

APPENDIX 7

FDER Diagnostic/Feasibility Study for Moorings Bay, Collier County, Florida, 1981 (from FDER, 1981).

DIAGNOSTIC/FEASIBILITY STUDY

FOR

MOORINGS BAY

COLLIER COUNTY, FLORIDA

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Prepared by the
Water Resources Restoration and Preservation Section
Department of Environmental Regulation
Tallahassee, Florida

SECTION V
RECOMMENDATIONS

A. Recommended Alternatives

Recommended alternatives for improving water quality in Moorings Bay can be divided into two major categories: (1) measures to decrease the pollutant load entering the bay through voluntary citizen action or regulation, and (2) measures to improve the circulation and flushing of the bay. Three alternatives are recommended under each category as follows:

1. Measures to Decrease the Pollutant Load

a. Conduct public awareness campaigns about the sources of pollution.

A campaign should be initiated to inform the public about sources of excess nutrients and other pollutant substances which enter the bay. It seems evident that lawn and garden debris represent one type of pollutant. A voluntary commitment by the citizens should be encouraged to eliminate as many pollutants as possible which may enter the bay. Residents should be urged to use this biodegradable debris as mulch or compost in place of fertilizers or to place the debris in sealed (preferably reusable) containers to be collected. This action will prevent the debris from washing into the bay.

Pesticides and fertilizers are other common pollutants. Residents should be encouraged to use native plants when landscaping. Native plants are generally resistant to insect pests and disease and are adapted to the amount of nutrients and water which is characteristic of the area. Therefore, the addition of pesticides and fertilizers and excessive watering should not be necessary.

Residents should also be warned about the hazards of dumping paints, oil, gasoline and similar substances directly into the bay, or on the street and in storm drains where the substances enter the bay indirectly. Raw sewage entering the bay via recreational boats is another substance which will degrade the bay. Boating enthusiasts should be urged to prevent raw sewage from entering the bay from their boats.

There are numerous ways to increase the public's awareness of these problems. Informative pamphlets could be printed at a nominal cost and distributed with utility bills, or by other means, by the city or the county. Public service announcements in local newspapers and on local radio and T.V. stations should also be of little cost. Technical assistance from the state would be available, if needed, for the development of pamphlets and public service announcements. Messages could be displayed on billboards, buses and similar outlets for advertising. A "hot line" could be established to encourage public involvement. The "hot line" could be used by citizens who wished to report incidents which might adversely affect the water quality. The line could also be used for residents seeking guidance as to how they might help prevent further pollution. The public awareness approach is the least costly and potentially the most effective of all proposed alternatives.

b. Decrease excess nutrients and other pollutants.

Informing the residents about the need to prevent pesticides, fertilizers, yard debris, sewage and similar substances from entering the bay and relying on voluntary commitments to this end may be sufficient. However, local governments have the regulatory authority to control these types of pollution. Enforcement of actions to prevent these types of pollution is generally most efficiently handled at the

local level. A moratorium could be placed on the application of all fertilizers and pesticides prior to heavy rains. An ordinance requiring that all yard debris not used for compost or mulch be placed in sealed containers and left by the road for collection could be developed and adopted. Those residents needing collection service could be required to purchase sturdy bins, or the bins could be furnished by the city or county.

c. Decrease the amount of stormwater entering the bay.

The first two recommendations do not address the complex problem of dealing with stormwater. Residents can be informed about the excess nutrients and pollutants carried into the bay via stormwater and they can be encouraged or required to prevent certain of these substances from being transported via stormwater. But the residents have little control over the large quantity of stormwater which is channeled into the bay. This problem must be addressed at a higher level.

The city and county are encouraged to work with the Southwest Florida Regional Planning Council on the stormwater issue. The council is in the process of compiling a plan for dealing with stormwater problems on a regional basis. Interest and input from the local level could be very effective in mitigating the amount of pollutants which enter the bay with the stormwater.

The reason that stormwater has become such a problem in this area is that prior to 1959 the majority of the surrounding shore stored the rainwater. The rainwater was then slowly released and was filtered through the ground and the mangroves before entering the bay. Now this area features vast expanses of impervious streets, parking lots and

structures. Rainwater which was previously cleansed and slowly released to the bay, now picks up additional pollutants from lawns, streets and parking lots and enters the bay in pulses.

Because the area surrounding Moorings Bay is extremely developed there will probably be little chance of constructing detention or retention ponds for partial treatment of the stormwater if treatment is deemed necessary. An alternative that may be of benefit is the use of suitable pervious materials to construct new streets and parking lots and to repair existing facilities. Costs for purchasing and placing pervious materials is not expected to be significantly greater than costs for constructing streets and parking lots with standard impervious materials, but a significant improvement in water quality could occur. More information is needed to determine the precise benefits and costs of this alternative.

Erosion should not be a significant problem in this area because of the established residences. Construction sites generally present a problem, though, and foremen should be required to take the necessary precautions (e.g., placing staked bales of hay).

Mandating the removal of as many excess nutrients and other pollutants as possible is a stronger measure than merely educating the residents about the causes of pollution. However, the cost of this action is minimal and recommendations 1a and 1b could readily be combined at the local level for a more comprehensive attack on the problem.

At an additional cost to the local governments, streets and parking lots could be swept frequently with mechanical sweepers to remove accumulated polluting materials which would otherwise be transported into the

storm sewers via runoff. Vacuum-assisted brush sweepers are best suited for removing the very small particles of inorganic nutrients, which are not removed by conventional sweepers (Sartor and Boyd 1972). Sweepers could effectively reduce the amount of inorganic nutrients, organic material, and man-made pollutants entering the bay, but are costly to acquire and maintain and are energy intensive.

The limited water quality data available indicate that the level of pollution in Moorings Bay may be decreasing. If a drive to reduce the pollutant load is effective and the exchange of waters with the Gulf can be improved, the quality of the water in the body of Moorings Bay should reach an acceptable level.

2. Measures to Improve the Circulation and Flushing

a. Return the depth of Moorings Bay and the canals to a more natural level.

Mitigating the pollutant load of Moorings Bay is a necessary first step in improving water quality but existing pollutants must then be removed from the system. Improving the circulation and flushing of the bay would deal with this problem. The most effective means of improving the flushing of the bay is by decreasing the depth. A depth of five or six feet at mean low water (MLW) should be sufficient to meet navigational requirements but would cause a reduction in the volume of the bay to approximately one half of its present volume. This reduction should significantly increase the rate of flushing. The decreased depth would also result in a more effective vertical mixing, partially alleviating the problem of low oxygen content of deep waters.

Reducing the volume of the bay and canals by decreasing the depth can be accomplished in one of two ways. The first way would be to place

clean, uncontaminated fill in the bay and canals to bring the depth within five to six feet MLW. The amount of fill required to produce this effect would be enormous (approximately 12×10^6 or 12 million cubic yards). Since large quantities of fill material are not available in the vicinity of the bay, the fill would have to be imported. The cost of purchasing, transporting, and placing large quantities of fill would be extremely high. Clean fill costs approximately \$3/cubic yard in Collier County, yielding a total cost of approximately \$36,000,000 for fill. Even if the funds could be obtained, or sufficient fill was donated, fill of an appropriate composition and grain size would have to be located and the necessary permits would have to be procured.

An easier and less costly solution would be to simply wait for the sedimentation process to fill in the deep areas of the bay and canals. It is difficult to estimate how long this process might take. If no maintenance dredging is conducted in the body of the bay, a gradual but noticable improvement in flushing is expected because of the decreased volume.

b. Widen the underpasses beneath the Harbour Drive and Parkshore Drive bridges.

Increasing the cross sectional areas of the bridge underpasses could enhance flushing of the central and northern segments of the bay by increasing the flow of water to and from these areas. Widening of these underpasses would also allow the waters of the three segments of the bay to intermix more freely. This action would primarily benefit the northern reaches of the bay through an increased rate of removal of introduced nutrients and organic detritus. Widening of these underpasses would be a relatively costly undertaking, since the bridges would

have to be destroyed and rebuilt. The cost of constructing a bridge over a body of water is approximately \$36/square foot according to estimates from the Florida Department of Transportation. A bridge 30 feet wide and 250 feet long would cost approximately \$270,000 to construct. The cost for reconstructing the bridges at Harbour Drive and Parkshore Drive would be expected to exceed \$5,000,000; however, the improved circulation and water quality which would accrue could be substantial enough to warrant serious consideration of the corrective action.

c. Maintain existing bathymetric contours at Doctors Pass and at bridge underpasses.

Bathymetric measurements suggest that Doctors Pass and the bridge underpasses are subjected to considerable shoaling and infilling (Missimer and Associates 1980). Periodic dredging of these areas could improve flow and, thereby, increase flushing. This limited maintenance dredging should be relatively inexpensive, and should be considered. State dredging permits are required and would need to be obtained before maintenance dredging could take place.

B. Alternatives Considered But Not Recommended

Six additional alternatives were considered but are not recommended. Some of these alternatives were proposed by Missimer and Associates (1980) while others had been regarded at the local level as options which might remedy the water quality problem. Rejection of the alternatives listed below is based primarily on the limited improvement in water quality which would be expected, the extreme costs, and the possible detrimental effects to other systems.

communication). Placing riprap along the entire shoreline of Moorings Bay would cost approximately \$4,536,000 to \$4,832,000. It is doubtful that the degree of improvement in water quality would justify such a large expenditure.

If riprap could be acquired at low cost and placed using city or county equipment the cost might be reduced considerably. It is also possible that certain areas of shoreline could be identified where the defraction is greatest. Riprap could be placed only at these locations to affect the greatest benefit for the least cost.

3. Construct an Additional Pass to the Gulf

A pass could be excavated through the narrow strip of land which separates the northern reach of the bay from the Gulf. By providing an additional route of exchange of bay water and Gulf water, flushing might be increased, particularly in the northern segment of the bay. However, construction of a new pass would be very difficult to accomplish since the strip of land which separates the bay from the Gulf is almost totally developed. In addition, there is an excellent possibility that the new pass would experience continuous shoaling. The lack of adequate undeveloped land through which a pass could be excavated and the expense of creating and maintaining a new pass makes this alternative an undesirable one.

4. Install Culverts to Connect the Canals

Culverts could be installed at the eastern ends of the canals in an attempt to increase flushing and circulation in the canals. While some movement of water would take place through the culverts, the magnitude of exchange would be slight because there would be little driving force

1. Enlarge the Connection Between Moorings Bay and Outer Clam Bay

Consideration was given to replacing the causeway at Seagate Road with a bridge. The width of the connection between the two bays would be increased to approximately 275 feet (Missimer and Associates 1980). The cost of replacing the causeway with a bridge would be approximately \$300,000. Increased exchange of water between the two bays could enhance flushing of the northern extremity of the bay. However, in order to prevent excessive dewatering of Clam Bay, a structure which would permit only northerly flow would have to be constructed. Such a structure would limit the potential increase in flushing and add to the overall costs. In addition, the flow of water from Moorings Bay to Clam Bay could have a significant negative impact on the water quality of Clam Bay. Activities which could significantly degrade the water quality of a Class II waterbody are stringently regulated. In view of the limited benefits expected in terms of flushing of Mooring Bay, the possible adverse consequences for Clam Bay and the sizable costs, this alternative is not recommended.

2. Place Riprap Along the Vertical Seawalls

Riprap placed against the concrete seawalls could enhance circulation and flow of water. Flow defraction and the formation of eddies at protruding seawalls would be decreased, with an ensuing increase in circulation in the canal. Riprap would also provide a narrow zone of shallow water habitat for organisms which inhabit the bay. The cost of placing riprap is estimated to be between \$70/linear foot and \$90/linear foot. The entire shoreline within Moorings Bay is approximately 64,800 linear feet (Tom McDaniels, Collier County Planning Office, personal

to induce movement of water between the ends of the canals. In addition, placement of culverts would necessitate extensive excavation through private developed property, and could greatly inconvenience the landowners.

5. Reroute the Storm Sewer System

The storm sewer system which empties into Moorings Bay could be rerouted to retention or detention areas on land, or to the sanitary sewer system where it would enter the Naples sewage treatment plant. This action would almost completely eliminate the influx of pollutant laden freshwater into the bay. The improvement in the water quality of the bay which would result from this course of action could be substantial. However, rerouting of the storm sewer system would be extremely costly and time consuming.

A detailed stormwater study was not possible with the limited funds available for this Phase I Study. Information concerning the type and amount of pollutants which enter the bay via stormwater would be necessary before large sums of money are spent to reroute the stormwater. In addition it is doubtful that a sufficient amount of undeveloped land exists in the vicinity of the bay for the construction of retention or detention ponds. Diversion of collected runoff to the Naples sewage treatment plant is inadvisable because the increased burden would overload the plant and the effluent from the plant is discharged into Naples Bay. Increasing the load of freshwater and contaminants which enters the plant could have a significant negative impact on Naples Bay which is already polluted (Simpson et al. 1979). Therefore, neither of these methods of rerouting the storm sewer system is recommended.

6. Remove Accumulated Sediments

Accumulated organic material in the sediments of the bay could periodically be removed by shallow dredging. This would be relatively expensive and is unlikely to have any long-term beneficial results in terms of the water quality of the bay. During the dredging operation, oxidizable sediment would be resuspended in the water column, thereby reducing the oxygen content of the water. This would adversely affect organisms inhabiting the bay. Following dredging, accumulation of organic matter in the sediments would resume, quickly negating the effect of their removal. The benefits to be derived from such maintenance dredging would be slight and, considering the costs and short-term problems associated with dredging, this action is not recommended.

7. Maintain Culverts Beneath Seagate Road

Maintenance cleaning of the culverts beneath Seagate Road could increase flow through the culverts, but is unlikely to produce any significant beneficial results in terms of flushing because the exchange of water through the culverts would still be very slight. Such action is, therefore, not recommended.