PRELIMINARY DESIGN REPORT

COMMUNITY WATER SYSTEM

STUMPY POINT COMMUNITY
WATER AND SEWER DISTRICT

DARE COUNTY, NORTH CAROLINA

PREPARED BY

HOBBS, UPCHURCH & ASSOCIATES, P.A.
2522 SOUTH CROATAN HIGHWAY, SUITE 2A
NAGS HEAD, NORTH CAROLINA

MAY 2000

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I. BACKGROUND

A. PROJECT DESCRIPTION

In January of 1998, a 300-foot test well was drilled on property owned by Dare County. A community fire station has recently been constructed on the test well site. Based on the test well results a study was prepared in June 1998 to analyze feasibility of constructing a community water system. The report recommended construction of a community water system with approximately 14,000 feet of 8-inch water main and 4,100 feet of 6-inch water main. A reverse osmosis water treatment facility and storage facilities was recommended to be constructed on Dare County property at the intersection of Stumpy Point Road and N.C. Highway 264. The RO facility should be capable of producing 50,000 gallons per day (gpd) and be expandable to 75,000 gpd. A 75,000 gallon elevated water storage tank will be constructed next to the facility. Two wells can be located on this same Dare County parcel. This system would be capable of serving the existing 118 residences with an allowance of a 50% growth rate for a total of 177 potential water customers.

B. BUDGET AMOUNT

The total budget amount for this project is $1,901,845. This budget number is obtained from the preliminary engineering report prepared for the project in October of 1998. The budget allows for $1,434,950 in construction costs and $466,895 for other costs.

C. GRANT DESCRIPTION

Funding was applied for through USDA-Rural Development, Rural Economic Development Center – Supplemental Grants, and 1998 Clean Water Bonds – DENR High Unit Cost Grant/Loan Funds. On March 10, 2000, a 100% grant in the amount of $1,901,845 was received from the Clean Water Bond Fund.

In order to receive funds, five criteria must be met by July 7, 2000. They are as follows:

1. Plans and specifications must be permitted by the DENR – Public Water Supply Section (PWSS) by July 7, 2000.

2. Any environmental assessment or impact statement must be completed. This project will not require either of these documents. A Categorical Exclusion was obtained on April 24, 2000.

3. All other funding for the project must be committed. In our case, all the funds have been committed through a grant.

4. Local Water Supply Plan has been submitted to the Department.

5. Applicant meets all criteria under the Capacity Development Program. Stumpy Point Water and Sewer District must have the Capacity Development approved by the August 1, 2000 deadline.

It is the intention to submit plans and specifications for approval to allow a minimum of 30 days for PWSS review.

D. NEED FOR THE FACILITY

A house count in 1998 indicated there are presently 110 residences and 8 businesses in the Stumpy Point Community. In the summer of 1998, the individual wells were sampled for coliform. Twenty-five percent of the wells were sampled for a total of 28 samples. Of these samples, 51% tested positive for total coliform and 5% tested positive for fecal coliform. This reinforced the need for a community water system and was a large determining factor in receipt of the Clean Water Bond Grant.

II. SYSTEM DEMAND

The service area for the water system includes the entire Stumpy Point Community. The community is primarily comprised of single-family residences. Businesses are comprised of the Fire Station Community Building, Forestry Office, and a few seafood and related businesses. The majority of the users are along SR1100 or Stumpy Point Road. This road is approximately 14,000 feet in length and contains all but five of the users. The service area along N.C. Highway 264 to Lake Worth is approximately 4,400 feet in length and will only serve five residences and businesses.

Average day usage is based on 6,000 gallons per month or 200 gallons per day per user. In accordance with the rules governing public water systems, a peak demand factor of "2" is utilized or 400 gallons per day per user for peak flow. Based on 100% of the existing users, present day average demand is 23,600 gallons per day or 47,200 gallons per day peak demand. Peak demand would be 70,000 gallons per day at 50% demand increase or design capacity of the treatment facility.

III. FACILITIES DESCRIPTION

A. RAW WATER

A test well was drilled approximately 8,000 feet from the proposed well sites. The well was drilled to a depth of 300 feet. Water bearing stratas were found in zones between 160-180 feet and 260-300 feet. Attached are water samples taken from depths of 170 feet and 260 feet. Also attached is a copy of the well driller's report.

Design of the proposed treatment facility will be based on the water quality from 260 feet. This was chosen because of a large amount of silica in the 170-foot sample. Iron, color and turbidity are very high in the 260-foot sample. Pretreatment followed by reverse osmosis will be required for treatment. Actual test wells will be drilled on the proposed sites during the final design phase of the project. This will provide us with actual water quality and screen settings.

The proposed wells will be installed in the southeast and northwest corners of the Dare County site. Based on the feed water requirements to the RO facility, the wells will be rated at 112,000 gallons per day or 80 gallons per minute each. Each well will have the capacity to meet a present day peak demand in ten hours. The pumps will be constructed of stainless steel supported by a 6-inch Certa-Loc PVC pump column. The well pumps will have the following estimated conditions:

	Plant Site Well	**Remote Well**
Design Capacity (GPM)	80	80
TDH (feet)	165	180
Horsepower	7.5	7.5
Minimum Pump Efficiency (%)	75	75
Maximum Speed (RPM)	3,500	3,500
Estimated Screen Setting (feet)	260	260
Estimated Pumping Water level (feet)	20	20
Well ID (inches)	6	6

The elevation of each well site is approximately three feet. The plant site well is presently cleared. The remote well site is wooded. It is anticipated that a 30-foot

Date Sample Drawn: (1) 1-20-98 (2) 1-21-98
Date Analysis Completed:(1) 1-21-98 (2) 1-22-98
By Whom: TO, TB

Water Treatment Plant: Skyco Water Plant

Certificate of Analysis or Test

	(1) 260' Depth	(2) 170' Depth	Max Contaminant Level
P - Alkalinity as $CaCO_3$, mg/l	90	60	N/A
Total Alkalinity $CaCO_3$, mg/l	200	750	N/A
Bicarbonate as HCO_3, mg/l	243	915	N/A
Carbonate as CO_3, mg/l	0	0	N/A
Hydroxide as OH, mg/l	0	0	N/A
Total Hardness as $CaCO_3$, mg/l	80	54	150.0 *
Calcium Hardness as $CaCO_3$, mg/l	28	30	N/A
Magnesium as $CaCO_3$, mg/l	52	24	N/A
Calcium as Ca, mg/l	11.2	12	60.0 *
Color, C.U. (Color Units)	796	1093	15.0 ✱
Silica as SiO_2, mg/l	8.8	53	N/A
Conductivity as μmhos/cm	3660	2100	N/A
Iron, Fe, mg/l	8	.17	0.30✱
Potassium, K, mg/l	41.2	14.79	N/A
Copper, Cu, μg/l	.98	.02	1,300 μg/l ☆
Manganese, Mn, mg/l	.21	.24	.05✱
Phosphate as PO_4, mg/l	.25	.39	5.0 *
Chloride as Cl^-, mg/l	1100	441	250.0 *
Fluoride as F, mg/l	1.06	.87	4.0 *
Nitrate as NO_3, mg/l	.308	.176	10.0✱
Zinc as Zn, mg/l	.028	.016	5.0 ✱
Chlorine (free Cl_2), mg/l	-----	----	0.2 *
Lead as Pb, μg/l	-----	----	15 μg/l ☆
Corrosiveness	.002	.930	N/A
pH	8.66	8.80	6.5–8.5 *
pHs	8.6	7.86	N/A
Turbidity, N.T.U.	55	25	1.0 ✱
Total Suspended Solids, mg/l	23.1	74	N/A
Total Dissolved Solids, mg/l	1830	1050	500.0 *
Sulfate as SO_4, mg/l	> 90	9.023	250.0 *
Sodium as Na, mg/l (est.)	712	567	250.0 ✱
Sulfide as S, mg/l	N/A	N/A	N/A

60° 63°

* Recommended State Maximums ✱ Mandatory State Minimum ✱ Mandatory State Maximums ☆ - Action Level N/A Not available - No limit
mg/l = Parts per million μg/l = Parts per billion

OXFORD Laboratories Inc.

Analytical and Consulting Chemists
1316 South Fifth Street
Wilmington, N.C. 28401
(910) 763-9793
Fax (910) 343-9688

DATE RECEIVED 01-23-98
DATE REPORTED 01-28-98
98W2324

received
1-30-98
DE

SKYCO/REGIONAL WATER SYSTEM DARE CO. P.O. #
RT. 1 BOX 1690
MANTEO, NC 27594

ATTENTION: DONNIE ROSS

SAMPLE DESCRIPTION: 2 TOC SAMPLES 1-21 & 22-98

1. 260 WELL 1-20-98
2. 170 WELL 1-21-98

RESULTS

	1	2
al Organic Carbon, as C, PPM	18.8	21.6

KEN SMITH, SENIOR ANALYST

ASHLAND, VA (804)798-1199

DRILLERS REPORT

JOB No. 702218 DRILLER Robert Taylor CUSTOMER WELL No. # 1

CUSTOMER DARE COUNTY LAYNE WELL No.

WELL LOCATION Stumpy Point Firehouse STATE PERMIT No.

FORMATION | SKETCH OF SETTING | REMARKS

0-20' - Shell/Sand Green/Black Sandy Clay

20-45' - Sandy clay mix with shell & course sand

45-160' - shell & clay

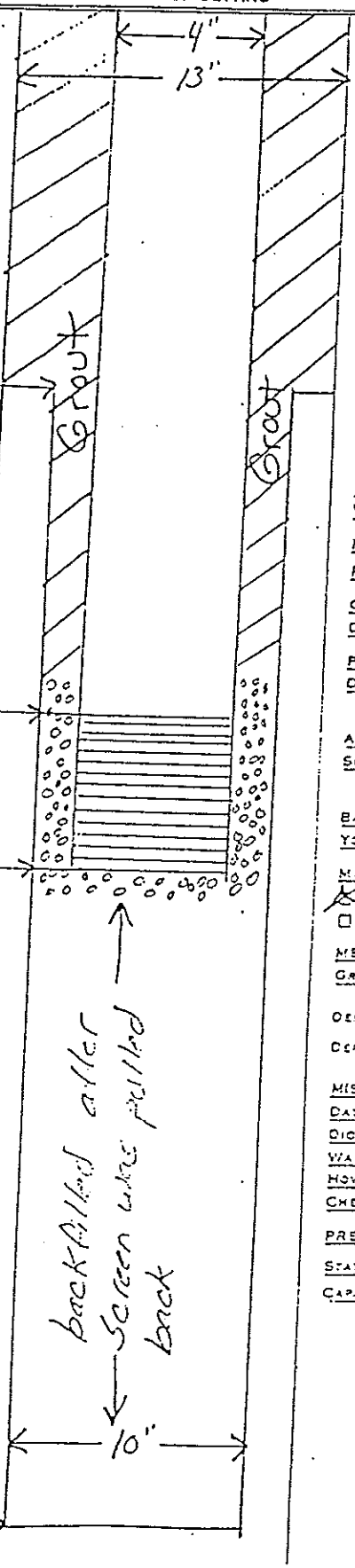
160-200' - coarse sand

200-260' - gray sandy clay & shell

260-310' - shell & course sand

310-362' - gray clay

Water Samples taken @ 165'-175' 262-272'



PIPE SET:

DIA.	WALL	LGTH.	MATL	T & C 10s WELDED
12"	.375	97	Steel	Welded

PIPE LEFT IN PLACE:

DIA.	WALL	LGTH.	MATL.	T & C 10s WELDED
4"	Sch. 40	165	Steel	T&C

SCREEN:
NOM. SIZE 4" I.D. 4" LGTH. 10 OPNG. .025
MFG. COOK TYPE Wire Wrapped STAINLESS STEEL GA. NO.
SET IN Coarse Sand FORMATION
WELL UNDEREAMED TO DIAMETER

MISCELLANEOUS:
P. & L. BACK OFF CUT OFF PACKER TYPE

CONE:
DIA. TOP DIA. BOTT. LGTH. MTL.

PLUG:
DIA. LGTH. MTL.

GRAVEL: CLAY:
AMT. 12 50 lb. bags BAGS PWDR. REG.
SIZE #2 Morie BAGS LAYNITE B-3

CEMENT: SEAL:
BAGS USED 35 100 lbs CLAY CEMENT
YDS. CONCRETE LGTH.

METHOD OF DRILLING:
☒ STD. ROT. ☐ REV. ROT. ☐ CABLE TOOL ☐ AIR ROT.
☐ OTHER

MEASUREMENTS:
GROUND ELEV. ABOVE SEA LEVEL
DEPTH OF WELL AFTER PLUG.
DEPTH TO GRAVEL WALL 155 FROM ☒ GRD. LEV. ☐ TOP OF CASING ☐ ORIG. GRD. LEV.

MISCELLANEOUS:
DATE WORK STARTED DATE FIRST PUMPED
DID WELL CLEAR UP HOW SOON
WAS SAND PUMPED HOW LONG
HOW LONG AGITATED HOW LONG PUMPED
CHEM. USED TO DEVELOP SAMPLE TAKEN

PRELIMINARY TEST DATA:
STATIC LEVEL DATE WATER TEMP.
CAPACITY GPM WITH PUMPING LEVEL

SKETCH OF LOCATION

SIGNATURE OF DRILLER

access will be cut into the woods with a clearing of approximately 75' X 75' for the remote well. Each well slab will be elevated to an elevation of 7 feet with an earthen mound. A fiberglass enclosure will be utilized for cover over the well meter, blowoff, check valve, and control panel.

A 4-inch PVC raw water main will connect each well with the treatment facility. The 4-inch raw water main for the remote well will follow N.C. Highway 264 and SR1100 rights-of-way.

B. TREATMENT FACILITY

The design of the water treatment system, chemical systems, instrumentation and control is being designed by AEPI/RosTek, Inc. This project includes civil, structural, mechanical, plumbing and electrical work to the treatment facility.

Attached are drawings of the building elevations and floor plans for the treatment facility. Also attached is a site plan which illustrates the plant site location along with the elevated tank and well.

The proposed treatment building is constructed of split face block walls with shingle roof similar to the booster pump station at the Cape Hatteras Water Treatment Plant. A 15' X 11' control room will be provided at the entrance of the plant. Based on current evaluation of the site, it is anticipated that a sewer system is not feasible and an electric incinerator toilet type arrangement can be provided. A freight dock with rollup door will access the treatment floor area. The process floor area is 1,200 square feet. Separate rooms constructed of stud walls are provided for the chlorine and fluoride feed system. The floor plan contains a layout of the proposed treatment facility.

The proposed plant site is a recently cleared area adjacent to a newly constructed ballfield. The site has an elevation of approximately three feet. The ballfield adjacent to the plant site has an elevation of approximately six feet. The flood elevation for this area is seven feet. The access around the plant and to the elevated tank and well will be elevated with approximately two feet of fill. The finished floor of the treatment facility will have a minimum elevation of eight feet.

C. DISCHARGE

The reverse osmosis and pressure filtration system will have a discharge of 37 gallons per minute or 52,500 gallons per day. A 4-inch PVC main will extend from the facility, approximately 400 feet south along SR1100 and along a 20-foot easement between two lots to the Stumpy Point Bay. The discharge pipe will be directionally bored into Stumpy Point Bay.

The discharge pipe will extend along SR1100 right-of-way. At the south right-of-way line, the pipe will extend between lots to the bay. The attached layout map illustrates the pipe location and the lots. A 10-foot utility easement will need to be acquired from each lot owner.

The discharge pipe will be permitted through the NPDES Group and the Division of Water Quality. An NPDES permit will be required for the discharged concentrate. The Division of Water Quality will review the construction standards. Mr. Al Hodge of the Division of Water Quality has visited the site and has indicated his concern is more of a lack of water depth in the bay. It does not indicate there is a problem with the quality of the discharge. He has indicated he would prefer the concentrate be discharged into a deeper channel that is within a reasonable distance of the shore. Surveyors will measure depth in the water to a distance of 500 feet from the shore. It is anticipated the water depth will be very shallow (i.e. less than three feet). If this is the case, the proposed discharge header will be constructed approximately 100 feet from the shoreline. The discharge header is preferred to have a design similar to the Cape Hatteras water treatment facility header.

It is anticipated that only an NPDES permit and an Authorization to Construct from the Division of Water Quality will be required for the permitting process. On April 24, 2000, a Categorical Exclusion was received from the Division of Water Quality which states an environmental assessment is not required for the discharge.

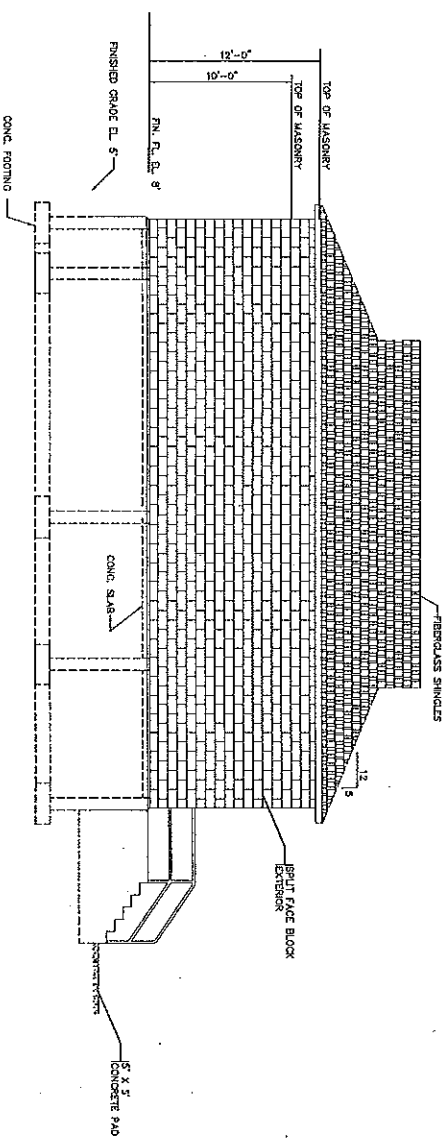
D. FINISHED WATER PUMPING AND STORAGE

A 10,000-gallon HDPE or fiberglass break tank will be installed on a pad adjacent to the treatment building. The RO treatment process will fill this tank while booster pumps will pump from this tank to the elevated storage tank. There are two proposed booster pumps at a rate of 175 gallons per minute each.

The proposed elevated storage tank will have a volume of 75,000 gallons per day. This will provide for one day of storage at maximum system buildout. To provide adequate pressure throughout the system, the tank will be 140 feet tall. The proposed tank configuration is a spheroid shape.

E. DISTRIBUTION SYSTEM

The distribution system will consist of 13,500 feet of 8-inch water main and 4,100 feet of 6-inch water main. The system is designed to maintain 20 psi at a 500 gallon per minute fire flow at the end of the system. An 8-inch water main will extend the length of Stumpy Point Road except for 700 feet of 6-inch water main at the end. The water main along N.C. Highway 264 will be a 6-inch water main. Installation of the water main will primarily be along the north side of Stumpy Point Road and the west side of N.C. Highway 264. Fire hydrants will be installed



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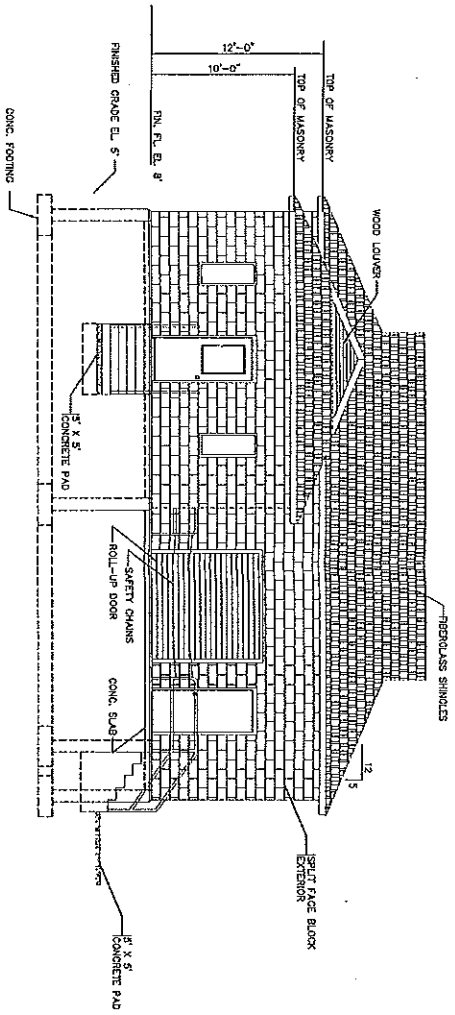

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STUMPY POINT WATER & SEWER DISTRICT
COMMUNITY WATER SYSTEM
DARE COUNTY, NORTH CAROLINA
REVERSE OSMOSIS WATER TREATMENT FACILITY
CONTRACT I
ELEVATIONS

DATE: MAY, 2000
DESIGNED: ETW
DRAWN: CJC
CHECKED: ETW
SCALE: NOT TO SCALE
SHEET NO. A-2
OF XX

Hobbs, Upchurch & Associates, P.A.
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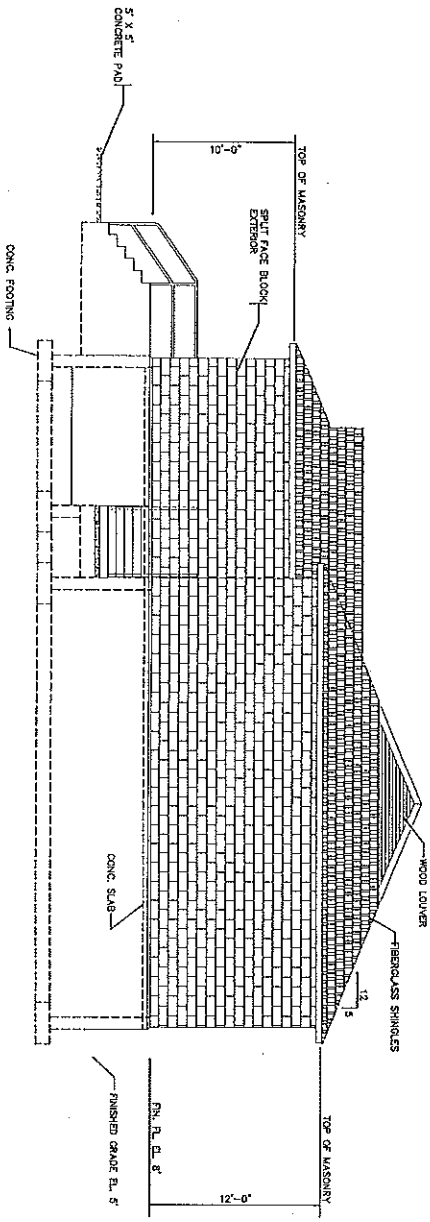
SOUTHERN PINES, NC – MYRTLE BEACH, SC
NAGS HEAD, NC – RALEIGH, NC – CHARLOTTE, NC
2522 S. Croatan Hwy., Suite 2A, Nags Head, North Carolina 27959
Phone: (252) 441-3913 – Fax (252) 441-2100

NORTH CAROLINA PROFESSIONAL SEAL 11975 ENGINEER WHITFIELD

REVISIONS

SYM.	DESCRIPTION	DATE



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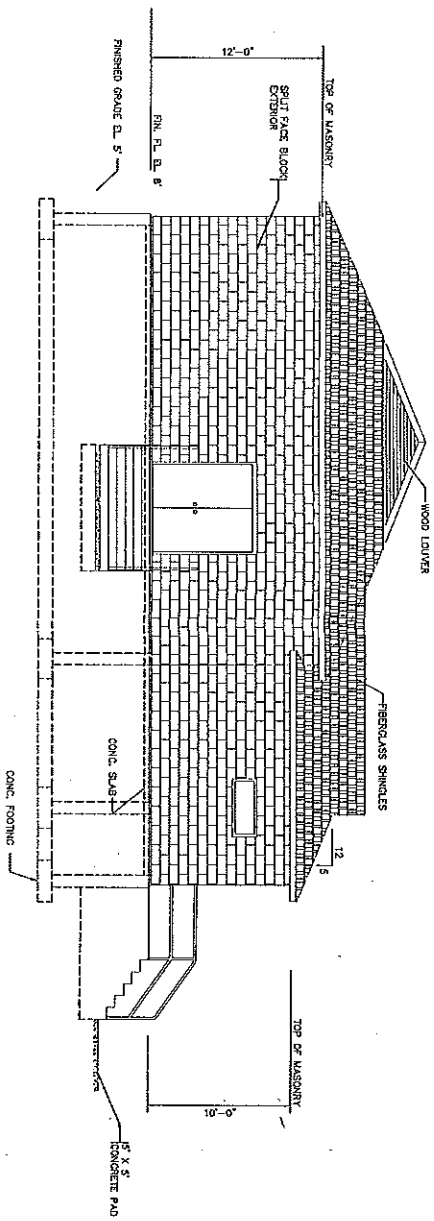

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STUMPY POINT WATER & SEWER DISTRICT
COMMUNITY WATER SYSTEM
DARE COUNTY, NORTH CAROLINA
WATER TREATMENT FACILITY
CONTRACT I
ELEVATIONS

DATE: MAY, 2000
DESIGNED: ETW
DRAWN: CJC
CHECKED: ETW
SCALE: NOT TO SCALE
SHEET NO. A-3
OF XX

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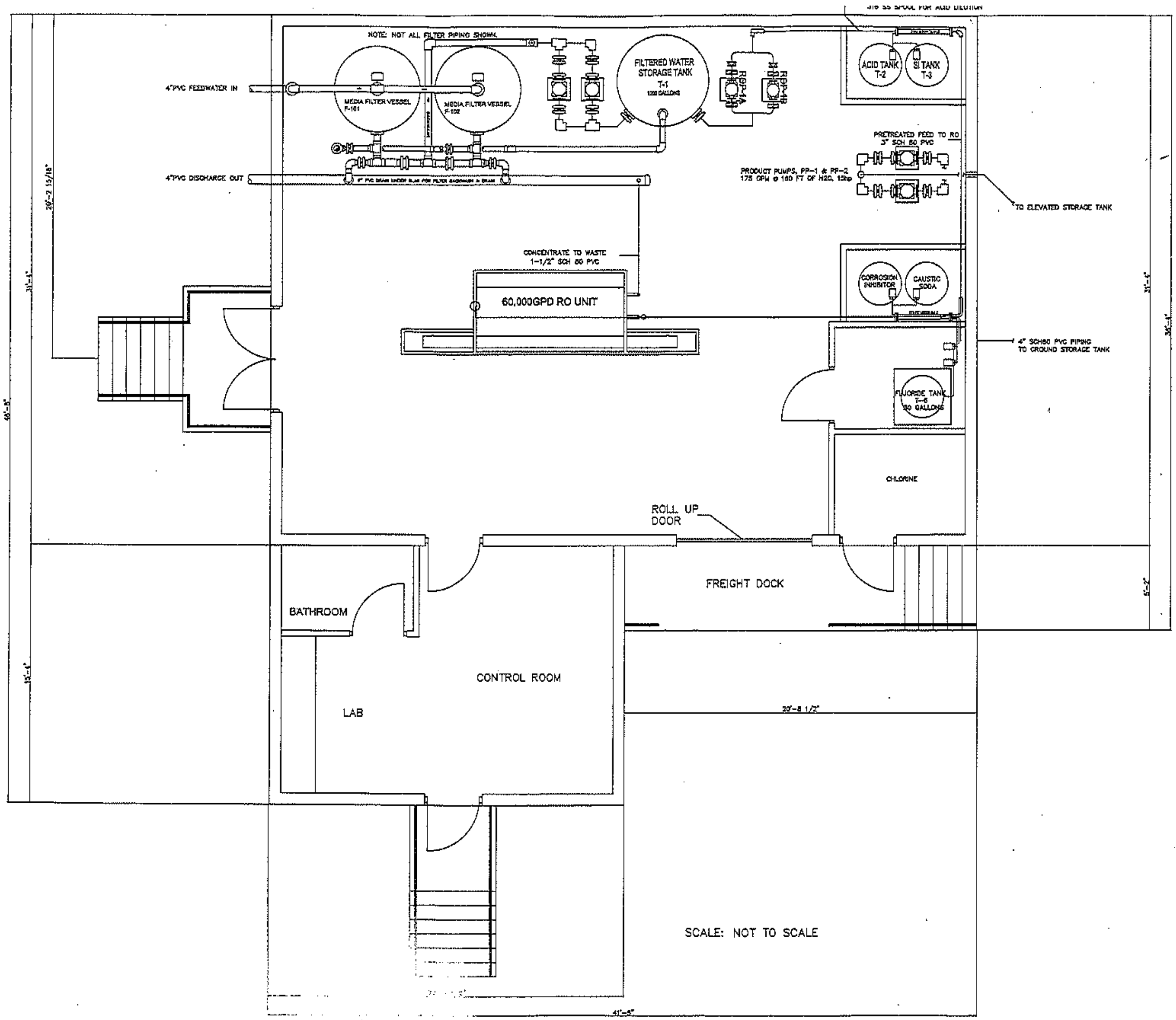
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 14936 ERIC T. WEATHERLY

REVISIONS		
SYM.	DESCRIPTION	DATE



SYM.	REVISIONS DESCRIPTION	DATE

NORTH CAROLINA PROFESSIONAL SEAL 14996 ENGINEER ERIC T. WEATHERLY

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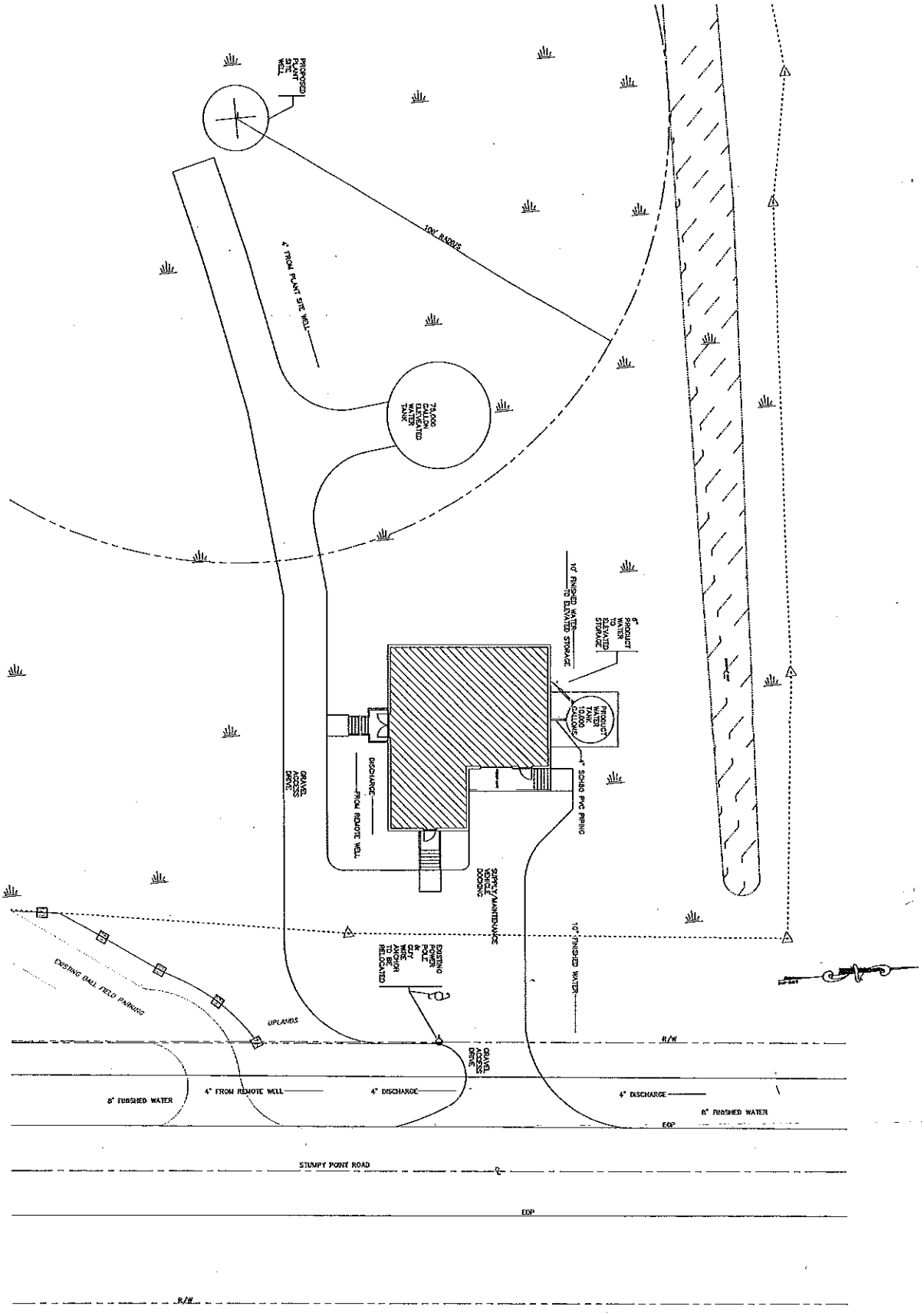
STUMPY POINT WATER & SEWER DISTRICT
COMMUNITY WATER SYSTEM
DARE COUNTY, NORTH CAROLINA
REVERSE OSMOSIS WATER TREATMENT FACILITY
CONTRACT I
FLOOR PLAN

DATE: MAY, 2000
DESIGNED: ETW
DRAWN: CJC
CHECKED: ETW
SCALE: NOT TO SCALE
SHEET NO.: A-4
OF XX



STUMPY POINT WATER & SEWER DISTRICT
COMMUNITY WATER SYSTEM
DARE COUNTY, NORTH CAROLINA
WATER TREATMENT FACILITY
CONTRACT I

SITE PLAN

DATE: MAY, 2000
DESIGNED: ETW
DRAWN: CJC
CHECKED: ETW
SCALE: NOT TO SCALE
SHEET NO. G-5
OF XX

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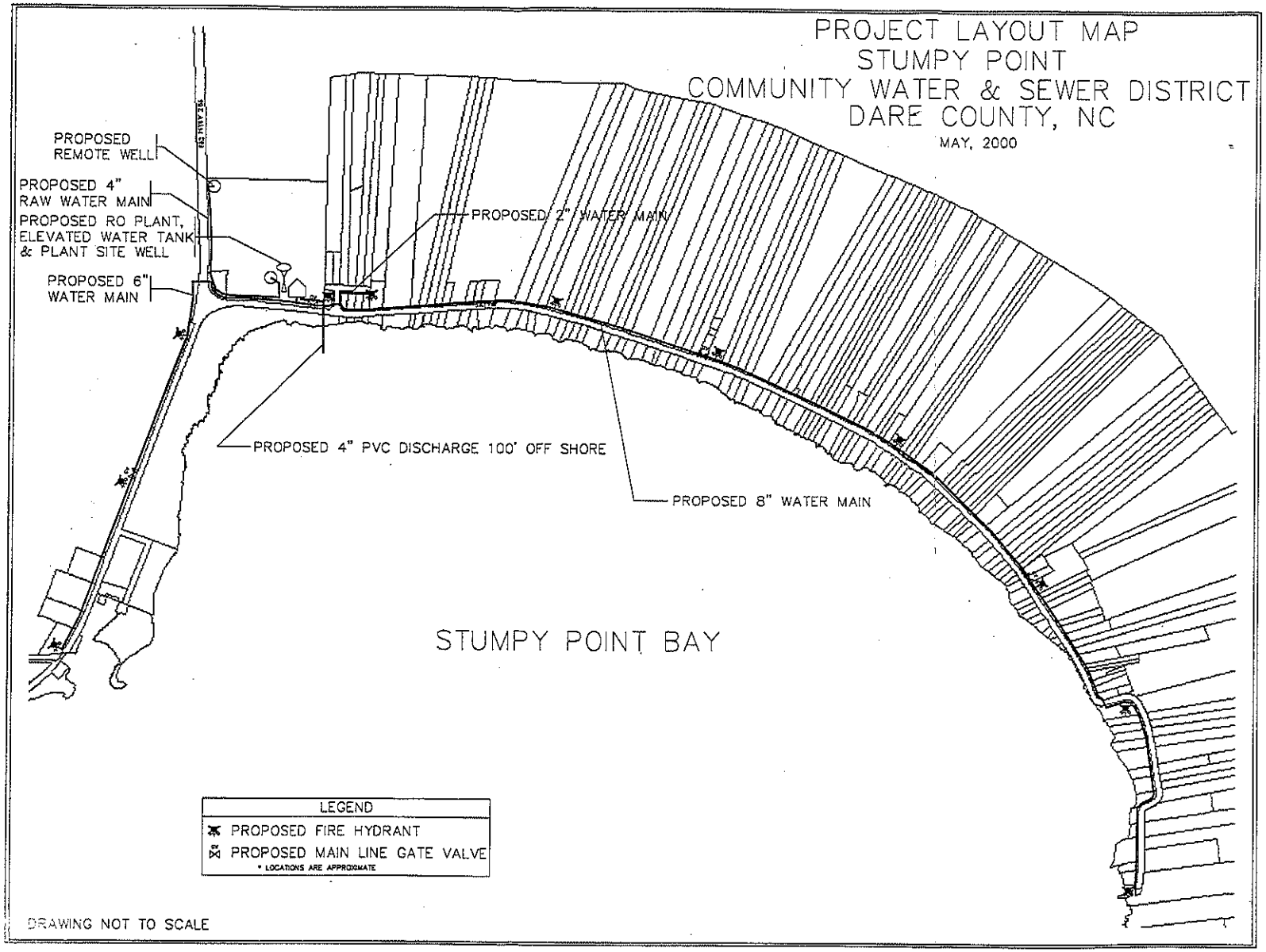
NORTH CAROLINA PROFESSIONAL SEAL 14988 ENGINEER

REVISIONS		
SYM.	DESCRIPTION	DATE

approximately every 2,000 feet. Three-quarter inch water services will be installed at each business and residence. The attached map illustrates the distribution system layout.


PROJECT LAYOUT MAP
STUMPY POINT
COMMUNITY WATER & SEWER DISTRICT
DARE COUNTY, NC
MAY, 2000
PROPOSED REMOTE WELL
PROPOSED 4" RAW WATER MAIN
PROPOSED RO PLANT, ELEVATED WATER TANK & PLANT SITE WELL
PROPOSED 6" WATER MAIN
PROPOSED 2" WATER MAIN
PROPOSED 4" PVC DISCHARGE 100' OFF SHORE
PROPOSED 8" WATER MAIN
STUMPY POINT BAY
LEGEND
PROPOSED FIRE HYDRANT
PROPOSED MAIN LINE GATE VALVE
* LOCATIONS ARE APPROXIMATE
DRAWING NOT TO SCALE

III. COST ESTIMATE

A.	WELLS			
1.	Wells	2 EA @ $80,000/EA	=	$160,000
2.	4" raw water main	2,510 LF @ $6.00/LF	=	$ 15,060
3.	remote well site work	LS @ $20,000	=	$ 20,000
B.	TREATMENT FACILITY			
1.	Site piping	LS @ $5,000	=	$ 5,000
2.	Fill material	1,000 CY @ $14.00/CY	=	$ 14,000
3.	Miscellaneous site work	LS @ $25,000	=	$ 25,000
4.	Treatment building			
		240 SF Administration area @ $125.00/SF	=	$ 30,000
		1,200 SF process area @ $100/SF	=	$120,000
5.	Standby generator	LS @ $30,000	=	$30,000
C.	DISCHARGE			
1.	4' directional bored HDPE pipe	300 LF @ $150.00/LF	=	$45,000
2.	Discharge header assembly	LS @ $10,000	=	$10,000
3.	4" discharge water main	600 LF @ $10.00/LF	=	$6,000
D.	STORAGE			
1.	75,000 gallon elevated storage tank	LS @ $250,000	=	$250,000
2.	Site work and piping	LS @ $30,000	=	$30,000
3.	Pilings	LS @ $50,000	=	$50,000
E.	DISTRIBUTION			
1.	8" PVC water main	13,500 LF @ $14.00/LF	=	$189,000
2.	6" PVC water main	4,100 LF @ $10.00/LF	=	$41,000
3.	8" gate valve	8 EA @ $700.00/EA	=	$5,600
4.	6" gate valve	25 EA @ $4500.00/EA	=	$11,250
5.	Fire hydrant assembly	21 EA @ $2,500.00/EA	=	$52,500
6.	Fittings	8,000 LBS. @ $3.00/LB	=	$24,000
7.	Bores	400 LF @ $150.00/LF	=	$60,000
8.	Water services	118 EA @ $475.00/EA	=	$56,050
9.	Driveway repair	LS @ $32,300	=	$32,300
		TOTAL CONSTRUCTION	=	$1,281,760

This cost estimate allows for approximately $153,000 for treatment equipment and instrumentation and controls. AEPI/RosTek, Inc. will supply a cost estimate for this work.

Difficult site conditions and the building size to accommodate the pressure filters will be adding extra cost to the project.

The necessity for the pretreatment system is not certain but is included at this time for insurance. The iron and silica issues with the previous test well may not be a problem in the proposed wells. A great deal of money will be saved if the two vessels, backwash pumps and filtered storage tank do not have to be installed.

Other cost savings can be realized if the 6-inch water main to Lake Worth is not installed at this time. Approximately $40,000 could be saved by not installing this line segment. A savings of approximately $30,000 can be realized by installing a leg tank instead of a spherical shaped elevated water tank. Finally, a savings of approximately $30,000 can be realized by installing a Butler Building style treatment plant house instead of the split face block architectural building.

Should funds allow, it will be desired to elevate the finished floor elevation of the building to ten feet.

IV. SCHEDULE

75% design complete	June 3, 2000
Obtain PWSS Approval	July 7, 2000
Receive funds	September 2000
Complete test wells	October 2000
Complete pilot plant	December 2000
100% design complete	February 2001
Receive bids and notice to proceed	April 2001
Complete construction	January 2002