

DEP Project Submittal

Project Name: Monroe County Canal and Stormwater Water Quality Improvements

The purpose of the proposed *Monroe County Canal and Stormwater Water Quality Improvements* is to decrease the discharge of nutrients and other pollutants to improve water quality in the Florida Keys National Marine Sanctuary (FKNMS), consistent with the mission of state and federal entities.

The proposed project will protect the biodiversity, natural beauty and recreational opportunities of the Florida Keys that are so important to the State of Florida's tourism industry. The *Florida Keys National Marine Sanctuary* is a significant part of the nation's collective natural resources, and is the nursery for commercial and recreational fish species of Gulf-wide importance.

In support of the importance of these water quality projects for Monroe County and the State of Florida, please note that Congressman Joe Garcia has provided a letter of support <http://www.monroecounty-fl.gov/DocumentCenter/View/5328>, as has the FKNMS <http://fl-monroecounty.civicplus.com/DocumentCenter/View/5331>.

Contact Information (include at least one name, phone number, email address, and organization if applicable):

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Project Location (Include a map, if possible, and the city, county, longitude/latitude and watershed):

Project limits: Ocean Reef to Key West

Watershed: Florida Keys watershed

Latitude Range: 24°32'N to 25°22'N
Longitude Range: 80°15'W to 81°48'W

The project includes canals with impaired water quality and stormwater retrofit projects located throughout the entire Florida Keys, in Monroe County, Florida. The cities of Key West, Marathon, Layton, and Key Colony Beach; Village of Islamorada, and unincorporated Monroe County are included. The map areas included can be found at <http://www.monroecounty-fl.gov/DocumentCenter/View/5306>. A list of the Keys' canals can be viewed at <http://www.monroecounty-fl.gov/DocumentCenter/View/5312>. Attachments are also provided.

The Florida Keys are an archipelago of small, low-lying, limestone islands surrounded by the waters of the Gulf of Mexico and the Atlantic Ocean. These waters include national coral reef parks and marine sanctuaries that are unique and incredibly valuable, yet very fragile. All of the Project Area lies within Florida Keys National Marine Sanctuary (FKNMS); the area also encompasses the fragmented boundaries of the Florida Keys Wildlife Refuges Complex, which includes the National Key Deer Refuge and the Great White Heron National Wild Refuge, which are home to 32 federally threatened and endangered species. The Keys are home to an estimated 75,000 permanent residents and host more than 2 million visitors each year.

Project Description (*Describe all aspects of the project*):

Monroe County proposes to construct and implement Federal and State-mandated stormwater and canal restoration projects in the Florida Keys, as specified in the Monroe County *Canal Management Master Plan* (CMMP) <http://www.monroecounty-fl.gov/DocumentCenter/View/5301> and the Monroe County *Stormwater Management Master Plan* (SMMP) <http://www.monroecounty-fl.gov/DocumentCenter/View/5309>. (Attachments also provided).

The Water Quality Action Plan (WQAP) of the FKNMS identifies priorities for local entities to implement solutions to restore healthy water quality in Sanctuary waters. **Canal restoration** is a critical item identified in *Strategy W.10*, addressing Canal Water Quality, and Activities 1-7 describe the need to conduct pilot restoration projects and implement technologies designed to improve canal water quality. **Stormwater** is addressed in *Strategy W.11*, Stormwater Retrofitting, of Activity No. 1, which calls for using engineering methods including structures to control stormwater runoff. These proposed projects would go far in implementing the WQAP of the Sanctuary.

When completed, the projects will result in significantly reduced nutrient loading to the Florida Keys National Marine Sanctuary, improved water quality in the Sanctuary, and compliance with **mandatory state water quality standards** and relevant federal and state regulatory standards.

A. Canal Restoration Projects

The County has already initiated the last of its wastewater projects that will eliminate sewage releases into canal and near shore waters. The completion of the wastewater projects will help clean up degraded near shore waters of the Florida Keys and prevent against further degradation. However, the wastewater projects won't eliminate the pollution *already in* the canal waters and the organics and pollutants that have settled up to several feet deep on the bottoms of many of the canals. Pollutants become trapped at the canal bottoms due to poor canal flushing. The County is proposing that **canal restoration projects** be implemented that will remove the pollutants and organics from the affected canals. Canal restorations will enhance flushing which will remove some trapped pollutants in the water column.

Construction of residential canals in the Florida Keys was initiated in the mid-20th century, before resource managers fully understood their impacts on local water quality and broader coastal ecosystems. Many of the 502 canal systems currently present in the Keys were excavated to depths of 20 to 25 feet in order to maximize production of fill material. Most canal systems were designed as long, multi-segmented, dead-end networks which maximize waterfront property but provide little or no tidal flushing and accumulate nutrients and decomposing organic material.

The Florida Department of Environmental Protection (DEP) has determined that the water quality is impaired in multiple water bodies (WBIDS) throughout the Florida Keys. The *Florida Keys Reasonable Assurance Documentation Update of 2011* (FKRAD Update) <http://www.dep.state.fl.us/water/watersheds/docs/bmap/keys-rad-update-2011.pdf> outlined extensive wastewater and stormwater restoration activities to address the nutrient impairments from these sources. However, DEP recognizes that even after the restoration and management activities detailed in the RAD are completed, water quality in many canals will likely not achieve Class III marine standards, as required by State water quality regulations. **Canal restoration**, including hydrological improvements, to improve tidal flow and reducing input of floating sea weed **will be required** in addition to reducing wastewater and **stormwater nutrient loading**. The poor water circulation, weed wrack, organic sediments, and/or deep water depth, were the cited reasons. Since the canals discharge directly to nearshore *Outstanding Florida Waters* in the Florida Keys National Marine Sanctuary (FKNMS), where DEP adopted a “zero-degradation” policy for marine waters, addressing on-going canal water quality impairment is of utmost importance.

Water quality conditions within various canal size classifications were evaluated as part of the 2003 Monroe County Residential Canal Inventory and Assessment. During the evaluation period, canal water quality was significantly poorer than the baseline reference for total nitrogen and total phosphorus for all canal types except Jumbo which was not significantly different for total phosphorus and likely a result of small sample size (refer to table below). Dissolved oxygen concentration within these canals is often less than 1.0 mg/l.

**SUMMARY OF WATER QUALITY FOR ALL CANALS IN THE FLORIDA KEYS
(FROM MONROE COUNTY CANAL INVENTORY AND ASSESSMENT 2003 REPORT)**

CATEGORY	WATER QUALITY DESIGNATION	WATER QUALITY PARAMETER	MEDIAN	MAX	MIN
JUMBO	POOR	Temperature (°C)	29.6	35.3	16
(> 10 hectares)		Salinity (ppt)	36.65	37.2	26
Very limited sampling, especially in winter		Total Nitrogen (µM)	26.8¹	263.3	8.8
		Total Phosphorus (µM)	0.36	2.7	0.1
		Chlorophyll a (µg/l)	0.54	15.22	0
LARGE	POOR	Temperature (°C)	29.9	41.5	15.0
(between 2-10 hectares)		Salinity (ppt)	35.2	50.3	8.8
		Total Nitrogen (µM)	31.6	184.65	8.33

CATEGORY	WATER QUALITY DESIGNATION	WATER QUALITY PARAMETER	MEDIAN	MAX	MIN
Better representation of POOR water quality		Total Phosphorus (µM)	0.39	10.09	0
		Chlorophyll a (µg/l)	0.49	23.09	0
MEDIUM (between 0.6 to 2 hectares ²)	FAIR	Temperature (°C)	26.5	38.5	14
		Salinity (ppt)	36.7	59.1	12.2
		Total Nitrogen (µM)	29.39	145.78	0.33
		Total Phosphorus (µM)	0.32	44.39	0
		Chlorophyll a (µg/l)	0.38	19	0
SMALL (less than 0.6 hectares)	FAIR TO GOOD	Temperature (°C)	26.8	41.5	15
		Salinity (ppt)	37.3	46.4	0.3
		Total Nitrogen (µM)	32.39	149.32	7.72
		Total Phosphorus (µM)	0.34	4.75	0.06
		Chlorophyll a (µg/l)	0.43	4.79	0
Cluster “B” Keys Nearshore Waters 2001- FKNMS Water Quality Monitoring	BASELINE	Temperature (°C)	27.5	39.6	15.1
		Salinity (ppt)	36.3	40	29.5
		Total Nitrogen (µM)	13.25	85.88	1.78
		Total Phosphorus (µM)	0.20	0.62	0.02
		Chlorophyll a (µg/l)	0.23	1.79	0
1. Values that are statistically different from the nearshore water baseline are shown in BOLD.					
2. Definitions of the canal size categories is contained in the 2003 Monroe County Residential Canal					

Monroe County proposes to implement canal restoration techniques that will improve the water quality in the Florida Keys canals and thus in the near shore waters affected by canal outflow. A Monroe County CMMP is underway and is evaluating the conditions of the Keys canals, prioritizing the need for water quality improvement, and identifying appropriate restoration

options for each canal. A Phase I CMMP completed in June 2012 initiated the canal restoration process. The complete CMMP will be completed in June 2013. The County is proposing that canal restoration projects be constructed and implemented that will restore water quality in the canals and near shore waters that currently have impaired waters. Funds are being sought to design/permit and implement the identified restoration technologies for all top priority canals. It is estimated that at least 126 canals will be identified as requiring restoration.

To address the specific Class III water quality exceedances (DO, nutrients) within the canals and surrounding near shore waters, several technologies are being evaluated in the CMMP and are proposed to be implemented as part of this grant including: (1) removal of organic accumulation (e.g. dredging), (2) minimization of further organic accumulation via weed gates, and (3) circulation of water within canals via pumping systems and culvert connections to facilitate water movement using natural tidal flow. These technologies will address the “legacy” load and will enhance the wastewater treatment improvements already made or underway within the watersheds as part of the RAD.

The proposed technologies will target water quality improvements using several strategies necessary for ecosystem recovery.

1. Removal of accumulated organic matter within the canals will prevent future release and cycling of nutrients resulting from bacterial decomposition during oxic conditions as well as release of iron-complexed phosphorus during anoxic conditions (e.g., Hupfer and Lewandowski, 2008).

2. Weed gates will provide a physical barrier to minimize additional accumulation of organics once the legacy organics have been removed.

3. Pumping systems and culvert connections will facilitate oxygenation of otherwise stagnant water which is expected to provide desirable fish habitat within the canals. The third strategy will be enhanced by achievement of reduced biological oxygen demand as a result of the first two strategies.

The following table shows the number of canals proposed for restoration along with the identified restoration technology. The Phase I CMMP report is attached which describes the CMMP process and identified restoration technologies.

Estimated Number of Canal Restorations by Selected Technology

Technology	Weed Wrack Gate	Organics Removal	Pumping	Culverts	Totals
Number of Canals	62	31	20	20	133

B. Stormwater Projects.

Sewage and greywater produced by residents and visitors quickly seeps out of cesspits and septic tanks, through the highly permeable limestone and into the residential canals and nearshore waters. Nutrients in the wastewater wreak havoc on water quality, clouding seawater, fueling algae blooms that may lead to fish kills, and feeding undesirable seaweed that smother vital habitats. Wastewater also harbors human pathogens that prevent residents and visitors

from swimming in some Keys waters, especially canals. The County has already initiated the last of its wastewater projects that will eliminate sewage *releases* into canal and near shore waters. The completion of the wastewater projects will help clean up degraded near shore waters of the Florida Keys and prevent against further degradation. However, the wastewater projects alone won't eliminate the sources of stormwater pollution or the pollutants from the runoff. While most studies have identified wastewater impacts as a major controllable source of pollutants affecting the environment, stormwater runoff has also been identified as a significant source. Therefore, the County is also proposing that **stormwater retrofit** projects be constructed and implemented, that will reduce the sediment and nutrient loading of near shore waters resulting from stormwater runoff.

The total estimated cost to retrofit 100% of urban areas with stormwater structures within the entire Keys is \$465 million. The project proposed for funding is implementation of stormwater retrofits at the highest priority stormwater problem areas within Unincorporated Monroe County. The SMMP identified 11 high priority problem areas that are shown in SMMP Table 4.2.1 <http://www.monroecounty-fl.gov/DocumentCenter/View/5313>. The retrofits focus on easy to install vegetated swales and berms alongside the major thoroughfare, US 1.

Monroe County
Stormwater Management Master Plan
Section 4.0 - Strategies and Solutions

Table 4.2-1
Monroe County Stormwater Management Master Plan
Summary of Retrofit Costs For Unincorporated Monroe County

Problem Area	Study Area	Rank	Description of Improvement	Estimated Cost
Saddlebunch Bike Trail - FDEP	Saddlebunch	2	Vegetated swales along one or both sides of road	\$445,900
Bahia Honda Bike Trail - FDEP	Bahia Honda	2	Vegetated swales along both sides of road	\$437,700
US1 Rockland Channel to Shark Channel	Big Coppitt	2	Vegetated swales along road, porous pavement	\$543,500
US1 Big Coppitt Boat Ramp	Big Coppitt	2	Berm with vegetated swales	\$43,000
US1 Boca Chica Channel to Rockland Channel	Boca Chica	2	Median to vegetated swale, swales along road, porous pavement	\$1,128,700
US1 Bayside Parking Area at MM66	Long Key	2	Vegetated swale, regrading	\$16,900
US1 Oceanside and Bayside Parking Areas at MM 77.5	Lower Matcumbe	2	Vegetated berm on both sides of road	\$2,600
US1 North Harris Channel to Park Channel	Lower Sugarloaf	2	Vegetated swales along road, porous pavement	\$418,000
US1 Bow Channel to East Side of Cudjoe Key	Cudjoe Key	2	Vegetated swales along road, porous pavement	\$1,045,100
US1 Indian Key - Bayside Parking Area at MM 78	Lower Matcumbe	2	Vegetated berm	\$2,100
Safe Harbor (Example Private Marina)	Stock Island	3	General cleanup; source controls; vegetated swales	\$361,100
Total Retrofit				\$4,444,800

Estimated Project Costs (Describe the estimated costs of the project, including any assumptions for contingency and ongoing operations/maintenance. Identify other secure funding sources such as matching funds, in-kind contributions, or state/federal dollars. In addition, if possible, complete and submit, the Cost Appendix Sheet associated with this form):

A. Canal Restoration: The estimated cost to implement the canal restorations proposed (for the estimated 126 canals only) is **\$27.5 million**. The canal restoration costs are based upon the existing GIS data base and conceptual designs developed during the Phase I CMMP. Preliminary assessment of canal conditions and assumptions regarding design and construction costs were utilized to develop the estimates. This proposal focuses on selecting and implementing the least expensive restoration technologies first. The tables below provide the **total estimated**

project costs as well as cost per each technology. The attached [Cost Appendix Sheet](#) provides additional cost detail. It is assumed that the long term operation and maintenance of the canal restorations will be paid for by the local residents. Many homeowner associations have already stepped forward indicating their commitment to contribute toward restoration costs including long term operation and maintenance.

Estimated Number of Canal Restorations by Selected Technology

Technology	Weed Wrack Gate	Organics Removal	Pumping	Culverts	Totals
Number of Canals	62	24	20	20	126

Likely Cost by Selected Technologies ¹ (\$M)

Number of Canals	Weed Wrack Gate	Organics Removal	Pumping	Culverts	Effectiveness Monitoring	Total Cost
126	\$3	\$16.5	\$5	\$2	\$1	\$27.5

¹ Costs are based upon the cost per technology, not per canal cleanup

B. Stormwater: The estimated cost to implement the proposed high priority stormwater retrofits is \$4.5million. The stormwater retrofit costs are based upon reasonable design estimates and the Final SMMP (previously referenced and also attached.) The SMMP Table 4.2-1 <http://www.monroecounty-fl.gov/DocumentCenter/View/5313> (also attached), provides the estimated cost for each of the top priority projects. The County will provide the funds for the long term operation and maintenance of the stormwater improvements.

Restore Act Investment funds of \$32 million will allow immediate design and construction of canal restoration and stormwater projects in Monroe County. Monroe proposes leveraging the *Restore Act* Investment of \$32 million with an additional **\$12.5 million** in local funds spread over 5 years for local road projects – which will include stormwater retrofits, plus an *additional* match of funds totaling **\$5 million** for canal retrofits. The total county-funded match for this project is therefore \$17.5 million.

Other Funding *(Indicate if the project is submitted for any potential funding and if it may be used to leverage additional funding, if so please describe the funding source [e.g. State/Federal Grants]):*

On September 19, 2012, the Monroe County Board of County Commissioners (BOCC) approved a revenue-producing grant agreement from the Environmental Protection Agency (EPA) OOD03712 that funded a \$100,000 Task Order with AMEC Environment and Infrastructure for Phase 2 of the Monroe County *Canal Management Master Plan*, which is active through September 30, 2013, and can be viewed at <http://www.monroecounty-fl.gov/DocumentCenter/View/5303>.

On February 20, 2013 the Monroe County BOCC approved a revenue-producing FL Department of Environmental Protection (FDEP) Grant S0640 providing an additional \$100,000 of funding to perform bathymetric surveys for the canal restoration program, which is active through June 30, 2013. The BOCC also approved a Task Order with AMEC Environment and Infrastructure to perform the bathymetric work, and can be viewed at <http://www.monroecounty-fl.gov/DocumentCenter/View/5302>.

Monroe County is providing **\$5 million** in local match to fund design and construction of up to five canal restoration projects and **\$12.5 million** in local stormwater match for projects located within Monroe County. Total matching funds therefore equal \$12.5 million in local match for stormwater, \$5 million in local match for canal retrofits, \$200,000 in state and federal match for canal retrofits, for a total of **\$17.7 million** total project match. The County proposes to fund the remainder of the project costs with state and federal water quality grant funds over the next several years.

Technical Feasibility *(Describe the technologies involved and any relevant past experience or proven success with similar projects):*

A. Canal Restoration: The canal restoration technologies being proposed have been identified in the CMMP and address two major water quality issues: seaweed loading (both prevention of future impacts and removal of existing accumulated organics) and improvement in canal flushing to restore the natural tidal flow and circulation via culverts or pumps that was destroyed during the canal construction. These technologies include:

1. Installation of weed wrack gates/air bubble curtains
2. Removal of accumulated organics from canal bottoms
3. Culvert installation to enhance tidal flow
4. Pumping to enhance circulation.

Each of these technologies has been implemented at one or more canal sites in the Keys.

Weed Wrack Gates/Air Bubble Curtains: Severe water quality problems in the Keys canals has resulted from excessive amounts of weed wrack (floating seaweed) entering the canals, fouling the water, and becoming trapped in the dead end sections of the canals. The orientation and prevailing winds at many canals do not allow the weed wrack to float back out of the canals, so it becomes trapped, decays and drops to the canal bottom, where it uses up dissolved oxygen and emits hydrogen sulfide and methane gases. Photographs are attached <http://www.monroecounty-fl.gov/DocumentCenter/View/5311> that show examples of this problem. Weed wrack gates in combination with air bubble curtains have been shown to be the most effective method for preventing weed wrack from entering the canals. The Phase I CMMP includes conceptual designs of this system. The design was based upon numerous discussions with local homeowners concerning existing systems. Pictures of the Big Pine Fish Camp and Ave J in Big Pine Key weed reduction systems, which are both a combination weed gate/air bubble curtain system. These are both good examples of operating weed wrack/air bubble curtains that are privately maintained.

Removal of Accumulated Organics: Even when seaweed is prevented from entering a canal, the existing accumulated organics are still an on-going source of water quality impairment. The removal of organics from the canal bottoms through hydraulic dredging or other technique will remove this on-going source. Under a current FDEP Grant # S0640, surveyors are collecting canal bathymetry data to determine the natural depth of the canals and the amount of accumulated organics. The FDEP grant scope also includes sampling the organic material to

determine the physical and chemical properties to assist in final design for removal, dewatering and disposal options. Although each organic sediment removal project varies depending on specific objectives, local conditions, and disposal options, similar projects have recently been completed in Florida with positive water quality response. Two similarly-scaled projects have been designed and successfully implemented by AMEC Environment & Infrastructure including the Lake Griffin Canal Restoration project (\$7.2 million construction cost, completed 2008), and the Lake Beauclair Aquatic Enhancement project (\$10.2 million construction cost, 90% complete) <http://www.monroecounty-fl.gov/DocumentCenter/View/5304>. (Project Descriptions are also attached.)

Culverts to Enhance Tidal Flow and Improve Circulation: The construction of homes in many parts of the Keys created long, multi-segmented, dead-end canal networks which maximize waterfront property but provide little or no tidal flushing and thus accumulate nutrients and decomposing organic material. Now that nutrient loading from septic tanks has been significantly reduced there are many canal systems that still have water quality impairment due to lack of natural flushing. The Keys have a natural tidal flow that can be utilized to improve water quality. Culverts, typically concrete box type, can be installed between canals or between canals and thin land strips to improve flushing. Jolly Roger Estates in Little Torch Key is an example of an effective box culvert installation that has greatly improved water quality. An aerial photo <http://www.monroecounty-fl.gov/DocumentCenter/View/5305> showing this canal system and location of culverts is attached.

Pumping to Improve Circulation: For canal systems that do not have an accessible area to install a culvert, a pump can be installed to promote water circulation within a canal. Water can be pumped from a 'dead end' canal to an enhanced mangrove water treatment area or water from a nearby near shore area can be pumped into the canal to increase dissolved oxygen levels and assist with flushing. Pump installations will be designed to prevent adverse secondary effects such as resuspension of sediments, bottom scouring, or negative impacts to the near shore waters. The Phase I CMMP contains a conceptual design for a pumping system in Marathon which was designed to pump in Florida Bay water to the dead end of the canal.

B. Stormwater:

The substrate in the Florida Keys is unique in that there is limited amount of soil overlying limestone bedrock. The *Soil and Water Conservation District* indicates that the infiltration rate of over 79% of the soils in **the Keys have a very slow infiltration rate**. The thin soil profile limits the amount of available stormwater retention, **more so here than in the rest of Florida because of this unique geography**. These conditions create a greater need than most places in the United States for the implementation of stormwater controls. Additionally, the Keys have **extremely limited natural buffer areas** to assist with stormwater treatment due to the large number of bridges and thin land masses that connect the various islands. Stormwater runoff can and does directly impact the nearshore waters of the FKNMS.

When rainfall falls on soil or undeveloped land covered with vegetation, some of the rainfall penetrates into the ground (infiltration) until the soil is saturated. The remainder runs off the land into natural storage areas (wetlands and depressions), conveyances (small creeks and ditches) or near-shore waters. During large storms, the limited natural storage and conveyance system can back up causing the flooding of normally dry land. Three major changes to runoff may occur with increased development in the Florida Keys.

First, the amount and nature of the runoff can change. Development increases the amount of impervious area such as roofs, driveways, parking lots, etc., which in turn increases runoff volume. In the same manner, the runoff peak flow may get larger, the time of the peak from the start of the rainfall event may shorten and runoff induced velocities may increase. The overall effect is that increased development creates more runoff water in less time.

Secondly, increased urban development (both residential and commercial) can place houses and buildings in areas that naturally flood during certain times of the year. With increased runoff, the flooding increases and flood-prone areas are inundated for longer times. With residential or commercial structures now in places where flooding historically occurs, the increased runoff leads to potential citizen health and safety concerns.

Thirdly, urban development changes the nature and volume of pollutants carried by runoff. Runoff from development can carry man-induced pollutants such as sediments, fertilizers, detergents (from car washing, etc.), automotive fluids, metals, and pesticides.

Many of the existing stormwater problems occur because development has increased the imperviousness of the area. Increased imperviousness changes the volume, timing, peak flow, and the pollutant content of stormwater runoff. The county will use vegetated and landscaped swales, pervious pavement, rain gardens and bio-filters to reduce pervious areas. The proposed retrofit and rehabilitation techniques that have been identified for this project are detailed in the SMMP. Examples of locations in the Keys where these systems have already been installed and operating effectively are also discussed in the SMMP. These projects address both flooding and water quality improvements.

Environmental Benefits *(Describe the nature, magnitude, and timing of any environmental benefits attributable to the project. If possible, describe potential environmental performance measures [e.g. pollutant reduction]. Please address any potential environmental impacts associated with implementing or maintaining the project [e.g. loss of a habitat or conversion of habitat from one type to another during implementation]):*

Benefits to Natural Resources:

This project will reduce nutrient and pollutant loading to the FKNMS, improve water quality in the Sanctuary, in support of the goals and objectives of the FKNMS Water Quality Protection Program, Florida Keys Water Quality Improvements Act (FKWQIA) and the FKWQIP, and in compliance with relevant federal and state regulatory requirements and mandates.

This project will improve water quality with benefits for seagrass beds and hardbottom communities dominated by corals, sponges, and other invertebrates. This nearshore environment provides critical nursery habitat for finfish and shellfish stocks including snapper, grouper, pink shrimp, and spiny lobster. Recreationally targeted species such as bonefish, permit, and tarpon will also benefit. The project will help federally listed species including sea turtles, smalltooth sawfish, staghorn coral, and other protected species including manatee, brown pelican and many other bird species.

The near shore tidal waters of the Florida Keys are a fragile, extremely valuable and unique network of interconnected ecosystems. Where the near shore seafloor is rocky, southern Florida and the Florida Keys support the only living coral reef system in the continental United States.

Areas where the seashore is sandy or muddy play host to dense and extensive beds of turtle grass (*Thalassia testudinum*) and other seagrasses. Both coral reef areas and seagrass beds provide critical nursery and feeding habitat for many commercially valuable fish and shellfish species, including the snapper, grouper, red drum, stone crab, spiny lobster, and queen conch. Both coral reef habitat and seagrass beds are considered *Essential Fish Habitat in the Florida Keys* due to the critical importance that these habitats have not only for commercially important fisheries species, but also for the West Indian manatee, many species of sea turtles, acroporid corals, small-toothed sawfish, and other marine species listed for protection under the Endangered Species Act of 1973 (ESA).

This unique ecosystem provides unparalleled support to fisheries and essential habitats throughout Florida and the Gulf of Mexico. According to NOAA's Florida Keys National Marine Sanctuary Revised Management Plan (2007), it provides critical spawning habitats to over 520 species of recreational and commercial migratory, endemic, coastal & pelagic finfish and shellfish. According to the US Army Corps' Florida Keys Water Quality Improvement Program Management Plan (2006), the Keys' waters provides habitat for 80 percent of the fish species in the U.S., and most commercially valuable fish species depend on Monroe County nearshore waters at some point during their development.

Coral reef and seagrass bed health is directly linked to near shore marine water quality. Both corals and seagrasses thrive in areas where water is clear (low turbidity), low in nutrients, and high in dissolved oxygen (DO). High levels of nutrients and low DO have been directly linked to extensive die-off in coral reefs in the coastal waters of Puerto Rico and Jamaica. Similarly, seagrasses show die-back in areas where turbidity and nutrients are high, favoring the growth of algae that can smother seagrasses. Therefore, the quality of stormwater runoff and water flowing from canals into the near shore waters of the Keys can have a direct effect – positive or negative – on the health of these critical near shore resources. The proposed stormwater improvements will reduce sediment and pollutant loadings and the canal water quality improvement activities would greatly increase DO and water clarity. DO and turbidity can be easily measured within the canals as well as in marine waters downstream of the canals to determine the effectiveness of different canal water quality improvement measures.

The health of near shore essential fish habitat has been negatively affected by oil spills and other human activity in the Gulf of Mexico, and low water quality output from the Keys canals and untreated stormwater runoff represents a long-term cumulative impact on these resources. Stormwater management improvements and canal restoration measures will help to reverse this trend and better protect nursery habitat for species covered under the *Magnuson-Stevens Fishery Conservation and Management Reauthorization Act*. In addition, improved canal water quality in the Florida Keys will directly benefit Threatened and Endangered species that depend upon near shore seagrasses and coral reef habitats. Improvements to near shore water quality resulting from improvements to the canal systems will reduce stresses on these critically important marine communities.

Economic and Social Benefits (*Describe the economic and social benefits including those related to the project's improved ecosystem services and estimates on jobs created or preserved*):

Economic: Monroe County is the **only county in Florida**, and Florida is the only state on the Gulf Coast, with a barrier reef. The coral reef tract in the Florida Keys is the third largest in the world, and the only living reef in the continental US. This reef environment generates more than 70,000 jobs and \$6 billion dollars in economic activity annually, according to a study

published in 2005 by the University of Miami. (*Towards Sustainable Multispecies Fisheries in the Florida, USA, Coral Reef Ecosystem, Bulletin of Marine Science, 2005; Ault, Jerald, et al.*)

Tourism: The quality of life for tourists in the Florida Keys relies on a healthy marine ecosystem and can be negatively impacted by water quality degradation. Over two million individuals per year visit the Florida Keys to enjoy its unique natural features. Water related activities, including snorkeling, diving, fishing, and other activities support 70 percent of tourism in the Florida Keys, which generates over \$2.3 billion per year and supports over 33,000 jobs (NOAA, FKNMS Socioeconomics Factsheet).

From 2007 to 2008, more than 400,000 visitors and residents of the Florida Keys engaged in over 2M person-days of recreational sports fishing. These recreational fishers spend \$262M in Monroe County, approximately \$103M of which was directly spent on fishing items (NOAA, FKNMS Socioeconomics Factsheet).

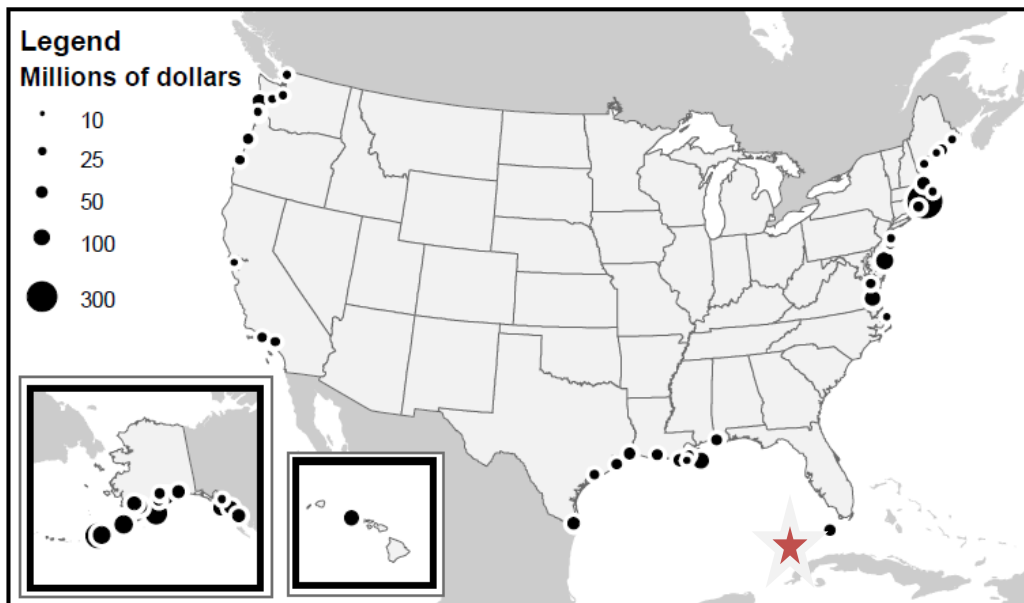
Approximately 739,000 visitors and residents participated in 2.8 million days of diving in the Florida Keys between 2007-2008; \$51.7M was spent at diving/snorkeling operations. Moreover, divers spend a total of \$450M in Monroe County, Florida Keys, supporting more than 7,500 jobs. (NOAA, FKNMS Socioeconomics Factsheet).

Recreational and Commercial Fishing: The Florida Keys ecosystem is home to 520 fish species, including over 260 species of reef fish, as well as spiny lobster and stone crabs that support valuable commercial and recreational fishing economic activity. The Keys are considered 'fishing capital of the world', generating hundreds of world records and billions of dollars of economic impact, in addition to providing well-known habitats and spawning grounds for many of the commercially and recreationally-harvested fish species that populate the Gulf.

With the highest number of recognized International Game Fish Association (IGFA) all tackle, saltwater line class, and saltwater fly rod "World Record Game Fish" records, Monroe County is the global center of recreational and sport fishing.

We are home to the 13th most valuable port the nation and the 5th most valuable port in the Gulf of Mexico, according to NOAA's Fisheries of the United States, 2011, dated August 2012. Monroe County is the only port in the entire state of Florida to rank among the nation's top 50 ports in landings tonnage (14M pounds) or landings value (\$56M). A map of ports of major value, from the report follows:

Commercial Fishery Value at Major U.S. Ports 2011



Environmental Justice: Nearly 25 percent of population within the Service Area is made up of individuals regarded as either low income or over 65 years of age. Approximately 7.7 percent of the population was living below the poverty level in 2008, and the portion of residents over the age of 65 is estimated to be approximately the same as that of the county and state (14.7 percent and 17.6 percent, respectively). This segment of the population often lives on fixed incomes and, while their income may not be below the poverty level, they are affected by cost of living changes. These factors suggest that while the majority of the residents within the Service Area are above poverty levels, there will be considerable impacts to residents associated with the costs of the Canal Restoration and Stormwater Improvements.

The County estimates indicate that construction of the proposed stormwater retrofit and canal restorations projects will create 750 jobs in the short term. The \$32 million in canal restoration and stormwater projects is estimated to provide 230 jobs in the short term. The project will also contribute to the local marine-based tourist economy.

Community Resilience *(describe if the project assists Florida's ability to anticipate, withstand, or recovery from hazards or threats [hurricane preparedness, establishing living shorelines]):*

The stormwater projects will assist in the County's ability to withstand and recover from hurricane flooding, and will address both flooding and water quality improvements. The control of flooding caused by excess stormwater runoff can be accomplished by (1) increasing the conveyance of stormwater away from the flooded area, (2) storing the runoff permanently or temporarily and (3) a combination of storage and conveyance. The canal restoration project will improve the water quality and prevent further degradation of canal and near shore waters that are essential to fish spawning grounds and barrier reefs that mitigate the negative impacts from storms.

The strength and stability of the local economy is integral to community resilience. The 3 million annual visitors to the Florida Keys provide the basis of the tourism industry on which the economy relies. Tourism is based on clean water and beaches as well as the abundant fish and wildlife that characterize this popular vacation destination. Consequently, potential economic impacts of the proposed projects must be considered when evaluating community resilience.

The canal restoration project provides a significantly lower cost alternative to homes than if these individual homes had to meet the federal and state standards individually. The collective savings to the property owners in this service as a result of this project also bolsters community resilience.

Conflicts or Complements to Existing Efforts *(Describe any on-going activities in the project implementation area, if the project is not part of another plan, and why the project does or does not interfere with this work. Please consider how the project may complement existing local, regional or state efforts/plans/objectives):*

A. Canal Restoration: This project does not interfere with any current projects; it complements existing Monroe County, State of Florida and Federal efforts/plans and objectives. An overview of how this project complements existing efforts is described below.

B. Stormwater Retrofits: Monroe County undergoes an estimated \$2-\$3 Million in roadway improvements each year. These improvements include stormwater retrofits, designed to capture and treat stormwater runoff. The proposed stormwater retrofits do not conflict with current objectives and projects, and in fact, will enhance them.

Relationship to Existing Federal/State Plans: The *Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006* provides for federal protection of commercial fisheries species and protection of essential fish habitat, which are both present in the Florida Keys. Canal restoration and stormwater retrofit measures will help to reverse a declining fish population trend and better protect nursery habitats. The FKNMS was established by Congress in 1990. Under its authority, NOAA and the FDEP manage all waters as well as natural and cultural resources surrounding the Florida Keys. The Sanctuary's *Water Quality Protection Program (WQPP)* was mandated by Congress and developed jointly by EPA, NOAA, the State of Florida, and Monroe County. Centralized waste water system development has been a focal effort of the Sanctuary and its WQPP over the last several years.

Now that these efforts are well underway, the WQPP recognizes that addressing the impaired water quality in the canals is the next focus. In 2007, the FKNMS developed a canal water quality improvement strategy that includes implementing improvement strategies in the canals. In 2012 the WQPP Steering Committee convened a *Water Quality Canal Subcommittee* to manage and oversee the implementation of canal water quality improvements. In February 2013 the Canal Subcommittee became an official *Canal Restoration Advisory Subcommittee* of the WQPP. This proposed canal restoration project will be performed under the oversight of this advisory committee.

Work Accomplished to Date to Address Water Quality Impairment: A total of \$900 million will be spent replacing inefficient septic tanks and cesspits with centralized waste water treatment plants and collection systems to reduce the nutrient loadings to the canals and near shore waters.

In addition to implementing waste water and storm water improvements, Monroe County, through FDEP and EPA grant funding, is developing a *Canal Management Master Plan* to prioritize need for improvement of the water quality in the canals and identify appropriate restoration techniques. A \$100,000 FDEP grant for a bathymetry survey is being undertaken to support design of canal restoration measures. \$5 million in County infrastructure money for demonstration testing of the same canal restoration technologies proposed in this submittal is in the development stage. The demonstration projects will verify the applicability, effectiveness and costs in real time on Keys canals. The demonstration canal restoration results will assist in modifying, if required, the restoration designs, and will provide costs and 'shovel ready' proposals that can be utilized for future restoration planning.

Complies with Federal, State, Local and Tribal Laws/Regulations *(Describe any concerns or potential conflicts):*

The canal restorations and stormwater retrofits will require permits from Monroe County, FDEP, US Corp of Engineers and FKNMS (and FDOT for roadway work.) To obtain the required permits, compliance with applicable federal, state, local and tribal laws/regulations will be ensured. Preliminary discussions with regulators have outlined the permit requirements and critical issues which include avoidance of impact to seagrass beds during the installation of piles for weed wrack barriers, manatee protection during construction, and sediment and erosion control during construction. All of these issues can be avoided by careful designs and construction oversight. For the canal restoration projects, organics removal will be considered maintenance dredging, will be exempted from permitting, and will not be subject to State severance fees. No significant concerns or potential conflicts have been identified.

The following is a chronological compilation of the local, state and federal laws and regulations to which the stormwater retrofits and canal improvements are pursuant:

- ✓ In 1990, in recognition of the importance of the Florida Keys ecosystem and the degradation of the ecosystem due to direct and indirect physical impacts, Congress passed the Florida Keys National Marine Sanctuary and Protection Act (PL 101-605) directing the US EPA and the state of Florida to develop a Florida Keys National Sanctuary Water Quality Protection Program. The Sanctuary is administered by NOAA and is jointly managed with the State of Florida.
- ✓ In 1997, Monroe County developed its Year 2010 Comprehensive Plan mandates that nutrient loadings to the marine ecosystem be reduced by the year 2010.
- ✓ In 1999, the Florida Legislature granted authority to adopt stricter permitting and enforcement for areas in the state that have been designated as Areas of Critical State Concern (Florida Keys designated in 1999, FS 380.0552), Outstanding Florida Waters (waters and canals of the Keys designated in 1999, FAC 62-302.700), and Class II Shellfish Harvesting Waters (waters of the keys so designated in 2000, FAC 62-302.400), all of which have been so designated for the Florida Keys. (Through the mechanisms at its disposal, DEP has made water quality in the area of the Florida Keys an issue of utmost priority.)
- ✓ In 2001, with Public Law 106-554, The Florida Keys Water Quality Improvement Act, the US Congress authorized the Corp to provide technical and financial assistance to

improve the water quality of the Florida Keys National Marine Sanctuary. This would be done through the Florida Keys Water Quality Improvement Program.

- ✓ In 2004, the Programmatic Environmental Impact Statement was prepared by the Corps for the proposed FKWQIP and published in the Federal Register. The PEIS provides a framework to address potential environmental impacts associated with design and implementation of the FKWQIP. The PEIS was prepared in accordance with the NEPA, the CEQ regulations implementing NEPA (40 CFR 1500-1508), and FEMA regulations (44 CFR Part 10, Environmental Considerations). These laws and regulations require the Corps to consider and address issues when funding any federal action.
- ✓ In 2006, The Corps, in partnership with the local municipalities in Monroe County, developed and completed the Florida Keys Water Quality Improvements Program (FKWQIP) Final Program Management Plan, a comprehensive plan to develop and implement wastewater and storm water improvements as the means for improving water quality in the National Marine Sanctuary.
- ✓ **Clean Water Act of 1972.** All state water quality standards will be met. The project is in compliance with this Act.
- ✓ **Farmland Protection Policy Act of 1981.** Implementation of the proposed project would not impact any prime or unique farmland. The proposed project is in compliance with the Act.
- ✓ **Wild and Scenic River Act of 1968.** No designated wild and scenic river reaches would be affected by project related activities.
- ✓ **Fishery Conservation and Management Act of 1976.** The proposed project has been coordinated with the National Marine Fisheries Service and is in compliance with the Act.
- ✓ **Submerged Lands Act of 1953.** This Act is applicable.
- ✓ **Rivers and Harbors Act of 1899.** The proposed work would not obstruct navigable waters of the United States. The proposed project is in full compliance.
- ✓ **Anadromous Fish Conservation Act.** Anadromous fish species would not be affected. The project will be coordinated with the National Marine Fisheries Service and will be in compliance with the Act.
- ✓ **Toxic Substances Control Act of 1976.** No substances regulated under this Act and related laws have been identified in project lands. The project is in compliance.
- ✓ **Magnuson-Stevens Fishery Conservation and Management Act.** No adverse effects to Essential Fish Habitat (EFH) are anticipated by implementing the proposed project. The project is in full coordination of the Act.
- ✓ **E.O. 11988, Flood Plain Management.** The project has been evaluated in accordance with this Executive Order. This project is in compliance.
- ✓ **E.O. 12898, Environmental Justice.** Executive Order 12898 requires the Federal Government to achieve environmental justice by identifying and addressing

disproportionately high adverse effects of its activities on minority or low-income populations, and by involving potentially affected minorities in the public coordination process. Environmental justice is specifically addressed in Sections 3.13 and 4.13 of this Draft EA. The project is in compliance with the Executive Order.

- ✓ **E.O. 13089, Coral Reef Protection.** This Executive Order applies to coastal projects that might directly or indirectly impact coral reefs. The Executive Order refers to "those species, habitats, and other natural resources associated with coral reefs." This project will not adversely impact coral reefs or coral reef resources and may, in fact, benefit these resources by improved water quality of the nearshore waters adjacent to the Service Area. The project complies with this Executive Order.
- ✓ **E.O. 13112, Invasive Species.** Construction equipment will use standard measures to avoid the spread of invasive species. This project will not authorize, fund, or carry out any action that might spread or introduce invasive species. Therefore, this project complies with the goals of this Executive Order

Readiness for Implementation *(Describe if the project has any design or permitting work started or completed [attach permits or design work]. Please address any issues that may delay start or finish of the project):*

The SMMP contains conceptual designs and recommendations for stormwater retrofits. The County is implementing yearly roadway maintenance, which includes stormwater retrofits, and has numerous designs completed or nearly completed.

The Phase I CMMP Report <http://www.monroecounty-fl.gov/DocumentCenter/View/5301> contains conceptual designs developed for three canal systems that include weed wrack barriers/air curtains, organics removal and pumping to enhance flushing. The conceptual designs provide a boiler plate for the designs in other canal systems. As discussed under the **Technical Feasibility** Section, the proposed restoration technologies have been applied at canals throughout the Keys, as well as Florida, and the design/permit packages are available.

Public Acceptance *(Describe any known or potential public approval or opposition to the project):*

The topics of stormwater and nearshore waters degradation in the Florida Keys National Marine Sanctuary and the need to reduce nutrient loading in the nearshore waters of the Keys is the highest priority of regulatory agencies and citizens alike, and the implementation of it is a strategy that is accepted and supported by the public.

The public has been involved, informed, and invited to participate throughout the development process of each of the following:

- FKNMS Water Quality Protection Program, 1997
- Monroe County Sanitary Wastewater Master Plan, approved in 2000
- Florida Keys Water Quality Improvement PEIS, 2004
- Florida Keys Water Quality Improvement Program PMP, 2006

The County has not received any opposition to the stormwater retrofit projects. Since the County began efforts on the canal restoration program approximately one year ago, public support has been very strong. The staff person managing the Program has spoken publicly numerous times and provided several presentations regarding the benefits of the program. See articles attached from the Florida Specifier, KeysNet.com, and the News-Barometer <http://www.monroecounty-fl.gov/DocumentCenter/View/5307>. Many interested residents have also written to the county to voice support for the program, and hope that restoration efforts will grow and continue. In addition, numerous meetings have been held with interested homeowners throughout the Keys (Monroe County), all of whom have expressed great interest in the program due to the poor water quality they are experiencing in their canals and the health concerns to their families and pets.

Presentations have been provided at the Monroe County Board of County Commissioners meetings, the FL Keys National Marine Sanctuary (FKNMS) Water Quality Protection Program (WQPP) Steering Committee meetings, and the FKNMS WQPP Canal Improvements sub-committee. One of the presentations is shown at <http://www.monroecounty-fl.gov/DocumentCenter/View/5308>. To date, only strong public support has been voiced. No verbal or written opposition has been received to date.

Background: The Florida Keys National Marine Sanctuary was congressionally mandated in 1990 and the first Florida Keys National Sanctuary Water Quality Protection Plan was released in 1997. Throughout those years between 1990 and plan's release, there were numerous public scoping meetings and abundant opportunities for verbal and written comments to the plan's multiple drafts and revisions. Since then the Plan has been revised twice, and is currently being revised once again, continuing the same level and opportunities for public involvement.

Public involvement was an integral component of the Monroe County stormwater planning process and the development of the SMMP. Public involvement activities conducted as part of this master plan included meetings with key stakeholders and the public. Public forums in the Upper, Middle, and Lower Keys were held to allow key stakeholders and interested citizens of Monroe County the opportunity to participate in, and influence, the outcome of the Master Plan. Interaction with the public throughout the development process significantly assisted in the development of the contents of the Master Plan. Numerous public involvement efforts were implemented as part of the Master Plan development process and are outlined below.

- Public forums and workshops
- Meetings with civic, business, and environmental groups throughout the Keys
- Preparation and distribution of project fact sheets and brochures
- Media coordination
- Production of two videos
- Development of a project web site

Interested citizens and key stakeholders directly influenced the development of the decision and evaluation processes, identified key issues to be addressed, and defined the elements of the SMMP, guiding Monroe County to achieve compliance with the Florida Statutory Treatment Standards of 2010. Comments provided by participants generally expressed concerns regarding:

- Implementation costs
- Extent of improved water quality
- Implementation approaches
- Alternative wastewater conveyance/treatment technologies

- Measure of project performance
- County responsiveness to public input

Additional Information you may wish to provide *(please include any maps, designs, drawings, photos, or background resources that may assist in completely and accurately understanding the project):*

Letter of support from Sean Morton, FKNMS
 Letter of support from Congressman Joe Garcia, House of Representatives, Congress
 Map of the Keys
 List of Keys Canals
 Phase I Canal Management Master Plan (CMMP) Report
 Power Point Presentation of Phase I CMMP
 Photographs
 Aerial Photograph of Jolly Roger Estates showing culvert locations
 Project Descriptions of Organic Removal Canal Restorations
 DEP Grant for Bathymetry
 EPA Grant for Phase II CMMP
 Media Articles: Florida Specifier, News-Barometer, and KeysNet.com
 Monroe County Stormwater Management Master Plan (SMMP)
 Canal Water Quality Table
 Table of Estimated Canal Restorations and Costs
 Map of Commercial Fisheries Value