

**DESCRIPTION OF
MARCO ISLAND
SEWER AND WATER
SYSTEM**

Prepared by

Southern States Utilities

Presented at

March 1991 Meeting

SYNOPSIS OF THE SYSTEM

Southern States Utilities Services, Inc. is a private corporation, indirectly tied to Minnesota Power and Light, and is one of the largest private utility holding companies in Florida. The company owns, manages and operates numerous water and sewer utilities in Florida. In 1989 they purchased the utility systems of Deltona Corporation, of which the Marco Island system was one.

All of the island is provided with water service, while less than half of the island is served with sanitary sewer. Most of the water system was built by Deltona, but Deltona constructed relatively little in the last five years they owned the system.

Collier County has set up assessment districts to build the remaining sanitary sewer lines, at such time as each assessment district area becomes more than 50 percent developed. Currently there are two assessment districts that meet this threshold, but neither abuts existing sewer areas. Three others are pending, so under the Board's policy, within two or three years gravity sewer construction in a number of these assessment districts should be initiated. Tests of coliform levels in the adjacent canals indicate this is prudent and will be required in the future by the regulatory agencies.

A portion of the system has already been constructed by the County, and residents are County sewer customers. The county "purchases" sewer treatment from Marco Island Utilities to serve these people. Excepting the County-constructed lines, the remainder of the system was built by Deltona Corporation, between five and twenty five years ago.

Two water plants exist on the island, the lime softening plant located on the north end of the island, and the new reverse osmosis plant built in 1991 with industrial revenue bonds. The original water treatment plant was built in the early sixties, and expanded in 1964, 1967 and 1971 in 1.0 million gallon per day increments. Several of these early installations have been abandoned and removed. Currently the plant is 7.0 million gallons per day (MGD), 2.0 MGD of the old expansions, and the new 5.0 MGD plant built in 1981 which is slated to remain on line. All parts of the water treatment plant are of the conventional lime-softening process, including degassification, lime reactors, aeration, filtration, flouridation, chlorination and ammoniation.

The raw water supply for the lime plant is derived from a set of interconnected infiltration galleries and shallow pits (probably rock quarries used when US 41 was constructed) located at the intersection of CR 951 and US 41. The pits were the original supply source for Marco Island, and were

supplemented when the infiltration galleries were constructed in 1976. The pits are leased from the Collier Development Corporation. The lease expires December 31, 1994 and is not expected to be renewed. Currently discussions are ongoing with the City of Naples concerning the purchase of raw water from the City for treatment in the lime plant. Also located on the site is a 250,000 gallon storage tank and pumping station. SSU periodically purchases potable water from the Collier County Water-Sewer District, on an "as available" emergency basis, to blend with the water in the pits, thereby blending down the chloride concentrations to acceptable levels.

The new reverse osmosis plant operates at 4 MGD and uses saline wells located on the island. The process uses degassification, odor control, membranes and chlorination, but curiously not ammoniation. This wreaks havoc in trying to maintain chlorine residuals and non-aggressive water. It has been recommended to SSU that they pursue ammoniation immediately to solve a number of water quality issues. Expansion capability of this plant to 6.0 million gallons per day has been designed into the facility. Brine disposal will be via a deep well to be constructed on the wastewater treatment plant site to be used for both the brine disposal and effluent disposal.

The wastewater treatment plant site is located adjacent to the water treatment plant on the north end of the island. The current plant capacity is 3.5 million gallons per day provided by two contact tanks, stabilization tanks, digesters, and chlorination, with effluent disposal to the Marco Island and Marco Shores golf courses. Effluent disposal is via spray irrigation to golf courses on Marco Island and Marco Shores, supplemented by percolation ponds located four miles north of the island. The current wastewater effluent disposal system is not adequate to dispose of the plant capacity of effluent (2.2 MGD vs. 3.5 MGD). The deep well for brine disposal for the reverse osmosis plant is located adjacent to the wastewater plant and is used also for disposal of excess effluent. Additional construction on the existing plant site will be difficult, due to its size and the configuration of existing facilities, without removal of the older portions of the water treatment process (as SSU plans).

The current average daily water and wastewater demands are 7.2 and 1.6 MGD respectively, according to SSU report to MICA. Maximum demands are 8.1 and 2.7 MGD respectively.

Potable water storage is one part of the distribution system. Three 500,000 gallon tanks are located on the water treatment plant site. Two two million gallon tanks and a one million gallon tank exist on the new reverse osmosis plant site, along with a booster station for the south end of the island. A small booster station is located near South Barfield and Winterberry Drive.

A review of the remaining water distribution system indicates that most of the lines were constructed by Deltona Corporation between 1964 and 1984. Over 120 miles of potable water mains exist on the system. Most of the lines are 4, 6 and 8 inch diameter asbestos cement lines. Newer water mains are polyvinyl chloride (PVC) lines. Fire flows on the four and six inch lines are likely inadequate during low pressure periods, and due to the lack of looping on the system caused by numerous cul-de-sacs.

The older asbestos cement lines pose some potential for problems in the coming years as the same lines in other areas of the County tend to show deterioration over time, resulting in brittleness and a tendency for shear breaks when disturbed. Direct tapping is not practical, and drilling into the pipe walls for services creates a hazard for employees. The same is true to repair work on these lines.

Though few in number, cast and ductile iron lines are likely in severely deteriorated shape, due to the constant submersion in salt water. The effluent line under the Marco River channel shows this type of deterioration. All of the poly-vinyl chloride (PVC) lines should be in good shape.

A few scattered two inch galvanized lines may still exist on the system, along with galvanized fittings on the water services. Marco Island representatives indicate that most of these fittings have been replaced due to leaks. Based on the County's experience on nearby Goodland Island, these small lines and fittings do need to be replaced. On Goodland it was found that many of the fittings leaked, and the tubercules built up inside the fittings were so large that the flow on the system was restricted significantly. The remaining fittings may account for some of the problems on Marco Island, just as it did on Goodland. County forces replaced all of the galvanized fittings and lines on Goodland in FY 89/90 to alleviate this problem. The same needs to be done to the few remaining fittings on Marco Island.

Flushing is done on a semi-regular basis, and appears to be low for the size of the system. An adequate flushing program is necessary to remove sediment in the lines, and to maintain chlorine residuals as required by the Safe Drinking Water Act.

Maintenance of valves and fire hydrants is being done on an as-needed basis. The Marco Island Fire Department maintains fire as necessary, but no routine program exists. The Marco Island Fire Department has requested that Marco Island Utilities share in the cost of fire hydrant maintenance, but the status of this is incomplete. Marco Island Utilities does not appear to have the manpower to provide substantial maintenance to the valves or the fire hydrants.

The system does not have a meter change-out program, which is needed since many of the meters are now twenty years old. This may account for some of the unaccounted-for water losses. No leak detection program exists, although unaccounted-for water figures do not appear to indicate that this is needed as yet.

The sanitary sewer system owned by Marco Island Utilities is made up of nearly 20 miles of shallow gravity sewer mains, nearly 11 miles of force mains and 21 submersible pumps in small lift stations. Most of the gravity lines are between seven and 25 years old, and constructed of vitrified clay pipe. Marco Island stopped using vitrified clay pipe in 1979. Vitrified clay pipe was the sewer industry's standard sewer material until the mid-sixties, when poly-vinyl chloride (PVC) pipe began replacing it. Clay pipe does not deteriorate, but is very brittle, is laid in short laying lengths (hence many joints), and due to the method of jointing, has a tendency to develop leaks at the joints in wet conditions. The groundwater table on Marco Island is very high since it is an island, and the pipe is no doubt submerged in salt water all year. A review of the FDER monthly operating reports indicates that summer flows increase some once the rains start, indicating that some infiltration and inflow exist on the system. The newer pipes are SDR 35 PVC and have elastomeric gasket joints that prevent leakage, thereby preventing any infiltration problems from spreading. A program to seal sewer lines to reduce infiltration and inflow does not exist, but is needed.

BUILD-OUT DEMANDS OF THE SYSTEM

A large portion of the permanent residents on Marco Island are older, retired people, having moved to Marco Island from various places in the United States and abroad. Many are on fixed incomes, and purchased their property years ago at much lesser values than the properties are currently worth. Many of the homes are valued between \$150,000 and \$250,000. Most are classified as waterfront properties, due to the extensive canal system on the island.

Per capita water use on the island is abnormally high, translating to high water bills. Even at the recent PSC conducted rate hearing the issue was raised. The utility and Public Service Commission agreed on an estimated 800 gallons per day of usage per single family dwelling on the island, but per capita usages of 500 gallons per day are not unheard of. SSU estimates that the average Marco Island resident uses 26,000 gallons of water per month, as compared to 10,000 for the west coast and a 5,000 median usage for the Collier County system. Existing and projected housing units served are broken down as follows:

Year	# Hsg. Units SF/MF	Served Water SF/MF	Served Sewer SF/MF
1989	3170 8889	3170 8889	1633 8889
1995	5349 10481	5349 10481	2388 10481
2000	7920 11737	7920 11737	3033 11737

NOTES:

1. All residents on the island are supposed to be served with water.
2. All Marco Island sewer customers are also Marco water customers.
3. However, a number of persons on the island are Collier County or
4. North Marco sewer customers, but are Marco Island water customers.

According to data compiled by the Collier County Planning Department, Table B-1 outlines the existing population and housing units on Marco Island. As there are numerous multi-family (MF) connections, all connections have been reduced to Equivilent Residential Units (ERU's) for comparison. The average persons per household in Collier County is 2.45, which is reasonable to assume on Marco Island. (SSU considers multi-family units as 2.2 persons per unit, versus 2.7 for single family units) The Growth Management Plan level of service assumes 121 gallons per capita per day for wastewater. The 800 gallons per unit per day figure agreed to by the PSC is used for water service. The disparity between the numbers is assumed irrigation, and is the amount of usage that needs to be addressed through conservation.

Given these figures, the number of units that could potentially use the water system as is presently exists is 8750. The current number of units connected is just over 12,000, hence the need for yearly restrictions on the island.

The sewer system can support 8600 units. Currently there are over 10,000 ERU units on Marco Island, of which 848 are customers of Collier County and about 650 are customers of North Marco Utilities, the treatment for both being the Marco Island Wastewater Treatment Plant.

To determine the build-out demand for water and sewer demands on the system, the average per capita consumption needs to be determined. Based on submittals to the PSC, the typical Equivilent Residential Unit demand is 24,000 gallons per month for water. (The water distribution system would need to be sized to provide for the higher irrigation demands experienced in the winter and spring months. A peaking factor of 1.5 is assumed.) The wastewater demand used is 121 gallons per capita per day. Given the above, build-out of the island would require capacities of 22.5 and 8.2 million gallons per day for water and wastewater respectively, to support 28,120 customers. (see Table B-1)

Given the existing space constraints and the current facility layouts, expansion of the wastewater plant could prove difficult without rearranging or eliminating existing facilities on site.

TABLE B-1
CUSTOMER BASE

YEAR	# UNITS WATER	SERVED DEMAND	WATER SERVED CAP. (MGD)	EXIST SEWER DEMAND (MGD)	SERVED DEMAND CAP. (MGD)	SEWER SERVED CAP. (MGD)	EXIST SEWER DEMAND (MGD)
1989	12059	12059	9.6	7.0	10522	3.1	2.5
1995	15830	15830	12.7	14.0*	14000**	4.1	3.5***
2000	19657	19657	15.7	16.0*	19500**	5.7	****
2005*****	24445	24445	19.5	****	24445	7.1	****
2010***** *****	28120	28120	22.5	****	28120	8.2	****

NOTES: * Capacity SSU proposed to build in their 10 year master plan
 ** Estimated from growth in Marco Island sewer areas, plus construction of remaining County assessment districts as most should pass the 50% developed phase. (50% development assumed in demand)
 *** Assumes planned SSU construction, but does not meet projected demand if assessment districts are constructed
 **** Data not planned out past 2000 by SSU
 ***** 2005 and 2010 numbers from Collier County Growth Planning Department. Other numbers from SSU master plan.
 *****Buildout expected in 2010.

COUNTY EXPECTATIONS TO MEET DEMANDS

In evaluating the future of the system, an analysis of the infrastructure needed to build-out the system to provide all users with service must be performed. Most of the island is served with potable water. Therefore, the additional linework necessary on the potable water system is limited. However, the source and treatment deficiencies that currently exist on the system are problematic.

On the sewer side, over half of the island lacks central sewer. The County currently installs sewers via assessment districts on the island. This prevents the large concentrations of septic tanks as were found in East and South Naples and in Golden Gate City. Still, many septic tanks are built as construction in the assessment districts are not initiated until fifty percent of the lots in a district are developed. Currently two assessment districts meet this criteria, but the neighboring districts, necessary to be installed to transmit wastewater to the wastewater treatment plant have not yet met the criteria. In addition, the wastewater treatment plant does not have the capacity to treat the additional load the areas would generate. The costs of installation are probably similar to those of East and South Naples, due to constant dewatering that is necessary in many areas of the island.

Preliminary design work indicates that over 50,000 feet of water mains, 330,000 feet of gravity sewers, 37,000 feet of force mains, a water booster station and 22 lift stations will be necessary to serve the island through build-out. In addition, 15.5 MGD of water treatment capacity and 5.7 MGD of wastewater capacity must be provided.

Of greater concern is the provision long term of adequate water supply, water conservation efforts and long term wastewater treatment and disposal. The County can attempt to enter into agreements with SSU to solve some of these problems in the short term, but cannot either force compliance or solve the problems permanently without acquisition of the system.

COSTS

A breakdown of the cost estimates for additional water and sewer infrastructure necessary to provide adequate service to all of the residents of Marco Island, both now and in the future for the water and wastewater components are broken down in Tables D-1 and D-2, respectively.

TABLE D-2

SUMMARY OF SEWER
INFRASTRUCTURE NEEDS

COLLECTION SYSTEM*

ITEM	UNITS	UNIT COSTS	TOTAL
Lift Stations	22	varies by size	1,430,000
Gravity Sewers	332960	\$45 per foot	14,983,200
Manholes	1268	\$1400 each	1,775,200
Force Mains	37500	\$12 - 20 per ft	652,350
Service Lines	5450	\$250 each	1,362,500
Const Contingency			2,020,325
Total Construction Costs			22,223,575
Engineering (15%)			3,333,500
Legal & Land Costs (5%)			1,111,000
Project Costs			26,668,075
Contingency (10%)			2,666,800
TOTAL PROJECT COSTS - Collection Only			29,334,875

IMMEDIATE TREATMENT COSTS**

1.0 MGD Wastewater Plant Expansion	2,155,000
16" Effluent Line	2,690,000
Additional Percolation Ponds	750,000
TOTAL COSTS - Immediate Treatment Needs	5,595,000
TOTAL IMMEDIATE WASTEWATER COSTS	34,929,875

FUTURE TREATMENT NEEDS

Future Treatment Needs (4.7 MGD)	9,400,000
TOTAL WASTEWATER COSTS	\$44,329,875

NOTE: * Costs provided for assessment districts by Engineer of Record, Wilson, Miller, Barton & Peek

** Treatment costs as per SSU 10 year plan for Marco Island.

TABLE D-1

WATER INFRASTRUCTURE NEEDS

DISTRIBUTION SYSTEM

ITEM	UNITS	UNIT COSTS	TOTAL
12" Water Main	5700 lf	30.00 per ft.	171,000
24" Water Main	9900 lf	28.00 per ft.	594,000
Total Construction Costs			765,000
Engineering (15%)			115,000
Legal and Land Costs (5%)			38,000
Project Costs			918,000
Contingency (10%)			92,000
TOTAL PROJECT COSTS - Distr. System Only			1,010,000

SHORT TERM WATER TREATMENT NEEDS*

5 MGD Lime Softening Expansion		5,200,000
2 MGD Reverse Osmosis Expansion		3,250,000
Add. Reverse Osmosis Raw Water Line & Wells Tankage		600,000
Raw Water Line - CR 951		1,250,000
		5,500,000
TOTAL COSTS - Future Needs**		16,300,000
TOTAL WATER COSTS**		17,310,000

NOTES * Cost data based on SSU 10 year master plan
 ** Costs fulfill only the 16.0 MGD demand projected by SSU.

An additional 6.5 MGD needs to be developed by either additional treatment, purchase from County system or conservation.