUMBER	1
PROJECT NAME	Sponsorship of Incentive Program for Clean Burning Fuels
PROJECT PURPOSE	<p>The combustion of fuels to heat boilers for various commercial purposes is a major source of air pollution in the Coastal Zone. This is particularly important since all counties in Delaware are non-attainment area for the ozone air quality standard. This non-attainment is currently related only to the smog pre cursors: nitrogen and sulfur emissions, but is likely to be non-attainment for fine particulate matter in the near future. This again is primarily a product of combustion and petroleum refining.</p> <ol style="list-style-type: none"> 1) Reducing smog precursors, i.e., N, S 2) Reduce emissions of fine particulate matter
DESCRIPTION	<p>Permittees would identify consumers of low-quality fuels (e.g. oil & high sulfur oil and wood) and sponsor program to assist conversions to natural gas (including running new gas lines to areas) or low sulfur fuel oil. These consumers could be commercial, industrial, institutional, manufacturing or residential consumers, based upon which combination could be shown to result in the greatest impact of air pollutants of concern (see above).</p> <p>Permitted recipients of conversion assistance must commit to maintain the improvement until reauthorization of an air quality permit at which time the improvement would become a part of the permit. Residential and non-permitted recipients must commit for at least 10 years. The permittee would be required to track this.</p>
INSTITUTIONAL ROLES	<p>Air Quality Permittees DNREC Air & Waste DNREC Secretary's Office oil/gas supply companies building contractors associations</p>
WHERE IMPLEMENTED	In the coastal zone of all three counties, primarily targeted towards New Castle and Kent.
PRELIMINARY COST ESTIMATE	Uncertain - \$2,000/home, \$3,000/commercial/retail, significantly more to run new gas line

WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?

A very accurate quantification of air quality improvement could be calculated based on the past fuel type and volume used in preceding years. This could be easily compared to the applicant's proposed new emissions to quantify a "clear and demonstrable" offset and environmental gain in the Coastal Zone.

WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT

No items listed.

PROJECT NUMBER	2
PROJECT NAME	Trash Districts
PROJECT PURPOSE	Reduce open burning of residential trash.
DESCRIPTION	Provide reduced rate or free residential trash collection to a community where several residents are know to burn trash provided landowners agree to use service and stop burning.
INSTITUTIONAL ROLES	DAWM Enforcement & AQM DAWM Solid and Hazardous Waste Management Branch Delaware Solid Waste Authority appropriate County/Municipal government departments
WHERE IMPLEMENTED	All three counties, especially in the Coastal Zone. NCC- below canal only. Would need to work with DAWM Enforcement to identify open burning problem areas.
PRELIMINARY COST ESTIMATE	Annual Operation and Maintenance is estimated to be \$10,000 to 50,000, but would be dependent on the size of the community being served.
WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?	Measure - Reduced open burning complaints/tickets in community Benefits - Reduced emissions
WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT	There are Legal concerns to be addressed. In particular, establishing removal contracts with residents.

PROJECT NUMBER	3
PROJECT NAME	Implement Atmospheric Nitrogen Deposition Controls on Feedlots.
PROJECT PURPOSE	Reduce atmospheric nitrogen levels to the atmosphere from animal feedlots.
DESCRIPTION	Concentrated animal feedlots are often significant sources of atmospheric nitrogen locally. Ammonia from animal waste enters the immediate local atmosphere/air (and quickly converts to ?) and rapidly deposits back onto the nearby land and water. These nitrogen deposits are either immediate loads to a waterbody or are latent loads to a waterbody after rainfall. Feedlots that are contained (poultry houses, cattle/cow dairy barns, other animal sheds) could be outfitted with pollution control devices such as wet scrubbers or carbon filters to capture the nitrogen before it leaves the housing unit. Currently the atmospheric loads are not regulated and this would reduce N loads.
INSTITUTIONAL ROLES	DNREC/DAWM-Air Quality & monitoring Department of Agriculture-identify sites where controls would be installed Conservation Districts-identify same and work with grower 319/6217 Programs NRCS/U.S. Department of Agriculture
WHERE IMPLEMENTED	We (DNREC) know where these sources are. Particularly in the Coastal and Inland Bays areas of Kent and Sussex Counties. We could use existing technology that is applied to other stationary sources. Some estimate that N loads from the airsheds of the Inland Bays & Delaware Bay are above 20%.
PRELIMINARY COST ESTIMATE	One-Time and Annual Operation and Maintenance costs should each be less than \$10,000 per facility.

WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?

Reduction of N to atmosphere from animal feedlots could set up atmospheric deposition samples near the areas & measure. Also, compare to existing monitoring network. Hopefully a "unit" that removes N could measure quantity removed.

WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT

There is the possibility that air emission permits would be needed.
Funding to buy or construct treatment systems and to measure effectiveness.
A disposal issue of what to do with N removed?

PROJECT NUMBER	4
PROJECT NAME	Community Plant-a-Tree Project
PROJECT PURPOSE	Sponsor community tree planting project to help reduce PM10 and increase carbon sequestration.
DESCRIPTION	By sponsoring a community tree planting project an applicant can offset increases in carbon and particulate matter.
INSTITUTIONAL ROLES	DNREC/DAWM DE Dept. of Agriculture, Forest Service
WHERE IMPLEMENTED	Implementation would be on a site-specific basis.
PRELIMINARY COST ESTIMATE	Cost dependent on # of trees needed to accomplish the decreases they are trying to achieve. One Time costs estimated \$10,000-50,000. There should be no Operation cost unless a minimum survival rate needs to be maintained.
WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?	Measurement is based on modeling or agreed to amounts of benefits (lower PM10) per tree & regular (yearly) checks to verify trees are surviving. Basically measurement is theoretical.
WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT	<ol style="list-style-type: none"> 1. Legal issues/review regarding tree give-aways & human efforts (possible injuries) in the planting. 2. Research to establish benefits/tree 3. Landowner permission for planting

PROJECT NUMBER	5
PROJECT NAME	Additional Treatment of Existing Sources
PROJECT PURPOSE	<p>There are many existing facilities that discharge treated wastewater into the State’s surface and ground water systems or emit pollutants to the air. These facilities are required to meet permit requirements regarding wastewater discharge or air emission. However, it is clear that the State’s environmental health will benefit from any load reductions from these facilities.</p> <p>Reduce loading of pollutants to air by replacing and/or modifying old plant components.</p>
DESCRIPTION	<p>Any reduction of pollutant loads from the existing facilities, above and beyond what is required under current regulations, are costly. Also, it is conceivable that the owners and operators of these facilities will be reluctant to invest additional capital for reducing pollutant loads. Therefore, it is recommended that Coastal Zone Offset be used as a funding source to provide additional treatment levels for the existing point sources of wastewater or air emission. In essence, the applicant would purchase pollution control equipment at another facility at a level, which clearly more than offsets the applicant’s new pollution load.</p> <p>If new process or modifying an existing process that would generate more emissions is proposed, an offset could be to replace or modify equipment/processes in another part of the plant (or another plant impacting the coastal zone) with the net result being an overall reduction in emissions. This could involve pollution prevention, and banking 50% of the pollution credits of a process line reduction or shutdown.</p> <p>Modifications to a plant outside of the coastal zone could be considered but the offset ratio should be greater than for modification of a plant within the coastal zone.</p>
INSTITUTIONAL ROLES	<p>Chemical Industry Council Chamber of Commerce DNREC/DAWM DEDO</p>
WHERE IMPLEMENTED	Anywhere in Delaware but because of air transport of pollutants, possibly out of CZ & out of state.

PRELIMINARY COST ESTIMATE

No cost estimate was given because costs will vary per project and amount of pollution to be offset.

WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?

This proposal allows for quantification of the environmental gain by estimating pollutant loads reduced as the result of improving treatment levels at the discharge plants or air emission sources. Comparisons can be made, by comparing before and after emission upgrading, thus insuring a defensible quantification of the offset.

Measure-Ambient air quality, acid deposition, TRI reductions, emissions inventory reductions, permit reporting & monitoring requirement

Benefit-Health benefits, WQ improvements, impacts on biota

WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT

Additional Air Quality permits.
Some way to make it enforceable (e.g. permit, M.O.U., contract)

PROJECT NUMBER	7
PROJECT NAME	Converting Brownfields to Open Space
PROJECT PURPOSE	Increase the recreational lands and improve aesthetics in the CZ. Utilize private for profit company/board to implement projects.
DESCRIPTION	Many acres of land existing in the coastal zone are remnants of passed industrial activities. These areas are owned by diverse entities such as public agencies, municipalities, private individuals and private companies. Because of financial limitations and perhaps liability issues, these industrial graveyards often called brownfields, sit idle or perhaps continue contaminating the environment. A for profit organization could be established to design clean up and restoration plans, obtain permits, negotiate partnerships, perhaps manage the lands (if not turned over to land management organizations), create financing plans that in general serve to clean up these grave yards and turn them into open space.
INSTITUTIONAL ROLES	DNREC-DFW DNREC-DPR Clean up design reviewed by DNREC-DAWM
WHERE IMPLEMENTED	Most brownfields are long the Delaware Bay in NCC and along the Christina River, although this project could potentially be conducted anywhere in the Coastal Zone.
PRELIMINARY COST ESTIMATE	Initial clean up would be expensive. (One-time cost \$100,000-500,000) Permits might be required. Long term maintenance would be low (mowing, on site manager). Operation and Maintenance \$10,000-50,000

WHAT ARE THE
ANTICIPATED
ENVIRONMENTAL
BENEFITS AND HOW
WILL THEY BE
MEASURED?

This project is significant because it can help with environmental justice issues.

WHAT IS NEEDED
UPFRONT TO
IMPLEMENT THIS
PROJECT

Need funding.
Landowner approval
Approval of clean up design
Permits if working in wetlands and potentially other permits as well.

PROJECT NUMBER	7
PROJECT NAME	Develop an environmental project clearinghouse.
PROJECT PURPOSE	To provide a medium for the exchange of environmental project concepts between industries, projects available for funding by another company seeking offset credits for a CZ project.
DESCRIPTION	<p>Develop a database of proposed air emissions either desired for a CZ project or available for funding by a company not having the technical ability to provide on-site offsets at their own plant.</p> <p>Possible implementation vehicles: through various trade organizations on a voluntary bases serving its membership or clients; located on a computer-based database system.</p>
INSTITUTIONAL ROLES	The database utility would/could be organized and provided by DNREC with input provided by various trade organizations, based on member/client input.
WHERE IMPLEMENTED	
PRELIMINARY COST ESTIMATE	<p>One-time - Database development, hardware, website creation, promotional/info literature and advertising. (\$10,000-50,000)</p> <p>Annual - Site/equipment maintenance (less than \$10,000)</p>
WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?	Promote funding of projects to enhance the air environment by generating CZ offsets.
WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT	<p>Assessment of interest for project listings.</p> <p>Legal-potential anti-trust, protection of funding company from liability.</p>

PROJECT NUMBER	8
PROJECT NAME	Environmental indicator data acquisitions.
PROJECT PURPOSE	Develop protocols and acquire basic data on Environmental Indicators for which data are non-existent or insufficient.
DESCRIPTION	<p>NOTE: As this possible project does not directly improve the Coastal Zone environment, a decision must be made as to its legitimacy versus regulatory requirements.</p> <p>NOTE: There are important E.I., identified in an earlier workshop, where data are not available, are not being collected, and where funding will not be available to permit data acquisition for several years or more.</p> <p>During the previous workshop, it was widely observed and accepted that Delaware does not monitor some of the most important E.I., especially some related to the "Living Resources" environmental goal. Examples include (1) identification and abundance trend information on key "indicator species", and (2) biodiversity index.</p> <p>In other words, while offsets need to convincingly lead to environmental improvement, "improvement" cannot be assessed for some of the most important E.I. since no measurement protocol or historical data are available ... nor does DNREC have funded programs to provide the needed information.</p> <p>In the early years of this new and innovative regulatory program, I believe that some offset proposals that would fill this data gap would be consistent with regulatory intent.</p> <p>NOTE: A variety of approaches can be conceived to fill these critical informational gaps, including for example:</p> <ul style="list-style-type: none">* direct effort on a specific EI, with funds, expert resources or both provided by the permit applicant* sponsorship of biannual technical symposia featuring invited expert speakers working on the same problem in other parts of the country* endowment of a university fellowship to develop and recommend protocols and develop beginning information on selected E.I. related to the permit application

**INSTITUTIONAL
ROLES**

1. Discuss with DNREC whether or not this approach is legitimate, considering regulatory requirements
2. Identify some E.I. which are needed, but where data are not available and no efforts are planned to get it
3. Consult with University of Delaware as to how they might assist with symposia or creation of endowed fellowship or some preferred alternative.
4. DNREC should identify three or four specific E.I. which might benefit from this approach

**WHERE
IMPLEMENTED**

Data collection may be needed anywhere in the Coastal Zone or other locations throughout the State.

**PRELIMINARY COST
ESTIMATE**

Assume the cost-equivalent of a full time person for one year, a half time person for the next three years and 0.1 person ongoing for as long as the permit is in effect. The applicant could provide either the person or the funds to support a person. Assume salary & benefits @ \$70k annually and equipment & expenses at 50% of S & B.

**WHAT ARE THE
ANTICIPATED
ENVIRONMENTAL
BENEFITS AND HOW
WILL THEY BE
MEASURED?**

- Benefit -
- * formal protocol established
 - * limited historical data identified
 - * Acquisition of current data (using protocol)
- Measurement -
- * formal acceptance of proposal by DNREC
 - * issuance by DNREC of new data; analysis including comments and trends
 - * Issuance of recommendation to modify the initial E.I. based on the new information if warranted.

**WHAT IS NEEDED
UPFRONT TO
IMPLEMENT THIS
PROJECT**

1. DNREC must determine whether or not this potential offset is consistent with regulations..legally..and should get reaction from members of the farmer CZPAC.
2. DNREC should identify several critical E.I.s, which will benefit the most by this approach.
3. For each E.I., DNREC should prepare a five or more year estimate of a.) Effort required, b.) cost (salary, benefits & other overhead, expenses)
4. Also DNREC needs to identify a contact person who can advise applicants on technical aspects of their offset proposed (i.e., a contact person expert in the E.I. under discussion)

PROJECT NUMBER	9
PROJECT NAME	Trading emissions with sources outside the Coastal Zone.
PROJECT PURPOSE	Improve quality of coastal zone environment by reducing emissions produced outside the zone that impact the zone. Pollutants covered: VOC, NO _x , SO ₂ , PM _{2.5}
DESCRIPTION	<p>Air emission of some contaminants can travel long distances before impacting the environment. In addition, some air quality problems in the Coastal Zone are the result of emissions from many sources, including some that are outside the Coastal Zone.</p> <p>Some examples include:</p> <ul style="list-style-type: none"> -Sulfur oxides/nitrogen oxides emitted from sources in the Midwest have an impact on acid & nutrient deposition in the Coastal Zone. -VOC/nitrogen oxides in the Midwest and possibly the Southeast can affect ozone concentrations in the Coastal Zone. <p>Proposed offset projects would need to specify amounts of emission reductions as well as modeled or predicted improvement that would result in the Coastal Zone.</p> <p>*Must be coordinated with projects on emission trading and project banking. Most of the same problems and principals will apply.</p>
INSTITUTIONAL ROLES	DNREC Other state environmental control agencies USEPA
WHERE IMPLEMENTED	Any site location that discharges upwind of Delaware's airshed.
PRELIMINARY COST ESTIMATE	This will vary widely depending on location, pollutant of concern, and amount of removal.

WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?

Improvement in air quality measured by:
-measured ambient pollutant concentration in Coastal Zone
-Predicted or modeled ambient pollutant concentration in Coastal Zone (this would require some means of verification/validation usually by direct monitoring), must be correlated with emissions reduction.
-measured pollutant concentrations depositing in Coastal Zone

Also need measurements of emissions at source to verify reduction.

WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT

1. Ability to verify and/or enforce emission reductions in states outside Delaware is problematic.
2. Amount of reductions needed from sources outside Coastal Zone may be very large in order to offset increased emissions inside zone.
3. Computer models used to calculate ambient improvements based on emission reductions may not yet exist or may be too inaccurate to be useful.

PROJECT NUMBER	10
PROJECT NAME	Small engine/boat motor replacement incentive program.
PROJECT PURPOSE	To reduce NOx, VOC, particulates and CO emissions by replacing small gasoline engines (lawn mowers, grass/hedge trimmers, etc.) with electric powered units. Replace 2-stroke boat engines with 4-stroke.
DESCRIPTION	An industry needing to offset an air pollution emission could offer incentives to local citizens, government agencies, and/or other private sector groups to replace their small gasoline powered units with electric powered units. Similar incentives could be offered to boaters for replacement of 2-stroke engines with 4-stroke units. The industry could buy the new units for give-aways or partially offset the price of the new units.
INSTITUTIONAL ROLES	<ol style="list-style-type: none"> 1. DNREC-Air Quality Management 2. Ozone Transport Commission (OTC) 3. Other states and local agencies (ex. California) may have similar programs 4. Office of Transportation and Air Quality (EPA) 5. Documents: 10/24/97 memo - Wilson - "Guidance on Incorporating Voluntary Mobile Source Emission Reductions in the S.I.P.", 3/94 - "Community Action Programs: Blueprint for Commercial Design"
WHERE IMPLEMENTED	<p>The small gasoline engines and 2-stroke boat engines are high emitters of pollutants. Anywhere that these items are in use could be potential sites.</p> <p>This project could be started with a pilot program replacing engines in the Division of Fish and Wildlife Enforcement Section.</p>
PRELIMINARY COST ESTIMATE	Costs will vary greatly depending on the amount of pollution to be offset.

WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?

Difficulties of the program are:
1) Quantifying emission reductions
2) Making reductions enforceable
3) Making reductions permanent

WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT

EPA, some states and local air pollution control agencies have developed similar programs. Some of these are "voluntary" where as Delaware's must be quantifiable, enforceable, and permanent. This will make the program difficult to implement initially and then track reductions on an ongoing basis.

PROJECT NUMBER	11
PROJECT NAME	Targeted landowner contact program
PROJECT PURPOSE	To improve land management on privately owned lands within the Coastal Zone through landowner education and technical assistance and to preserve ecologically significant lands/or scenic vistas in private ownership.
DESCRIPTION	Meet individually with all landowners in specifically defined areas within the Coastal Zone. (e.g., the Inland Bays watershed or shoreline, or riparian owners along the Indian River) Educate them on the environmentally sensitive features of their lands, ecologically sensitive land management, and legal techniques (and financial incentives) for preservation in private ownership (costs would be borne by permittees as an environmental offset).
INSTITUTIONAL ROLES	Consultation or contractual arrangements to conduct the project could be with NGOs with a conservancy aspect to their missions (the Nature Conservancy, Delaware Wild Lands, Inc., Delaware Nature Society) or land acquisition personnel of the DNREC-DPR or DFW, or the Department of Ag-Agricultural Lands Preservation Program or Delaware Forest Service.
WHERE IMPLEMENTED	Any portion of the State in the Coastal Zone. Done by DNS in New Castle County, landowner contact is most effective when it involves landowner peers with a trained land management or preservation specialist. The target geographic area should be well defined and the contact coverage comprehensive (every landowner treated the same). Teams of diverse peer volunteers, e.g., business people, farmers, fisherman, young parents - to accompany specialist are most easily assembled by private organizations (NGOs). Volunteer/lower rate legal consultation needed for conservation easements, gifts of land, etc.
PRELIMINARY COST ESTIMATE	Cost estimates highly variable according to size and duration of project/number of landowners to be contacted. Salaries would be largest item (\$40,000-50,000), travel expenses (\$10,000), miscellaneous supplies/printing (\$6,000),

WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?

Monitor - Response to contacts: constructive change in land management resulting in e.g., improved habitat, decreased runoff, improved water quality
Benefit - log of proceedings, inspection/revisit

Monitor - Land preservation
Benefits - number of acres of _____ (land cover type) permanently protected

Follow up contacts/cultivation of landowner attitudes, actions to obtain additional documentation of environmental improvements, habitat protection.

WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT

Research to select pilot geographic focus area, landowner info from public record, printed materials to explain program.

PROJECT NUMBER	12
PROJECT NAME	Assistance to Local Governments
PROJECT PURPOSE	Improve local government's ability to map/inventory/monitor/analyze activities in the Coastal Zone through the use of GIS.
DESCRIPTION	Industries within the Coastal Zone would provide funding (and technical assistance, if possible/necessary) to enable or enhance local governments use of GIS the Coastal Zone.
INSTITUTIONAL ROLES	DNREC, could provide technical assistance with the design, implementation, and maintenance (especially in terms of providing up-to-date data) of a GIS (or GIS enhancements).
WHERE IMPLEMENTED	Within the Coastal Zone or in the counties if land use activities impact the coastal zone.
PRELIMINARY COST ESTIMATE	Start-up and annual costs should each be less than \$10,000. If local governments don't have any GIS capabilities, start-up costs may exceed \$10k.
WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?	Local governments have land use authority within their respective jurisdictions. The utilization of GIS greatly enhances local governments land use decisions. Therefore, with respect to the Coastal Zone, the ability to map/inventory/monitor/analyze/etc., land use activities within the Coastal Zone or that have an impact on the Coastal Zone would be improved through the use of GIS.
WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT	Need inventory of local governments existing GIS capabilities.

PROJECT NUMBER	13
PROJECT NAME	Wildlife habitat restoration along with species reintroduction.
PROJECT PURPOSE	<ol style="list-style-type: none"> 1) Improve habitat for wildlife. 2) Reintroduction of lost species to a specific land area or region of the Coastal Zone.
DESCRIPTION	Find a specific degraded acreage that has lost wildlife due to the degradation of habitat-acquire through purchase or landowner permission to restore such acreage-then after restoration of the habitat reintroduce the lost species of that habitat (for example: Delmarva Fox Squirrel, could be waterfowl, Eagle, turtle, frog).
INSTITUTIONAL ROLES	<p>U.S. Fish & Wildlife Service DNREC – Fish and Wildlife, Parks and Recreation, Water Resources, Office of State Planning Coordination</p>
WHERE IMPLEMENTED	In wetland areas of the Coastal Zone and Inland Bays regions.
PRELIMINARY COST ESTIMATE	Cost would depend on the value of the wetlands, forest, etc.; to be restored - the size of the wetland, etc. - plus the cost of the reintroduction of a specific species; plus restoration materials (plants, trees, and soil).
WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?	<ol style="list-style-type: none"> 1) Improved habitat for all wildlife. 2) Providing a more diverse population of wildlife for areas where there has been a decline in diversity. 3) Healthy natural environment.
WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT	<p>Research Needs: How many wildlife species have declined in the Coastal Zone? What species have declined? In what specific areas of the Coastal Zone have they declined (name sites, areas, region)?</p> <p>Assessing amount of funds needed to purchase land (if necessary) - amount of funds for a study of the needs for restoration of the area and wildlife.</p>

PROJECT NUMBER	14
PROJECT NAME	Subaqueous habitat restoration
PROJECT PURPOSE	Restore damaged subaqueous lands back to native condition.
DESCRIPTION	<ol style="list-style-type: none"> 1. Identify subaqueous lands to be restored in CZ. 2. Identify problems with that area. 3. Remove pollution/irritant that caused degradation. 4. Create plan after science to bring area back w/native plantings & animal species. 5. Maintain. 6. Protect through enforcement by appropriate department. 7. Monitor water quality, spread of native plantings & increase in number of animal species inhabiting area.
INSTITUTIONAL ROLES	DNREC – Div. of Soil & Water, DE Coastal Programs, and Div. of Water Resources
WHERE IMPLEMENTED	Depending on where degraded subaqueous lands are identified - estuary, inland bays, channelized stream areas.
PRELIMINARY COST ESTIMATE	No estimate of cost given.
WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?	<p>Restored/improved habitat</p> <p>Return of native animal species</p> <p>Improved water quality</p> <p>Water quality protection</p>
WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT	<p>Additional permits depending on pollutant/stressor found.</p> <ul style="list-style-type: none"> -identify areas that need work -get permission to do work from landowner -scientific study of pollutant/stressor -identify plants & animals native to area -possible permits needed if hazardous materials found

PROJECT NUMBER	15
PROJECT NAME	Increasing the use of Agricultural Best Management Practices.
PROJECT PURPOSE	<p>Agriculture is a major land use activity within the State and contributes significantly to pollutant and nutrient loads that enter the State's surface and ground waters. Runoff from agricultural fields carries significant loads of nutrients and other pollutants and cause pollution of State's ponds, streams, and bays. The State has come under new court mandates to reduce non-point source pollution loadings. Runoff and drift of pesticides increases the exposure of non-target species to unhealthy conditions.</p> <ol style="list-style-type: none"> 1) Increase speed & quality of implementation of BMPs on farmland in critical areas throughout DE. 2) Reduce non-point pollution of nitrogen & phosphorus in critical areas in DE. 3) Have industry pay farmers to implement BMPs to reduce the distribution of pesticides into the environment, especially downwind drift due to aerial applications.
DESCRIPTION	<p>Although there are existing regulations and voluntary actions designed to control and reduce pollutant loads generated by agricultural activity, the poor water quality condition of many of our State's streams, lakes and estuaries indicate that additional work is needed to restore the health of our State's water resources. Most of these additional activities are currently voluntary and may not get implemented if public funding is not provided.</p> <p>Since public funding is limited to develop and implement additional Best Management Practices (BMPs), it is recommended that Coastal Zone Offsets be used as a funding source to develop and implement BMPs that are above and beyond the current regulatory requirements. Some of possible BMPs include development and implementation of nutrient management plans, establishment of wooded stream buffers, construction of artificial wetlands to capture and treat runoffs from agricultural lands, etc.</p> <ol style="list-style-type: none"> 1. Identify farms in critical areas of DE that need BMPs established/implemented. 2. Review and plan for best way to work with

- farmer/landowner to reduce non-point.
3. Establish nutrient management plan or strengthen existing one incorporating BMPs.
 4. Take certain edge land out of production as determined by plan - plant or establish riparian buffer areas or other techniques as they become available.
 5. Maintain these areas over time - monitor.
 6. Purchase land edges or purchase development rights or easements or rent those pieces of land each year

**INSTITUTIONAL
ROLES**

DNREC (AWM, DSWC)
Delaware Department of Agriculture
Farm Bureau
Department of Ag (State & Federal)
Nutrient Management Commission
University of Delaware
Farmland Preservation Foundation
Other technical groups that create management plans & provide planting expertise & plants

**WHERE
IMPLEMENTED**

Critical areas in CZ first, then in other critical areas of the State.

**PRELIMINARY COST
ESTIMATE**

No costs given but project phases as follows:

- establish or review existing nutrient management plan for farm
- take certain areas out of production - wetland, establish easement, purchase development rights, buy land
- study area for riparian buffer or other type BMP work & prepare planting plan
- plant area in plan
- maintain area - monitor

**WHAT ARE THE
ANTICIPATED
ENVIRONMENTAL
BENEFITS AND HOW
WILL THEY BE
MEASURED?**

This proposal allows for quantification of the environmental gain by considering pollutant and nutrient loads that will be reduced as the result of implementing the above BMPs.

- 1) Less pesticide reaching the Coastal Zone. These would be measured through soil sampling in the CZ and downwind of farms.
- 2) reduce phosphorus & nitrogen run-off from farm
- 3) quicker implementation of BMPs - get water quality improvements sooner
- 4) Create habitat along stream corridors, etc.
- 5) improve vistas
- 6) reduce erosion
- 7) put channelized streams back to natural feature

**WHAT IS NEEDED
UPFRONT TO
IMPLEMENT THIS
PROJECT**

- 1) Identify farms that qualify & are interested
- 2) Establish long term situation of edge land - will it be rented, bought easement, p & r?
- 3) Nutrient management plan
- 4) Identification of critical areas - (see letter from Secretary DiPasquale to President of Nutrient Management Commission late March 2000 for map.)

PROJECT NUMBER	16
PROJECT NAME	Shoreline Restoration
PROJECT PURPOSE	<p>Restore the beach/dune complex to coastal areas with the long-term goal of allowing natural coastal processes to continue. This can be accomplished by;</p> <ul style="list-style-type: none">• Removing ecologically/geologically negative shoreline stabilization structures, such as building bulkheads and "engineered" stabilization to improve habitat, water quality and aesthetics.• Restoring coastal features eroded by man induced activities with tidal flats, vegetated marshes, dunes or similar features that historically provided habitat, stabilized the shore and protected inland areas from flooding during storms.• Removal of existing structures along the coastline that are located so far seaward that they are affected during minor coastal storms. Design a plan that addresses retreat along the entire shoreline.• Protection of undeveloped land along the Delaware Bay shoreline between Prime Hook Beach and Slaughter Beach and between Slaughter Beach and S. Bowers Beach if currently privately owned.
DESCRIPTION	<p>Coastal areas altered by construction or changed use of the adjoining waterways have created erosional zones. Boat/ship wake increased current velocities and changed current patterns are frequent causes of this problem. This erosion results in habitat loss, sediment pollution and increased flooding/storm damage to inland areas. Applicants could propose studies to: identify such areas; design restorative measures, incorporating features such as tidal flats, beaches, vegetated marshes and dune systems along with removal or alteration of the causative structure or feature; and implementing the selected restorative measure. The restorative measure would replace lost habitat, stabilize the remaining existent habitat and aid in protecting inland areas from flooding, such projects who be applicable to coastal areas of New Castle, Kent and Sussex Counties.</p> <p>Funding could be provided to acquire ocean and bayfront properties that are currently subject to the effects of sea level rise & coastal storms. This would include removal of the existing structures and restoration of the dune in that area. Funding could also be supplied to the counties</p>

to allow them to change setback requirements for all ocean front properties. Currently property owners are required to maintain a setback of 20 or 30' from their front property lines. This should be reduced to 10 or 15'. Elevation or relocation of flood prone repetitive loss properties. Dealing with the elevation and relocation of repetitive loss properties one would work with DNREC as well as FEMA (Federal Emergency Management Agency).

Restoration of shoreline/beaches and tidal flats as well as dune replenishment. These projects could include a variety of techniques including:

Planting dune grass, removing riprap and other hardened shorelines, buying-out homeowners and removing structures to allow dune migration, and [placing suitable] dredged material to rebuild the dune/beach interface. Careful consideration will need to be given to coastal geomorphic processes and how these projects may impact them.

Efforts are currently underway by the Nature Conservancy, Delaware Wildlands, etc, to purchase undeveloped shorelines. This includes the beach and dune system along with some wetlands. Due to the demand for waterfront properties these parcels of land can be expensive. Enhancements should include funding (donations) to the above organizations for the purpose of purchasing these lands beginning with those located closer to access roads. Benefits would include land preservation and prevention of septic systems, which could lead to decreased water quality.

**INSTITUTIONAL
ROLES**

The DNREC Wetlands & Subaqueous Lands branch and Div. of Soil & Water Conservation must be consulted and permits will likely be needed.
The Divisions of Fish & Wildlife, Parks and Recreation should be consulted as they manage extensive lands in this area.
Federal - Fish & Wildlife, EPA, FEMA & USACE
University of Delaware Coastal Studies Department
County Planning Offices
Nature Conservancy
Delaware Wildlands
Other Land Preservation Organizations
Private landscaping or wetlands planting consulting firms that do work on these specialized restoration projects.

**WHERE
IMPLEMENTED**

Areas of coastal development that are prone to flooding, erosion or provide opportunity to restore natural shorelines. Specifically,

- Kent County Shoreline/Coast: Woodland Beach, Bowers Beach, Big Stone Beach, Kitts Hummock, Pickering Beach (for flooding concerns)
- Delaware Bay beaches: Broadkill - currently there are a few structures that have water under them during minor coastal storms; Big Stone Beach - this area should be restored to a natural shoreline.

Purchase land that is currently for sale and make offers to those land owners who haven't put their land on the market yet.

**PRELIMINARY COST
ESTIMATE**

Don't really know exact cost estimates. Would vary according to magnitude of project, machinery required, plant materials, hand labor vs. machine, etc.
\$100,000 – 2,000,000

One-time cost highly specific to the project. Annual costs, if successful, progressively less per year after implementation.

For flood or coastal hazard areas there is a site specific selection process - must be repetitive loss property FEMA match if applicable 75%/25% (property owner)
\$10,000-50,000 one-time \$50,100,000 annual

WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?

Benefit - improved aesthetics
Measure - somewhat subjective

Benefit - reduced run-off
Measure - water quality monitoring for nutrients, opacity, sedimentation in immediate area

Benefit - improved habitat
Measure - surveys, other observations

Benefit - shoreline stabilized
Measure - regular monitoring/landowner reporting to ascertain vegetation viability.

Stable shoreline - minimal erosion of installed system, minimal erosion of adjacent areas.
Benefits - Improved water quality, improved/expanded habitat, reduced flood/wave damage inland.

Once elevated or relocated flooding possibility drastically diminishes. Flood insurance rates decline. Good solid investment for all involved.

Removal of seaward structures could allow construction of a continuous dune that would provide flood protection to inland areas and allow additional shoreline migration & habitat. With a well-established dune system flooding of inland areas by overwash will be eliminated during minor storms.

Beaches (beach strand) provide important habitat for a variety of species including horseshoe crabs and shorebirds.
Measurement could include miles of beach/dune restored, miles of structure removed, width of dune/beach increased, and additional spawning/nesting occurrences.

Land preservation. These parcels of land will continue to provide a buffer to inland areas, which include wetlands, ag lands and wildlife areas. The dunes if left intact will continue to provide protection of inland waterways from flooding during coastal storms. Measurements will be available if the land is developed. At that point we'll see a decrease in water quality, loss of dunes and vegetation, loss of habitat and increase of public expenditure as a result of responding to clean up after coastal storms.

**WHAT IS NEEDED
UPFRONT TO
IMPLEMENT THIS
PROJECT**

Implementation is project specific. Candidate sites might be on the applicant's property, public property or another privately owned site. Research would be needed to establish cause and effects. Assessment of candidate sites and the proper technique would be needed. If not on the owner's property, contracts/easements would be needed. Permitting might include subaqueous lands, dredging 404.

- FEMA application process detail
- Available housemovers who want the work.
- Engineering for project money? Property owner match?
- Bid process/proposals for work (time constraints/money)
- If structures are to be relocated additional land area will need to be acquired.
- If structures are demolished then disposal options must be explored.

1) Characterize the beach/dune complex shoreline types throughout the State.

2) Identify restoration opportunities.

PROJECT NUMBER	17
PROJECT NAME	Sub-division redesign assistance
PROJECT PURPOSE	Redesign & re-subdivide un-built and partially built sub-developments to maximize open space and habitat preservation, avoid wetland destruction & other environmental impacts, and take advantage of modern conservation design concepts.
DESCRIPTION	Provide assistance (funding, technical &/or legal) to developers to encourage redesign of old, approved subdivisions that have not begun construction or for which only minimal construction has begun. Incorporate open space, recreation, clustering & other "modern" community design concepts.
INSTITUTIONAL ROLES	County & Municipal governments Office of State Planning & Coordination Urban Land Institute American Planning Association Builder's group Dev.& Real Estate Commission
WHERE IMPLEMENTED	This would be appropriate wherever lands are under development pressure.
PRELIMINARY COST ESTIMATE	\$100,001-\$500,000 This would be very dependent on the extent of redesign and number of projects funded.
WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?	Increased community function <ul style="list-style-type: none"> • trip reduction • public recreation Protection of existing habitat Incorporation of buffers Improved stormwater management
WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT	Research to identify candidate developments. Legal & Permits to re-subdivide. Landowner permission & cooperation. This may also involve buying or trading lots already purchased but not built upon. This will require lots of education.

PROJECT NUMBER	18
PROJECT NAME	Brownfields preliminary assessment and trading
PROJECT PURPOSE	To facilitate data gathering assessment of impacts of brownfield affecting the coastal zone & contributing watersheds. To facilitate remediation of properties contaminated with hazardous substances
DESCRIPTION	Permit applicant would fund (& conduct with DNREC oversight) a Brownfield Preliminary Assessment (BPA). Some ratio would need to be formulated (2:1 acreage, etc.). BPA are assessment and data-*** tools. They provide info on past uses and practices identify sources and receptors and evaluate risk to both human health and the environment. BF sites are within every watershed contributing to the Coastal Zone. BF tracts could be targeted pursuant to targeted growth/preservation areas as identified by SPO, county or municipal agencies. CZM permit applicants could offset by cleaning-up brownfield sites (DNREC designated). Some form of ratio would be used (100' shoreline: 1 acre BF or 1:2 acreage). Applicant could then redevelop or sell property (state would be provided first right of refusal). Contiguous parcels to BF sites may be included. BF sites are within every watershed and contributing waterbody.
INSTITUTIONAL ROLES	DNREC – SIRB Office of State Planning Coordination County & municipal land use administrators
WHERE IMPLEMENTED	No specific location given.
PRELIMINARY COST ESTIMATE	\$25,000 - \$75,000 BPA may be deemed equivalent to a Facility Evaluation (FE) or Remedial Investigation (RI). Work plan and sampling, along with oversight costs. Applicant would have to purchase property, investigate and remediate. \$100,000 - \$500,000 one-time costs with less than \$10,000 annual operation

WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?

Environmental data gathering & assessment as well as risk evaluation.

Benefits include remediation of contaminated sites, preservation of greenspace/deacceluation of **** and the attendant environmental benefits. Could be used for parks &/or greenways.

The benefit itself would be relatively quick, the trick is how much is it an offset - would likely depend on the investigation & remedy.

WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT

Access agreement would have to be negotiated & a consent order in place.

BF site owner would have to want to sell property. Legal ramification involved in consent order necessary to ensure remediation is properly conducted.

PROJECT NUMBER	19
PROJECT NAME	Riparian buffer / stream corridor management
PROJECT PURPOSE	<p>Preserve / restore / enhance riparian habitat along Delaware's waterways.</p> <p>In view of meeting Total Maximum Daily Loads (TMDLs) being established on many of these impaired segments of watercourses and significant advances in stream corridor Best Management Practices (BMPs), a potential offset could be to restore, mitigate and improve stream corridors. This type of offset, depending on BMPs selected, would eventually show demonstrable improvements in temperature, nutrient levels and decreased sediment loads. The overall water quality improvement would compensate for additional nutrient loadings from NPDES discharges.</p>
DESCRIPTION	<p>Dredging, filling and realignment, straightening and piping physically alter many of Delaware's streams and watercourses. As a result, water quality has been degraded due to factors such as temperature increases, sedimentation and nutrient concentrations. Often viewed as an urban and suburban issue. Delaware has nearly 3,500 miles of drainage networks that have similar water quality issues.</p> <p>In comparison to salt (tidal) marshes, which are fairly well protected, freshwater wetlands along upland streams are still being lost to development. The resulting increase in sediment and pollution run-off shows up as increased turbidity and pollutant concentrations in downstream coastal rivers, bays and estuaries. If landowners and developers building along these streams could be induced to incorporate vegetative riparian buffers in their plans, an improvement in water quality and habitat could be achieved.</p> <p>Stream restoration can also be done for a variety of goals, including the restoration or enhancements of aquatic and riparian habitat, providing functional recreational corridors in urban areas, and as well as to improve water quality. Stream restoration activities include recreation of meander bends to straightened channels, modification of channel geometry, planting banks with riparian vegetation, and creating open channels from streams formerly encased in underground culverts. A detailed restoration plan, involving a cross-disciplinary team of professionals, must</p>

include design criterion and projected goals. Each project will be unique in terms of the final results and benefits, depending on the major activity (e.g. agriculture, urban) within the watershed.

Streams and drainage ditches would be assessed using Rosgen methodologies. Waterways would be improved by incorporating meanders, rocks veins, restoring floodplains, creating wetland filters, etc. Streamside planting would be done to create habitat, hold soil in place, shade the waterways, etc. resulting in water quality improvements. Plantings would take into consideration the need for periodic maintenance of drainage ditches. In addition federal, state or local permits may be required for this type of project.

Removal of contaminated soil and fill if necessary;

removal of debris (concrete, timbers, pilings, etc.)

Replace with clean soils and design/install bioengineering with suitable plant species to provide bank stabilization and natural habitat.

Purchase or easement of areas that are not degraded.

Re-establish original (or appropriate) stream channel, bars, banks as needed including appropriate structures and formations that provide habitat for fish and other species using the stream and banks.

**INSTITUTIONAL
ROLES**

DNREC - Division of Soil and Water, Drainage Section and Sediment and Stormwater Program; assistance with implementation and permitting
DNREC - Division of Water Resources, Wetland Section and Watershed Assessment Section; identifying degraded waterways and permitting
DNREC - Division of Fish and Wildlife
DNREC - Div. of Parks and Recreation
DNREC-SIRB
USFWS
US Army Corps of Engineers
Conservation Districts
EPA

**WHERE
IMPLEMENTED**

Stream restoration is typically needed in the Piedmont area (dictated by relief and stream gradient). Drainage ditch restoration is primarily needed in Southern Kent and all of Sussex County. With respect to the Coastal Zone, initial focus should be targeted in the Inland Bays Basin (aside from being in the CZ, effort would be a perfect link to assist in meeting nutrient load reductions required by TMDL initiative).
Require developers to include riparian buffers for projects along upland streams. Monitor buffers with aerial photography or remote sensing techniques.
The Wilmington waterfront area is currently undergoing redevelopment. This project would improve the aesthetic and environmental quality of the redeveloped areas and protect undeveloped riparian areas from future development.

**PRELIMINARY COST
ESTIMATE**

This is primarily a one-time cost. The actual cost depends on the size, slope and value of the property. Cost of maintaining buffers should be minimal, if natural vegetation is used.
Costs dependent on length (acreage) of riparian zone restored and the cost of land.
\$500,000-2,000,000 one-time, \$10,000-50,000 annual
Cost is dependent upon size of project. Smaller project costs generally start at \$10,000 (minimum costs) and increases proportional to number of stream/ditch miles. Operations and Maintenance would be mainly needed to maintain drainage ditches ("dip outs" are not done annually so cost would be low if calculated on annual basis)

WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?

The monitoring of this type of offset over time will evaluate the effectiveness of the restoration. Parameters to consider are physical measurements, biological and chemical monitoring. Physical measurements will include the width, depth, and stream bank angle, riparian conditions and land use/land cover. Some of the physical and biological parameters to consider are temperature, turbidity, dissolved oxygen, pH, and toxins. While quantification of design parameters varies on this type of environmental project, there is an emerging body of science in terms of the improvement of water quality. For example, a grass buffer width of 16 feet along streams has shown a reduction in terms of phosphorus and nitrogen of over 50 percent (1997.)

- Habitat improvement for numerous wildlife species
- water quality improvement
- Aesthetic improvement for citizens visiting the Riverfront area.
- Monitoring by water/sediment chemical analysis; biological inventory (birds, etc.); vegetation/habitat quality parameters
- Measurement could include stream miles restored and documented increase in wildlife use.
- Nutrient Reduction (Monitor N and P)
- Sediment Reduction (Monitor total suspended solids)
- Habitat Creation and Increased Biodiversity (Population counts to measure increase/decrease in species and diversity of species)
- Pass new laws to specify (adequate setback) riparian buffers for any new construction.
- Provide incentives to new and old owners to include riparian buffers.

Steps:

1. Identify appropriate target species and habitat restoration needs for these species.
2. An assessment would be needed utilizing Rosgen methodologies to determine specific restoration needs for waterway under consideration.
3. Engineering design
4. If not working on state or federally owned lands, would entail a more detailed process for permission of landowners or purchase/easement agreements.
5. Determine contaminant concentrations in soil/sediments
6. Permits (Subaqueous Lands, Army Corps, etc.) would be needed for channel modifications, etc.

WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT

PROJECT NUMBER	20
PROJECT NAME	Habitat Restoration
PROJECT PURPOSE	To restore degraded habitat areas, especially near urban areas, e.g. Wilmington, New Castle, Delaware City. This restoration would provide needed "green" areas close to urban populations and help to restore the natural resource base and enhance the environment.
DESCRIPTION	An industry would agree to restore a "targeted" habitat area, say at a ratio of 2 to 1. For example, for 20-acre development, the industry would need to restore 40 acres of targeted habitat area. This could provide for the needed restoration of natural areas/systems close in to existing urban populations. Said populations, which have little or no easy access to natural areas. In addition, there would be a mutual improvement to habitat quality, e.g. water, flora, fauna, etc.
INSTITUTIONAL ROLES	DNREC, Cities of Wilmington, New Castle County, Delaware City, New Castle
WHERE IMPLEMENTED	This program would be mainly aimed at the developed portion of the coastal zone in New Castle county.
PRELIMINARY COST ESTIMATE	Projected costs are over \$2 Million one-time and \$500,000 to \$2 Million annually
WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?	Better water quality, increased biodiversity, improved vistas, and expanded public education opportunities for urban residents re: natural resources and the environment. The monitoring of these benefits would include water quality testing, biodiversity inventories, etc.
WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT	<ul style="list-style-type: none"> • Research - the identification of the "targeted" habitat areas. • Legal - The form & content of legal agreements between an industry and the effected governmental unit. • Additional Permits - wetlands permits, local ***/subdivision contracts, etc.

PROJECT NUMBER	21
PROJECT NAME	Baseline studies related to Habitat Indicators
PROJECT PURPOSE	To develop the needed baseline data regarding the current health/condition of the habitat/environment.
DESCRIPTION	Industry would contribute financially to fund the preparation of needed baseline studies. These studies could be "targeted" to specific data voids that need to be filled. Furthermore, the industry would also have to financially participate in the remedial measures as identified in the analysis of the baseline data. The industry's financial participation could be based on a pro rata share depending upon its impact on the environment.
INSTITUTIONAL ROLES	DNREC the specific industry
WHERE IMPLEMENTED	This program would be aimed at the entire coastal zone areas in Delaware.
PRELIMINARY COST ESTIMATE	One-time and annual costs estimated to be greater than \$2 Million.
WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?	Increased information about the quality of the habitat/environment. Can be measured by standard tests, e.g. water quality, biodiversity inventories, etc.
WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT	<ul style="list-style-type: none"> • Research - what types of data "voids" need to be filled. • Legal - the form & content of agreements between an industry and DNREC re: financial participation.

PROJECT NUMBER	22
PROJECT NAME	Wetland Mitigation Banking – preservation, enhancement, restoration, and creation
PROJECT PURPOSE	Encourage preservation and expansion of wetland acreage in Delaware. Tidal & freshwater wetlands. Improve water quality, expand habitat area, provide riparian and shoreline buffers.
DESCRIPTION	Conclude agreement with Phila. Dist. of Corps of Engineers to permit banks for mitigation of wetland impacts. Banking wetland encourages preservation/restoration/creation of large wetland tracts of greater ecological value than "postage stamp" wetlands required today. For purposes of the CZA wetland restoration/creation activities would be encouraged adjacent to riparian corridors and coastal tidal wetland areas. Banking was identified in *PPI regulatory summit in mid 90's as a priority. Off and on negotiations have taken place between the state and the Corps.
INSTITUTIONAL ROLES	DNREC James McCulley (wetlands biologist, designer) DeIDOT Corps of Engineers
WHERE IMPLEMENTED	"Service areas" of wetlands banks should be as large as possible (4-5 in Delaware watershed areas) to provide flexibility in their source of offsets.
PRELIMINARY COST ESTIMATE	Private sector will create banks, if mitigation credits are allowed by agreement with Corps.
WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?	Wetland restoration/creation requires monitoring (5-20 years) and permanent management. These would be required under Corps banking agreement and methodologies are well established.
WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT	Banking Agreement with the Army Corps of Engineers.

PROJECT NUMBER	23
PROJECT NAME	Phragmites control and management
PROJECT PURPOSE	To reduce the coverage of the invasive plant species phragmites, and to allow the re-establishment of native march plants. Phragmites has a tendency to form a monotype and reduce the plant diversity, and consequently, the wildlife diversity within an area.
DESCRIPTION	The "herbicide" and "burn" technique developed by the Delaware of Fish and Wildlife will be employed. Helicopter application of a glyphosate based herbicide will be done in late summer - early fall for at least three consecutive years. The dead phragmites stems will be burned off to improve conditions for the native vegetation. Areas for control will be on State Wildlife areas or state park management areas as specified by the respective regional wildlife biologist. After the three years, the amount of control and re-establishment of native plants will be evaluated. Spot spraying of herbicide and seeding of native vegetation may be necessary after the third year.
INSTITUTIONAL ROLES	The Delaware Division of Fish and Wildlife already has and operational phragmites control program on State Wildlife Areas and also administers a 50/50 cost-share program for control on private lands. Regional Wildlife Biologists with the Division set priorities for areas to be sprayed. The statewide phragmites control coordinator would be the initial contact for an applicant. Div. of Parks and Recreation also maintains numerous areas where these projects would be useful.
WHERE IMPLEMENTED	The Division of Fish and Wildlife administers wildlife areas throughout the Coastal Zone. They are all public multiple use areas. The most expansive concentration are located from the Smyrna River and north.
PRELIMINARY COST ESTIMATE	Herbicide spraying including helicopter and chemicals is approx. \$60/acre. Burning by helicopter is \$1,150/hour. Number of hours is highly variable but this is done only one year. Easy to do 200 acres in one hour. Require applicant to provide funding for at least 3 aerial applications. Seeding may or may not be necessary. Usually, natural establishment is sufficient.

WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?

Increase in plant diversity and consequent increase in wildlife (waterfowl, waterbirds, shorebirds, furbearers, and fish) diversity and populations. Increase in native species, drop in invasive species. Vegetation transects, similar to ones the Division used in the past, can be used to ascertain control and revegetation from a ground level. Aerial photography could also be used.

WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT

This activity can be done immediately. Spraying is done during the mid-August to mid-October time frame. The plant needs to be sprayed before it is burned. The Division of Fish and Wildlife performs their activities on a routine, annual basis. They already have certified pesticide applicators under contract. Burning requires a permit from the Div. of Air and Waste Management (DNREC)

PROJECT NUMBER	24
PROJECT NAME	Purchase of development rights and land conservation easements
PROJECT PURPOSE	To provide funding to purchase development rights, easements on key parcels of property to allow for restoration of degraded/impacted habitats in the short term protect essential habitat necessary for biodiversity or sustaining specific species at risk create green edges, buffers and vistas preserve farmsteads and historic sites in and near the coastal zone provide for long-term protection of the source area of public drinking water, both surface and ground sources
DESCRIPTION	Applicants would provide funds as offset that could be used to purchase less than fee simple interest in property. Some development rights or conservation easements that might be coupled with some form of restoration (e.g. riparian vegetation, reforestation) to allow for the enhancement of important habitats or previously impacted or degraded areas (e.g. riparian vegetation on agricultural lands to serve as buffers as well as provide habitat). This form of property might be more cost effective than outright fee-simple purchase of the property. Alternatively, the applicant might be allowed to purchase development rights to properties that are at imminent risk of permanent alteration, impact or degradation, but which currently provide very important tracts of habitat values or that offer significant opportunities for restoration or enhancement. Purchase of critical land or of conservation easements within delineated source water areas, which serve as sources of public drinking water. Only limited defined land-use allowed which maintain or enhance surface water runoff and ground water recharge. The farmsteads and historic sites may not be high priorities for open space or farmland preservation efforts but are worthy of protection because of their contribution to the character and history of the coastal zone.

**INSTITUTIONAL
ROLES**

Div. of Parks and Rec. Open Space Program
Dept. of Ag - Ag Land Preservation.
State Resource Agencies for assistance with design of
vegetation, reforestation aspects of project (e.g. Forestry,
DNREC, etc)
NGO's to assist with of property interests (TNC, Delaware
Wildlands, etc.)
DNREC - Division of Water Resources for maps of
delineated areas
DHSS/Division of Public Health - Office of Drinking
Water - public water quality information
WRA at UD - Technical information
County and Municipalities
Division of Historic and Cultural Affairs
UD Center for Historic Architecture and Design
Natural Heritage Program

**WHERE
IMPLEMENTED**

Less than fee simple acquisition projects could occur
almost anywhere the potential exists to restore habitat of
desired living resources. NOTE: it would be critical to
have completed and assessment of the priority types of
habitat needed to sustain particular species or maintain or
enhance overall biodiversity, such that the plan would
ensure the most cost effective acquisition projects.
For water supply protection: All watersheds supplying
surface water are located within the Piedmont Province
i.e. are outside of the Coastal Zone
Public water supply wells are located throughout the state
including within the coastal zone. Wellhead protection
areas are delineated under public funding sources and will
be completed by April 2003 for all systems.
Historic/Farmsteads: Special attention to properties in or
adjacent to the coastal zone in southern New Castle
County, Kent County and Northern Sussex County. The
Route 9 corridor is of particular interest. Areas identified
as State Resource Areas that are not otherwise protected.

PRELIMINARY COST ESTIMATE

Costs will be dependent on location, size of acquisition, and the terms of the easement or PDR that is executed with the landowner. Tax incentives may exist to promote conservation easements or PDRs voluntarily. Additional costs would include any restoration or enhancement efforts.

WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?

Living resources:

- Restoration of riparian forested or scrub shrub or other critical upland habitats necessary to support or sustain individual living resources or biodiversity.
- Improvements to water quality from increased acreage of riparian-forested cover and decrease in nutrient, sediment, and contaminant inputs to waterbodies.
- Long term protection and maintenance of existing important habitat.

Water Supply Protection:

- Water Runoff improvement
- Ground water recharge improvement
- Open space preservation
- Upland habitat improvement/maintenance (gw)
- Watershed preservation (sw)

Historic/Farmsteads:

- Will support state growth initiatives by helping to define growth areas
- Promote more compact development
- Enhances other open space initiatives
- Willing landowners will be needed to acquire fee simple interests in properties.
- Should have prioritized acquisition plan noted earlier to ensure cost efficient acquisition.
- Will need to have public/ private / NGO roles established to secure title and agree to implementation plans for acquired parcels.
- Provide for periodic inspections of land use occurring within purchased land/easement area
- Development of criteria to relate dollars/acres acquired to the offset.
- Refinement of historically significant and SRA designations

WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT

PROJECT NUMBER	25
PROJECT NAME	Oyster reef restoration
PROJECT PURPOSE	To restore oyster reefs at selected sites in Delaware Bay. Historically, oyster reefs provided shellfish for harvest, as well as special habitat for other marine species (crabs, fish).
DESCRIPTION	Oyster populations in Chesapeake and Delaware Bays have declined in recent years, because of overharvest, disease, sedimentation, and poor water quality. Healthy, productive oyster populations provide multiple benefits of harvestable shellfish, habitat for other species, and improving water clarity/quality through their filter feeding. Oyster reef restoration projects have been initiated in the Chesapeake by planting shell substrate at historical and or likely locations, planting oyster spat (juveniles) using native stock oysters. Sedimentation, water quality, and oyster growth/survival must be monitored at each site.
INSTITUTIONAL ROLES	DNREC - Fisheries Management Section probably has the lead role. Maryland DNR has similar projects in Chesapeake Bay, and New Jersey may have projects ongoing along the eastern shore of Delaware Bay. Individual watermen's groups, watershed groups, coastal communities, may be interested in participating. Rutgers Univ. Haskins Shellfish Lab and Univ. of DE may provide scientific expertise.
WHERE IMPLEMENTED	Historical sites of oyster reefs in Delaware Bay are probably known. Careful consideration of habitat parameters (salinity, currents, sedimentation, depth, and temperature) may identify sites most promising for restoration, or possibly identify new sites for establishing new reef habitat.
PRELIMINARY COST ESTIMATE	One-time: \$50,000 to \$100,000 Annual: less than \$10,000 Startup costs include identification of potential sites, selection of target sites, transport and planting of shell substrate, rearing of larval and juvenile oyster spat, etc. Operations/maintenance includes monitoring of oyster survival/growth, water quality, etc.

WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?

Historically, oyster populations in the Chesapeake filtered the entire volume of the bay in a matter of days, whereas current populations take months or years. Oysters, therefore, can have a profound effect on the overall water quality/clarity of Bay, affecting many other aspects of the ecosystem (SAV, Fishes, crustaceans, etc.) While Delaware Bay never had the same abundance of oysters, current populations are substantially declined and similar benefits could accrue from the restoration of local oyster reefs. Local groups (fishermen's associations, landowners, and coastal communities) may become active participants in these projects and provide much of the volunteer labor.

WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT

- Consult with other states (MD, NJ) to see what approaches have been successful.
- Assessment of historical reefs and populations.
- Identify candidate sites for restoration.
- Coordination between state DNREC-Fisheries and local/community groups
- Use each site as an opportunity for public involvement and education.

PROJECT NUMBER	26
PROJECT NAME	Fish passage
PROJECT PURPOSE	Expand habitat (foraging, breeding, and nursery) available to fish populations.
DESCRIPTION	Several techniques may be used depending upon site (removal, fish ladders) and the target species. Project could include supplementary stocking upstream to establish new spawning populations, etc.
INSTITUTIONAL ROLES	DNREC USFWS NOAA
WHERE IMPLEMENTED	In-stream action that could include earthmoving, regrading, filling, and placing structures. Supplemental projects could include funding hatcheries to obtain fish for restocking.
PRELIMINARY COST ESTIMATE	<ul style="list-style-type: none"> • Costs: design, Construction, monitoring, maintenance, interpretive signs, restocking • Cost determined by specific action, removal being the least expensive. Ladder costs are estimated by the rise (height).
WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?	Monitoring of fish movement (upstream and downstream) past a historic blockage, upstream extension (distance) utilized, and documented breeding above the obstruction.
WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT	<ol style="list-style-type: none"> 1. Stream blockage inventory and characterization. 2. Target species for each blockage. 3. Quantification of upstream habitat potentially available if blockage were removed or a ladder built. Include estimated production that would be realized.

PROJECT NUMBER	27
PROJECT NAME	Expand forest cover
PROJECT PURPOSE	<ul style="list-style-type: none"> • Increase forest area to decrease edge effects. • Reduce invasive species. • Increase biodiversity.
DESCRIPTION	<p>Improve and expand existing forest by planting appropriate species and/or removal of inappropriate species.</p> <p>NOTE: This can be applied to other terrestrial communities. Grassland communities are in particular need of attention. Note the low or declining numbers of grassland bird species (e.g. eastern meadowlark, grasshopper sparrow).</p>
INSTITUTIONAL ROLES	<p>DE Forest Service DNREC - Non-game biologist Amateur groups can help with monitoring (e.g. DOS for birds) DNREC - Division of Parks and Recreation</p>
WHERE IMPLEMENTED	Upland areas of the state.
PRELIMINARY COST ESTIMATE	<p>One-time cost: \$10,000-50,000 Annual cost: less than \$10,000</p>
WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?	<ul style="list-style-type: none"> • Increased forest area • Measure species diversity before and after planting. • Look at breeding bird (and herptofauna?) diversity, both numbers of pairs and species composition. • Look for decrease in numbers of brown-headed cowbirds in forest, look for increase in numbers of forest interior specialists. • One goal is for the area to change from a population sink to a population producer.
WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT	Landowner permission.

PROJECT NUMBER	28
PROJECT NAME	Impoundment enhancements
PROJECT PURPOSE	To improve the water management capabilities of brackish water impoundments located within the Coastal Zone on state wildlife areas by replacing water control structures and refurbishing dikes.
DESCRIPTION	Brackish water impoundments that serve a valuable wildlife habitat will have water control structures and dikes refurbished. The new structure will allow more precise water level control that will improve the area for native vegetation, fish populations wetlands and birds. Dikes that surround these areas are in need of constant maintenance due to deterioration from storms, muskrats, etc. Cable concrete is necessary in highly erodible areas of the dike and for serving as an emergency spillway. Regional wildlife biologists have a 'wish list' of construction projects that could be done in each area.
INSTITUTIONAL ROLES	The Division of fish and Wildlife's four regional biologists would be the primary contact.
WHERE IMPLEMENTED	The Division has impoundments in the Coastal Zone statewide. More specifically, they would be Augustine, Little Creek, Ted Harvey, and Assawoman wildlife areas. Which would be existing impoundments; no new impoundments would be created.
PRELIMINARY COST ESTIMATE	Water control structures may run anywhere from \$1,000-\$10,000. Dike work and cable concrete work can be provided by the Div. of Fish and Wildlife at any time.

WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?

Better water level management will result in an increased diversity of plant species. Varying water levels are attractive to waterfowl, waterbirds and shorebirds - the level can be tailored to each individual group. Water levels can be adjusted for a fish species also. Aerial photography can be used to document vegetation change/recovery. Regional Wildlife Biologists make routine checks in structures and dikes to determine integrity.

WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT

A State wetlands permit and Army Corps of Engineers permit will probably be needed. Since these are existing structures, the permit process is not 'Individual.' The Division secures these permits on a routine basis.

PROJECT NUMBER	29
PROJECT NAME	Noxious weed control
PROJECT PURPOSE	Contract out the noxious weed control activities in filter strips, buffers, old field habitat, CRP area, etc. that the Delaware Div. Fish and Wildlife maintains on state wildlife areas and those areas maintained by Div. of Parks and Recreation.
DESCRIPTION	In an effort to encourage old field habitat, wetland buffers, riparian zones, etc. the Division has been taking Agricultural ground out of production and allowing it to revert. Even in areas that are planted, many times state declared noxious weeds become established in these areas. By law, these plants must be controlled and most times herbicides are the only practical way to manage them. The limited staff of the Division, and the increasing amount of this type of habitat, is making it difficult to accomplish this task. Contracting some of the work would allow more land to be entered into CRP, CREP type programs to encourage the old field habitat.
INSTITUTIONAL ROLES	Regional wildlife biologists within the Division of Fish and Wildlife would supervise the contractor on what is to be sprayed and when. See also appropriate state park manager.
WHERE IMPLEMENTED	The Division administers 55,000 acres of State Wildlife areas. Many are in the Coastal Zone, some are not. The amount of old field habitat maintained is currently not known, but current management practices are causing this type of habitat to increase.
PRELIMINARY COST ESTIMATE	Depending on the herbicide, cost can vary from \$15-\$120 / acre.

WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?

The numbers of exotic and invasive species will decline. If the Division know that it can maintain these types of areas free of noxious weeds, regional wildlife biologists will opt to create more of this type of habitat. This will result in an increase in natural vegetation habitat and biodiversity.

Regional biologists and the Dept. of Agriculture (who monitors compliance with the Noxious Weed Law) would keep track of noxious weeds from year to year.

Contractors would have record of amount of herbicide sprayed.

WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT

Contractor would have to be a commercially certified pesticide applicator. Regional biologists would coordinate the activities on each individual area.

PROJECT NUMBER	30
PROJECT NAME	Restore submerged aquatic vegetation
PROJECT PURPOSE	To increase the quantity and quality of submerged aquatic vegetation in Delaware Bay, the Inland Bays, and their tributaries. Increased SAV will help to reduce suspended sediment and provide habitat for commercial and recreational species.
DESCRIPTION	<p>The focus of this effort is on the re-establishment and expansion of areas of SAV in coastal and estuarine waters. Ideal sites will be identified through the use of habitat suitability models in a GIS environment. Once identified, sites will be planted appropriate species of SAV, candidate species include eelgrass?</p> <p>Target areas should be those that result in the greater positive impacts. Plantings will have to be monitored for growth to determine whether the site is ultimately suitable for widespread reintroduction of SAV. Qualified individuals should do Plantings in a controlled manner.</p>
INSTITUTIONAL ROLES	It would seem that a university connection would be ideal to help with the modeling, site assessment, species selection, and monitoring work. DNREC would appear to be a logical lead for sponsoring the work. May need to involve Army Corps of Engineers? The Chesapeake Bay Program could provide some expertise in this area.
WHERE IMPLEMENTED	The exact sites would be determined by the assessment and modeling activities done through a GIS. It is probably safe to say that there are many estuarine areas that could benefit from reintroduction of SAV.
PRELIMINARY COST ESTIMATE	One-time cost: \$50,000 Annual cost: less than \$10,000 Annual costs would be for monitoring.

WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?

Probably the only ways to measure impacts would be :

- 1) The acreage of SAV
- 2) Sampling of animals (types/numbers) in the area inside and outside of the SAV beds. (Seining?)
- 3) Increase in water clarity measured by secchi disk.

WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT

best species and conditions
Assessment of the existing conditions [in planting areas]
Permits may be required by USACE

PROJECT NUMBER	31
PROJECT NAME	Reduce and/or eliminate combined sewer overflows
PROJECT PURPOSE	Reduce the number or eliminate combined sewer overflows discharging into the Delaware River System.
DESCRIPTION	<p>Provide funding for design/engineering/construction of improvements to waste water treatment facilities in Wilmington and elsewhere. Increase capacity and eliminate the need for CSOs, which result in bypassing of treatment during storm events.</p> <p>Studies by Delaware River Basin Commission have shown that PCBs and other contaminant loadings to the river are greatly increased through the discharge of CSOs.</p>
INSTITUTIONAL ROLES	<p>DRBC DNREC - Watershed Assessment, Div. of Water Resources</p>
WHERE IMPLEMENTED	Delaware estuary along the River and Bay coasts.
PRELIMINARY COST ESTIMATE	<p>One-time costs: more than \$2 million Annual costs: \$50,000 to \$100,000</p>
WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?	<p>Reduced contaminant loading [and therefore reduced] ecological impacts (fish, invertebrates, etc.) and human health impacts (currently many fish consumption advisories for PCBs)</p> <p>Improved water and sediment quality</p> <p>Monitoring - water chemistry, sediment chemistry, and fish tissue analysis.</p>
WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT	Research, assessment and other permits.

PROJECT NUMBER	32
PROJECT NAME	Restore habitat for or populations of Rare, Threatened, or Endangered species
PROJECT PURPOSE	To help recover species on the brink of extinction, with long-term objectives of stabilizing and 'delisting' species.
DESCRIPTION	This is a suite of projects that are developed in close cooperation with DNREC-Natural Heritage Program, Non-Game Program, and USFWS. Each project will be developed on a species and site specific basis. Examples could include establishing additional local populations, building nesting structures, restoring habitats, captive breeding and release programs. Participation in species survival plans including research, management, propagation, and release should be encouraged.
INSTITUTIONAL ROLES	DNREC USFWS
WHERE IMPLEMENTED	Location will depend upon the species involved.
PRELIMINARY COST ESTIMATE	
WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?	These projects will help the recovery of rare, threatened and endangered species. Depending upon the species and project, measurements may include: number of individuals or local populations added, amount of increased habitat, and/or change in listing status (improvement).
WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT	Prerequisites would include <ol style="list-style-type: none"> 1. establishment of recovery plans; 2. Development of projects/species that are in need of funding to aid in recovery.

PROJECT NUMBER	33
PROJECT NAME	Animal invasive species control
PROJECT PURPOSE	Reduce invasive species (land and water) and return areas to natural habitats. Increase native species habitat and biodiversity. Improve water quality.
DESCRIPTION	<p>1) Overall Invasives Control Strategy/Plan</p> <p>A) Identify and characterize</p> <ul style="list-style-type: none"> - extent - displaced species - other impacts <p>B) Prioritize</p> <ul style="list-style-type: none"> - species (invasive) - species (impacted) - locations/habitats to improve <p>C) Assess</p> <ul style="list-style-type: none"> - impacts with control action - progress of actions - techniques - new invasive species <p>2) Site Specific Actions</p> <p>A) Plan</p> <ul style="list-style-type: none"> - methods, timing, frequency, impacts, costs <p>B) Implement removal/control and restoration</p> <p>C) assess</p>
INSTITUTIONAL ROLES	DNREC, USFWS, Academia
WHERE IMPLEMENTED	Areas with populations affecting the coastal zone.
PRELIMINARY COST ESTIMATE	<p>There will be a generalized funding requirement for developing overall State "Strategy Plan"</p> <p>Specific funding requirements for implementing site specific "Actions"</p> <p>anywhere from \$10,000-\$2 million</p>

WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?

Using site-specific species surveys: increased natural habitats, reduced invasive species, and increased biodiversity.

- Improved water quality (secondary impact)
- other secondary impacts (e.g. reduced water intake clogging due to zebra mussel)

WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT

Assessment and planning needs as outlined in the “Description.”

PROJECT NUMBER	34
PROJECT NAME	Funding alternative dredged material disposal practices
PROJECT PURPOSE	Alleviate adverse impacts to habitat, water quality, and biodiversity; or produce beneficial impacts from dredged material disposal by funding alternative placement of dredged materials above and beyond the cost required to meet state or federal requirements to either further minimize adverse impacts or achieve beneficial impacts through beneficial use of the material.
DESCRIPTION	Applicants would provide funds to cover the cost differential between the costs of disposing of dredged materials consistent with state and federal law and the cost of placing the material to further lessen adverse impacts (e.g. upland disposal vs. open-water) or to create net positive environmental impacts (e.g. creating wetlands, beach and dune habitat, etc.).
INSTITUTIONAL ROLES	USACE, DNREC, CZM - for principal regulatory authority and assistance in design. NOAA/NMFS, USFWS and EPA regulatory, design implementation, and monitoring.
WHERE IMPLEMENTED	Alternative or beneficial disposal sites could be in water submerged lands, in bays or rivers for habitat creation, on Atlantic Coast or Delaware Bay beaches for beach renourishment, or uplands for impact mitigation.
PRELIMINARY COST ESTIMATE	Funds would be used to pay for the difference between proposed dredged material disposal costs and the cost of alternative disposal or beneficial use. Cost dependent on type of use or location of disposal.

WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?

Anticipated benefits: water quality benefits from reduced open water disposal (turbidity, DO); as well as benefits for benthic and SAV habitat. Increased intertidal habitat from wetland creation or beach replenishment (although it would be measured as a net benefit as there could be adverse impacts to benthic shallow water habitat from the creation).

1. The Corps and state would need to monitor water quality with assistance from the applicant.
2. The Corps, DNREC would monitor for habitat acreage and function as well as negative impacts to benthic shallow water habitat from other creation efforts.

WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT

1. Offsets would depend first on a dredging project producing dredged materials where the offset could allow for alternative placement of materials.
2. Offsets would in all cases require Corps permit and in many cases other state permits or certifications.
3. A long term dredged material management plan or beneficial use of dredged material plan would aid in identifying and prioritizing those beneficial use projects with the greatest "net benefit" so that applicants wouldn't have to do the assessment themselves.

PROJECT NUMBER	35
PROJECT NAME	Remediation of contaminated sediments
PROJECT PURPOSE	Dredging or removal of contaminated sediments from streams and other water bodies to prevent unacceptable impacts to aquatic life and humans.
DESCRIPTION	In areas where hazardous substances (metals, PCBs, pesticides, etc.) are contaminating sediments, and cleanup is not being addressed through some other program (e.g. Fed or state "Superfund") dredge or otherwise remove/stabilize the sediments.
INSTITUTIONAL ROLES	DNREC - DSWC, SIRB, Water Resources NOAA USFWS
WHERE IMPLEMENTED	Removal in specifically identified areas.
PRELIMINARY COST ESTIMATE	Dependent on the volume of contaminated sediment - estimate \$100-\$300 per cubic yard.
WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?	Reduced mortality and sublethal effects (reproduction, etc.) on benthic invertebrates and fish - also reduced negative impacts through the food chain (piscivorous birds, mammals, and humans). Monitoring - sediment toxicity tests population assessments of invertebrates and fish, fish tissue analysis.
WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT	<ul style="list-style-type: none"> • Identify contaminated areas • Dredging permits.

PROJECT NUMBER	36
PROJECT NAME	Public access to natural areas
PROJECT PURPOSE	To provide public access to natural areas while reducing disturbance and habitat degradation.
DESCRIPTION	Public access will include both non-consumptive and consumptive uses. Uses include birding, hiking, biking, fishing, hunting, clamming, photography, etc. Possible public access includes trails, boardwalks, observation platforms, and kiosks, boat access. The overall goal is to provide areas for the public to visit natural areas while keeping select areas "off limits" to disturbance.
INSTITUTIONAL ROLES	DNREC - Parks and Rec. DNREC - Fish and Wildlife USFWS - Bombay Hook and Prime Hook
WHERE IMPLEMENTED	Provide public access to selected natural areas along Delaware's Coastal Zone.
PRELIMINARY COST ESTIMATE	One-time cost: \$10,000-50,000 Annual cost: less than \$10,000 Project costs for public access will be dependent upon the method utilized to control the public disturbance - i.e. trails, boardwalks, birding platforms, etc.
WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?	<ul style="list-style-type: none"> • long term public support for preservation of natural resources • opportunities for public education
WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT	No prerequisites listed.

PROJECT NUMBER	37
PROJECT NAME	Increase public education and outreach
PROJECT PURPOSE	Enhance public awareness towards projects effecting Delaware's Coastal Zone.
DESCRIPTION	Delaware's citizens have a vested interest in the environment, especially the coastal zone. Through the Delaware Coastal Zone Act, offsets have been incorporated into the application of future projects, which will have direct effects on the natural resources. Increased public awareness as to how these offsets will "enhance" the current resources will lead to a greater understanding and overall acceptance.
INSTITUTIONAL ROLES	Department of Education DNREC - I & E, Parks & Recreation, Fish & Wildlife, Delaware Estuary Program Center for Inland Bays
WHERE IMPLEMENTED	Educational outreach efforts should focus on projects, which have direct impacts on Delaware's Coastal Zone.
PRELIMINARY COST ESTIMATE	Project cost for public outreach will be project dependent based on the form of outreach tools utilized, i.e., signs, brochures, reports, video, school curriculum, etc.
WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?	Greater understanding of Delaware's natural resources and the impacts caused by our use of them. This can be assessed through questionnaires, surveys, public outreach assessments, etc.
WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT	Coordination with educational organizations (DOE, DNREC, Inland Bays, Del. Estuary). Partnerships with other non-government agencies, TNC, DNS, DOS, Audubon, DE Wildlands.

PROJECT NUMBER	38
PROJECT NAME	Re-establish or create additional potential heronry
PROJECT PURPOSE	Provide additional/alternative colonial nesting sites for herons and egrets, as a way of helping to maintain the heron/egret "meta population".
DESCRIPTION	To restore and establish alternative rookery sites that could be used by heron and egret populations. Project would include 1) protecting the site and suitable buffer area; 2) managing/minimizing disturbance to birds; 3) restoration of appropriate tree structure; 4) (optional) encouraging bird use of the site.
INSTITUTIONAL ROLES	DNREC, USFWS, USACE
WHERE IMPLEMENTED	Isolated sites that could support sufficient forest habitat and would be free from disturbance.
PRELIMINARY COST ESTIMATE	No cost estimate given.
WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?	<p>Would potentially expand population of colonial birds and provide alternative site in case Pea Patch Island fails.</p> <p>Measures of benefit could include, 1) establishment of site and potential breeding pairs it would support; 2) documentation of bird use; 3) increase in coastal zone population of breeding pairs or production.</p>
WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT	<p>1) ID of potential sites</p> <p>2) Characterization of potential sites, target species and general restoration that would be needed in order to create a suitable site for a heronry.</p>

PROJECT NUMBER	39
PROJECT NAME	Septic tank maintenance program
PROJECT PURPOSE	<p>Septic tanks contribute to nitrate and bacterial contamination of groundwater and surface water. Poor septic tank maintenance contributes to septic tank failure.</p> <p>As new manufacturing occurs within Coastal Zone, allow that permit holder to more than offset their new environmental impact by eliminating holding tanks within the Inland Bays region. This could be done by them paying for the design and construction costs of alternative septic systems on lots that could accommodate those types of systems. Some of the cost would be paid by the homeowner at a rate comparable to the cost of pumping the holding tank out for five years. On other lots that will not accommodate alternative technology, the offset could be in the form of paying for the design or construction to connect the property to a central sewer system or to a community treatment system.</p>
DESCRIPTION	<p>Permanent holding tanks were included in the 1985 regulations to provide an alternative for property owners denied on-site septic systems on previously recorded lots if the soils were found unsuitable or if isolation distances could not be met. Temporary holding tanks were included to allow property owners in established sewer districts an alternative to installing on-site systems that would have to be abandoned when service became available. There are 278 holding tank permits, 244 permanent and thirty-four temporaries, issued in the Inland Bays/Atlantic Ocean Basin. Of the permits, 257 are issued within the basin's shellfish waters line. Approximately eighty-five tanks will be eliminated when Sussex County's Ocean View and Cedar Neck sewer becomes available; however, the number of temporary tanks issued in the two districts is expected to increase before this happens.</p> <p>The majority of the tanks now has structural problems and need to be replaced. Groundwater infiltration, greywater lines, illegal pumping and lack of maintenance are evident when evaluating annual pump-out records and performing inspections. Cottages on White's Creek, developed in 1989, consisting of eighty-eight lots, obtained forty-five permanent holding permits. An investigation in 1992</p>

revealed twenty-eight greywater violations in the development. In addition, three years of water consumption records for thirty-eight lots were compared with the pump-out records. Total water usage was calculated at 2,787,000 gallons with pump-out records accounting for 648,275 gallons transported to a wastewater treatment plant for proper disposal. The figures indicate that less than 24% of the wastewater generated was transported to the facility.

In some states and towns served by septic tanks the municipality or public utility has a septic tank maintenance program where septic tanks are inspected on a regular basis. Homeowners pay an annual utility charge or may be part of property taxes to cover cost of the program.

INSTITUTIONAL ROLES

DNREC, Sussex County, Kent County, New Castle County, Cooperative Extension

WHERE IMPLEMENTED

Some of the communities in the Inland Bays would be a good place to implement on an experimental basis. Given the structure of town and county government it may be difficult to implement. May implement an education program along with the maintenance program to homeowner civic associations.

PRELIMINARY COST ESTIMATE

Annual and one-time costs would both be \$100,000 to \$500,000 but would ultimately depend on the extent of the project.

WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?

- The termination of holding tanks in the Inland Bays region would benefit the environment. Quantification would be realized by calculating the “never pumped” tank water to other systems, or a sewer system.
- Should reduce the number of failed septic tanks. Bacteria contamination of groundwater and surface water in septic tank areas. Biological Monitoring

WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT

Waste management areas either through an utility or municipality would have to be created to implement a program. Would probably need something passed by county council.

PROJECT NUMBER	40
PROJECT NAME	Providing additional treatment levels for existing wastewater treatment facilities
PROJECT PURPOSE	There are many existing facilities that discharge treated wastewater into the State’s surface and ground water systems. These facilities are required to meet permit requirements regarding wastewater. However, it is clear that the State’s environmental health will benefit from any load reductions from these facilities. To reduce nutrients and pollution loads to state's surface waters through providing additional treatment of existing Wastewater treatment plants.
DESCRIPTION	Any reduction of pollutant loads from the existing facilities, above and beyond what is required under current regulations, are costly. Also, it is conceivable that the owners and operators of these facilities will be reluctant to invest additional capital for reducing pollutant loads. Therefore, it is recommended that Coastal Zone Offset be used as a funding source to provide additional treatment levels for the existing point sources of wastewater. In essence, the applicant would purchase pollution control equipment at another facility at a level, which clearly more than offsets the applicant’s new pollution load. By providing funding for additional treatment of existing wastewater treatment plants effluents, the nutrients and other pollutants loads to state's surface waters will be reduced.
INSTITUTIONAL ROLES	DNREC, EPA, Municipalities
WHERE IMPLEMENTED	It is preferred to be located within the coastal zone and within the watershed that the impact occurs.
PRELIMINARY COST ESTIMATE	Cost entirely dependent on amount and type of pollutant to be controlled.

WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?

This proposal allows for quantification of the environmental gain by estimating pollutant loads reduced as the result of improving treatment levels at the discharge plants. Comparisons can be made, by comparing before and after emission upgrading, thus insuring a defensible quantification of the offset.

1) Reduced nutrient and pollutants load. It can be measured through monitoring.

WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT

NPDES Permits

May require additional research to quantify the effectiveness of additional treatment levels and processes.

PROJECT NUMBER	41
PROJECT NAME	Regional wastewater to replace domestic and failing septic systems.
PROJECT PURPOSE	Eliminate nutrient and bacterial loads from domestic septic systems into ground water and ultimately surface water. Enhances the quality of ground water recharge at wastewater spray irrigation facility. Improve drinking water quality from aquifers.
DESCRIPTION	<p>Non-point source pollution (NPS) is a major form of water pollution in Delaware's Coastal Zone. Rapid and widespread development has necessitated the use of thousands of on-site septic tanks and cesspools. Such devices generate nutrient pollution of the ground water and waterways of the Coastal Zone and its tributaries upstream. Surface breakouts of failing on-site systems may cause health risks to the local area.</p> <p>Many areas of the Coastal Zone do not have central sewer and water supply. It is well known that traditional cesspools and gravity septic tanks place minimally treated wastewater into the surface aquifer water table. This contamination is both a health problem for the immediate neighborhood and an environmental problem since the dissolved nutrients will eventually reach open water where they are likely worsen summer eutrophication problems.</p> <p>A CZA Permit applicant discharging new water pollution, including stormwater runoff, to the Coastal Zone may consider the sewerage of clustered homes, preferably near waterways in the Coastal Zone. This would be done using a small diameter dedicated pipe allowing for little or no additional growth of the affected neighborhood. This wastewater should be connected to the nearest wastewater collection system with prior approval of the system's owner. The collection system needs to be designed and constructed to standards of the receiving system owner.</p> <p>Once complete, the applicant and the regional collection owner takes official ownership of the new system, the CZA Permit applicant is no longer responsible for operation or maintenance of the new wastewater collection system.</p>

**INSTITUTIONAL
ROLES**

DNREC/DWR
Counties
Municipalities
Engineer Consultants and Earth Science Consultants
US EPA

**WHERE
IMPLEMENTED**

Preferred to be within coastal zone or watersheds that drain into the coastal zone. Preferred in area with dense septic system (e.g. 1/2 acre lots with septic systems)

**PRELIMINARY COST
ESTIMATE**

One time costs \$500,000 to \$2 million
[assumed to be per project/neighborhood]

**WHAT ARE THE
ANTICIPATED
ENVIRONMENTAL
BENEFITS AND HOW
WILL THEY BE
MEASURED?**

The CZA Permit applicant may get its needed offset by eliminating an appropriate number of on-site wastewater disposal systems and decommissioning the on-site system at no cost to the owner.

Known areas of on-site failures, near waterways, will receive priority and therefore “count” more towards an acceptable offset than other areas.

1. Improved ground water quality where septic systems are eliminated - ground water monitoring.
2. Improved recharge to ground water in area at wastewater spray irrigation - ground water monitoring.
3. Improved surface water quality for nutrients and microbials - surface water quality monitoring.

**WHAT IS NEEDED
UPFRONT TO
IMPLEMENT THIS
PROJECT**

Local County approvals
DNREC W/W permits
Land use agreements or Land purchase
Design Development Report (DNREC review)

PROJECT NUMBER	42
PROJECT NAME	Converting impervious lands to pervious.
PROJECT PURPOSE	It will reduce stormwater runoffs, nutrient and sediment loads, and improve ground water recharge. It may result in improving habitat quality as well.
DESCRIPTION	<p>Urbanization and conversion of wooded lands to housing developments and commercial/industrial sites will reduce the available pervious lands within a watershed and will increase runoff and pollutants loads generated in the watershed. Studies have shown that when the percentage of impervious lands in a watershed exceeds the 15 – 20 percent threshold, water quality of the receiving streams degrades significantly.</p> <p>Since public funding is limited to address the above concern, it is recommended that Coastal Zone Offsets be used as a funding source to acquire open space and convert impervious lands to pervious by planting trees, grasses, or installing pervious paving material.</p>
INSTITUTIONAL ROLES	<p>DNREC/DSWC New Castle County Planning Department UD Water Resources Agency Private Consultants County Planning Commissions (office)</p>
WHERE IMPLEMENTED	Preferred to be within the coastal zone or the watershed feeding to the coastal zone that the impact will occur.
PRELIMINARY COST ESTIMATE	Cost depends on the magnitude of impact and the required acres for offset.

WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?

This proposal allows for quantification of the environmental gain by considering the volume of the overland runoff that will be reduced as the result of converting impervious land to pervious. Furthermore, considering concentration of various pollutants and nutrients in the runoff, it will be possible to quantify pollutant loads and nutrients that will be reduced as the result of this conversion.

1. Reduced stormwater runoffs. It can be measured through monitoring or appropriate modeling tools.
2. Reduces nutrient and sediment load. It can be measured through monitoring or appropriate modeling tools.
3. Increases ground water recharge. It can be measured through monitoring wells or appropriate modeling tools.
4. May improve habitat quality. It can be measured through surveys.

WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT

1. In New Caste County WRPA ordinance may require county approval.
2. May need pre-implementation monitoring to quantify the environmental improvements.
3. May require additional research to identify the most effective paving methods and materials.

PROJECT NUMBER	43
PROJECT NAME	Funding for accidental release cleanup resources.
PROJECT PURPOSE	To reduce impacts from environmental incidents by improving response capabilities. Propose initiating a fund to provide monetary support to purchase state of the art resources for responding to, cleaning up, and remediating spill sites.
DESCRIPTION	<p>Offsets could purchase and site incident response equipment at sites selected by the LEPC (Local Emergency Planning Commission) or SERC (State Emergency Response Commission), build or enhance access sites for response (roads, boat ramps, docks), approved by LEPC or SERC, conduct emergency response training for personnel beyond their own staff, develop emergency response databases, and/or develop & implement emergency notification systems for environmental incidents. Might also consider developing accidental release prevention plans for industries not covered by Extremely Hazardous Substances law.</p> <p>As detailed in issue WQ5, significant accidental releases of hazardous substances can have a negative impact on the ecology and human health in a short time frame. The most effective way to limit the negative impacts from accidental releases, short of avoiding them, is to have the necessary personnel and equipment to respond in a timely manner, limit the extent of the release, and initiate remediation as quickly as possible. This project would set up a fund to support, both in personnel and equipment/resources, emergency response actions in DE.</p>
INSTITUTIONAL ROLES	LEPCs, SERC, DNREC-Emergency Response Branch, DEMA, Coast Guard
WHERE IMPLEMENTED	Fund could be used for emergency response throughout DE.

PRELIMINARY COST ESTIMATE

May be assessed, as a one-time fee during application process with cost be a percentage of the proposed project cost.

WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?

Measures-Deployment/response time, time it takes to stop/control spill, number of incidents.

Benefits-Reduction in the amount of pollution released and the number of people impacted, acres impacted.

Faster response time should help limit the extent (area and length of time) of environmental damage.

May be measured by:

1. Response time
2. Cost of cleanup (i.e., smaller spills should cost less?)
3. Damage estimates

WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT

Assessment of needs.

Research of computer programs, equipment.

Landowner permission if road/dock/ramp needed or staging of equipment.

Legal requirements to purchase, maintain, replace equipment.

PROJECT NUMBER	44
PROJECT NAME	Remediate hazardous waste sites.
PROJECT PURPOSE	To address issue WQ2 and WQ4 regarding contaminants and water quality. One source of contaminants in the coastal zone is hazardous waste sites within the coastal zone and near tributaries of the coastal zone. Initiating a method to remediate these sites would decrease the amount of contaminants entering the coastal zone and improve water quality, habitat, and environmental health.
DESCRIPTION	This initiative would provide an option to permittees to "adopt a hazardous waste and remediate site" or contribute to a fund to be used to remediate a site. DNREC Water Resources and SIRB could generate a list of potential sites. This would help reduce contaminants entering coastal zone, return contaminated sites to useful sites (industrial, residential, or natural), reduce contaminant levels in fish and wildlife, and improve water quality.
INSTITUTIONAL ROLES	DNREC <ul style="list-style-type: none">• Water Resources, to identify sites contributing toxicants to tributaries/coastal zone• Site Investigation and Restoration Branch (SIRB), to initiate and direct remediation
WHERE IMPLEMENTED	Throughout the state of DE with special emphasis on the Brandywine and Christina watersheds
PRELIMINARY COST ESTIMATE	Once specific sites and appropriate remediation methods are identified, a cost per site (specific) could be assigned.

WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?

Reduce contaminant loading to coastal zone and tributaries

- measured by water quality assessments
- # of sites remediated

Improve quality of fish by reducing contaminants in fish thereby reducing fish consumption advisories

- measure contaminant concentration trends in fish

WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT

- Research and assess sites that could be adopted/contributed to for remediation
- Legal aspects of future liability

PROJECT NUMBER	45
PROJECT NAME	Reforestation of uplands
PROJECT PURPOSE	To improve water quality and quantity through the re-establishment of wooded uplands. Wooded lands minimize runoff, reduce nutrients and promote groundwater recharge.
DESCRIPTION	<p>The reforestation of uplands could be used to offset the loss of forested uplands. Besides providing prime habitat, forested uplands provide many water quality related benefits. Forests slow the delivery of rainwater to the ground surface. This minimizes runoff, promotes ground water recharge and virtually eliminates soil erosion. It has also been determined that groundwater contamination due to nutrients is significantly less in wooded areas. Several options exist for implementing this project. Conservation easements can be purchased from existing landowners, land can be purchased and recorded with deed restrictions, or land can be purchased and given to the state or governing agency. Once land has been obtained it can be allowed to revert to forestland through natural succession or it can be replanted. This may be a good use for marginal farmland (i.e. land with steep slopes or wet conditions).</p>
INSTITUTIONAL ROLES	<ol style="list-style-type: none">1. State of Delaware Department of Agriculture2. Water Resources Agencies (for recharge areas)3. DNREC and Inland Bays Committee (for watershed management)4. DNREC- Div. of Parks and Recreation
WHERE IMPLEMENTED	This is a prime candidate for watershed protection and groundwater recharge. It is applicable to all of Delaware.
PRELIMINARY COST ESTIMATE	Depends on acreage involved.

WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?

The environmental benefits are:

1. Nutrient Reduction
2. Reduced Runoff
3. Groundwater recharge
4. Increased habitat
5. Increased open space
6. Attenuation of rainwater and slowed release to upland streams, thereby maintaining baseline streamflows over extended periods.
7. Reclamation of marginal farmland
8. Carbon sink (reduction of green house gases)
9. Natural filter for air particulates

WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT

This program is easily implemented. No special zoning is necessary and the Delaware Department of Agriculture encourages forestation through cost share programs. There may be a problem implementing this program in suburban and urban areas where local laws may have strict property maintenance requirements. Special approvals or education may be needed in these areas.

PROJECT NUMBER	46
PROJECT NAME	Dredge-spoil dewatering discharge – collection and treatment.
PROJECT PURPOSE	To collect the supernatant from the dredge spoil site (Wilmington North Site of the US Army Corps of Engineers at the Christina River across from the Port of Wilmington) by installing a drainage collection system. The collected supernatant that contains many contaminants could then be pumped to the Wilmington Wastewater Treatment Plant for treatment. This would be an improvement over the present practice of discharging supernatant directly to the Christina River without treatment.
DESCRIPTION	Installation of a drainage collection system at the US Army Corps of Engineers Wilmington North dredge spoil disposal site. Currently the USCOE dredges the Christina River at the Port of Wilmington periodically to maintain a required depth in the water for ships. This dredge spoil is pumped into a 160 acre site (Wilmington North) where the material is allowed to dry as supernatant either is released back to the Christina River or migrates down into the groundwater. Installing a drainage collection system consisting of pervious material and piping would divert this contaminated water to a pump station, which would pump it to the Wilmington Wastewater Treatment Plant for treatment.
INSTITUTIONAL ROLES	Delaware Solid Waste Authority US Army Corps of Engineers DRBA City of Wilmington DGS DNREC - Division of Air and Waste Management DNREC - Division of Water Resources Port of Wilmington Gannett Fleming, Inc Schnabel Engineering Associates
WHERE IMPLEMENTED	At the US Army Corps of Engineers Wilmington North Dredge Spoil disposal site on the Christina River across from the Port of Wilmington.

PRELIMINARY COST ESTIMATE

One-time cost: more than \$2 million

WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?

The Operations and Maintenance Costs is for the treatment charge if $200,000 \text{ gpd} \times \$0.002/\text{g} = \$400/\text{day} \times 365 =$ approximately \$150,000/yr

Removal of heavy metals from river water

-sample and analyze supernatant from dredge spoils for heavy metals

-sample and analyze City of Wilmington treatment plant influent and effluent for heavy metals

Improving ambient water quality of Christina River and Delaware River

-sample and analyze Christina and Delaware Rivers for heavy metals

Improving ground water quality

-sample and analyze ground water for heavy metals

WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT

US Army Corps of Engineers permission would be needed to allow this project to proceed on their property. Several million dollars would be needed to construct and annually several hundred thousand dollars per year would be required to operate and maintain.

Permission and permits would be needed from the City of Wilmington, and probably DNREC - Water Resources Division.

PROJECT NUMBER	47
PROJECT NAME	Remediation of agricultural sites.
PROJECT PURPOSE	Remediation of nitrate contaminated groundwater underneath agricultural lands.
DESCRIPTION	Currently these are Ag lands where nitrate levels in monitoring wells indicate that ground water N levels exceed standards. (ex Millsboro 200mg/l N) Project would include pumping ground water from remediation wells and spray irrigating the ground water over vegetated fields (could be the same site). Over time, due to uptake of nutrients by the vegetation the contaminated plume will be reduced. Example of this is the old Del farms site (former DuPont sludge disposal site) This could be conducted in conjunction with Project 46 - Reforestation of uplands. Ground water could be used to irrigate seedlings.
INSTITUTIONAL ROLES	DNREC - Water Resources, Ground Water Section, Land Treatment Section Use "Del Farms" plan as a Template
WHERE IMPLEMENTED	Based on information DNREC - Water Resources has on water quality around existing ag lands the sites with the highest concentrations should be remediated first. If DNREC doesn't have data then data should be gathered based on past farming practices, location of chick houses, hog and cattle plots, etc. Once a site is remediated the equipment can be moved to another site.
PRELIMINARY COST ESTIMATE	One-time costs: \$50,000 to \$100,000 Annual cost: \$10,000 to \$50,000

WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?

- Improved ground water quality (nitrates, phosphorus)
- Measured from data collected from monitoring wells around and within the site

WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT

- Water Resources Permits
- Determine which sites need remediation
- Get permits/funding

PROJECT NUMBER	48
PROJECT NAME	Ocean outfall of wastewater in coastal towns and cities.
PROJECT PURPOSE	The purpose of this project is to reduce the amount of nutrients (Nitrogen, Phosphorus) entering Inland Bays of Delaware through wastewater discharge from coastal towns and cities, particularly the city of Rehoboth Beach.
DESCRIPTION	<p>Wastewater discharge into the Inland Bays is a major source of nutrients entering the fragile estuary. Wastewater alternatives have been explored including land application and deep well injection. Since few areas of open space exist to apply treated wastewater, direct application onto farm fields is not feasible. Deep well injection is also problematic since this process could disrupt ground water supplies or possibly increase salt-water intrusion. Pumping treated wastewater several miles into the ocean would be the best alternative since these nutrients would disperse in nutrient poor areas, would not disturb marine habitat (locations of pipe need prior assessment) and nutrient flow would not meander back to the coastal areas. This has been verified by Dr. Bill Ullman (Geochemist, U of D) and Dr David Krantz (Geologist, USGS).</p>
INSTITUTIONAL ROLES	<p>Office of the Mayor, Rehoboth Beach - Mr. Sam Cooper College of Marine Studies, University of Delaware - Dr. Bill Ullman USGS - Dr. David Krantz Center for the Inland Bays - Dr. Bruce Richards</p>
WHERE IMPLEMENTED	The most pressing need is the City of Rehoboth Beach, but other coastal towns (Dewey, Bethany, Fenwick, etc) may need future upgrading to advance ocean outfalls.
PRELIMINARY COST ESTIMATE	Initial start up should approach approximately \$2million. Annual maintenance probably under \$50K

WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?

- Wastewater nutrients will be moved away from coastal zone. In land application or even deep well injection, the nutrients remain within the coastal zone.
- Once ocean outfalls are in place, little maintenance is needed and the life of the pipe is extensive.
- The areas off the Delaware shore have major zones of barren benthos (no life); thus outfalls wouldn't harm marine life.
- The well-established nature of off shore currents suggest little likelihood of waste material returning to the shore.

WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT

Research

- Verify the risk of harming marine life
- Verify the direction of flow of treated wastewater released in offshore currents.

Assessment

- Conduct engineering models to test feasibility
- Assess cost/benefit analysis for policy makers
- Assess public attitudes on subject.

PROJECT NUMBER	49
PROJECT NAME	Water conservation landscaping (SMARTYARDS)
PROJECT PURPOSE	Homeowners and nonresidential property owners would install water friendly conservation landscaping to reduce the runoff of lawn fertilizers and pesticides and conserve water.
DESCRIPTION	The University of Delaware Cooperative Extension would assist homeowners in installing SMARTYARDS. Coop Extension would provide landscape design assistance and owners would receive funds to install native plants instead of water intensive conventional landscaping.
INSTITUTIONAL ROLES	University of Delaware Cooperative Extension, Master Gardeners University of Delaware, Water Resources Agency
WHERE IMPLEMENTED	Available for implementation anywhere in Delaware.
PRELIMINARY COST ESTIMATE	The estimated cost is \$1,000 per home, so 100 homes would be \$100,000
WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?	Native landscaping at urban and suburban dwellings would reduce fertilizer and pesticide use (sources of nutrients, N and P and organics) and conserve water.
WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT	Funding to assist the homeowners to do these SMARTYARD projects.

PROJECT NUMBER	50
PROJECT NAME	Combined sewer overflow abatement.
PROJECT PURPOSE	Abate the 39 CSO's outfalls, which are a source of floatables, pathogens, sediment, and toxics to the tidal areas of the Brandywine Creek and Christina River in and around Wilmington.
DESCRIPTION	This project would reduce the frequency and or eliminate the overflow of combined sewage into these rivers. This work is underway by the City of Wilmington working in concert with DNREC. The goal as presented to DNREC and EPA is the reduce 85% of the CSOs by the year 2010. Sewer separation, storage facilities, and modifications to outfalls may accomplish the CSO abatement.
INSTITUTIONAL ROLES	City of Wilmington DNREC – NPDES program UD Water Resources Agency
WHERE IMPLEMENTED	Project is targeted at conditions in New Castle County.
PRELIMINARY COST ESTIMATE	Total cost exceed \$200,000,000, but individual outfall abatements would be \$2,000,000 to \$10,000,000 per outfall.
WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?	Stream monitoring of pathogens, toxics (Metals), solids, and organics.
WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT	Funds to complete the design and implementation of the CSO abatement plan.

PROJECT NUMBER	51
PROJECT NAME	Removal of abandoned dams.
PROJECT PURPOSE	Remove abandoned dams along the tributaries to the DE coastal zone to improve habitat and restore natural tidal and fluvial flow (increase DO levels).
DESCRIPTION	This project would systematically remove the abandoned low dams along the tributaries of the coastal zone. Many streams particularly along the Brandywine Creek, White Clay Creek, Christina River, Naamans Creek and Shellpot Creek have abandoned dams no longer in use and no longer have value. These dams would be removed to restore the free flowing nature of these streams. Other States have been doing this.
INSTITUTIONAL ROLES	DNREC Division of Fish and Wildlife, Division of Soil and Water Conservation (Dam Safety), Division of Water Resources (Watershed Assessment) University of Delaware Water Resources Agency
WHERE IMPLEMENTED	Targeted implementation for New Castle County.
PRELIMINARY COST ESTIMATE	No cost estimate given.
WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?	Benefits to habitat and DO levels, etc.
WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT	An assessment of the low dams no longer in use, identify property owners, and develop an overall plan for removing the no longer functional dams one by one.

PROJECT NUMBER	52
PROJECT NAME	Artificial reef construction.
PROJECT PURPOSE	To construct artificial reefs in the ocean along the Delaware Coast.
DESCRIPTION	<p>Construct artificial reefs made of concrete structures, abandoned buses, ship, or concrete-filled tires. Reefs will create the environment for fish and shellfish, possibly offsetting any ocean ecosystem damage caused by industry.</p> <p>As a side benefit, would be increased recreational fishing, bringing additional income to the area.</p> <p>Improved water quality would result from the increased shellfish population inhabiting the structure.</p>
INSTITUTIONAL ROLES	<p>DNREC – Div. of Fish and Wildlife</p> <p>NOAA – National Marine Fisheries Service</p>
WHERE IMPLEMENTED	
PRELIMINARY COST ESTIMATE	<p>One-time cost: over \$2 million</p> <p>Annual cost: \$10,000-\$50,000 would be for monitoring the site(s) for increased fish and shellfish populations.</p>
WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?	<ul style="list-style-type: none"> • Shellfish population • Types of fish living on reef • Increase in recreational fishing (dollars spent by fishermen); number of fish harvested
WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT	<p>Artificial reefs have been constructed off the NJ coast; some information on costs and benefits already exist. There still needs to be research on the best place to construct the reef(s), as well as continued research on the recreational benefits and tourist income that are brought to the area.</p>

PROJECT NUMBER	53
PROJECT NAME	Storm water management.
PROJECT PURPOSE	Reduce pollution coming from storm water outfalls discharging to waters in the Coastal Zone.
DESCRIPTION	<ol style="list-style-type: none"> 1. Identify storm water outfalls in and around the site/area. 2. Identify best treatment technology at each site(s) to prevent storm water flows (i.e. treatment, sediment control) 3. Implement "stenciling" program to write, "Do Not Pollute" on storm drains in towns and cities. 4. Public education program (or public service announcements) informing people about storm drains (i.e., don't throw oil down storm drains, where storm drains discharge). What they can do to prevent storm water pollution.
INSTITUTIONAL ROLES	EPA DNERC Local governments
WHERE IMPLEMENTED	<ol style="list-style-type: none"> 1. Construction of treatment at outfalls is site specific. 2. Stenciling storm water intakes would occur in towns. 3. Public education would occur statewide.
PRELIMINARY COST ESTIMATE	One-time cost: over \$2 million Annual cost: \$50,000 to \$100,000
WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?	Parameters to be monitored: <ol style="list-style-type: none"> 1. Reduction of bacteria, nutrients (P, N) suspended solids, oil and grease, floatables. 2. Measurements to be performed during rainfall events, using automatic samplers. 3. Environmental benefits will be reduction of above contaminants being discharged and the subsequent improvements to water quality.
WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT	Research and Treatment techniques for Storm water management is well documented. Assessment is needed concerning the location of the outfalls.

PROJECT NUMBER	54
PROJECT NAME	Nutrient management planning and implementation costsharing.
PROJECT PURPOSE	To provide funding assistance to parties who need to obtain and implement nutrient management plans.
DESCRIPTION	An institution looking for an enhancement project could provide financial assistance to support nutrient management planning, to include implementation of the plan. If for example, projects are funded on a per acre basis, the polluting party could claim a nutrient reduction over so many acres and potentially a percentage decrease in nutrient levels in the watershed. The project should support BMP establishment, increased use of conservation practices and the reduction of fertilizers, pesticides and herbicides.
INSTITUTIONAL ROLES	Department of Agriculture Delaware Farm Bureau DPI Cooperative Extension (U of D and DSU)
WHERE IMPLEMENTED	This could apply to all agricultural land and any land subject to industrial discharge or waste disposal.
PRELIMINARY COST ESTIMATE	Funding would depend on amount of land enrolled. Cost assistance should be on a per acre basis.
WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?	<p>Benefits</p> <ul style="list-style-type: none"> • Reduction of N, P, K in waters of the state • Reduction in sedimentation and erosion • Decrease in eutrophication of affected water bodies • Increased farmer participation in nutrient management <p>Measurement</p> <ul style="list-style-type: none"> • Current monitoring practices and technologies will be able to detect improvements over large treated areas • Long term monitoring might be needed to measure success.
WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT	Contact and permission of landowners.

PROJECT NUMBER	55
PROJECT NAME	Assistance for environmental audits for small companies.
PROJECT PURPOSE	Companies either in the Coastal Zone or outside the Coastal Zone distance pollutants by air and water. Purpose would be for pollution prevention or pollution reduction.
DESCRIPTION	Companies may discharge N, P, toxic pollutants (metals, organics) in their wastewater and toxic pollutants in their air emissions. Most large companies have technical experts on staff or hire consultants to conduct environmental audits to reduce pollutants at source. This may result in changing manufacturing processes or treatment methods. Many small companies will not use their resources to hire consultants to conduct environmental audits so pollution reduction will not occur. DNREC a few years ago did some environmental audits on several food processing plants as part of a federal grant and funded a program at the University of Delaware for several years. The University of Delaware could conduct some using graduate students or DNREC could contract with a private firm to conduct the audits.
INSTITUTIONAL ROLES	DNREC Delaware Consulting Engineers Council Chamber of Commerce University of Delaware (could use graduate students to conduct audits)
WHERE IMPLEMENTED	Available for implementation throughout the state.
PRELIMINARY COST ESTIMATE	Start-up costs would be low \$10,000-50,000. Annual costs may run \$100,000 - \$150,000 to implement.

WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?

Reduction in industrial wastewater discharge loads and air emissions. Things like metals, toxic organics would be monitored.

WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT

Support of industry to allow environmental audits to be conducted in their facility. May be a problem of limited access to manufacturing facility or manufacturing process is proprietary information.

PROJECT NUMBER	56
PROJECT NAME	Reduce cooling water flows.
PROJECT PURPOSE	Reduce heat load on receiving waters.
DESCRIPTION	Improve energy inefficient process to offset increased capacity.
INSTITUTIONAL ROLES	Energy Conservation Specialist Pollutant Prevention Groups
WHERE IMPLEMENTED	Existing industrial sites.
PRELIMINARY COST ESTIMATE	One-time and annual costs over \$2 million Increased operation expense offset by improved energy efficiency.
WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?	<ul style="list-style-type: none">• Reduce heat loss to cooling water impact on receiving stream• Reduced air emissions from fuel burning
WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT	Additional permits of construction and possible changes in Air Emissions Permits.

PROJECT NUMBER	57
PROJECT NAME	Reclaim abandoned property in New Castle, DE.
PROJECT PURPOSE	Industrial/residential land recovery project
DESCRIPTION	Reclaim abandoned property in New Castle, DE
INSTITUTIONAL ROLES	Engineers Landscapers DNREC – brownfield issues
WHERE IMPLEMENTED	Industrial area south of New Castle, DE
PRELIMINARY COST ESTIMATE	One-time cost: over \$2 million Annual cost: less than \$10,000
WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?	<ul style="list-style-type: none">• Improve recharge to ground water• Reduce storm water runoff• Improve aesthetics
WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT	Legal assistance to settle potential liability issues.

PROJECT NUMBER	58
PROJECT NAME	Land application of wastewater.
PROJECT PURPOSE	Reduction of nutrients going into the estuaries. Groundwater recharge. Nutrient utilization of nutrients in wastewater and preservation of open space.
DESCRIPTION	Today along the Inland Bays and southern New Castle County there is increased and wide use of septic tanks in present development. Septic tanks discharge to groundwater that ends up as baseflow in streams going to the estuary. Sewers are replacing septic tanks and if land application is used for new wastewater treatment plants instead of stream discharge water quality will be enhanced. Two projects are already using this - M-O-T plant and the Long Neck plant.
INSTITUTIONAL ROLES	DNREC University of Delaware Tatman and Lee Consultants
WHERE IMPLEMENTED	Planned sewer district for south of the canal and present M-O-T plant. Inland Bays for Long Neck plant.
PRELIMINARY COST ESTIMATE	Sewer project for southern New Castle County is \$150 million or more. Cost of M-O-T plant was \$20 million plus
WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?	Land application permit requires monitoring of crops and groundwater. Measure tributaries for N and P where there is conversion from septic tanks. N and P mass loads that will be kept out of streams by new plants for wastewater treatment if they discharged to the coastal zone.
WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT	Large cost for sewers. Need engineering studies and permit approval for new projects.

PROJECT NUMBER	59
PROJECT NAME	Added value products from poultry manure.
PROJECT PURPOSE	The poultry industry in Sussex County produces an excess of nutrients that are known to enter the Inland Bays and Chesapeake Bay. Added value products would move poultry manure out of Sussex County and reduce nutrient input to estuaries.
DESCRIPTION	The poultry industry has grown over the years in Sussex County and more feed is imported from the Midwest, which has produced an excessive imbalance in the N and P balance in Sussex County. Some of the excess P and N end up in the estuaries. By applying all of the manure to the land in Sussex County the nutrient balance is not changing. By creating added value products out of the poultry manure by composting or composting and pelletizing these products may be moved out of Sussex County and used as a fertilizer, soil amendment or potting soil mix.
INSTITUTIONAL ROLES	Delaware Dept of Ag Cooperative Extension University of Delaware DNREC Delmarva Poultry Industry Perdue
WHERE IMPLEMENTED	Nanticoke and Inland Bays watersheds have the greatest concentration of poultry production.
PRELIMINARY COST ESTIMATE	Perdue is in process of building a plant in Sussex County. One-time costs: greater than \$2 million Annual costs: \$500,000 to \$2 million

WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?

Nutrient reduction loads to the Inland Bays. N and P concentrations in Inland Bays and tributaries of Nanticoke especially Broad Creek.

WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT

Financial incentives or nutrient management regulations saying manure can not be spread on soil with high P concentrations. Also need support of poultry integrators.

PROJECT NUMBER	60
PROJECT NAME	Shellfish Hatchery
PROJECT PURPOSE	Nutrient uptake, habitat enhancement, recreational fishery enhancement, commercial fishery enhancement
DESCRIPTION	Filter feeding by bivalves has been suggested as means of reducing eutrophication in coastal estuaries. University of Delaware in cooperation with the Center for the Inland Bays, Inland Bays Citizen Monitoring Program, and other Sea Grant institutions, is involved in several ongoing shellfish enhancement projects. Sources of certified "disease-free" seed stock has been issue in current enhancement projects. Several grow out system, including an oyster reef and Floating Upweller System (FLUPSY) are proposed for deployment in the inland bays.
INSTITUTIONAL ROLES	University of Delaware, College of Marine Studies DNREC/Fish and Wildlife Center for Inland Bays Note: The UD College of Marine Studies faculty and staff have experience in hatchery system design, operation, and management. Faculty have research experience with shellfish disease and genetics. Facility can a small scale hatchery for enhancement projects
WHERE IMPLEMENTED	For implementation in the Inland Bays and Delaware Bay.
PRELIMINARY COST ESTIMATE	One-time costs: \$100,000 to \$500,000 Annual costs: \$50,000 to \$100,000 Start up includes renovation of current facility. Annual operation includes salary for hatchery technician and supplies

WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?

Populations of juvenile/young adult bivalves have capacity to assimilate significant amounts of organic nitrogen. A hatchery with intermediate grow out facilities (FLUPSY) and natural grow out could contribute to recreational and commercial fishery and remove organic nitrogen from eutrophic coastal estuaries.

WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT

Additional Permits - for certification (disease free) and transport
May also need Inland Bays Shellfish Management Plan.

PROJECT NUMBER	61
PROJECT NAME	Alternative fuel vehicles.
PROJECT PURPOSE	Purchase of AFVs or the conversion of existing fleets could be considered as an offset project for the reduction in nitrogen oxides (NOx) and volatile organic compounds (VOC) which are key ingredients in the production of ozone (O3). This could be useful in meeting the 1-hour National Ambient Air Quality Standard for ozone by 2005, future ozone standards relating to long-term exposure, and satisfying the offset requirement of the Coastal Zone Regulations.
DESCRIPTION	<p>Alternative Fuel Vehicles (AFVs) are vehicles that run on fuels other than petroleum products. In one form or another, they have been around for more than one hundred years. Only recently, have they become commonplace and practical as a transportation option.</p> <p>According to United States laws, alternative fuels include; alcohol derivatives such as methanol, ethanol (both either in pure forms or in mixtures with gasoline); compressed natural gas; electricity; hydrogen; liquefied natural gas; liquefied petroleum gas; coal-derived fuels; and vegetable oil-based fuels. Vehicles using these fuels can be factory installed (original) equipment or conversions. With the number of vehicle miles traveled (VMT) increasing every year and the fact that the majority of air pollution comes from mobile sources, the use of AFVs can no longer be ignored as a strategy in improving air quality. This could be an effective strategy if focused on reducing or eliminating the number of vehicles that operate on diesel.</p>
INSTITUTIONAL ROLES	DNREC – Air Quality Management DelDOT Chamber of Commerce
WHERE IMPLEMENTED	Available for implementation statewide.
PRELIMINARY COST ESTIMATE	No cost estimate available, would be dependent on the amount of pollution to be offset/number of vehicles.

WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?

All AFVs must meet Federal Exhaust Emissions for Low-Emission Vehicles (LEV), Inherently Low-Emission Vehicles (ILEV), Ultra-Low-Emission Vehicles (ULEV), and Zero-Emission Vehicles (ZEV). In order to demonstrate that the operation of these vehicles on clean fuels does advance Delaware's ability to attain the air quality standards, a quantitative analysis must show how much alternative fuel replaces conventional gasoline and how many vehicle miles the alternative fueled vehicles are replacing conventional vehicle miles. The analysis will need to replace the emission factors of conventional vehicles with clean burning fueled vehicles, then multiplying those values by the VMT. The resulting emissions will be less for both VOC and NOX and therefore could be an offset for other sources that are not as clean.

WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT

Tracking method to ensure use replacement of conventionally fueled vehicles.
This would include miles traveled.

PROJECT NUMBER	62
PROJECT NAME	Construction of in-line passive nutrient management systems for agricultural drainages.
PROJECT PURPOSE	This offset proposal would entail the construction of passive treatment systems comprised of pond cells along major agricultural drainage ways such as tax ditches and private ditches.
DESCRIPTION	All of Delaware's ponds and lakes suffer from eutrophication. The Inland Bays also suffer an over enrichment of nutrients. Much of this water quality problem originates from farmland runoff. Many of these nutrients begin their trip to the bays in drainage ditches. Water would be diverted for most storms from a ditch into special small ponds. These ponds would be specifically managed in harvestable vegetation known to have high nutrient uptake efficiency. Vegetation, i.e. duckweed (Lemna), that has been proven to be effective in tertiary treatment systems of municipal treatment systems would be grown in these ponds. Lemna could also be composted after harvest and used as a soil amendment.
INSTITUTIONAL ROLES	DNREC – Div. of Soil and Water Conservation; Div. Water Resources Del. Dept. of Agriculture Conservation Districts Tax Ditch Associations
WHERE IMPLEMENTED	Implementation would be targeted to areas of intensely drained agriculture that also have downstream water quality problems. Inland Bays watershed would be of particular interest.
PRELIMINARY COST ESTIMATE	

WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?

This proposal would allow for emissions, especially water emissions, from the applicant. The new emissions would be offset by the use of duckweed in special ponds along tax ditches. Data from tertiary STP flows could probably provide a good estimate as to the effectiveness of the nutrient removal value of duckweed.

Applicant would be directly responsible for the harvesting and composting of the duck-week, or the hiring of a contractor to do so. In estimating the needed intensity of this offset, consideration must be taken into account for dry weather (dormant) conditions.

WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT

Contact and identification of willing landowners.

PROJECT NUMBER	63
PROJECT NAME	Corporate Mentoring.
PROJECT PURPOSE	Many small businesses lack the expertise and funding to keep them more than minimally in compliance with State and Federal regulations. In this offset, a larger company will assist a smaller company or facility to do better than just meet the Federal or State minimal emission release requirements.
DESCRIPTION	The first step in this process would be to match up a large company with a smaller willing business. Applicant would have to look at the types of operations each facility conducts. It would be much easier for the larger company to help the smaller one if they have similar processes, operations, and goals. Before reaching a formal agreement to work together, these companies must be in compliance with all state and federal regulations. The large company would act as a consultant for the smaller business. Initial meetings would have to be set up between both company's' environmental contacts. During this initial meeting, the smaller company would have to outline their environmental plans for the larger company to review. After review of those plans, the larger company would have to explain what the smaller company is doing correctly and incorrectly. From this point the larger company would have to propose a new environmental plan to enhance the smaller companies' emission situation.
INSTITUTIONAL ROLES	DNREC DEDO Office of Ombudsman
WHERE IMPLEMENTED	Available for implementation statewide with a preference for the Coastal Zone area.
PRELIMINARY COST ESTIMATE	No cost estimate available.

WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?

This would entail providing some of the financing and expertise needed to further reduce emission at the smaller facility. Once the reduction plan has been established, the larger company should monitor the progress of the smaller company. This emissions reduction would improve the environmental quality of the Coastal Zone and more than offset the new pollution from the larger company. Furthermore, the smaller company is far exceeding their minimal emission requirements.

WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT

Establishment of procedures that would allow emissions trading/credit for discharge permits.

PROJECT NUMBER	64
PROJECT NAME	INSTALLING WATER CONSERVATION, REHABILITATION, and/or RECYCLING SYSTEMS in PUBLIC BUILDINGS
PROJECT PURPOSE	Many public buildings, schools, and offices in the State lack water conservation devices. This results in excessive usage of water within the facility and increases the pressure on State's limited water resources. At the same time, this excessive water usage increases the amount of wastewater generated by the facility and results in additional discharge of pollutants (and nutrients) to the ground and surface waters of the State.
DESCRIPTION	Since public funding is limited to address some of the above environmental concerns, it is recommended that Coastal Zone Offset be used to provide funding to replace the existing plumbing and faucet systems in some of the older public buildings with devices designed to conserve water. Furthermore, it is recommended that Coastal Zone Offset be used to provide opportunity for installation of wastewater rehabilitation/recycling systems for some public buildings. The rehabilitated/recycled wastewater can be used for lawn watering, spray irrigation, etc. In addition, there are some State facilities and public buildings that are currently disposing their wastewater through conventional methods, which can benefit from the more environmental friendly methods of wastewater disposal such as wastewater rehabilitation and recycling.
INSTITUTIONAL ROLES	DNREC – Div. of Water Resources Dept. of Public Health Water system providers County Wastewater systems
WHERE IMPLEMENTED	Available for implementation statewide with preference for same watershed as the impact.
PRELIMINARY COST ESTIMATE	No cost estimate given.

WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?

This proposal allows for quantification of the environmental gain as the pounds of pollutants (and nutrients) eliminated through the installation of water conservation devices and/or rehabilitation/recycling of wastewater.

WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT

Additions/changes to water and wastewater regulations to permit recycling activities.

PROJECT NUMBER	65
PROJECT NAME	Mandatory employee vanpooling.
PROJECT PURPOSE	An applicant needing a CZA Permit may consider requiring some of the employees to vanpool, or carpool, to and from work. Under this proposed offset, the applicant will obtain one or more vans or minivans for employees to use to and from work. Many employees might consider this to be a tax-free employee benefit! A few carpools may suffice for small offset needs, or where employees live far from each other.
DESCRIPTION	Most regulated facilities in the Coastal Zone are not requiring their employees to carpool or vanpool, despite the State's chronic non-attainment status for ozone. These employees driving separately to work worsens the air quality by pouring tons of ozone pre-cursors into the atmosphere each day. This ozone problem has the potential to become an economic burden to Delaware if this ozone non-attainment issue is not better addressed. Much of the ozone non-attainment problem originates with transportation equipment, especially the automobile.
INSTITUTIONAL ROLES	DNREC – Air Quality Management DeIDOT DART
WHERE IMPLEMENTED	Available for implementation in Kent and New Castle Counties.
PRELIMINARY COST ESTIMATE	No cost estimate given.

WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?

Air and or other emissions can be quantified at both the regulated facility and at the tailpipe of the automobile. To document the applicant's offset as being sufficient and implemented; the miles NOT traveled by the employees can be added and then multiplied by a given (typical) automobile emission rate. These savings in air pollution should more than offset minor new sources of air pollution at the regulated facility.

The State can monitor this offset by examining the mileage of the designated vans and the drop in mileage of the involved employees' cars from DMV records for the vehicles.

Further reduction now (or later if another CZA Permit is needed with a small offset) could be found if the vans or minivans or carpools used compressed natural gas as a fuel.

WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT

System to document the use of system and account for the reduction in vehicle miles.

PROJECT NUMBER	66
PROJECT NAME	Solid waste recycling center.
PROJECT PURPOSE	May of Delaware's neighborhoods are not yet conveniently served by a recycling center. Some existing centers do not offer ways of recycling batteries and waste oil. Solid waste buried in a landfill creates water pollution and air emissions; recycled material will not. Recycled materials usually need less energy and materials to become useful again compared to wholly new materials.
DESCRIPTION	<p>The CZA Permit applicant will design, develop and install a solid waste and used motor oil recycling facility where one is not currently available, or upgrade several existing centers. The new facility will meet with local and State approval near a major residential area preferably in the Coastal Zone.</p> <p>Applicant will be responsible for finding markets or buyers of the solid waste. The permit holder to defray the costs of the facility may retain any funds from sales. Applicant will also ensure that on-site equipment is properly maintained, safe for the public's use, and does not have an odor or become an aesthetic problem. Applicant will develop and implement a public education program aimed at the local residents regarding the benefits of recycling.</p>
INSTITUTIONAL ROLES	DNREC – Div. of Air and Waste Management Del. Solid Waste Authority
WHERE IMPLEMENTED	Available for implementation statewide with a preference for location that would serve areas in the coastal zone, while not being in the coastal zone.
PRELIMINARY COST ESTIMATE	No cost estimate given.

WHAT ARE THE ANTICIPATED ENVIRONMENTAL BENEFITS AND HOW WILL THEY BE MEASURED?

The scale of the recycling center shall be of sufficient scale as to clearly and demonstrably more than offset the permit holder's solid waste generation or other forms of new pollution to the Coastal Zone. It may also be of lesser scale as part of a packaged offset proposal using other offset concepts along with this solid waste recycling station concept.

WHAT IS NEEDED UPFRONT TO IMPLEMENT THIS PROJECT

Siting for facilities.
Recycling facility may require its own permits.