CHARLES COUNTY
DEPARTMENT OF PLANNING AND GROWTH MANAGEMENT

BENEDICT CENTRAL SEWER SYSTEM FEASIBILITY STUDY

PGM #VCI 03-0046

September 23, 2004

WALLACE, MONTGOMERY & ASSOCIATES, LLP
TOWSON, MARYLAND 21204

CHARLES COUNTY DEPARTMENT OF PLANNING AND GROWTH MANAGEMENT

BENEDICT CENTRAL SEWER SYSTEM FEASIBILITY STUDY
PGM #VCI 03-0046

FINAL REPORT

SEPTEMBER 23, 2004

Prepared by

WALLACE, MONTGOMERY & ASSOCIATES, LLP
Towson, MD

ABSTRACT

Benedict is a rural village located along the west bank of the Patuxent River, in eastern Charles County, Maryland, containing a mixture of permanent and seasonal dwellings, and a few commercial establishments. The village has a community water supply, but sewage disposal is handled by on-site subsurface disposal systems of varying age, many known to be malfunctioning. This study identified and evaluated alternative methods of providing a needed public sewerage system, including alternatives for collection, treatment, and effluent disposal. Alternatives for three different collection system approaches were developed. Alternatives for four different treatment and effluent disposal alternatives were developed. The estimated costs of each of the collection, treatment and disposal alternatives were developed and presented in the report.

ACKNOWLEDGEMENTS

Wallace, Montgomery & Associates expresses our appreciation for the support and assistance of the staff of Charles County Department of Planning and Growth Management in the development and production of this study and report. Our thanks are due, in particular, to Program Manager Mr. Michael Hinchy, Project Managers Mr. John Stevens, Mr. Thak Bakhru and Mr. Joseph Bayatafshar, Planner Jason Groth, Utilities Director Jerry Michael, Maintenance Chief Mr. Ed Gorham, and Engineer Magda El-Khawalka.

This Report was prepared by Wallace, Montgomery & Associates, LLP, Civil and Structural Engineers of Towson, MD, under a contract with Charles County. We acknowledge the support of our subconsultant, MAR Engineering, of Timonium, MD, for their expert evaluation of treatment and disposal alternatives.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

ACRONMYM LIST

AADF	Annual Average Daily Flow
ADF	Average Daily Flow
BNR	Biological Nutrient Removal
BOD	Biochemical Oxygen Demand
CHWM	Coastal High Water Mark
CSBR	Continuous-feed Sequencing Batch Reactor (SBR)
DMR	Discharge Monitoring Report
DO	Dissolved oxygen
ENR	Extended Nutrient Removal
FEMA	Federal Emergency Management Agency
gpd	Gallons per minute
HDPE	High-density polyethylene (pipe material)
HVAC	Heating, Ventilating & Air Conditioning
LF	Lineal feet
LS	Lump sum
MALPF	Maryland Agricultural Land Preservation Foundation
MDE	Maryland Department of Environment
MGD	Million gallons per day
MLE	Modified Leutzak-Ettinger process
MOT	Maintenance of Traffic
NAD88	North American Datum (surveying datum)
NH_3	Ammonia
NPDES	National Pollutant Discharge Elimination System
O&M	Operation and Maintenance
PFA	Priority Funding Area
PIP	Poured in place (concrete)
PS	Pump Station
PVC	Polyvinyl chloride (pipe material)
SBR	Sequencing Batch Reactor (see also CSBR)
TKN	Total Kjeldahl Nitrogen
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TSS	Total Suspended Solids
UV	Ultraviolet light (disinfection process)

EXECUTIVE SUMMARY

Benedict is a rural village, identified as such by Priority Funding Area designation under the Maryland Smart Growth Initiatives. Benedict is located along the west bank of the Patuxent River, in eastern Charles County, Maryland, and contains a mixture of permanent and seasonal dwellings, and a few commercial establishments. The village has a community water supply operated by the County, but sewage disposal is handled by on-site subsurface disposal systems of varying age, many known to be malfunctioning. Need for mitigation of failing septic systems is identified in the Charles County Water and Sewer Plan. Benedict needs a centralized sanitary sewer collection and treatment system to improve the water quality of both the ground and surface waters.

This study identified and evaluated alternative methods of providing a needed public sewerage system, including alternatives for collection, treatment, and effluent disposal. Alternatives for three different collection system approaches were developed. Alternatives for four different treatment and effluent disposal alternatives were developed. The estimated costs of each of the collection, treatment and disposal alternatives are summarized below:

Collection System:	
Grinder Pump Pressure Sewer System	**$ 1,012,567**
Vacuum Sewer System	**$ 1,050,268**
Gravity Sewer System	**$ 1,153,571**
Treatment & Discharge System:	
SBR – Surface Water Discharge	**$ 2,089,841**
Schreiber® Process – Surface Water Discharge	**$ 2,177,656**
Schreiber® Process/Land Application	**$ 4,145,531**
SBR/ Land Application	**$ 4,427,254**

The least cost aggregate system is: a grinder pump pressure collection system, combined with an SBR treatment system and discharge of treated effluent to the Patuxent River, with a total estimated cost of **$3,102,408**. For the estimated buildout of Benedict, 243 lots, this is $12,800 per lot. If the cost were to be borne by only the existing residences, it would be proportionately higher, something over $23,000 per lot.

Estimated cost of the collection system alternatives is very similar. Treatment alternatives are also very similar in cost. Effluent disposal alternatives' costs, however, differ greatly, resulting in treatment/disposal cost variance of ± 31% of the mean. So project cost is relatively insensitive to the choice of collection or treatment process, but varies greatly with effluent disposal approach, nearly doubling if land disposal is selected.

SECTION 1
INTRODUCTION & BACKGROUND

1.1 INTRODUCTION

1.1.1 Authorization.

The County Commissioners of Charles County executed Contract No. 03-44 on November 19, 2003. By letter dated November 21, 2004, the County gave Wallace, Montgomery & Associates, LLP notice to proceed with performance of the contract effective December 4, 2003, under PGM #VCI 03-0046.

1.1.2 Scope of Services.

The Scope of Services is published in Charles County's Professional Services Contract Proposal No. 03-44 for PGM #VCI 03-0046. The Scope of services is excerpted from that contract, pages SP-1 to SP-4, and PL-1 to PL-4 and included in Appendix A for ease of reference.

1.1.3 Charles County Governing Regulations & Policies.

Charles County maintains a Comprehensive Water and Sewer Plan in conformity to requirements of Maryland state law. The current version of the Charles County Water and Sewerage Plan was adopted as amended May 29, 2003. The Water and Sewerage Plan (W&S Plan) sets forth the County's goals, objectives, general policies and implementation policies in regard to sewer services. It also sets out a system of Sewer Service Priority Classifications[1]. The W&S Plan further establishes six failing septic system condition categories, and a process for implementing corrective measures[2]. It identifies Benedict Central Sewer System as a year 2003-2007 improvement project[3].

The Water & Sewer Ordinance of Charles County provides the administrative and enforcement structure to implement the W&S Plan. It provides the guidelines and requirements for gravity sewers, pump stations basis for estimating planned wastewater flow rates, establishing design dimensional, separation and material requirements, as well as hydraulic and layout criteria. Applicable content from Sections 8.2, 8.2 and Appendices V and W, are excerpted in Appendix C of this report.

1.2 BACKGROUND

Benedict is a rural village located along the west bank of the Patuxent River, in eastern Charles County, Maryland, containing a mixture of permanent and seasonal dwellings, and a

[1] Charles County Comprehensive Water and Sewer Plan, Section1
[2] Charles County Comprehensive Water and Sewer Plan, Section 4
[3] Charles County Comprehensive Water and Sewer Plan, Appendix 4X

few commercial establishments. The village has a community water supply, but sewage disposal is handled by on-site subsurface disposal systems of varying age, many known to be malfunctioning.

Need for mitigation of failing septic systems is identified in the W&S Plan[4], (see Appendix B of this study Report). Benedict, which is located in eastern Charles County, is a rural village, and identified as such by Priority Funding Area designation under the Maryland Smart Growth Initiatives, consisting of single family homes and commercial establishments with private septic tank systems. The village is in need of a centralized sanitary sewer collection and treatment system in order to improve the water quality of both the ground and surface waters.

[4] Charles County Comprehensive Water and Sewer Plan, Appendix 4-M

SECTION 2
STUDY METHODOLOGY & DESIGN APPROACH

2.1 PLAN OF STUDY

The sewer service alternatives for Benedict all comprise a combination of a collection system, treatment facility and effluent disposal technology selections. This study will identify reasonable alternatives, and examine the constraints to their implementation, then structure specific alternatives with the least limitations, and evaluating then is terms of relative cost of construction and

2.2 ALTERNATIVES

2.2.1 Collection.

A range of engineering approaches to collection of domestic wastewater are available. Collection alternatives include "conventional" gravity sewers, using sloping underground piping and access manholes, and several "innovative" types of sewers. These innovative approaches are actually well-proven, with installations now in place for over 20 years. They include: pressure sewer systems with small-diameter pressure pipes, and individual homes served by either solids-handling pumps or grinder pumps, one to each house or several houses; vacuum sewer systems, with a central vacuum system that keeps the entire small diameter piping system under a negative pressure, and; septic-tank effluent pumping systems, similar to other pressure sewers except that the septic tank remains in service to capture most solids.

A variety of specific arrangements are available, and a system design must be tailored to the spacing of houses, the slope of the land, excavation characteristics of the local underground, interference of other underground utilities. Generally-accepted engineering design criteria, and the regulations of the County's Water and Sewer Ordinance, govern the design parameters and features. Relevant sections of the ordinance are excerpted as Appendix C. Three alternative approaches to the collection system were selected, and are described in detail in Section 3.3.

2.2.2 Treatment and Disposal.

The technologies for treating domestic wastewater, and disposing of the treated effluent, are well established. The appropriate technology for any given community is determined by the impact of the effluent on the land or water to which it is discharged. State water quality regulators are vested with responsibility for application of the Clean Water Act, and dictate the maximum permitted pollutant levels. Located immediately adjacent to the environmentally-stressed Chesapeake Bay, Benedict will have to provide advanced treatment

technology. The goal of this engineering feasibility analysis is to provide the required level of treatment at the most reasonable cost. Taking seriously its responsibility for good stewardship of all County resources, including land, water or space, means that Charles County facilities must meet the requirements of any land or surface water discharge permits and must protect public health. Public use should not be hampered and where possible, beneficial use of reclaimed water should be considered a positive. These concerns are primary. Other factors that will be kept in mind include liability issues, operation and maintenance complexity and cost, impact on the community, aesthetics and economics.

The study approach is to identify the disposal requirements, and then determine the treatment requirements needed to implement them. Several alternatives will be considered, a few options that appear most feasible will be evaluated as the most likely treatment and disposal combinations. Associated costs will be developed to enable the County to assess the overall economic impacts, at least in order of magnitude, so that more specific direction can be given to the designers who proceed with the more detailed design efforts.

The design concepts for treatment and disposal will be kept simple, while providing sufficient capability to meet variable requirements and influent loadings. Low levels of operator attention and initial cost, coupled with process flexibility and high effluent quality are the goals.

2.3 CONSTRAINTS & IMPACTS

2.3.1 Environmental Impacts.

2.3.1.1 Wetlands. A review of topical wetlands mapping compiled by US Fish and Wildlife Service revealed significant wetlands around the village of Benedict. USFWS mapping shows both estuarine and marine wetlands, and freshwater forested/shrub wetlands immediately adjacent to the populated areas of the village. Wetland areas are mapped immediately adjacent to the prospective site considered for the wastewater treatment plant. The areas mapped as wetlands are shown on a map in Appendix D.

Detailed siting analysis will be required to determine the exact areal extent of the wetlands areas; the investigation of this study is limited to reconnaissance-level information on type, size and location.

2.3.1.2 Forest Conservation. No forested areas are located within the village of Benedict.

2.3.1.3 Historical. A review of mapped historical sites revealed no historical sites within the study area.

2.3.1.4 Chesapeake Bay Critical Area

The Chesapeake Bay Critical Area Act requires the establishment of a minimum Buffer of 100 feet of natural vegetation landward from the Mean High Water Line of tidal waters or the edge of tidal wetlands and tributary streams. It is intended to protect this largest and most productive estuary in the United States, its watershed of 64,000 square miles, its sheltering habitat for 2,700 species of plants and animals. The required forested buffer acts as a filter for the removal or reduction of sediment, nutrients, and toxic substances which enter adjacent waterways in land run-off. The buffer also minimizes the adverse impact of human activities on habitat within the Critical Area.

In cooperation with the Critical Area Commission, local critical area management programs are administered by the 61 local governments whose jurisdictions are partially or entirely within the Critical Area. To accommodate future growth, a local jurisdiction is authorized under the Critical Area Act to change a land use designation and allow development at a density or intensity which exceeds the limits of a site's original designation.

Critical Area goals are:

- Minimize adverse impacts on water quality that result from
- Conserve fish, wildlife, and plant habitat in the Critical Area; and
- Establish land use policies for development in the Critical Area which accommodate growth and address adverse environmental impacts.

Clearing of trees is not allowed except with an approved Buffer Management Plan prepared by a professional forester. No other development (e.g. swimming pools, tennis courts, structures, septic fields) or other land disturbances are permitted in the Buffer.

Detailed siting analysis will be required to determine the exact areal extent of the required Critical Area forested buffer around wetlands areas. The investigation of this study is limited to reconnaissance-level information on type, size and location.

2.3.1.5 Floodplains. The village is subject to flooding from the adjacent Patuxent River. Hurricane Isabel of September 19, 2003 produced storm surge to an elevation of 5.4 feet NAD 88. FEMA's CHWM Collection Final Report of November 19, 2003 showed that water reached two feet depth at structures in the village (Appendix K).

2.3.1.6 Agricultural Easements/Open Space. No agricultural or open space areas are located within the village of Benedict. Any land effluent disposal approach has potential to impact agricultural and open space land. Prospective land disposal areas north of MD Route 231 are currently in agricultural use. The land area characteristics, and requirements for crop and nutrient management are discussed in detail in Section 3.3.4.2 of the Report.

2.3.2 Flood & Stream Hydrology.

Hydrologic setting of the village of Benedict is defined by the adjacent estuarine Patuxent River. Surface and storm water flows east and west from a very low, gently ridge toward a wetland on the west, and the river on the east.

The village is subject to flooding from the adjacent river. Hurricane Isabel of September 19, 2003 produced storm surge to an elevation of 5.4 feet NAD 88 (see Appendix K).

2.3.3 Utilities.

Existing underground and overhead utility lines present a design constraint for design of a sewerage system, particularly grade-dependent gravity sewers. Utilities with possible line locations in Benedict were contacted and mapping solicited. Responses of the utilities are provided in Appendix E of this Report.

Benedict is served with public water for a system owned and operated by Charles County. Two water pump stations, located at the north and west of the village, pressurize the system. The distribution piping for the water system is located beneath the streets of the village, consisting mostly of 6" and 8" diameter PVC piping, 42" below grade, on average. Record Drawing of the system, dated November 28, 1980, is provided in Appendix L.

Underground telephone cabling, owned by Verizon Communications, is also located in the streets of Benedict. Natural gas utilities Washington Gas and Dominion Transmission indicated they do not have facilities located in Benedict. Southern Maryland Electric Cooperative serves the village, but does not have any underground distribution facilities mapped.

2.3.4 Design Flow.

The amount of sewage flow generated by the homes and businesses in Benedict will determine the size requirements for the collection system, the size and configuration of the process tankage and equipment of the wastewater treatment plant, and the sizing of any land disposal system for the treated effluent. The total pollutant load of discharged effluent will also depend upon rate flow. The permitting conditions for its discharge to the river will be largely determined by this flow and loading.

2.3.4.1 Current. Water use records furnished by Charles County for 2002 and 2003 show monthly average daily water production ranging from 16,700 gallons per day (gpd) to 29,900 gpd. Monthly highest day values range up to 53,000 gpd, with several summer months each year exceeding 50,000 gpd. Annual average daily flow was 22,200 gpd and 22,900 gpd, respectively. The permit limit for the system is 56,000 gpd, and the pumping capacity is considered to be between 280,000 gpd and 375,000 gpd. Summary of water pumpage records appears in Appendix F.

Annual average daily wastewater production is considered to be approximately 22,000 gpd.

2.3.4.2 Buildout. The Scope of Services for this study contemplated planning for wastewater flows at buildout (pages SP-2 and SP-3 Scope of Services, Appendix A). The Charles County Water & Sewer Ordinance establishes wastewater flow planning criteria by zoning classification. Criteria are established for Base and Cluster uses. Figure 2-1 shows the zoning classifications in Benedict, the regulatory wastewater production rates, and the gross areas in the village, by zone.

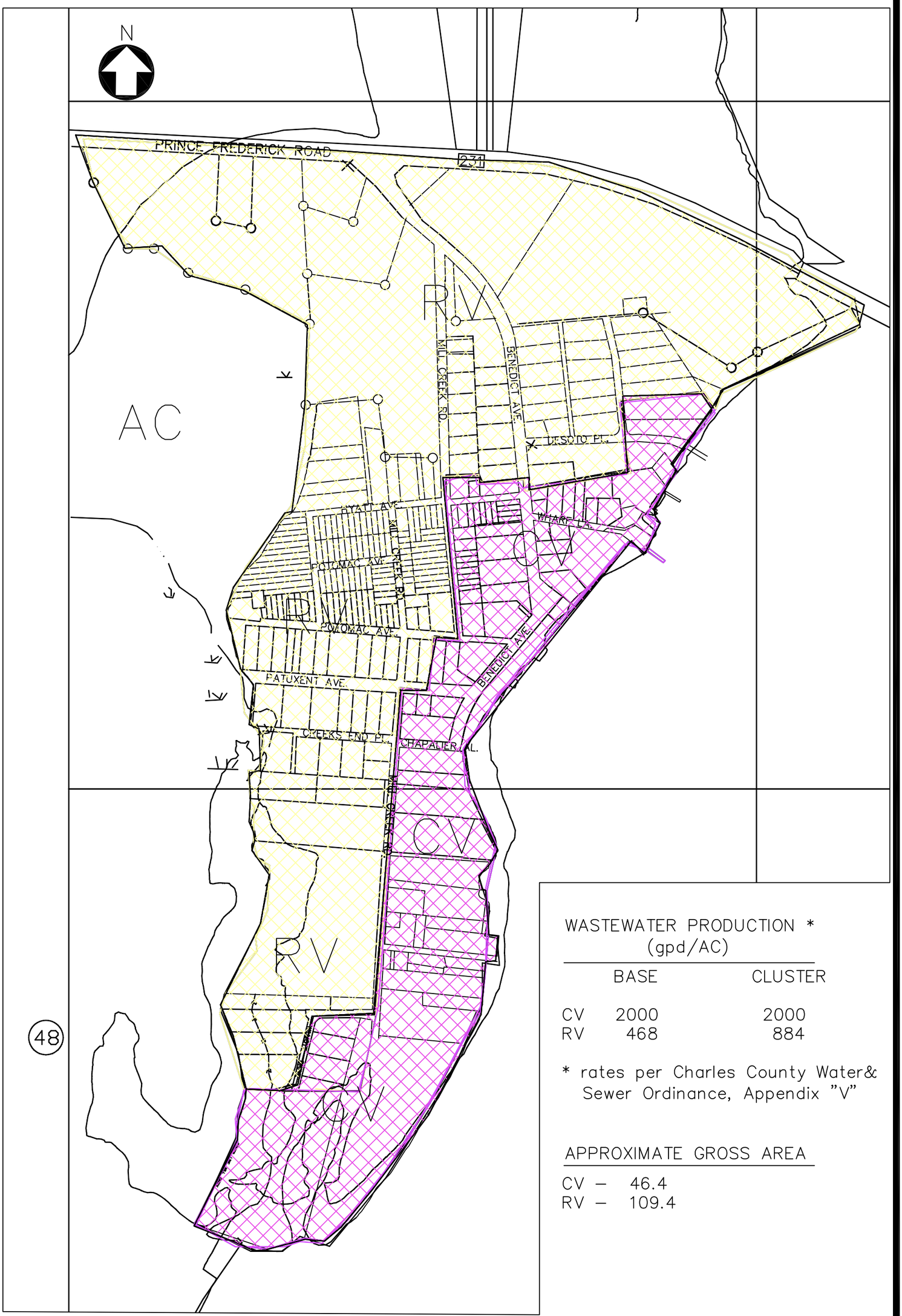
The resulting calculation establishes the buildout wastewater flow at current zoning values, to be approximately 128,000 gpd (base) to 164,000 gpd (cluster). This would represent a growth of 300% to 500% for the village. After reviewing the lots of record and possible future subdivision, the County's Planning Department determined that 243 lots will ultimately be served by the plant, at a flow of 333 gpd per lot. See correspondence in Appendix G. The wastewater planning flow for purposes of this study is 81,000 gpd AADF.

2.3.5 Discharge Limits.

The treatment process discharge limits are prescribed by the method of disposal. This study considers the feasibility of two distinct disposal methods, land application (surface or subsurface) and surface water discharge. The following text provides overview discussions of each, generally identifying the level of treatment required and the implementation issues associated with each.

2.3.5.1 Surface Water Discharge.

In early May of 2004, a request was made to the Maryland Department of the Environment seeking guidance in determining the discharge limitations for a surface water discharge. A response was received by letter dated July 22, 2004, which is included as Appendix H. The limits prescribed for an 81,000 gpd discharge into the Patuxent River at Benedict are summarized in the Table 2-1.



WASTEWATER PRODUCTION *
(gpd/AC)

	BASE	CLUSTER
CV	2000	2000
RV	468	884

* rates per Charles County Water& Sewer Ordinance, Appendix "V"

APPROXIMATE GROSS AREA

CV – 46.4
RV – 109.4

WALLACE, MONTGOMERY & ASSOCIATES, LLP

SCALE: 1" = 400'

BENEDICT CENTRAL SEWER SYSTEM FEASIBILITY STUDY
CHARLES COUNTY PGM VCI# 03–0046
EXISTING ZONING & WASTEWATER PRODUCTION RATES

FIGURE 2-1

203014.00 UT08BENE.DWG

[redacted]	[redacted]	[redacted]	[redacted]
Biochemical Oxygen Demand (BOD_5)	30	mg/l	Monthly Average
	45	mg/l	Max. Weekly Average
Total Suspended Solids (TSS)	30	mg/l	Monthly Average
	45	mg/l	Max. Weekly Average
Total Nitrogen (TN)	8.0	mg/l	Monthly Average
	12	mg/l	Max. Weekly Average
Total Phosphorus (TP)	2.0	mg/l	Monthly Average
	3.0	mg/l	Max. Weekly Average
Dissolved Oxygen (DO)	5	mg/l	Minimum
pH	6.5	S.U.	Minimum
	8.5	S.U.	Maximum
Total Residual Chlorine (TRC)	>0.1	mg/l	Non-detectable level
Fecal Coliform	14	MPN/100 ml	

[redacted]

Although these limits in themselves are not unusually stringent and simply represent the receiving water requirements, MDE's correspondence goes on to stipulate that higher levels of treatment will be required, as excerpted below:

> "To avoid increasing the nutrient loading to Chesapeake Bay, new treatment plants, which were not permitted in 2000 are expected to install an advanced level of BNR, and also offset their remaining nutrient load by obtaining at least an equal amount of nutrient reduction at other point or non-point source."

This means that MDE's policy will be to permit no net increase to the nutrients being discharged into the receiving water due to a new discharger. So, if the plant were to discharge 8 mg/l TN at a flow rate of 81,000 gpd (5.4 lb/d) per the permit guidelines in the table, then an equivalent reduction in the discharge of nitrogen of 5.4 lb/d must be realized somewhere else. This offset must result in a zero net increase of nitrogen into the bay.

Another approach is to treat to a higher level of nitrogen removal to reduce the amount of offset required. Currently-available treatment technology can reduce effluent total nitrogen down to a level of about 3 mg/l. With this level of treatment at 81,000 gpd the discharge to the receiving water would contain about 2.02 lb TN/d.

MDE makes the presumption that subsurface disposal systems like those currently serving the Benedict community are already impacting the adjacent water bodies by percolating nitrogen through the groundwater, which eventually makes its way to the water body. Because the new treatment facility will eliminate this source of nitrogen from continuing to migrate to the adjacent waters, it is considered part of the required offset. MDE has recently set a precedent of allowing such a reduction based on current flows and estimated discharges resulting from the existing septic systems. The MDE formula allows the credit of one half (1/2) of the total TN discharge estimated to have been reduced. For Benedict, the historical flow based on water consumption is about 23,000 gpd. Using this and MDE's 29mg/l TN estimate of the amount of nitrogen discharge resulting from septic systems adjacent to water bodies, implies a reduction of 5.56 lb TN/d. Per the MDE formula, half of this, or 2.78 lbTN/d is realized as an offset.

The 2.78 lb TN/d offset is greater than the 2.02 lbTN/day discharged at 3 mg/l TN, therefore the offset requirement is met if the treatment facility treats to a TN level of 3 mg/l TN.

Nutrient loads have been discussed above in terms of daily values. In reality, MDE generally extrapolates these loads to an annual basis and sets an annual mass loading that serves as the total nitrogen discharge allowed. For this facility to exactly meet the offset requirement, it needs to discharge less than the 2.78 lb TN/d (1014.7 lb TN/year). This can be done by attaining a discharge TN of 4.11 mg/l TN. In practical terms, this level cannot be consistently met with MLE-type BNR treatment systems. Such systems can only attain nitrogen discharge levels ranging from about 5 to 7 mg/l TN consistently. Attaining 4 mg/l TN consistently, requires technologies that can consistently produce a higher level of treatment - with a separate denitrification stage. The Bardenpho® process - or an MLE or SBR process followed by denitrification filters - are the predominant treatment technologies used to attain levels less than 4 mg/l TN. Such a process usually attains TN in the range of 2 – 3 mg/l TN.

For the purposes of this study, the treatment level required for surface water discharge is presumed to be nitrogen controlled, and requires attaining effluent total nitrogen of 3 mg/l TN to meet the MDE offset requirement. Additional details of the treatment technologies and concepts considered for surface water discharge are presented in Sections 3 and 6 of this report.

2.3.5.2 Land Disposal.

Application of wastewater to the land can be done for purposes of treatment and disposal, or disposal alone. As an example of the former, traditional subsurface disposal systems provide minimal treatment by septic tank, followed by distribution through disposal beds comprised of rock and soil. Additional treatment occurs in the unsaturated rock and through the soil matrix as the wastewater percolates to the groundwater. In the latter only disposal occurs. An example of this is the re-use of

more highly treated wastewater for irrigation purposes taking advantage of the moisture for irrigation, rather than what limited nutrients it might contain. This provides beneficial use of the water for crop growth and serves to recharge the surface water aquifer.

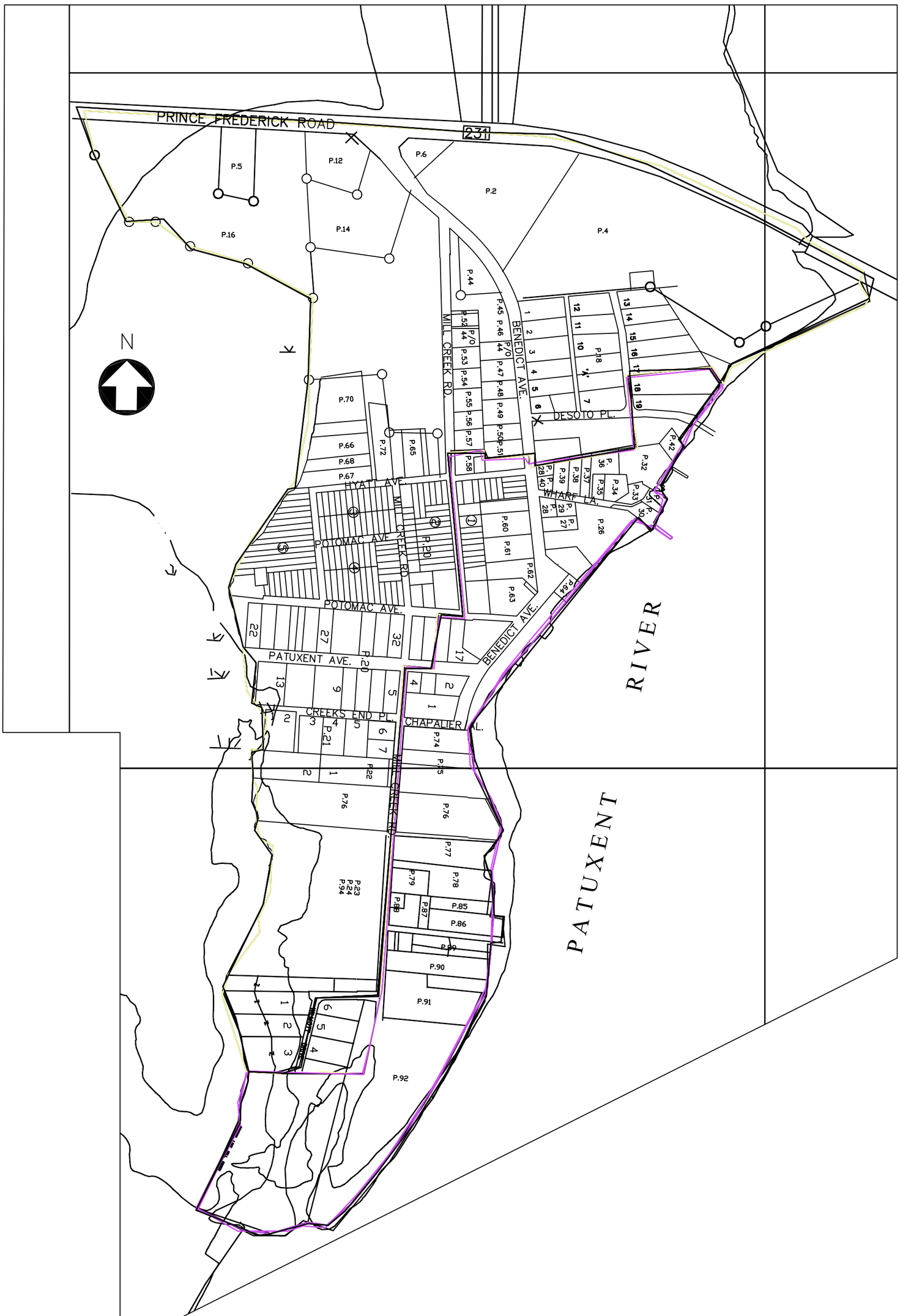
The controlling factor in land application, surface or subsurface, is the protection of the groundwater quality. Obviously, the better the treatment provided prior to land application, the better the quality of the percolate into the ground. This project used available information, predominantly the USGS soils mapping documents as its basis for assessing the potential of land application. Detailed site evaluations were neither warranted, nor performed as part of this work. If economically feasible, the technical feasibility will need to be developed further as part of the detailed preliminary design efforts.

For the application of treated domestic wastewater to the land, the primary contaminant of concern is nitrate nitrogen. Nitrate nitrogen is a regulated contaminant limited to 10 mg/l in water used for drinking. Groundwater protection includes limiting nitrate accumulation related to land disposal such that the nitrate levels leaving a treatment/disposal site do not exceed this limit.

For the purpose of this project, all nitrogen discharged (total nitrogen) is assumed to ultimately end up as nitrate in the groundwater unless it is reduced to nitrogen gas by the soil biology, or taken up as a nutrient by crops that are then harvested and carried off site as nitrogen bound in the grain. Nitrogen accounting at land application sites can be complex requiring significant time top monitor and record application rates, nitrogen concentrations, crop uptake and numerous other elements. This is further complicated by the need to add fertilizer for agricultural reason, which also contain and add nitrogen to the soil and percolate. All this nitrogen accounting is followed by performing a nitrogen balance to estimate how much of the applied nitrogen actually reached the groundwater, the effect of dilution by rainfall, etc. monitoring wells are required to verify that the theoretical balance and actual groundwater nitrogen levels are both less than the required limits.

Another approach for land application that is widely adopted by municipalities using land application for disposal is to remove nitrogen to a level below the 10 mg/l requirement during treatment so that the land applied water is assured of being less than the 10 mg/l requirement. This is the approach taken by most municipal entities because it represents good stewardship of the groundwater resource, it is prudent from a practical standpoint, and it limits the potential liabilities that could result from groundwater contamination. It also represents a less complicated operational scenario rendering the applied water as a beneficial irrigation use rather than a potential threat to groundwater quality.

For the purposes of this study, it is presumed that the treatment facilities treating the wastewater prior to land application must be capable of treating to a total nitrogen



WALLACE, MONTGOMERY & ASSOCIATES, LLP

SCALE: 1" = 400'

BENEDICT CENTRAL SEWER SYSTEM FEASIBILITY STUDY
CHARLES COUNTY PGM VCI# 03-0046

PARCEL MAP

FIGURE 2-2

203014.00 UT07BENE.DWG

level of less than 8 mg/l. Additional details of the land application concepts considered are presented in Sections 3 and 6 of this report.

SECTION 3
ANALYSIS

3.1 FRAMEWORK FOR ANALYSIS

3.1.1 Cost Estimate Bases

Back up power will need to be provided for both the main pump station and the treatment plant in the form of an emergency generator. The treatment plant is expected to have the larger load and includes the costs of this element of work. It is assumed that the pump station and plant will be in close enough proximity to share a generator and only one generator is provided for as a result.

The cost estimates for the treatment facilities include estimates for site work, a minimal building to house the treatment facilities, equipment costs, odor control, back up power, electrical, HVAC/mechanical, and installation estimates. All cost summaries will include a contingency of 20% as well as a line item for future engineering efforts of 10%.

Budget estimates have been provided for major equipment including the package treatment plants and pretreatment (screen/grit) equipment. Costs for pumps and structures not included in the package plant, lagoon construction, labor for construction, electrical and controls, the building, etc. are based on similar work bid over the last year and scaled up, or down to fit the Benedict situation.

3.1.2 Operation & Maintenance.

Annual Operation and Maintenance costs for the treatment options have been broken down into nine categories as follows:

1. Operations Labor –includes the normal daily visits to the site to perform operational controls and minor preventive maintenance. Based on input from the Bureau of Utilities, this has been assumed as 6 hrs/d, 6 d/wk, 52 wks/yr at $36/hr and is the same for all treatment options. Additional operations time is added for the land application alternatives adding 6 hr/d, 3 d/wk, 30 wk/year @ $36/hr for monitoring well samples, field inspection and lagoon oversight.

2. Maintenance Labor – includes the labor required more infrequently than operations labor to work on specific equipment issues or malfunctions. This is included as 8 hr/d, 1½ d/wk, 26 wk/yr at $36/hr. additional maintenance labor is added for the land application alternatives as 8 hr/d, 1½ d/wk, 8 wk/yr @ $36/hr to service the pivots and irrigation pumps.

3. Electric Motors – from horsepower and run time estimates, equipment electric costs are estimated for the treatment options at $0.08 /KW-hr. Alternatives with land

application include additional costs for the pivot motors and irrigation pumps at the same cost rate.

4. Electric Heat – includes general building electric consumption. By being conservative on heating, lighting is considered included. These estimates are based on the nominal 90' x 100' building for all treatment alternatives, with additional costs for alternatives with land application for a 15' x 20' irrigation building. R-values are assumed and gross calculations of building surface area are used. Degree days, adjusted for 45 degree interior temperature are assumed at 3500.

5. Chemicals – the need for chemicals is not well defined and will be highly dependent on wastewater characterization for process chemicals. Disinfection chemicals will be required for the land application alternatives. Chemical costs indicated are allocations of $1200 for process chemicals on surface discharge options, and $3000 on land application alternatives with chlorination and dechlorination.

6. Sludge Hauling – All treatment alternatives include estimates of the cost for hauling sludge from the Benedict plant to Mattawoman for further treatment. Four (4) 2000 gallon loads per month at a cost of $300 per load was used to develop this estimate. The same estimate is used for all treatment alternatives.

7. Materials and Equipment costs – without specifically identifying equipment life and replacement needs, this category represents a sinking fund for long term replacement items. Surface discharge alternatives include a $2500 allocation and land application alternatives include an extra $1200, $3700 total.

8. Administrative Costs – this category is intended to pick up laboratory and County office support like planning, capital projects, etc. it is estimate as a percentage of the estimated annual O&M. Two (2) percent is used.

9. Contingency – this category is included to account for the margin of error associated with estimating costs at this level of project development. A five (5) percent contingency is applied to the estimated annual O&M cost.

The undeniable O&M element is that any options using land treatment will require additional operator attention to those with a stream discharge. Up to the point of being pumped from the treatment facility, O&M will be very similar for the treatment options. From that point on, analytical costs for the surface water discharge options will be greater, but actual operator time to manage the land application system, coordinate with land users, maintain records of application rates and quality, and other agronomic related activities, maintaining an additional set of spray pumps and center pivot irrigation systems will consume significant time.

Annual O&M Cost summary tables are provided later in this section along with the capital cost summaries.

3.1.3 Odor.

Due to the proximity of the collection, treatment and disposal facilities to the community, odor is a significant concern. The short residence time in the collection system is expected to be beneficial in this regards. Hydrogen sulfide formation is less likely under these circumstances, but odor control will still be provided. For the collection system, odor control is provided at the main pump station in the corm of Purifil type carbon canisters.

The odor control at the treatment facility will be a bit larger and more complex. First off, all facilities will be housed in a minimal cost structure along the lines of a pole shed, but insulated; this is to help contain any odors from the process. The active odor control strategy is be to provide an odor control system that pulls from headspaces at the influent facilities including the screen and grit facilities, as well as from the process feed wet well. Initially it is not anticipated that the entire structure headspace will need odor control. This large space would be expensive to treat and unnecessary if the headspace alternative is successful. Space will be left for a future odor system should it be found to be needed, but is not included in the costs.

3.2 CHARACTERIZATION OF ALTERNATIVES

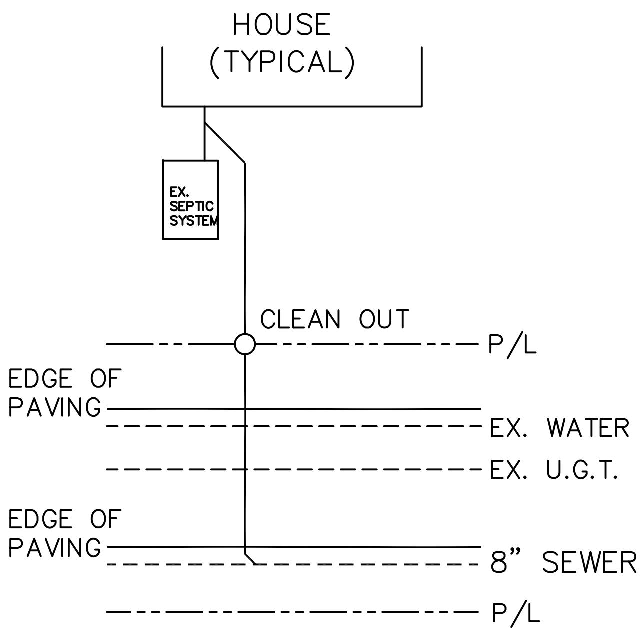
3.2.1 General.

The sewer service alternatives for Benedict all comprise a combination of a collection system, treatment facility and an effluent disposal regime. The collection system alternatives choices are largely independent of the treatment and disposal, but certain pairs of treatment options and effluent disposal are appropriate.

3.2.2 Collection System Alternatives.

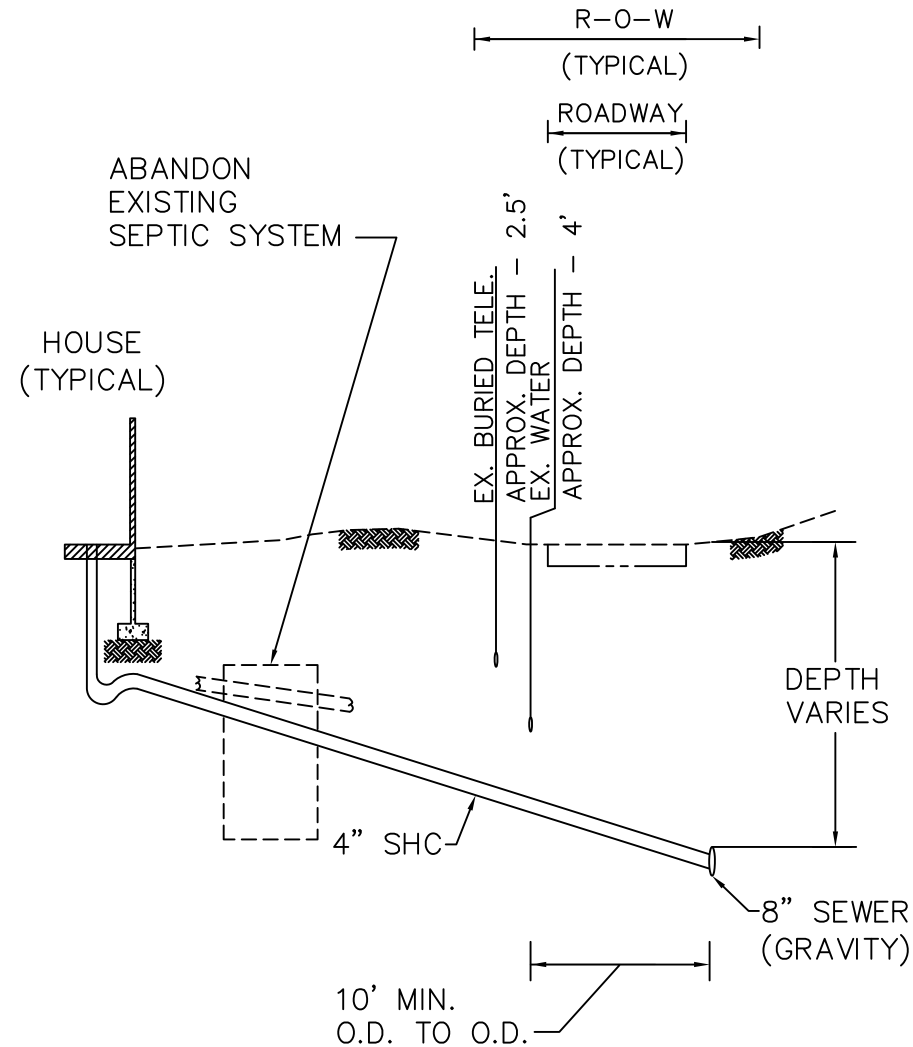
3.2.2.1 Gravity Collection System with Submersible Pump Station (s). Gravity sewers designed in accordance with requirements of the Sewer and Water Ordinance and standard engineering practice. Depths to be established for service to lowest floors in final design (many structures in Benedict are slab-on-grade). Manhole spacing 250 feet average, 400 feet maximum. Materials to be in accordance with County standards. Sewer alignment generally in shoulder of roadway or street. Submersible pump station to be sited adjacent to wastewater treatment plant at north (lower) end of collection system. Minimum grade on gravity sewers will result in deep trench excavation for construction at lower (north) end of gravity system near plant, requiring well-point dewatering during construction. Sub-alternatives may be investigated prior to design, involving partial gravity, partial pressure system, alleviating some deeper excavation. (Refer to County Design Standards, Appendices C and D).

General arrangement of sewers on lot, and relative to street, is shown on Figure 3-1. Overall layout of gravity sewer system in Benedict is shown on Figures 3-4 and 3-5. Estimated costs for the gravity sewer system are tabulated below, in Table 3-1.



PLAN

SCALE: N.T.S.



CROSS SECTION

SCALE: N.T.S.

WALLACE,
MONTGOMERY
& ASSOCIATES, LLP
CIVIL AND STRUCTURAL ENGINEERS
110 WEST ROAD
TOWSON, MARYLAND 21204

BENEDICT CENTRAL SEWER SYSTEM FEASIBILITY STUDY
CONCEPTUAL GENERAL ARRANGEMENT
GRAVITY SEWER SYSTEM

SCALE: NOT TO SCALE DATE: 09/23/04

FIGURE 3-1

PRINCE FREDERICK ROAD

231

WASTEWATER TREATMENT PLANT

PUMP STATION

EX. 8" WATER

EX. 6" WATER

EX. BURIED TELE.

PROP. 8" SEWER

EX. 6" WATER

MILL CREEK RD.

BENEDICT AVE.

DESOTO PL.

HYATT AVE.

POTOMAC AVE.

WHARF LA.

MATCH LINE

KEY MAP
NOT TO SCALE

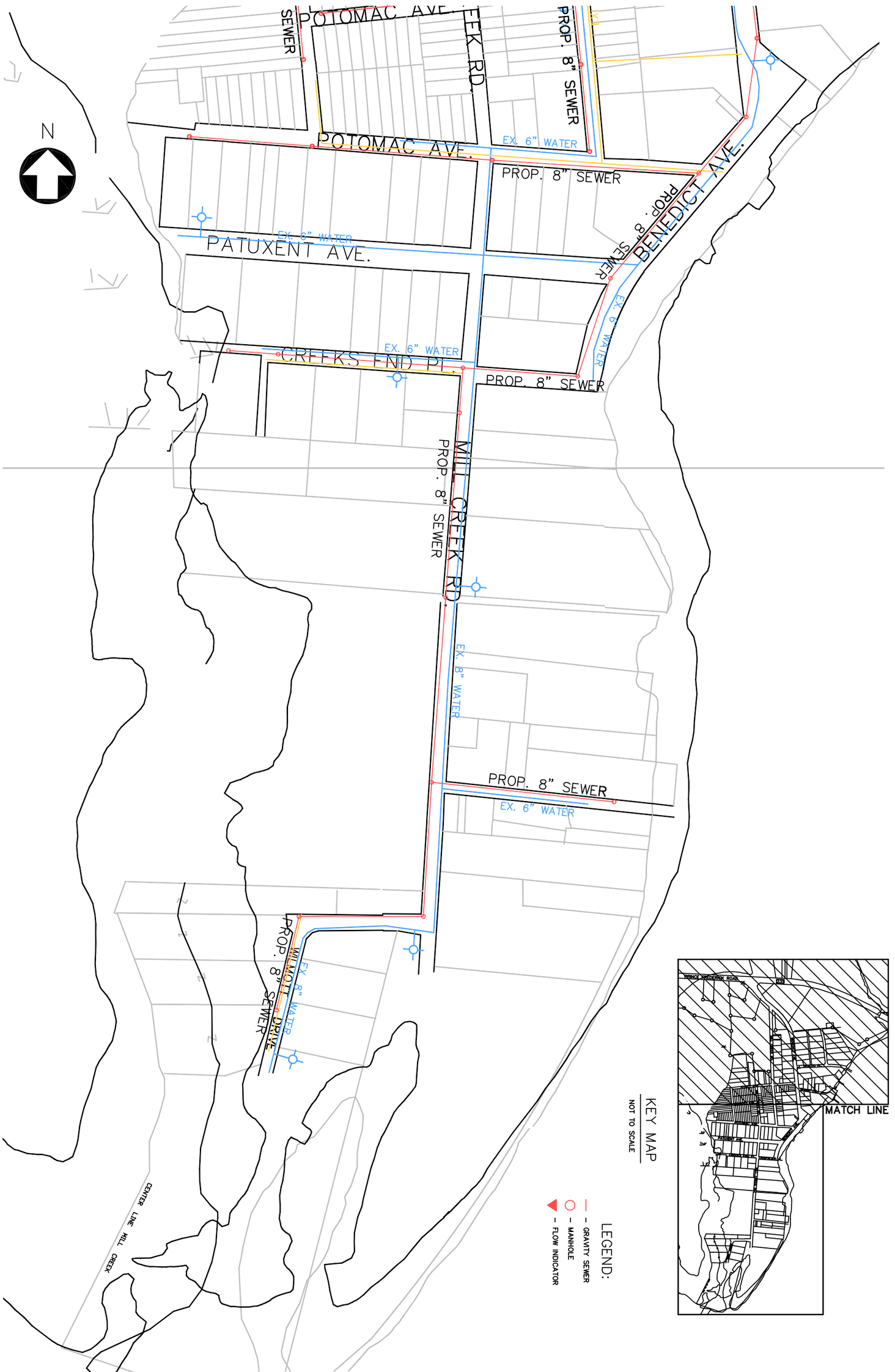
N

LEGEND:
- GRAVITY SEWER
- MANHOLE
- FLOW INDICATOR

BENEDICT CENTRAL SEWER SYSTEM FEASIBILITY STUDY
CHARLES COUNTY PGM VCI# 03-0046
GRAVITY SEWER COLLECTION SYSTEM – NORTH END
FIGURE 3-4

WALLACE, MONTGOMERY & ASSOCIATES, LLP

SCALE: 1" = 200'



WALLACE, MONTGOMERY & ASSOCIATES, LLP

SCALE: 1" = 200'

BENEDICT CENTRAL SEWER SYSTEM FEASIBILITY STUDY
CHARLES COUNTY PGM VCI# 03-0046
GRAVITY SEWER COLLECTION SYSTEM – SOUTH END

FIGURE 3-5

M:\PROJ\ | | | | | | \Utilities\Benedict\CD 08-25-08\Figures\ut01bene FIG 3-5.dwg

203014.00 UT01BENE.DWG

DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	TOTAL
8" Dia. PVC Sewer (5-10' Deep)	LF	$23.97	7,739	$185,515
8" Dia. PVC Sewer (10'+ Deep)	LF	$34.64	2,907	$100,698
4" Vacuum Main	LF	$13.00	0	$0
6" Vacuum Main	LF	$15.00	0	$0
8" Vacuum Main	LF	$18.00	0	$0
3" Vacuum Service Connection	LF	$11.00	0	$0
Vacuum Main 6" Division Valves	Ea	$1,100.00	0	$0
3" Pressure Sewer	LF	$8.60	0	$0
1-1/2" Pressure Sewer	LF	$5.49	0	$0
H.C. - 4" DIA. (75 LF/Hse) (Gravity Lateral)	LF	$10.53	9,825	$103,457
4' Dia. Precast Concrete Manholes (8' Deep)	Ea	$3,175.00	27	$85,725
4' Dia. Precast Concrete Manholes (14' Deep)	Ea	$6,025.00	14	$84,350
Grinder Pump Units (Duplex w/ Baffle)	Ea	$8,000.00	0	$0
Grinder Pump Units (Simplex)	Ea	$4,000.00	0	$0
Vacuum Main Collection Chambers	Ea	$2,500.00	0	$0
Submersible Pump Station	Ea	$87,000.00	1	$87,000
Vacuum Station (Includes Building and Installation)	Ea	$205,000.00	0	$0
Well Points	LS	-----	-----	$91,614

Common

Abandon Existing Septic Systems	Ea	$401.22	131	$52,560
Restoration (Paved & Unpaved)	LS			$86,443
MOT	LS			$10,000
Erosion and Sediment Control	LS			$0

			Subtotal:	**$887,362**
Engineering Cost @	10	**%**		**$88,736**
Contingency @	20	**%**		**$177,472**
			Total:	**$1,153,571**

Table 3-1 - Estimated Cost for Gravity Sewer System

3.2.2.2 Grinder Pump Pressure Sewer System. Pressure sewer system delivers wastewater to head of treatment plant with pressure established by individual grinder pumps on system. High-head positive or semi-positive displacement pumps with integral grinders, located in fiberglass-reinforced polyester tanks, sited on each lot (where practical, two lots may be ganged together on a duplex unit). Location of grinder pumps to minimize length of existing lateral. Pressure collection system to be sited near as practical to house, minimizing gravity house connection, in favor of longer pressure sewer. Grinder pump units to be accessed for maintenance with "meandering easements". Replacement of all service laterals from house wall to grinder station influent to alleviate infiltration and inflow source. Pressure sewers to be approximately 2½" to 3" diameter PVC or HDPE, laid approximately 36" to 42"

deep, without regard to grade. Construction may be by open trench or directional drilling.

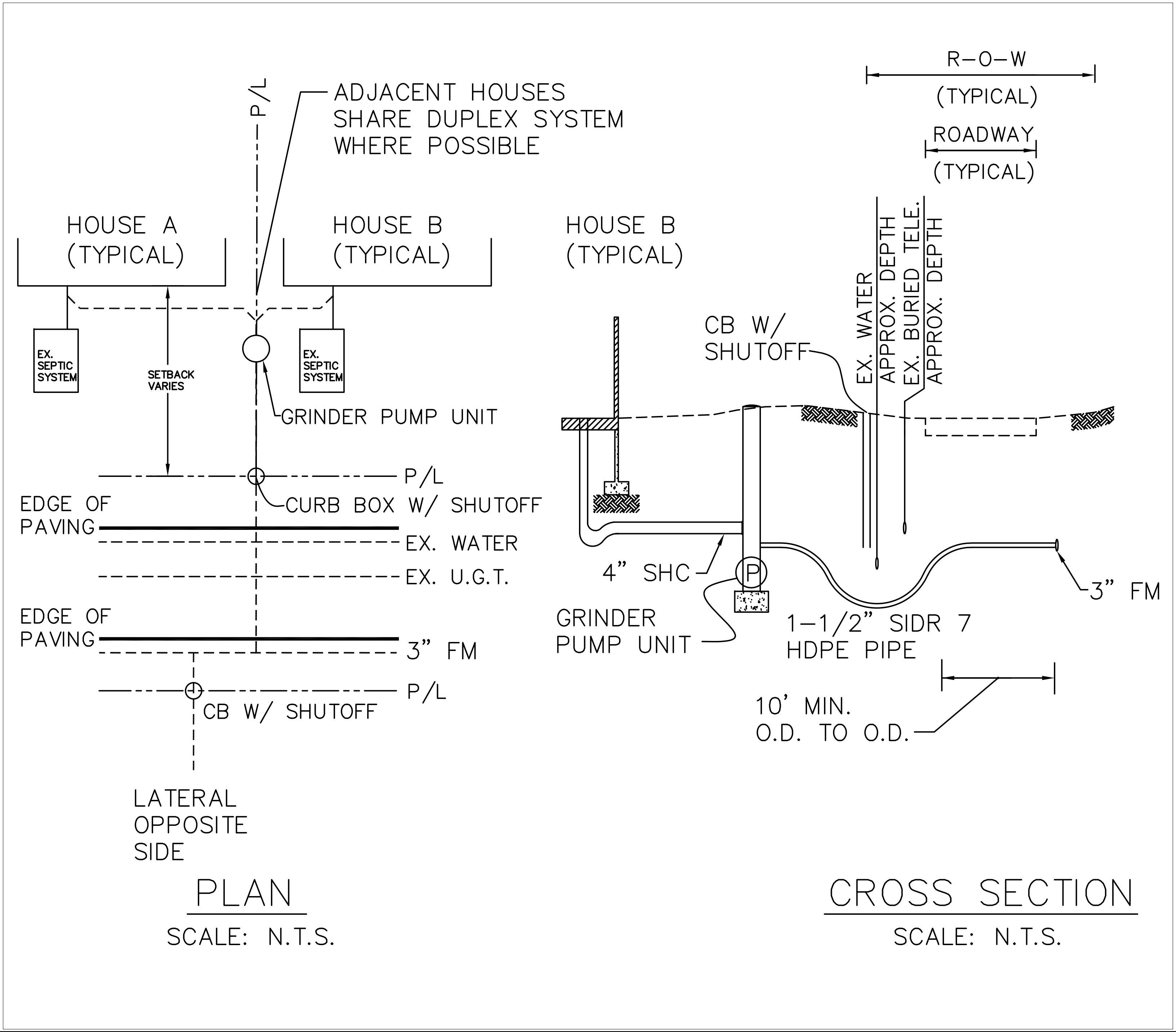
General arrangement of sewers on lot, and relative to street, is shown on Figure 3-2. Overall layout of gravity sewer system in Benedict is shown on Figures 3-6 and 3-7. Estimated costs for the pressure sewer system are tabulated below, in Table 3-2.

DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	TOTAL
8" Dia. PVC Sewer (5-10' Deep)	LF	$23.97	0	$0
8" Dia. PVC Sewer (10'+ Deep)	LF	$34.64	0	$0
4" Vacuum Main	LF	$13.00	0	$0
6" Vacuum Main	LF	$15.00	0	$0
8" Vacuum Main	LF	$18.00	0	$0
3" Vacuum Service Connection	LF	$11.00	0	$0
Vacuum Main 6" Division Valves	Ea	$1,100.00	0	$0
3" Pressure Sewer	LF	$8.60	11,500	$98,900
1-1/2" Pressure Sewer	LF	$5.49	5,100	$27,999
H.C. - 4" DIA. (60 LF/Hse) (Gravity Lateral)	LF	$10.53	5,100	$53,703
4' Dia. Precast Concrete Manholes (8' Deep)	Ea	$3,175.00	0	$0
4' Dia. Precast Concrete Manholes (14' Deep)	Ea	$6,025.00	0	$0
Grinder Pump Units (Duplex w/ Baffle)	Ea	$7,000.00	46	$368,000
Grinder Pump Units (Simplex)	Ea	$4,000.00	39	$156,000
Vacuum Main Collection Chambers	Ea	$2,500.00	0	$0
Submersible Pump Station	Ea	$87,000.00	0	$0
Vacuum Station (Includes Building and Installation)	Ea	$205,000.00	0	$0
Well Points	LS	-----	-----	-----
Common				
Abandon Existing Septic Systems	Ea	$401.22	131	$52,560
Restoration (Paved & Unpaved)	LS			$57,735
MOT	LS			$10,000
Erosion and Sediment Control	LS			$0

			Subtotal:	**$824,897**
Engineering Cost @	10	**%**		**$82,490**
Contingency @	20	**%**		**$164,979**
			Total:	**$1,012,567**

Table 3-2 - Estimated Cost for Grinder Pump Pressure Sewer System

3.2.2.3 Vacuum Sewer System. Central vacuum station with vacuum receiving tank will be located adjacent to wastewater treatment plant. Central vacuum station will be equipped with pumps to lift sewage from bottom of receiving tank to plant influent screen system. Location of vacuum tank on lot to minimize length of existing lateral. Vacuum system to be sited near as practical to house, minimizing gravity house



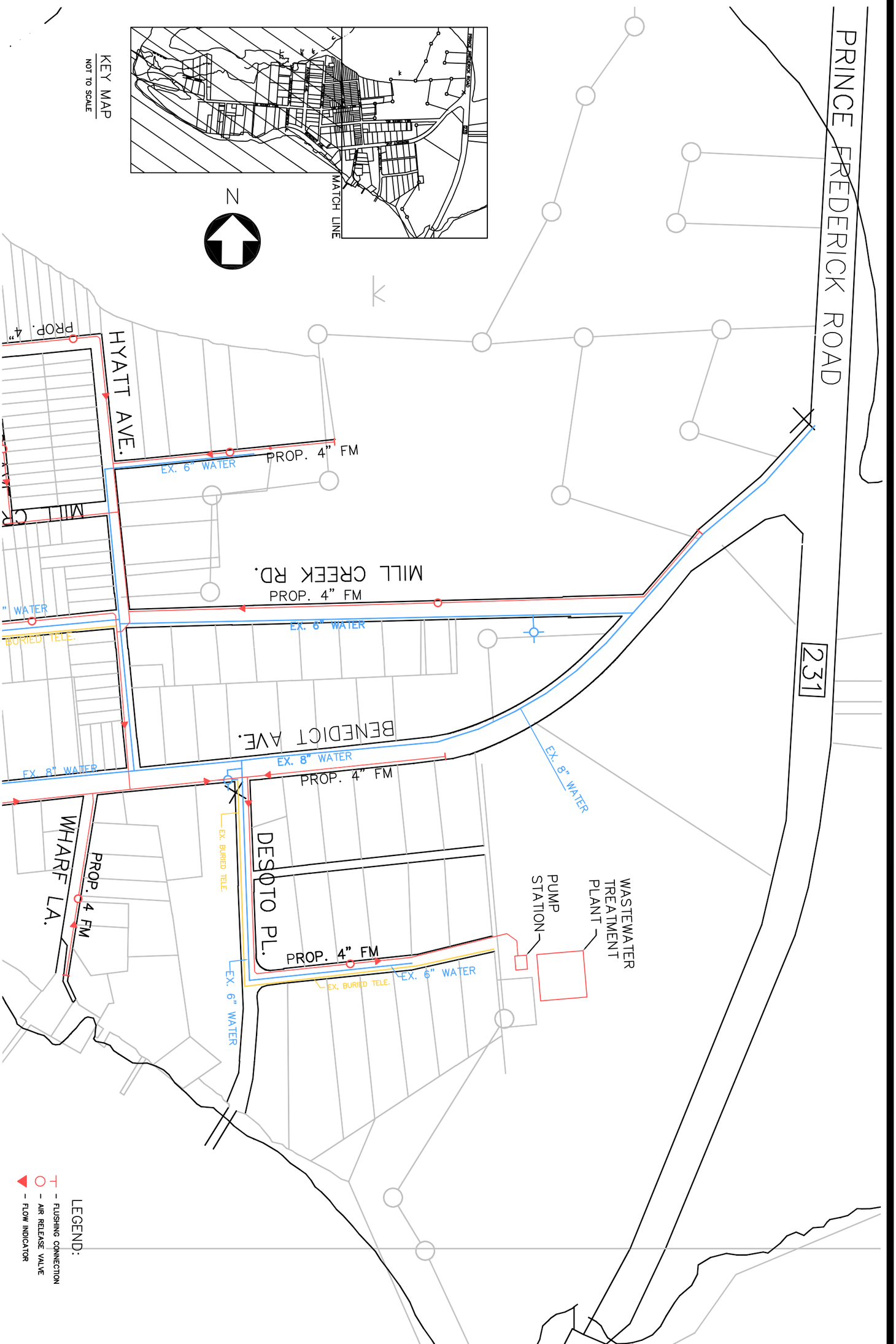
WALLACE,
MONTGOMERY
& ASSOCIATES, LLP

CIVIL AND STRUCTURAL ENGINEERS
110 WEST ROAD
TOWSON, MARYLAND 21204

BENEDICT CENTRAL SEWER SYSTEM FEASIBILITY STUDY
CONCEPTUAL GENERAL ARRANGEMENT
GRINDER PUMP PRESSURE SEWER SYSTEM

SCALE: NOT TO SCALE   DATE: 09/23/04

FIGURE 3-2



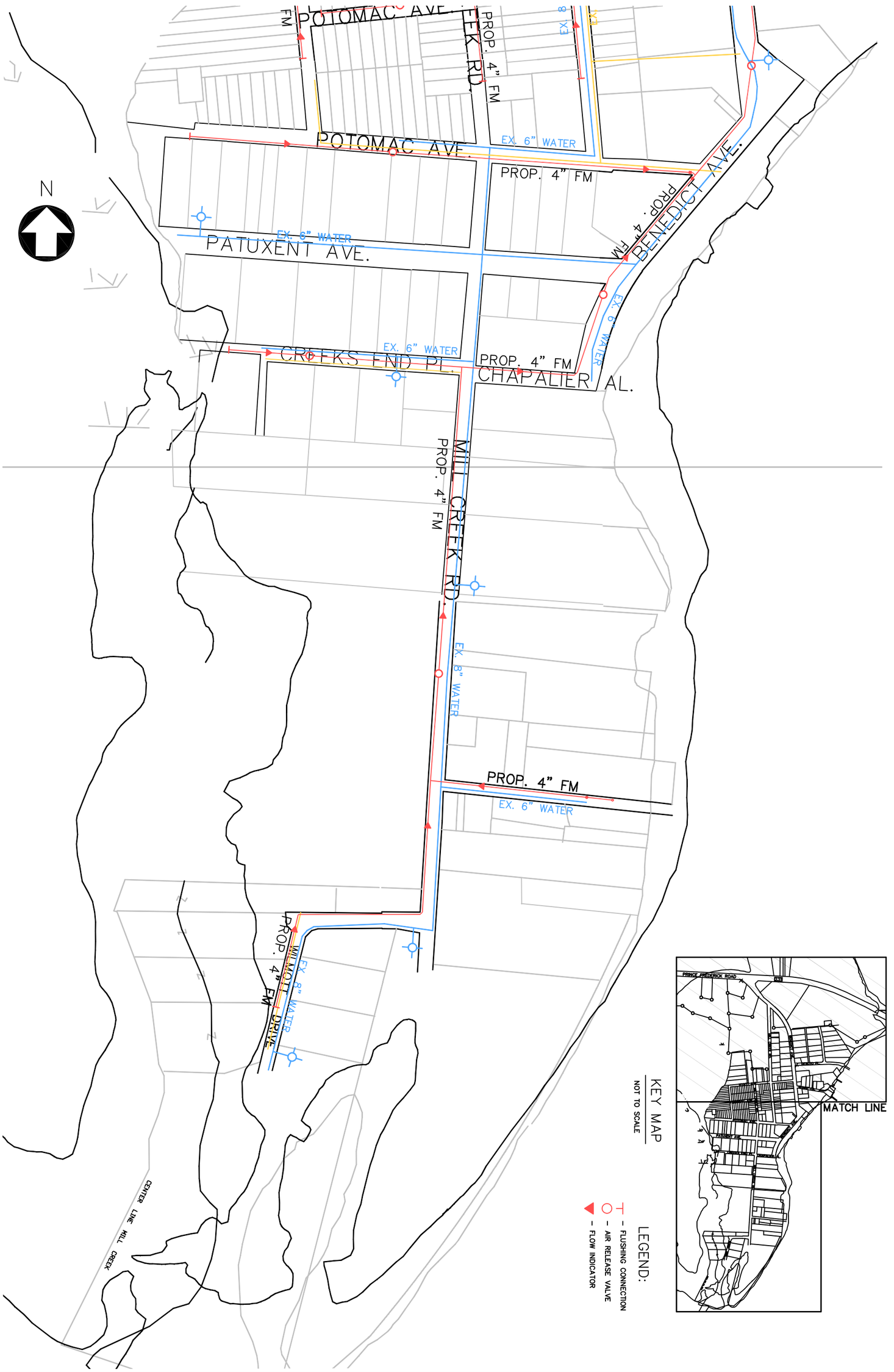
WALLACE, MONTGOMERY & ASSOCIATES, LLP

SCALE: 1" = 200'

BENEDICT CENTRAL SEWER SYSTEM FEASIBILITY STUDY
CHARLES COUNTY PGM VCI# 03-0046
GRINDER PUMP PRESSURE SEWER – NORTH END

FIGURE 3-6

203014.00 UT04BENE.DWG



WALLACE, MONTGOMERY & ASSOCIATES, LLP

SCALE: 1" = 200'

BENEDICT CENTRAL SEWER SYSTEM FEASIBILITY STUDY
CHARLES COUNTY PGM VCI# 03-0046
GRINDER PUMP PRESSURE SEWER SYSTEM - SOUTH END

FIGURE 3-7

M:\PROJ\ | | | | | | \Utilities\Benedict\CD 08-25-08\Figures\ut03bene FIG 3-7.dwg

203014.00 UT03BENE.DWG

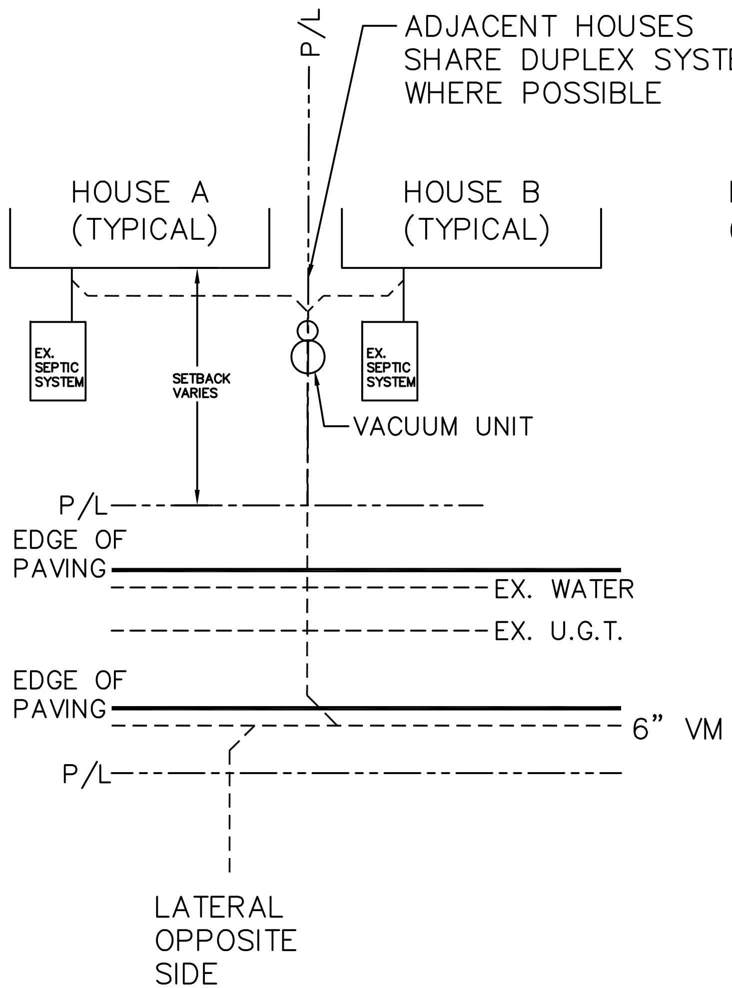
connection, in favor of longer vacuum sewer. Vacuum units to be accessed for maintenance with "meandering easements". Replacement of all service laterals from house wall to vacuum station influent to alleviate infiltration and inflow source. Pressure sewers to be approximately 3" to 4" diameter PVC or HDPE, laid approximately 36" to 42" deep, on a "sawtooth" profile for successive vacuum lifts along length of system. Construction may be by open trench or directional drilling.

General arrangement of sewers on lot, and relative to street, is shown on Figure 3-3. Overall layout of gravity sewer system in Benedict is shown on Figures 3-8 and 3-9. Estimated costs for the pressure sewer system are tabulated below, in Table 3-3.

DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	TOTAL
8" Dia. PVC Sewer (5-10' Deep)	LF	$23.97	0	$0
8" Dia. PVC Sewer (10'+ Deep)	LF	$34.64	0	$0
4" Vacuum Main	LF	$13.00	8,450	$109,850
6" Vacuum Main	LF	$15.00	1,850	$27,750
8" Vacuum Main	LF	$18.00	1,200	$21,600
3" Vacuum Service Connection	LF	$11.00	5,100	$56,100
Vacuum Main 6" Division Valves	Ea	$1,100.00	1	$1,100
3" Pressure Sewer	LF	$8.60	0	$0
1-1/2" Pressure Sewer	LF	$5.49	0	$0
H.C. - 4" DIA. (60 LF/Hse) (Gravity Lateral)	LF	$10.53	5,100	$53,703
4' Dia. Precast Concrete Manholes (8' Deep)	Ea	$3,175.00	0	$0
4' Dia. Precast Concrete Manholes (14' Deep)	Ea	$6,025.00	0	$0
Grinder Pump Units (Duplex w/ Baffle)	Ea	$8,000.00	0	$0
Grinder Pump Units (Simplex)	Ea	$4,000.00	0	$0
Vacuum Main Collection Chambers	Ea	$2,500.00	85	$212,500
Submersible Pump Station	Ea	$87,000.00	0	$0
Vacuum Station (Includes Building and Installation)	Ea	$205,000.00	1	$205,000
Well Points	LS	-----	-----	-----
Common				
Abandon Existing Septic Systems	Ea	$401.22	131	$52,560
Restoration (Paved & Unpaved)	LS			$57,735
MOT	LS			$10,000
Erosion and Sediment Control	LS			$0

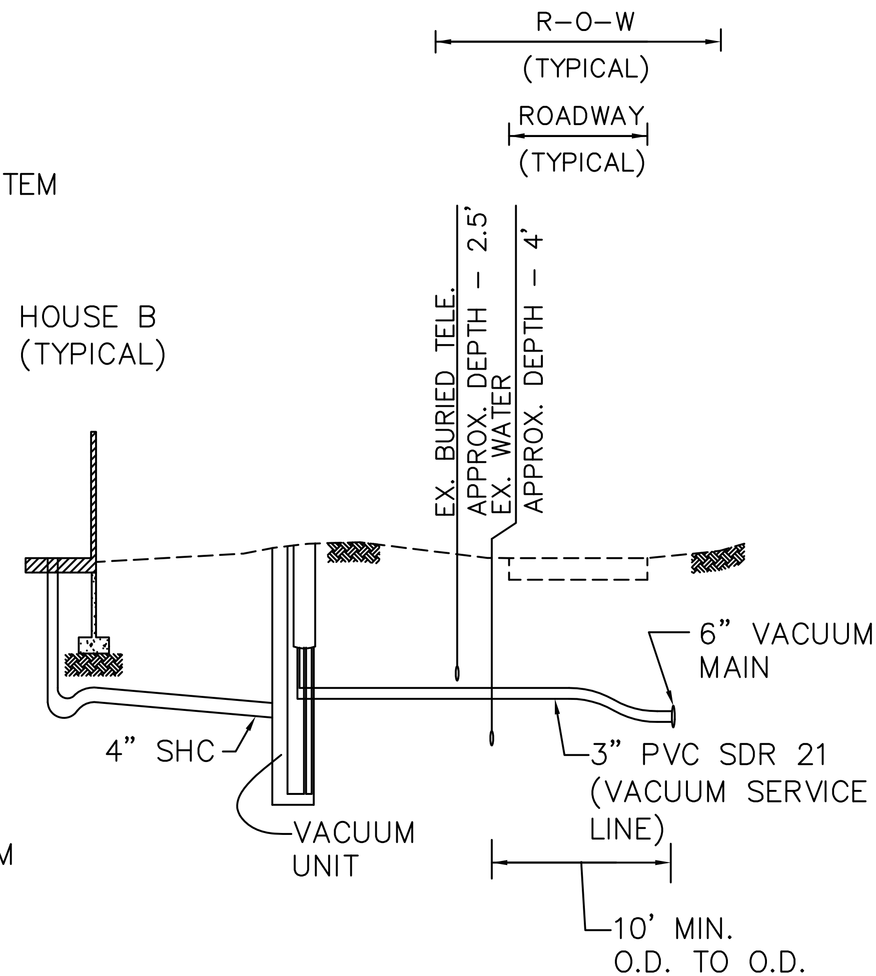
		Subtotal:	**$807,898**
Engineering Cost @	10 **%**		**$80,790**
Contingency @	20 **%**		**$161,580**
		Total:	**$1,050,268**

Table 3-3 - Estimated Cost for Vacuum Sewer System



PLAN

SCALE: N.T.S.



CROSS SECTION

SCALE: N.T.S.

WALLACE,
MONTGOMERY
& ASSOCIATES, LLP

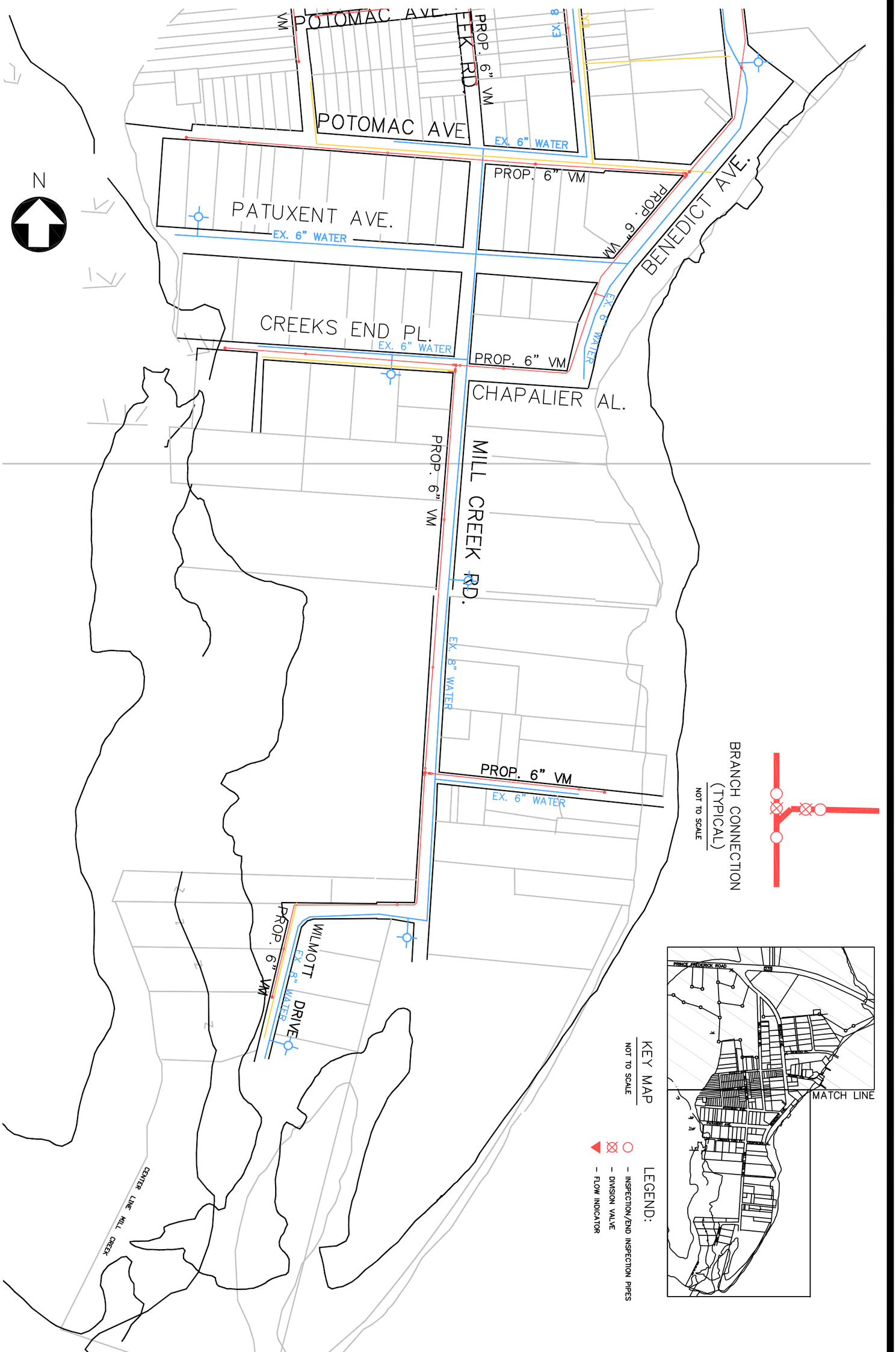
CIVIL AND STRUCTURAL ENGINEERS
110 WEST ROAD
TOWSON, MARYLAND 21204

BENEDICT CENTRAL SEWER SYSTEM FEASIBILITY STUDY

CONCEPTUAL GENERAL ARRANGEMENT
VACUUM SEWER SYSTEM

SCALE: NOT TO SCALE DATE: 09/23/04

FIGURE 3–3



WALLACE, MONTGOMERY & ASSOCIATES, LLP

SCALE: 1" = 200'

BENEDICT CENTRAL SEWER SYSTEM FEASIBILITY STUDY
CHARLES COUNTY PGM VCI# 03-0046
VACUUM SEWER SYSTEM - SOUTH END

FIGURE 3-8

M:\PROJ\ | | | | | | \Utilities\Benedict\CD 08-25-08\Figures\ut05bene FIG 3-8.dwg

203014.00 UT05BENE.DWG

PRINCE FREDERICK ROAD

231

WASTEWATER TREATMENT PLANT

VACUUM STATION

EX. 8" WATER

EX. 6" WATER

BENEDICT AVE.

PROP. 6" VM

EX. BURIED TELE.

DESOTO PL.

MILL CREEK RD.

PROP. 6" VM

EX. 6" WATER

EX. 8" WATER

HYATT AVE.

WHARF LA.

MILL CR

BURIED TELE.

MATCH LINE

KEY MAP
NOT TO SCALE

N

BRANCH CONNECTION (TYPICAL)
NOT TO SCALE

LEGEND:
- INSPECTION/END INSPECTION PIPES
- DIVISION VALVE
- FLOW INDICATOR

BENEDICT CENTRAL SEWER SYSTEM FEASIBILITY STUDY
CHARLES COUNTY PGM VCI# 03-0046
VACUUM SEWER SYSTEM – NORTH END

FIGURE 3-9

WALLACE, MONTGOMERY & ASSOCIATES, LLP

SCALE: 1" = 200'

M:\PROJ\1 1 1 1 1 1 .1 1\Utilities\Benedict\CD 08-25-08\Figures\ut06bene FIG 3-9.dwg

3.2.3 Treatment Facility Alternatives.

Three treatment technologies are evaluated:

- Modified Ludzack-Ettinger (MLE)
- Schreiber® continuous feed Countercurrent Aeration w/DO control
- Continuous feed Sequencing Batch Reactor (CSBR)

In earlier stages of the study program, before discharge limits and additional conditions were established, conventional activated sludge was proposed as a process to precede land application. Conventional activated sludge has nitrification capabilities, but no denitrification capability. This means that little nitrogen reduction takes place in an activated sludge system and that the land application process would be required to fulfill the role of further reducing nitrogen to prevent groundwater contamination. As discussed in Section 2, it is more appropriate to go a step further in treatment from the beginning to reduce liability and to simplify the operations and monitoring requirements. Also, should the land application system ever fail or become obsolete, the MLE process is more easily upgraded to meet surface water discharge levels of 3 mg/l TN.

In Section 2, the level of treatment required for land application was identified as 8 mg/l TN to be sure there is no risk of groundwater nitrate contamination. This is prudent here not only because of the reduced liability, but also from a design standpoint. Detailed site evaluations have not been performed on the land application site, but local elevations and proximity to the adjacent Patuxent River would tend to indicate that the water table may be high, at least seasonally, further reducing the capabilities of the land system to adequately reduce any applied nitrogen. Appendix I contains an excerpt from the Charles County Soil Survey, detailing the characteristics of the Sassafras soil series prevalent in the Benedict area.

The level of treatment identified in Section 2 for surface water discharge is to achieve a 3 mg/l TN level, along with associated reductions in BOD, solids and phosphorus. For surface water discharge, the process technologies require greater reductions in BOD than indicated by MDE, and filtration following the process will assure compliance with the MDE prescribed TSS limit.

All three alternatives are similar in their ability to meet these two levels of treatment (8 mg/l TN and 3 mg/l TN). They all can produce 8 mg/l TN along with the 30/30 MDE prescribed BOD and TSS limits, and all three require an add on process in the form of denitrifying filters to reach the 3 mg/l TN level.

All collection system alternatives result in the collected wastewater being pumped to the treatment plant. Due to high water table and potential flooding, the plant facilities for all alternatives will be at surface, or with very shallow excavation.

County comments on interim study submittals suggested the need for screening for removal of rags, are prudent; an alternate screen is proposed. All three alternatives include a Lakeside

"Complete Plant" combination screen, grit and grease removal system for preliminary treatment. This system is proposed in its enclosed configuration to create an odor collection headspace. It is of all stainless steel construction and is provided with bagger attachments for grit and screenings collection. The screens are available in various sizes but smaller than 3/8 inch is recommended. A washer system is standard for the screenings helping to insure that the vast majority of organics remains in the liquid stream and also helping to reduce odors related to screenings handling. Consideration should be given during the detailed design to providing a comminuter ahead of the screen for the vacuum and gravity/pump station collection alternatives, but the pressure sewer alternative will already have reduced the wastes with the grinder pumps in the system. A manual bypass screen with 3/8" spaces is suggested rather than redundancy.

Following the screen/grit unit is a single equalization/process pumping tank including a pair of rail mounted submersible pumps. The Package MLE process includes the equalization in its package configuration. The SBR system does not require equalization as the process design and batch nature account for that, and the Schreiber® system does not include equalization. Equalization capacity will be smaller than originally indicated to eliminate the need for mixing and aeration. This is done not only to simplify operations, but also to assure that the process feed to the plant is not oxygen rich, which can inhibit BNR particularly for the MLE process. It also creates another odor control headspace since the tank will be a precast tank with cover. The pumps will feed the screened, degritted wastewater to the process tanks for treatment.

The MLE and SBR alternatives will be priced initially based on a package steel preassembled configuration since the facilities will be housed indoors. The Scheiber® system does not come as a package, so a concrete tank will be priced for only that alternative. These process alternatives will include parallel process trains of 40,500 gpd ADF capacity each.

Because the process of nitrification and denitrification is a net consumer of alkalinity, there must be sufficient alkalinity present to support it. As the alkalinity of Benedict raw wastewater is not yet established, an alkalinity addition system is recommended. All systems will include a sodium hydroxide feed system for this purpose consisting of dual chemical metering pumps. It is assumed that the feed pumps will draw directly from 55 gallon chemical drums, or if larger quantities are needed, carboys.

As shown in the simplified flow diagrams in Figure 3-10 below, the treated wastewater for surface water discharge will pass through a denitrification system and then UV disinfection prior to discharge. The denitrification system is comprised of a continuous backwash sand filter with a substrate feed system to provide additional food for denitrification. Substrate can be methanol, sucrose, or other high BOD source, but sucrose is assumed for this study.

For the land application treatment, the denitrification step is not needed, nor is effluent filtration. A chlorination/dechlorination system would provide for disinfection in these systems. Consideration can be given during detailed design to having a filter and using UV disinfection if the County preference is not to deal with the additional chemicals and feed

systems. It might be possible to have UV without filtration, but it is appropriate at this design level to include it for consideration.

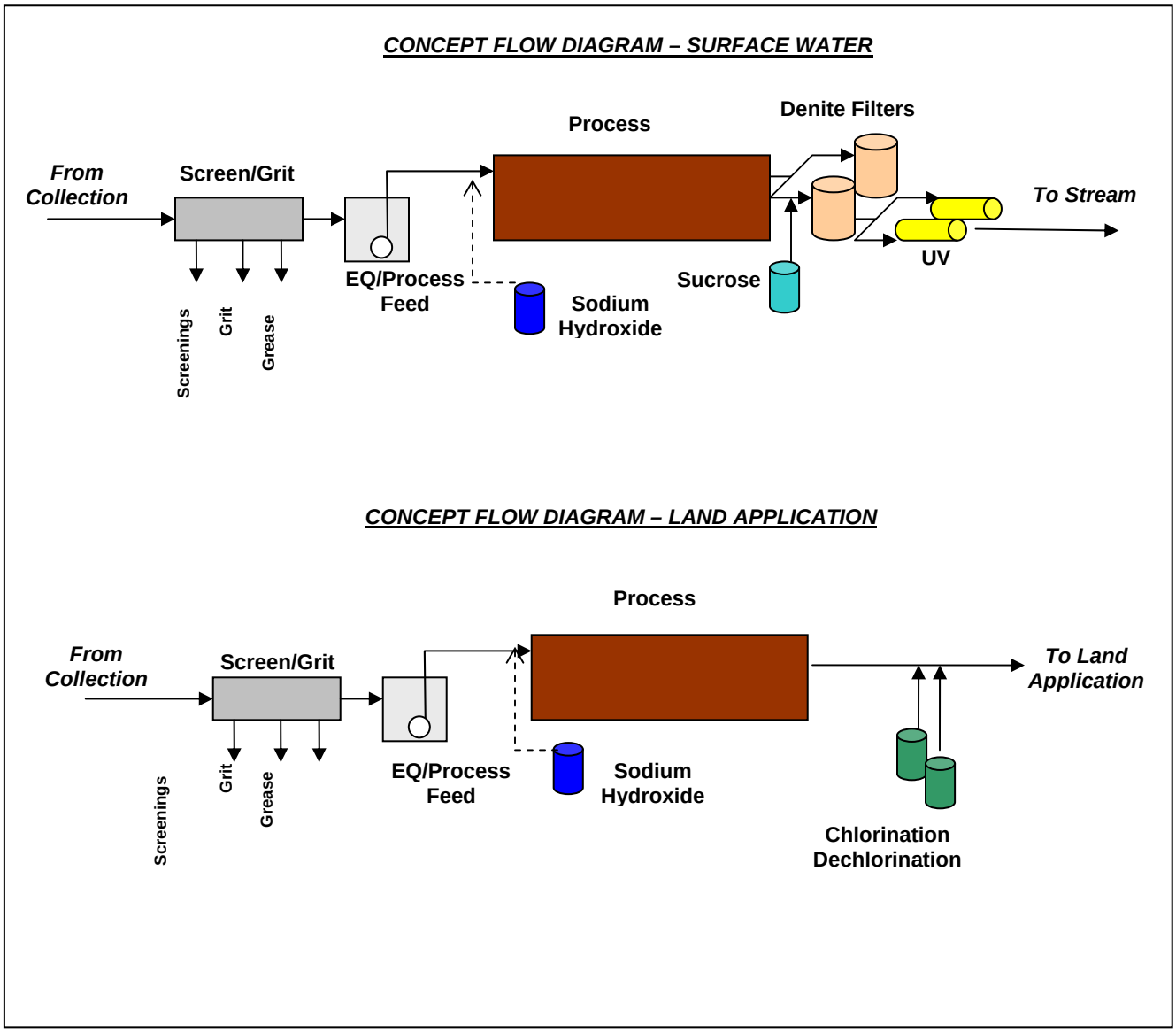


Figure 3-10 – Process Flow Diagrams for Surface Discharge & Land Application

3.3.3.1 Modified Ludzack-Ettinger (MLE).

The MLE process includes an anoxic zone followed by and oxic zone, with high rate recirculation from the latter, back to the former. The anoxic zone is absent of dissolved oxygen and is where the wastewater biology converts nitrate nitrogen to nitrogen gas, denitrifying the wastewater. The oxic zone has adequate dissolved oxygen for carbonaceous BOD reduction and conversion of organic and ammonia nitrogen to nitrate. The recirculation

takes the nitrate rich mixed liquor back to the anoxic zone where food is plentiful so that the denitrification can occur.

Mechanically, the process, following preliminary treatment, includes:

- Process feed pumps
- Anoxic mixer(s)
- Blowers for aeration of oxic and sludge holding
- Recirculation pumps
- Sludge recycle pumps
- Filter backwash pumps

This process is very effective, but requires an amount of operator attention, particularly if there is a process upset. It is limited to producing TN levels of about 4.5 mg/l and greater and requires recirculation rates as high as six (6) to seven (7) times the influent rate to reach these levels. Clarification and return of settled sludge is also needed to produce a clarified effluent. suitable for disinfection. To reach the 3 mg/l target of this design, the process is followed by a denitrification filter system for surface water discharge..

3.3.3.2 Countercurrent Activated Sludge (Schreiber® Process).

The Countercurrent system consists of a circular process tank wrapped around a circular clarifier. Because it does not come as a packaged prefabricated system, concrete tankage will be required. The process normally operates based on dissolved oxygen monitoring in the process tank. A diffuser grid mounted on an arm rotates around the tank providing aeration and mixing. Depending on DO, the aeration turns on and off to optimize conditions and to provide alternating oxic and anoxic conditions for nitrification and denitrification. The process is highly automated minimizing operator attention.

Mechanically, the process, following preliminary treatment, includes:

- Process feed pumps
- Rotating arm drive
- Blowers for aeration, sludge lift pumps
- Filter backwash pumps

3.3.3.3 Activated Sludge, Sequencing Batch Reactors (SBR).

SBR technology also uses aeration cycles within a single reactor tank to create anoxic and oxic conditions. It goes further than the Schreiber® system though by also doing the clarification settling in the same process tank and then decants the treated effluent from the process tank lowering the water level to make room for the next batch. With dual trains as proposed here, the batches can alternate from train to train to allow longer process times and more efficient utilization of aeration. The end result is that equalization is not really needed as the fluctuating tank levels accommodate any short term variations. The process also produces denitrified effluent into the mid single digit range and is highly automated from a control perspective. To meet surface water discharge levels, it will be followed by a denitrification filter system as described above.

Mechanically, the process, following preliminary treatment, includes:

- Process feed pumps
- Submersible mixers for anoxic stage mixing
- Blowers for aeration, sludge lift pumps
- Small motorized process tank decant lower/lift system
- Filter backwash pumps

3.3.4 Effluent Disposal.

3.3.4.1 Surface Water Discharge. The technical requirements and discharge limits for a surface water discharge have been discussed in Section 2. Other factors related to the discharge include the 24 hour a day liability for any noncompliance with the permit requirements, potential impacts on shellfish areas, and th logistics of getting the treated wastewater from the plant to the receiving water, in this case, the Patuxent river.

Because of the high level of treatment being provided, the impact on the receiving waters should ne negligible unless there is some catastrophic failure of the process or disinfection system. Then, any impacts would be short lived as the County is bound to correct the situation promptly and effectively by the NPDES Permit.

Of the two sites available, one at the south end of town, the other at the north near the water plant, the northern site has several advantages. First, if land application is pursued, the potential land application sites are all more accessible from the northern site. Second, from a land area perspective, the northern site is larger and has more flexibility to accommodate the necessary tanks and structures, next, with the water plant already located at the northern site it would consolidate town utilities at that location.

Based on site reconnaissance and aerial photo review, the most practical discharge point for the treated effluent is near the bridge at Route 231 and the Patuxent River. Discharging at this narrow point in the river will get the discharge as close as possible to the main channel without the expense of extending the outfall into the River. This allows for maximum dilution and assimilation of the treated effluent by the River before any shore areas can be impacted.

3.3.4.2 Land Application.

The Charles County Soil Survey (Appendix I) indicates the soils in the flood plain west of the Patuxent River are classified as Sassafras sandy loam (no erosion class), and indicates these soils have only slight limitations for sewage disposal filter fields, and moderate limitations for infiltration lagoons. The presence of the Mattapex series adjacent to the Sassafras combined with the low elevation relative to the nearby River may be indications of more severe limitations than the traditional Sassafras series.

Matapex soils tend to indicate the presence of more fine, silty materials tan traditionally associated with Sassafras. The proximity to the River and at least seasonably high groundwater table will indicate a series with higher moisture levels. Only more detailed site analysis during detailed design will confirm this, but the area shown as Sassafras north of Route 231 (Parcel 27 on the Tax Map- See Figure 2-2) would likely be reclassified as Hambrook series if reevaluated. For this reason, use of this area for land application will be considered at less than optimum application rates as disposal alternatives are evaluated. Even so, this does not appear to preclude this parcel from consideration as a land application site and its use with restricted application rates will be discussed.

Two types of land application have been considered, subsurface disposal and surface application. Subsurface disposal has the advantage of being a year round answer with no real restrictions due to weather. Given the soils and anticipated detailed characteristics, a trench system would be shallow, but would still run the risk of seasonal high groundwater interference. The highly treated nature of the treated effluent should mitigate this factor, but this will be new ground for the State regulators dealing with a system this size of such high quality. What they will be able to do relative to groundwater issues may be limited. This may mandate the use of a mound type system constructed above grade, but covered with soils. In either case, installation of subsurface disposal would eliminate the parcel from active farming. This would be contrary to the goals of the Maryland Agricultural Land Preservation Foundation goals, and with their easement on part of the property, this does not appear to be an appropriate avenue of disposal to follow. Because of the potential water table issues and the MALPF issues, subsurface disposal will not be considered further.

For surface application, spray irrigation is recommended as an enhancement to agricultural practices. This means of disposal would use the reclaimed water for the beneficial use of irrigating crops, enhancing crop production and recharging the groundwater aquifer. The Maryland Department of the Environment Guidelines for Land Treatment of Municipal Wastewaters establishes the criteria for land application. The basic requirements are pretreatment, to which Benedict is treating to Class II levels, 4 feet of vertical depth to water table, a minimum of 60 days storage, 0 to 2 inch per week annual average applications rates, and a one day load, six day rest cycle. A 25% reserve area is also required.

Actual application rates can only be determined by a detailed site evaluation by a qualified soils scientist. These detailed investigations need to include soil classification, wetlands delineation, infiltometer tests to determine percolation rates and limiting soil horizons, and water table identification. Additional study and calculations need to be performed to determine if water mounding will further limit application rates from a hydraulic standpoint. Based on the discussions of the available soils above, it is estimated that an application rate of 1-1/4 inches per acre per week is a reasonable estimate on which to base this feasibility study. Center pivot

type irrigation is envisioned. And at 81,000 gpd for 365 days a year, 29,565,000 gallons per year of reclaimed water will need to be sprayed during the spray year.

A concept flow diagram for the spray irrigation system follows:

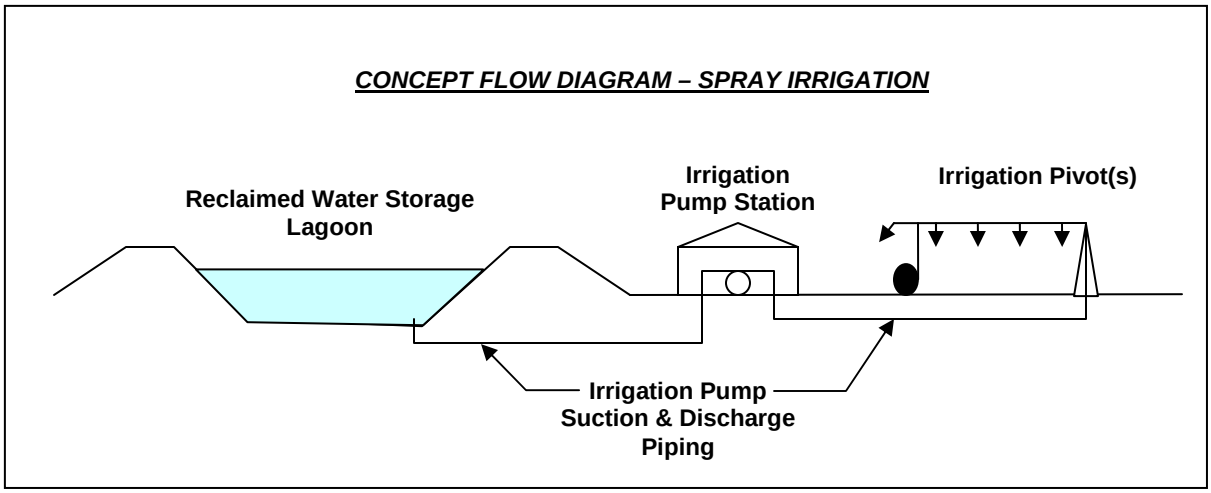


Figure 3-11 -Spray Irrigation System Diagram

Meeting the 60 day storage requirement means providing 9 weeks storage and applying over 43 weeks. This equates to applying about 688,000 gallons per week. At an application rate of 1.25 inches per week, an area of 20.25 acres wetted, with an additional 25% reserve bringing the total wetted acreage needed to 25 acres.

For the sake of comparison, providing 90 days storage means providing 13 weeks storage and applying over 39 weeks. This equates to applying about 758,000 gallons per week. At an application rate of 1.25 inches per week, an area of 22.33 acres wetted, with an additional 25% reserve bringing the total wetted acreage needed to 28 acres.

Treated effluent would be pumped through a bored pipeline crossing of MD Route 231 to an agricultural land application site on the north side of Rt. 231. The effluent would be discharged into a storage lagoon and stored until the appropriate times for spraying. MDE prefers a one day apply/ 6 day rest cycle. This implies that the system would spray one day per week during the spray period, and store during the remaining times. As shown in the diagram above, the lagoon, a spray irrigation pump station, and a distributor are needed for this type of disposal. Some type of strainer device is needed to preclude any foreign matter that might enter the lagoon from clogging the spray system. Flow metering is also needed to monitor and control application rates and quantities.

The lagoon required needs to have a capacity of 7.3 million gallons to meet the 90 day storage scenario above. Construction requirements include a minimum 3.5 to 1 slope on the berms, a 12 foot perimeter access road around the top of the berm, fencing to limit access and a liner system to prevent seepage directly into the ground. It is

assumed that the lagoon can be only about 3 feet below existing grade. Design would have a minimum water level of 2 feet at the pump intake and about 6 inches at the toe of the berm to keep pressure on the liner bottom. 3 feet free board is recommended. For Benedict, these requirements result in a low water level about 1 foot below existing grade and an 8 foot working range with 3 foot free board. This puts the inside top of berm at about 10 feet above existing grade

Given these restraints, and assuming an 8 foot operating range, the lagoon will occupy about 5.5 acres with an outside toe to toe dimension of about 500 feet square. Anticipated limitations on depth below existing grade result in a shortfall of material to build the berms by about 700,000 cubic feet. This material will need to hauled in to make up the shortage for lagoon construction.

Wetted spray acreage requirements can be met in various ways depending on the property constrictions ranging from a single center pivot to multi-zoned solid set spray heads. At this point in the process, it is recommended that at least two pivots be used, and as many as seven to allow redundancy and resting of areas that may become over watered. Configuration of existing fields, cropping practices and other agronomic considerations will need to be addressed in detailed design.

Table 3-4 below shows the range and sizes that can be used. For illustration purposes, Figure 3-12 shows an arrangement with 4 center pivots and ample space to arrange them.

# Pivots	Diameter (ft)	Area Each (acres)	Total Area (acres)
2	881	14	28
3	719	9.3	28
4	623	7	28
5	557	5.6	28
6	509	4.7	28
7	471	4	28

Table 3-4 – Dimensional Requirements for Center-Pivot Irrigation Systems

In all, the area needed to handle the land application system by spray irrigation is about 35 acres, plus buffer areas, but under conservative basic assumptions. The parcel known as the Serenity farm (Tax Map 48, Parcel 27 is listed in the Maryland Department of Assessments and Taxation data base as being 212.28 acres, though the linked map indicates 300.98 acres. In either case, this far exceeds the required land area, and if agreement can be reached, it appears that the locations of application and other elements of the system can be optimized for the most favorable conditions within the confines of this property.

Effectively, there are two treatment options and two disposal options for further consideration. The treatment options are the Schreiber® Process (Countercurrent

203014.00\DRAWING1.DWG

CRITICAL AREA
BOUNDARY LINE

P.27

AC

P.17

P.7

2

2

2

SPRAY IRRIGATION
PIVOTS, TYP.

550

500

5.45
ACRES EA.

RECLAIMED WATER
STORAGE LAGOON
(8± MG)

P.13

EFFLUENT FORCE MAIN
(LAND APPLICATION,
OPTION ONLY)

SPRAY IRRIGATION
PUMP STATION

ROAD CROSSING

231

P.5

P.12

P.6

P.2

P.16

P.14

P.4

WASTEWATER
TREATMENT
PLANT

PUMP
STATION

EX. 8" WATER

EFFLUENT FORCE MAIN
(SURFACE DISCHARGE,
OPTION ONLY)

P.1

PLAN
SCALE: 1" = 400'-0"

BENEDICT CENTRAL SEWER SYSTEM FEASIBILITY STUDY
CHARLES COUNTY PGM VCI# 03-0046
PROCESS FLOW DIAGRAMS FOR SURFACE DISCHARGE & LAND APPLICATION

FIGURE 3-12

WALLACE, MONTGOMERY & ASSOCIATES, LLP

SCALE: 1" = 400'

aeration) and the Sequencing Batch Reactor (SBR). The disposal options are Land Application by Spray Irrigation, and Surface Water Discharge top the Patuxent River.

3.3.5 Feasibility level cost estimates

Cost estimates have been prepared for each of these components of a complete system. The treatment facility costs are provided as an “a” and ”b” option since the disposal method has slightly differing treatment requirements. In all, there are four treatment and disposal combinations as follows:

1a – Schreiber Process/Land Application
1b – Schreiber Process – Surface Water Discharge
2a – SBR/ Land Application
2b – SBR – Surface Water Discharge

The probable costs for these options are provided on the following pages. The first four pages include capital cost estimates. The last four pages show the Annual O&M cost estimates. One element not included is the land costs for the land application alternatives. The availability of the parcel known as the Serenity Farm or just a portion of it was not investigated as part of this effort. Negotiations would be needed to confirm land availability as well as options for using it, including purchase, lease, or alternative agreements.

Cost Estimate
Land Application Treatment Option No. 1a
Countercurrent Aeration (Schreiber Process)

1	Site Work		96,500
2	Equipment		554,200
3	Installation		227,100
4	Concrete (PIP)		220,000
5	HVAC/Electrical		193,970
6	Building		188,100
7	Discharge Force Main to Storage		79,000
8	Lagoon Storage		1,335,000
9	Irrigation System (incl. PS)		245,000
	Total Construction Cost		***$ 3,188,870***
10	Engineering	10%	318,887
11	Contingency	20%	637,774
	TOTAL PROJECT COST		**$ 4,145,531**

Cost Estimate
Surface DischargeTreatment Option No. 1b
Countercurrent Aeration (Schreiber Process)

1	Site Work			96,500
2	Equipment			609,200
3	Installation			304,600
4	Concrete (PIP)			220,000
5	HVAC/Electrical			213,220
6	Building			188,100
7	Outfall Force Main			43,500
	Total Construction Cost		***$***	***1,675,120***
8	Engineering	10%		167,512
9	Contingency	20%		335,024
	TOTAL PROJECT COST		**$**	**2,177,656**

Cost Estimate
Land Application Treatment Option No. 2a
Sequencing Batch Reactor (SBR)

1	Site Work			96,500
2	Equipment			758,800
3	Installation			379,400
4	Concrete (PIP)			24,000
5	HVAC/Electrical			256,580
6	Building			222,300
7	Discharge Force Main to Storage			79,000
8	Lagoon Storage			1,335,000
9	Irrigation System (incl. PS)			245,000
	Total Construction Cost		***$***	***3,405,580***
10	Engineering	10%		340,558
11	Contingency	20%		681,116
	TOTAL PROJECT COST		**$**	**4,427,254**

Cost Estimate
Surface DischargeTreatment Option No. 2b
Sequencing Batch Reactor (SBR)

1	Site Work			96,500
2	Equipment			554,200
3	Installation			277,100
4	Concrete (PIP)			340,000
5	HVAC/Electrical			206,220
6	Building			222,300
7	Outfall Force Main			43,500
	Total Construction Cost		***$***	***1,607,570***
8	Engineering	10%		160,757
9	Contingency	20%		321,514
	TOTAL PROJECT COST		**$**	**2,089,841**

Annual O&M Cost Estimate
Land Application Treatment Option No. 1a
Countercurrent Aeration (Schreiber Process)

1	Operations Labor			86,832
2	Maintenance Labor			14,688
3	Electric Motors			12,067
4	Electric Heat			4,050
5	Chemicals			3,000
6	Sludge Hauling			14,400
7	Materials and Equipment Costs			3,700
	Annual O&M Cost		***$***	***138,737***
8	Administrative Costs	2%		2,775
9	O&M Contingency	5%		6,937
	TOTAL ANNUAL O&M COST		**$**	**148,449**

Annual O&M Cost Estimate
Surface Discharge Treatment Option No. 1b
Countercurrent Aeration (Schreiber Process)

1	Operations Labor			67,392
2	Maintenance Labor			11,232
3	Electric Motors			10,929
4	Electric Heat			3,897
5	Chemicals			1,200
6	Sludge Hauling			14,400
7	Materials and Equipment Costs			2,500
	Annual O&M Cost		***$***	***111,550***
8	Administrative Costs	2%		2,231
9	O&M Contingency	5%		5,578
	TOTAL ANNUAL O&M COST		**$**	**119,359**

Annual O&M Cost Estimate
Land Application Treatment Option No. 2a
Sequencing Batch Reactor (SBR)

1	Operations Labor			86,832
2	Maintenance Labor			14,688
3	Electric Motors			12,486
4	Electric Heat			4,050
5	Chemicals			3,000
6	Sludge Hauling			14,400
7	Materials and Equipment Costs			3,700
	Annual O&M Cost		***$***	***139,156***
8	Administrative Costs	2%		2,783
9	O&M Contingency	5%		6,958
	TOTAL ANNUAL O&M COST		**$**	**148,897**

Annual O&M Cost Estimate
Surface Discharge Treatment Option No. 2b
Sequencing Batch Reactor (SBR)

1	Operations Labor			67,392
2	Maintenance Labor			11,232
3	Electric Motors			10,929
4	Electric Heat			3,897
5	Chemicals			1,200
6	Sludge Hauling			14,400
7	Materials and Equipment Costs			2,500
	Annual O&M Cost		***$***	***111,550***
8	Administrative Costs	2%		2,231
9	O&M Contingency	5%		5,578
	TOTAL ANNUAL O&M COST		**$**	**119,359**

SECTION 4
CONCLUSIONS

4 CONCLUSIONS

A quick review of the capital costs in Section 3 yields a few obvious observations. First, the cost of land application doubles the initial capital costs for the options using land disposal (options 1a & 2a) as a result of the increased facilities needing construction to implement it. Second, the levels of treatment required for either disposal method are very similar and the costs of the technology used for treatment is nearly indistinguishable at this stage of concept development. Lastly, because the treatment technologies have similar operations requirements from an O&M standpoint, the real differentiating factor from an O&M perspective is the additional operations attention required for the land application facilities, which does not exist for the surface water discharge option. Again, the extra facilities required are the driving factor in increased O&M costs.

Nevertheless, the County will wish to consider additional factors before selecting an alternative for implementation. The most significant are considerations of environmental stewardship, liability and potential public impact. On these factors, land application offers some advantages. Replenishment of the groundwater aquifer helps maintain a water balance and stave off brackish water intrusion that can impact local wells. Given the level of treatment provided, impact on groundwater quality, which are measured over the longer term are much less likely to occur that NPDES permit violations that can accompany surface water discharges. Fines for NPDES discharges are significant and cumulative. While they cannot really be factored in directly in an economic evaluation, at $10,000 per day or more, a significant potential for economic hardship exists with a surface water discharge that does not exist with a groundwater discharge. And lastly, a surface water discharge that has disinfection failure and high fecal coliform has the potential to contaminate the receiving water where public contact can cause illness either by direct ingestion, or by ingestion of contaminated shellfish, etc. even as remote as these issues may appear to be, they are important considerations to be kept in mind during the decision making process.

Just to summarize the capital costs, lowest to highest:

Collection System:

Grinder Pump Pressure Sewer System	**$ 1,012,567**
Vacuum Sewer System	**$ 1,050,268**
Gravity Sewer System	**$ 1,153,571**

Treatment & Discharge System:

SBR – Surface Water Discharge	**$ 2,089,841**
Schreiber® Process – Surface Water Discharge	**$ 2,177,656**
Schreiber® Process/Land Application	**$ 4,145,531**
SBR/ Land Application	**$ 4,427,254**

Another factor needing mention is that the Schreiber® process differs from the SBR in that it has concrete tankage included in its cost and the SBR does not. The SBR is a metal package tank that may or may not be considered a disadvantage, possibly requiring more maintenance, cathodic protection replacement and painting.

The least cost system aggregate is a grinder pump pressure collection system combined with an SBR treatment system and surface water discharge, with a total estimated cost of $3,102,408. For the estimated buildout of Benedict, 243 lots, this is $ 12,800 per lot. If the cost were to be borne by only the existing residences, it would be proportionately higher, something over $23,000 per lot. To the associated debt service, would be added annual operation and maintenance costs of $63,274, approximately $260 per year for 243 lots.

SECTION 5
RECOMENDATIONS

5.1 RECOMMENDATIONS

The least cost system aggregate is a grinder pump pressure collection system combined with an SBR treatment system and surface water discharge, with a total estimated cost of $3,102,408. For the estimated buildout of Benedict, 243 lots, this is $ 12,800 per lot. If the cost were to be borne by only the existing residences, it would be proportionately higher, something over $23,000 per lot.

Estimated cost of the collection system alternatives is very similar; they differ in estimated cost by only -5.5% to +7.5% of the mean. Treatment alternatives differ by only ±2% of the mean, holding effluent disposal constant. Effluent disposal alternatives differ by ± 31% of the mean. So project cost is relatively insensitive to the choice of collection or treatment process, but varies greatly with effluent disposal approach, nearly doubling if land disposal is selected.

5.2 DEPARTMENT OF UTILITIES SELECTIONS

5.2.1 Collection System.

The Bureau of Utilities reviewed the collection system alternatives presented in Section 3.3.2, and concluded that a conventional gravity system is the only acceptable option.

Other comments from the Department of Utilities are applicable to all collection system alternatives:

- Infiltration and inflow is a severe problem for the County. All existing sewer house connections shall be replaced from the building to the new clean out manholes, to meet County water and sewer standards. (lateral replacement up to the building was included in all collection system alternatives).

5.2.2 Treatment System.

The Bureau of Utilities indicated a preference for an oxidation ditch with filtration treatment process over the alternatives considered in Section 3.3.3, noting it is similar to Mattawoman WWTP and the proposed Swan Point WWTP. Oxidation ditch was a process option not included among those agreed upon by the County at the outset of the study, and was not among those evaluated.

Other comments from the Department of Utilities are applicable to all treatment alternatives:

- Steel-prefabricated tanks should not be permitted, only concrete tanks (the estimates were based on concrete tankage for the countercurrent aeration alternative, steel tanks for the others, which would be housed indoors);
- Flow equalization should be provided (this was included in the processes evaluated);
- The proposed design must meet effluent requirements under both startup and build-out flow rates (the processes considered were chosen with this requirement in mind);
- Freezing needs to be addressed ("…utilities operations staff expressed a strong concern regarding winter temperatures and the desire to have the tanks enclosed in buildings to minimize temperature problems…"). The screening and influent pumping operations are defined as covered in each alternative, and the MLE and SBR plants would be accommodated indoors, as would be the filtration and chemical feed processes. The countercurrent aeration system would be accommodated in an outdoor tank.
- Steel, prefabricated pumping station shall not be allowed. A "pumparound" shall be provided at all pumping stations. The pumping station design will accommodate WB40 turning radius, and snow removal provisions.
- The facility should include telemetry to relay alarms and key operating data to the Mattawoman WWTP. The County has a standard equipment specification for this telemetry.
- The facility design must eliminate all single points of failure, and provide redundancy in accordance with requirements of the Ten States Standards and the Charles County Water and Sewer Ordinance.
- A standby generator is preferred over a dual power supply. It shall be reasonable sized to facilitate continued compliance with the discharge permit. This should include all necessary equipment to ensure ongoing safety, security, and elimination of freezing for very long outage conditions. Critical equipment shall be designed to automatically restart (in sequence) upon transfer to standby power. All equipment shall re-start upon resumption of normal power.

5.2.3 Effluent Disposal.

The Bureau of Utilities reviewed the effluent disposal alternatives presented in Section 3.3.4, and indicated that Surface Water Discharge is preferred because of ease of maintenance and operation.

5.2.4 Project Implementation Approach.

The Department of Utilities' comments indicate:

A design/build project is not preferable. It is very difficult to review and evaluate the design build project, therefore the Department of Utilities prefers a complete set of construction drawings and construction specifications.

SECTION 6
PRELIMINARY DESIGN

6.1 STANDARDS & REQUIREMENTS

Standards and requirements were previously discussed in Section 2.

6.2 SITING

Two probable locations exist for siting the treatment facility. One is a large unimproved parcel at the north end of Benedict is adjacent to the County's water system parcel. A portion of the parcel is occupied by an athletic field with baseball diamond. The parcel abuts the Patuxent River just south of the MD Route 231 bridge. Ability to maintain the ball field will need to be determined during detailed design. Another possible location is a large parcel at the south end of Benedict currently in use for boat maintenance and storage activity. This location also provides direct access to the Patuxent River.

The northern property offers more flexibility in siting a plant, and is also closer to potential land application sites north of Rt. 231. the northen site is also further from local residences and provides a potential outfall alignment to the river that circumnavigates adjacent wetlands simplifying construction of an outfall to the river. The southern site offers no real advantages and is further from possible land application sites making theoir utilization more difficult. For the purposes of this report, the northern site is used to evaluate the feasibility of wastewater treatment and disposal, as well as for estimating their costs.

6.3 UNIT PROCESS DEFINITION

The processes, technologies and unit processes considered were described in Section 3 of this report. Briefly reiterated, the flow path includes a combined screen/grit and grease removal unit that receives pumped raw wastewater from the collection system. This unit discharges into a flow equalization tank that helps lessen peaks into the plant over the day and allows more constant feed to the process.

Pumps in the equalization tank transfer screened wastewater the main treatment process tanks. Two processes were discussed including SBR and the Schreiber Countercurrent treatment technologies. At this point, both these technologies are considered a single unit process. For surface water discharge, the treatment process is followed by denitrification filters to assure reaching 3 mg/l TN. One SBR manufacturer incorporates an anaerobic conditioning step in its process and claims top be capable of attaining 3 mg/l TN without the denitrification filters. Nonetheless, the denitrification filters are kept for all surface water discharge alternatives. Detailed design can eliminate them if units selected for final installation is found to be capable.

For the surface water discharge options, the denitrification filter effluent passes through Ultr-violet disinfection units prior to being pumped for discharge. For land application, no filters are provided and chlorination/dechlorination with liquid calcium hypochlorite and bisulfate are assumed.

The reader is referred back to Section Three for additional description and information.

6.3.1 Mass Balance.

The Influent characteristics are presumed to be typical domestic wastewater. Effluent is as described in Section 2. Both are summarized in the following table:

PARAMETER	*Influent*	*Effluent*	*Pounds Removed*
Flow (MGD)	0.081	0.081	-
BOD_5 (mg/l)	240	10	155
TSS (mg/l)	240	10	155
TKN (mg/l)	40	2	
NH_3 (mg/l)	-	1	
TN (mg/l)	40	3	25

Table 6-1 - Mass Balance

For more detailed design information typical of the processes evaluated, please refer to the design calculation summary of Fluidyne Corporation included in Appendix J as part of their process documentation. These calculations are typical of what would be representative of all the processes included in thius study. More detailed mass balances and design calculations should be developed during detailed design for the selected option.

6.3.2 Solids Handling.

The treatment processes are provided with wasting capabilities and sludge holding facilities. The holding facilities allow for decant of supernatant and thickening of the solids as a result. Solids are not intended to be treated at the facility, only held and concentrated. Ultimately they will be hauled to the Mattawoman plant where they will be introduced into the facilities at that location and treated along with the waste solids produced there.

It is intended that the 8000 – 10,000 gallons of storage provide about 30 days holding at the Benedict plant. This is based on the recommendation of a standard CSBR manufacturer, KA Engineered Systems. Another manufacturer, Fluidyne has an internal anaerobic compartment that digests sludge as part of the process and reduces wasting significantly. They indicate wasting rates for their process at about 185 gallons per day, or less than 6000 gallons per month, without decanting to concentrate further. Sludge production and storage sizing will be dependent on actual wastewater quality, quantity and process selected. The worst case scenario would be increased hauling frequency of lower concentration sludge. Such a

situation is not expected to occur, but if it should, options such as addition of coagulants to enhance settling can be employed to help mitigate the situation. Partially defined elements like this are included as part of the overall contingency allotted for each alternative.

6.4 DISCHARGE

6.4.1 Siting.

A proposed alignment for the outfall and land application force mains is provided on Figure 6-1. Both use the Route 231 ROW as the primary means of getting to the ultimate discharge location. This is done for several reasons. The direct route from the proposed northern site near the water plant to the Patuxent River would require crossing areas shown on the soils mapping as tidal marsh. Avoiding wetlands if possible not only makes initial construction simpler, it also makes it easier to access the pipe should repair be necessary in the future. The routes along the road ROW also minimize the need to deal with other property owners relative to easements and ROW agreements simplifying implementation.

Final verification of these alignments will need to be done as part of developing the detailed design in subsequent efforts. For current purposes, assumption has been made that effluent pumping will be required for both discharge options.

6.5 DRAWING LIST

A Drawing List is presented on the following page.

203014.00\DRAWING1.DWG

CRITICAL AREA BOUNDARY LINE

AC

P.27

P.17

P.7

2

2

2

SPRAY IRRIGATION PIVOTS, TYP.

550

500

5.45 ACRES EA.

RECLAIMED WATER STORAGE LAGOON (8± MG)

SPRAY IRRIGATION PUMP STATION

231

P.13

EFFLUENT FORCE MAIN (LAND APPLICATION, OPTION ONLY)

ROAD CROSSING

EFFLUENT FORCE MAIN (SURFACE DISCHARGE, OPTION ONLY)

P.5

P.12

P.6

P.2

P.16

P.14

P.4

WASTEWATER TREATMENT PLANT

PUMP STATION

EX. 8" WATER

WATER

RV

P.1

PLAN

SCALE: 1" = 400'-0"

BENEDICT CENTRAL SEWER SYSTEM FEASIBILITY STUDY
CHARLES COUNTY PGM VCI# 03-0046
EFFLUENT FORCE MAIN ROUTE

FIGURE 6-1

WALLACE, MONTGOMERY & ASSOCIATES, LLP

SCALE: 1" = 400'

DRAWING LIST

	DRAWING DESCRIPTION	GRAVITY	PRESSURE	VACUUM
1	Title/Approval Sheet, incl. Drawing Index, Loc'n Map, Utility Contact List	X	X	X
2	Plans and Profiles - Benedict Avenue	X	X	X
3	Plans and Profiles - Mill Creek I	X	X	X
4	Plans and Profiles - Mill Creek II	X	X	X
5	Plans and Profiles - DeSota Place/Wharf Lane	X	X	X
6	Plans and Profiles - Hyatt Avenue/Potomac Avenue	X	X	X
7	Plans and Profiles - Patuxent Avenue/Creek End Place/Chartier Alley	X	X	X
8	Gravity Sewer Details - Connection and Lateral	X		
9	Pressure Sewer Details - Connection and Lateral		X	
10	Vacuum Sewer Details - Connection and Lateral			X
11	Central Vacuum System Plan and Section and Details			X
12	Lift Station Plan, Sections and Details	X		
	Discharge to:	**Land**	**Water**	
13	Waste Water Treatment Plant - Process and Instrumentation Diagram	X	X	
14	Waste Water Treatment Plant - Site Civil - Grading	X	X	
15	Waste Water Treatment Plant - Site Civil - Details	X	X	
16	Waste Water Treatment Plant - Civil Details, Incl Outfall Plan and Profile	X	X	
17	Waste Water Treatment Plant - Civil Details, Incl Outfall Plan and Profile	X	X	
18	Structural I - Foundations	X	X	
19	Structural II - Building Sections and Details	X	X	
20	Lagoon Supply Pumping Station	X	X	
21	Electrical - Power	X	X	
22	Electrical - Lighting	X	X	
23	Electrical Details	X	X	
24	Land Disposal System - Plan	X		
25	Land Disposal System - Storage Lagoon Sections	X		
26	Land Disposal System - Storage Lagoon Details I	X		
27	Land Disposal System - Storage Lagoon Details II	X		
28	E & S Plan General	X	X	
29	E & S Plan Details I	X	X	
30	E & S Plan Details II	X	X	
31	E & S Plan Land Disposal System Details	X		
32	Land Disposal System - Storm Water Management	X		
33	Land Disposal Pumping Station Plan and Structual	X		
34	Route 231 Bored Crossing Details	X		
35	Land Disposal Pumping Station Mechanical/Electrical and Details	X		
36	Land Disposal Distribution System Plan - Details I	X		
37	Land Disposal Distribution System Plan - Details II	X		

APPENDIX A

Scope of Services

SPECIAL PROVISIONS

SCOPE OF SERVICES

1. GENERAL

A. PROJECT DESCRIPTION

The Charles County Department of Planning and Growth Management is seeking proposals from qualified multi-disciplined engineering firms to do a feasibilty study for the sewer collection and treatment system for Benedict area in Charles County, MD.

B. BACKGROUND

Benedict , which is located in Eastern Charles County, consist of single family homes and commercial establishments with private septic tank systems and is in need of a centralized sanitary sewer collection and treatment system in order to improve the water quality of both the ground and surface waters.

2. SCOPE OF SERVICES

A. Feasability Study Report

The overall scope of the County's project is to do a feasibility study by providing various altenatives for a sanitary sewer collection and treatment system and recommendation of the best alternative. The best alternative will be based on capital, operations and maintenance costs. The feasabilty study shall determine the following:

- Location of the plant with Soils Borings information at the plant location. Also provide soils data infomation needed at the land application site and recommendation of the type of soils needed. Groundwater Monitoring wells location and groundwater testing for background quality in accordance with MDE requirements. (Soils data at the land application Site if Consultant determines that it is the best option to dispose plant effluent.
- Capacity of the treatment plant and sizing unit processes.
- Mass Balance Calculations and Hydraulic Computations are required.
- Sewer Design, Sewer Alignments and type of sewer whether gravity, low pressure main or combination , location of intermediate pump stations in gravity option etc
- Cost of the various alternatives
- Identify all the permits needed and any environmental impacts such as wetlands, forest conservation etc,

- Type of plant with expected discharge limits either surface or ground discharge based on effluent disposal option chosen and MDE requirements. Discuss how solids and effluent will be disposed
- Identify easements required based on each alternative chosen

The County's Project Manager is: Michael Hinchy
(301) 645-0625 / fax (301) 645-0622
email: hinchym@govt.co.charles.md.us

Charles County Department of Planning & Growth Management
Development & Capital Services
P.O. Box 2150
Charles County Government Building
200 Baltimore Street
La Plata, Maryland 20646-2150

- **Feasabilty Study Report**

Feasabilty Study report shall comprise the following tasks:

a. Develop a sewer shed map map showing all the existing properties and also show areas to be included in the sewer shed. The map shall clearly differentiate between residential, commercial, and industrial properties (type of business, area, flow).

b. Determine the Plant Capacity based on flows expected to be generated using the Charles County Water and Sewer Ordinance, MDE regulations, and any other governing authority regulations. The plant shall be sized to treat design flows and to handle hydraulically the peak flows plus I/I on W&S ordinance.The feasabilty must have a analysis of Basis of Design Flow and give justification. The plant shall be sized for full build out of the sewer shed area. Include the cost for repairing the existing sewer house connection with County standard pipes and clean out. Include the cost of abandoning existing septic system (septic tanks and septic lines).

c. At a minimum three treatment alternatives shall be given such as surface discharge, ground discharge, lagoon with spray fields etc. The proposed draft limits shall be decided with consultations with MDE, before alternatives are chosen. Consultant is expected to give at a mimimum two sewer layouts and select the optimal alignment

considering costs and ease in operations and maintenance. Cost summary of the alternatives of the complete sewer and treatment system, selecting the best alternative taken into account, costs, operations and maintenance and odor. Locate intermediate pump station(s) in case of gravity flow. Pumps must include treatment for hydrogen sulfide prior to the discharging point. Grinder pump sizing and head requirements must be mentioned and optimum low pressure main sizing shall be done.

d. Describe each unit operations and size units based on design solids loading and peak hydraulic loading. Solids Mass Balance must be submitted. Sizing of units shall be based on MDE standards. Also describe solids treatment and disposal.

e. Investigate any impacts to the environment such as wetlands, forest conservation, historic areas etc.

f. Identify all permits needed to get the sewer and treatment system built.

g. Site loction of the plant needs to be investigated and the total property size needed to install the plant and operate the plant with ease. Potential sites shall be determined and the best site justified. Attach Soils report at the plant location and land application Site.

h. Submit a Drawing List and a Specification Outline.

Drawings:

a. At a minimum the following drawings shall be submitted

1) Sewer Shed Plan comprising the complete build out sewer service area showing all the properties/lots with the zoning.

2) Site plan showing recommended location of the treatment plant and land discharge appliction area(s) if land option chosen.

3) Plant layout and influent and effluent pipe profiles showing effluent pipe distribution in case of land application.

4) Sewer plans and profiles and any utility crossings.

5) Pump Station drawings.

6) Reflect existing utilities, streams, etc. to avoid and/or verify potential conflicts.

Schedule:

a. A project schedule for the completion of the feasability study shall be submitted. Regular monthly meetings shall be required and minutes taken by the Engineer, which shall be submitted within ten days of the meeting.

Document Submission:

a Six review sets shall be submitted to Development Services and two to CIP. Packages shall be submitted at 30%, 60%, 90% and at 100%. Six Final Sets shall be submitted and one electronic copy, with expansion ACAD and TIFF formats and using WordPerfect for word processing & Lotus for spreadsheets.

* * * End of SPECIAL PROVISIONS * * *

APPENDIX B

Septic Tank Failure Areas (excerpt)

Charles County, Maryland
Appendix 4M
Septic Tank Failure Areas

Name	Total Number of Homes	Total Number of Homes with Septic Tank Failures	% Failure	Previous Listing (2)	Change from Previous Listing	State/Federal Grant Monies (1)
MATTAWOMAN SEWER SERVICE AREA						
Avon Crest	61	3		yes		
Bel Air Estates	21	11		yes		
Bensville (MD 229)	43	9		yes		
Billingsley Forest	19	2		yes		
Billingsley Park	63	9		yes		
Brierwood Road	10	5		yes		
Brookshaven	41	21		yes		yes
Brookwood Estates	115	8		yes		
Cedarville Mobile Home Park	262	262		yes		
Chapman's Landing	51	21		yes		
Cleveland Park Estates	58	3		yes		
Columbia Park	34	10		yes		
Cramer's Subdivision (Middletown)						
Davis Road	45	28		yes		yes
Dutton's Addition	21	11		yes		
East Poplar Lane	39	35		yes		
Fenwick	27	7		yes		
Ford Height's (MD 224)	61	40		yes		
Gateway Boulevard				yes		
Glymont Road	37	20		yes		yes
Hope Acres						
Jones View	21	7		yes		
Laurel Acres	47	35		yes		yes
Marbury Area N.W.	116	82		yes		
Marbury Area S.E.	109	37		yes		
Marshall Hall	31	7		yes		
McDaniel Road				yes		
Middletown Road	16	7		yes		
Nike Site Drive	4	4		yes		
Old Indian Head Road	85	44		yes		
Phillips Road	17	7		no		
Pisgah	89	32		yes		
Pomfret Area	99	49		yes		
Pomonkey	22			no		

Appendix 4M
(continued)

Name	Total Number of Homes	Total Number of Homes with Septic Tank Failures	% Failure	Previous Listing (2)	Change from Previous Listing	State/Federal Grant Monies (1)
Quiet Acres	21	3	14.3	yes		
Raby Road	13	6	46.2	yes		
Red Hill	83	38	45.8	yes		
Renner Road				yes		
Ripley-North	33	14	42.4	yes		
Ripley-MD 225	42	14	33.3	yes		
Ripley-South of MD 225	132	132	68	yes		
Robie Manor	61	10	16.4	yes		
Shady Acres	36	6	16.7	yes		
Singing Hills	55	16	29.1	yes		
Southerland	36	21	58.3	yes		
Spring Valley	22	1	4.5	yes		
Stavor's Road	24	12	50.0	yes		yes
Sun Valley	46	31	67.4	yes		yes
Twinbrook	35	3	8.6	yes		
Waldorf (MD 228 Corridor)	49		0.0	yes		
TOTALS	**2,352**	**1,059**	**45.0**			
REMAINDER OF CHARLES COUNTY						
Annapolis Woods Road				yes		
Aqualand Area				yes		
Banks O'Dee	35	9	25.7	yes		
Beantown Park	46	5	10.9	no		
Bel Alton Estates	109	3	2.8	yes		
Bellewood	32	2	6.3	no		
Benedict				yes		
Bryantown Hills	32	2	6.3	yes		
Caernavon Woods	11	2	18.2	yes		
Capitol Estates	75	2	2.7	yes		
Chapel Point	72	4	5.6	yes		
Charles County Gardens	82	5	6.1	no		
DuMar Estates	46	5	10.9	yes		
Dump Road (WXTR Road)		3		yes		
Ellenwood	96	12	12.5	yes		
Fenwick Road	27	5	18.5	no		
Forest Grove	79	4	5.1	no		
Forest Park (Charles Co. Gardens)	79	8	10.1	no		

Charles County, Maryland
Appendix 4X
0, 5, 10-Year Improvement Projects

Year	Description	Estimated Costs			Construction Start	5 & 10-Year Project
		Total	State/Federal	Local		
2003-2005	Mattawoman BNR	$13,000,000	$4,288,000	$8,133,000	2004	Yes
2002-2007	Mattawoman WWTP Expansion Design	$777,000	$0	$762,000	n/a	Yes
2003	Mattawoman Control Building Rehabilitation	$78,000	$0	$62,000	2003	No
2003-2004	Bryans Road Business Park Sewer	$569,000	$75,000	$494,000	n/a	No
2003-2006	Zekiah Pump Station Upgrade	$4,500,000	$0	$0	2005	No
2003-2007	Benedict Central Sewer System	$641,000	$0	$641,000	n/a	No
2003	White Plains Business Park Sewer	$5,100,000	$0	$5,100,000	2003	No
2003-2004	Piney Branch Interceptor Rehabilitation	$2,000,000	$0	$2,00,000	2003	No
2003	Cliffton WWTP Lagoon Rehabilitation	$180,000	$0	$180,000	2003	No
2005-2007	Cliffton WWTP Rehabilitation	$210,000	$0	$210,000	n/a	Yes
2003-2005	Jude House WWTP	$219,000	Unknown	Unknown	2004	No
2002-2007	Inflow/Infiltration Program	$50,000	$0	$50,000	ongoing	n/a

Source: Charles County Department of Planning and Growth Management, 2002

APPENDIX C

Charles County Water & Sewer Design Criteria – Sewer Mains (excerpt)
Charles County Water & Sewer Design Criteria – Pump Stations (excerpt)

I. Abandonment Procedures

Abandoned service connections shall be cut and plugged at the service main, and the meters removed and salvaged if their condition permits reuse. Distribution mains that are to be abandoned shall be plugged at the point of abandonment and on each side of any existing valves, and the valves and hydrants removed and salvaged if their reuse appears practical. Any necessary buttresses or anchorage required shall be designed in accordance with the Standard Detail Manual and this ordinance.

J. Water Pumping, Treatment and Storage

A detailed presentation of design criteria for pumping, treatment, and storage facilities is beyond the scope of this ordinance. The design of these facilities will always be part of a plan submittal. The County will specify the exact requirements to be met by the design of these facilities. The sizing of water pumping and storage facilities will be in accordance with Appendix "R".

8.2 SEWER MAINS

A. General

(1) Sewer plans submitted for review and approval to the County will not be required to include the standard details on the plans. The plans however must include a table, on the cover sheet, listing by detail number and name all sewer details which are applicable to the project. In cases where the County has no adopted standard detail for a specific construction method, the engineer must submit a special detail to the County Water & Sewer Engineer for review and approval. Once approved, the special detail shall be placed within the plans with notes in plan and profile on all applicable sheets referring to the special detail.

(2) Lines terminated for future shall end with a manhole and a one (1) foot temporary capped stub.

(3) Computations shall be shown on the plans in accordance with Chapter 2, 1.J, Technical Bulletin: M-DHMH-EHA-S-001 Edition "Design Guidelines for Sewer Facilities", State of Maryland.

(4) Provide concrete encasement for protection of sewer mains per State Health Standards/Maryland Department of the Environment requirements as they relate to the vicinity of other utilities. Concrete encasement is also to be provided where SDR-PVC mains have less than a 2 foot clearance under storm drains, C-900-PVC and ductile iron mains have less than a 1 foot clearance under storm drains, under stream crossings, and on a case by case basis as determined by the County.

(5) Ductile iron pipe and restrained joints, in accordance with the County Standard Specifications for Construction Manual and Standard Detail Manual, shall be used for jack and bore carrier pipe.

(6) Ductile iron pipe with NBR rubber gaskets is required if gasoline storage is within 100 feet of the lines.

(7) Sewer mains are to be constructed to the property line of all adjacent properties for future looping or extension.

(8) The repaving of roads shall be in accordance with the County Standard Specifications for Construction Manual and Standard Detail Manual.

B. Collector Sewers

(1) Design Basis

A sewage delivery system shall ordinarily be designed to service the potential development of the mini basin at full build out based on the zoning ordinance permitted densities. Systems shall also be designed to connect with existing trunk lines or sub-interceptors at existing stub-outs wherever feasible. Whenever cost-effectiveness permits, the construction may be programmed in stages to accommodate the needs.

(2) Existing Development

In developed areas, the basis for the flow projection shall be the actual number of single or multi-family homes, apartments units, various types of businesses, etc., present in the drainage area as determined by field count. An allowance shall be made for undeveloped areas as described below. Unless field investigations give reason to choose a different number, it shall be assumed that 3.0 persons reside in each dwelling unit. If there is strong evidence from field investigations that sufficiently less than 3.0 persons reside in each dwelling unit in the drainage area and that this condition will persist throughout the design period, the County will consider using a smaller number for design.

(3) Future Development

In small undeveloped areas, the basis for flow projection shall be the maximum number of residential units per acre according to current zoning regulations. This applies to residential or mixed residential/commercial zones. It shall be assumed that 2.83 persons will reside in each dwelling unit. In the case of small undeveloped portions of commercial or industrial zones, design flows shall be based on the land use consistent with current zoning regulations which would provide the most likely maximum sewage flow.

In large, undeveloped areas, the average daily flow for a given zoning classification shall be as given in Appendix "V", flow generation rates by zoning classification.

(4) Average Daily Flow

The average daily flow for collector sewers is based on the population and land use inventories and projections described above. Appendices "W" and "X" are compilations of average daily flow generation rates for various types of establishments. The flow from each existing establishment shall be based on Appendix "W" when the number of persons using the facility can be determined or on Appendix "X" when only the gross area of the facility can be determined. The average daily flow shall be the sum of the flows projected for the existing or ultimate land use of each lot or parcel in the drainage basin. In the case of largely undeveloped drainage basins, the average daily flow shall be based on Appendix "V", as described in Section 8.2.B.3.

Average daily flows given in the appendices for industrial facilities are for domestic-type flows only. Flows generated by industrial processes must be determined on a case-by-case basis.

(5) Peak Domestic Flow

The peak domestic flow is the average daily domestic flow peaked in accordance with the curve entitled "Diagram for Converting Average Daily Domestic Flow to Peak Flow" (Appendix "Y").

Peak commercial or industrial flow is the average daily commercial or industrial flow peaked in accordance with a factor determined by evaluation of historical data for the commercial or industrial facilities and the periods in which these flows are generated. If historic peaking data for these facilities is unavailable, the average daily domestic flow, average daily commercial flow, and average daily industrial flow may be combined and then peaked using the curve in Appendix "Y".

(6) Infiltration and Inflow

In areas where sewer is being designed to replace an existing sewer with existing SHC's, a minimum infiltration rate of 400 gallons/acre of drainage basin per day shall be used. A higher rate of infiltration may be justified if there is evidence of poor soil conditions, high groundwater table, or deteriorated SHC's.

In area where the sewer will serve future development, the infiltration rate should be determined on a case-by-case basis. Factors affecting this

determination include the proposed sewer elevation relative to the normal groundwater elevation and the soil types present. The infiltration rate selected for design of new sewers shall be 100 gpd/in-dia/mile.

New clear water connections to sanitary sewers are strictly prohibited, and allowance for storm water inflow need not be made.

(7) Design Hydraulic Flow

The design hydraulic flow shall be the sum of the peak flows determined as described in Section 8.2.B.5, the infiltration rate determined as described in Section 8.2.B.6, and any industrial flows.

C. Interceptor Sewers

Determination of design hydraulic flows for interceptors sewers shall be generally as outlined for collector sewers. Interceptors which carry flows from a significant number of older collectors may have infiltration rates far in excess of 400 gallons/acre/day. ASCE manuals on Engineering Practice No.37 (WPCF MOP-9) and No. 60 (WPCF MOP FD-5) should be consulted for further information on computation of design flows for interceptor sewers. In all cases, the design hydraulic flows shall be approved by the County prior to proceeding with sewer design.

D. Hydraulic Criteria

(1) Collector Sewers

(a) Size

The size of the sewer shall be sufficient to carry the previously discussed design hydraulic flow with the hydraulic gradient coincident with or sightly below the crown of pipe. Size shall be determined by the relationship $Q = VA$, where:

Q = quantity of sewage in cubic feet per second (design flow)
V = velocity in feet per second
A = required cross section area of conduit in square feet

(b) Velocity

Velocity shall be determined by the manning formula:

$$V = \frac{1.486}{n} R^{2/3} S^{1/2}$$

n = coefficient of roughness as indicated in Appendix "Z"
S = slope in feet per foot

R = hydraulic radius - area divided by wetted perimeter

Minimum velocities of 2.5 feet per second shall be provided. Minimum velocities shall be determined based upon present average sewage flow. Appendix "AA" (Mannings Formula Solutions) shows required slopes for various velocities with pipes flowing full. Appendix "BB" (Hydraulic Elements of Circular Section) indicates hydraulic elements of pipes flowing partially full.

Where velocities greater than 15 feet per second are attained, provisions shall be made to protect against erosion and displacement by shock. If practical, suitable drop manholes shall be provided to reduce steep slopes so as to thereby limit the velocities in pipes and manholes. When drop manholes are impractical for reduction of velocities, the sewer shall be ductile iron or other abrasion resistant material as approved by the County.

(2) Interceptor Sewers

(a) Size

Interceptor sewers shall be sized to carry the design hydraulic flow when two-thirds full (i.e., the hydraulic grade line will be at D/d - 0.67).

(b) Velocity

Velocities in interceptor sewers shall be as presented in Section 8.2.D.1.b.

E. System Layout Criteria

(1) Collector Sewers

(a) Horizontal Layout

(i) General

Collector sewers shall be laid on tangents only. All changes of direction and connections to other collector sewers shall be accomplished at manholes. In laying out the sewer, the design engineer shall take into full account such factors as environmental impact, maintenance of traffic, maintenance of existing utility services, constructability, and system

maintenance, and shall produce the overall most cost-effective design.

(ii) New Subdivisions

In new subdivisions, collector sewers shall be located five (5) feet from the centerline of the street right-of-way, generally on the side of the street toward low ground. Collector sewers shall be located within the pavement area wherever possible, no less than five (5) feet from the face of existing or proposed curb. Where it is not feasible for manholes to be located within the pavements, they shall be located wholly within the grass plot or wholly with in the grass plot between the curb and sidewalk. On private roads and parking areas manholes are to be located outside of parking areas. Manholes will not be allowed in sidewalk.

(iii) Existing Developments (Closed Section Roads)

In existing developments with curbs, sewer location shall generally be the same as in new subdivisions. The location of other existing and proposed utilities shall be fully considered.

(iv) Existing Developments (Open Section Roads)

In existing developments without curbs, collector sewers shall generally be located four (4) feet outside of the edge of pavement, except that the sewer shall not be located under a future curb. The location of other existing and proposed utilities shall be considered.

(v) Parks and Public Rights-of-Way

Where location of sewer would require the removal of or damage to trees within parks or public rights-of-way, design engineers shall obtain approval of the state department of forestry for sewer alignment and trees to be removed.

(vi) Easements

All sewer utility easements widths shall be in accordance with latest Plan Preparation Package. No other utilities will be allowed in the sewer utility easement without written County approval.

(b) Profile Layout

(i) Grades

Grades shall be such as to require the least excavation while satisfying minimum and maximum velocity requirements, clearances, and depth requirements discussed hereinafter. All collector sewers shall be on tangent grades with required breaks in grade accomplished in manholes.

(ii) Depth

In developed areas, sewer inverts shall be a minimum of 2' + H below the basement elevations, where H = length of house lateral connection between the sewer and the point of connection to the existing house sewage system, or stack, multiplied by the required house connection slope. For houses without basements, sewers shall be a minimum of 2' + H below the first floor elevations. In all cases, sewer depth shall be sufficient to meet criteria established for house connection, depth, grade, and clearance.

Sewers at stream crossings shall be constructed with a minimum of three feet of cover between the pipe and stream invert. At all stream crossings, the design engineer shall consider such items as flotation, stream meandering and scouring, and infiltration; and shall include protective measures for such in the design.

(iii) Upstream of Pumping Stations

In order to insure that pumping station failures will not result in sewage backing up into basement and first floor plumbing fixtures of nearby residences, the design of all pumping station collection systems shall:

(A) Determine the rim elevation of the lowest manhole upstream of the pumping station that is not required to have a watertight frame and cover assembly.

(B) For projects having basement service, all basement elevations lower than the manhole frame and cover established in Section 8.2.E.1.b.iii.1 above shall identified.

(C) For projects or portions of projects having first floor

service only, first floor elevations lower than the manhole frame and cover established in 8.2.E.1.b.iii.1 above shall be identified.

(D) All vacant lots having a ground elevation lower than the manhole frame and cover established in 8.2.E.1.b.iii.1 above shall be identified.

(E) All dwellings, structures, and lots identified in 8.2.E.1.b.iii.2-4 above shall be noted on the drawing with the following:

"This lot is subject to sewage backup in the event of a pumping station malfunction. Backwater valves in any structure on these lots connected to the sewage system may be required, in accordance with the latest edition of the Maryland State Plumbing Code and the Maryland Department of Environment."

(iv) Gravity Service not to be provided

Sewer project plans shall clearly label any improved lots for which gravity service is not to be provided. Any recommendation for not providing gravity service is to be documented, with the reasons therefore, by the design engineer to the County for approval. For lots where it is determined that gravity service is not available, a note shall be placed on the drawings as follows:

"A grinder pump is required for sewer service to this lot."

(c) Clearances of other Utilities

(i) Interactive Considerations

In general, existing utilities have prior right to maintain their location. The existence and location of such utilities must be considered when designing new sewers. Clearance shall be measured between outside of pipes. Design engineers shall investigate clearance between sewer and other utilities, both existing and future.

(A) General

The following design factors must be considered in providing adequate separation:

- Materials and type of joints for water and sewer pipes
- Soil conditions
- Service and branch connection into the water main and sewer line
- Compensating variations in horizontal and vertical separations
- Space for repair and alterations of water and sewer pipes
- Location of manholes

(B) Parallel Installation

A horizontal distance of at least 10 feet shall separate water mains and sewers. The distance shall be measured edge to edge. In cases where a 10 foot separation is not practical, deviation may be allowed on a case-by-case basis subject to County and State approval if supported by data from the design engineer. Such deviation may allow closer installation provided that the water main is laid in a separate trench or on an undisturbed earth shelf located on one side of the sewer at such an elevation that the bottom of the water main is at least 18 inches above the top of the sewer.

(C) Crossings

Where water mains must cross sanitary sewers, building drains or storm drains must cross, there shall be a vertical separation of 18 inches between the bottom of the water main and the top of the sanitary sewer, building or storm drain. This vertical separation must be maintained horizontally for a distance of 10 feet. The 10 foot distance is to be measured as a perpendicular distance form the sewer, building or storm drain to the water line.

(D) Exceptions

When it is impossible to obtain the proper horizontal or vertical separation as stipulated above, both the

water and sewer lines shall be constructed of ductile iron with mechanical joints. Other types of pipe and joints with equal or greater integrity may be used at the discretion of the County. Thermoplastic pipe may be used with mechanical or solvent weld joints. These installations shall be pressure tested to assure water tightness before backfilling. Where a water main must cross under a sewer, additional protection of the water main shall be provided. The County shall be consulted to discuss the use of double casing or concrete encasement of the sewer and/or water main.

(ii) Separation of Utilities and Sewer Manholes

No utilities shall pass through any part of a sewer manhole.

(iii) Clearances at other Utilities

Sewers shall have a minimum of 12 inches clearance from drains, gas mains, and other unspecified utilities. If 12 inches cannot be maintained at crossings, provide encasement of sewer for the width of the utility trench.

(d) Appurtenances

(i) Manholes

(A) Details are shown in the Standard Details Manual. The designer shall use these standards as required to meet the design situation and shall designate the type of each manhole on the drawings.

(B) Manholes are to be constructed two (2) feet above finished grade in flood plains and non-maintained areas.

(C) Maximum spacing for manholes on sewers less than 18 inches in diameter shall be 400 feet; 500 feet for sewers 18 to 27 inches in diameter; and 600 feet for sewers larger than 27 inches.

(D) Line manholes shall generally be used at all changes of pipe size, grade, alignment, or connections of two or more sewers. A minimum drop of 0.10' shall be

used at line manholes.

(E) Interior coating of manholes shall be as specified in the Charles County Standard Specifications for Construction Manual.

(ii) Frames and Covers

(A) Provided a bolt-down frame & cover for all manholes in flood plains and non-maintained areas in accordance with the County Standard Detail Manual.

(B) Water tight frames and covers are to be provided for manholes within flood plains, ditches or other areas of collecting or passing water.

(e) Structural Considerations

(i) Soil Conditions / Foundations

Where extremely poor soil conditions, such as running sand, material with high organic content, etc., are anticipated; design engineers shall secure soil samples and discuss the analysis of the samples with the County. In all cases, a proper foundation shall be provided for pipes. Where pipes are to be placed on fill, ductile iron pipe shall be placed on timber pile bents unless special measures satisfactory to the County are taken to consolidate the fill.

(ii) Grades / Anchors

Sewers design on slopes of 20 percent or greater shall have anchorages in accordance with the Standard Details Manual as follows:

20% - 34% - 36' center to center (max.)

35% - 50% - 24' center to center (max.)

50% + - 16' center to center (max.)

(iii) Under Drains

Where there is evidence of spring heads or a high groundwater table in the area of the proposed sewer, under drains shall be provided and shown on the drawings.

(iv) Depth and Loading

Minimum and maximum permissible depths and loadings for pipes of the various types and classes shall be in accordance with the Standard Specifications for Construction Manual and the manufactures' recommendations and bedding requirements. Manufactures' data shall be submitted as part of the plan submittal.

(f) Venting

The design engineer shall indicate the method of proposed ventilation of gravity sewers if other than manhole top openings.

(2) Interceptor Sewers

(a) Horizontal Layout

Interceptor sewers generally follow streams or the valley of a drainage area. They shall be located so as to best serve the drainage area. Special caution is required to insure the proper location of manholes for future connection of collecting sewers.

Sewers 27 inches or less in diameter shall be laid with straight horizontal alignment between manholes. Larger diameter interceptor sewers may employee long radius horizontal pipe curves subject to department approval and criteria. Where the sewer is planned in a County road right-of-way or park, layout shall be as described for collector sewers in Section 8.2.D.1.a.v.

(b) Profile Layout

Grade requirements shall generally be as described for collector sewers in Section 8.2.E.1.b.i. The depth of interceptor sewers is not directly controlled by lot and house elevations. The depth of interceptor sewers shall be sufficient to allow connection of all existing and foreseeable future collector sewers within the drainage basin served. In general, sewer elevation should be three feet lower than the stream bed and have six feet of cover where possible.

Sewers at stream crossings shall be constructed with a minimum of three feet of cover between the pipe and stream invert. At all stream crossings, the design engineer shall consider such items as flotation, stream meandering and scouring, and infiltration; and shall include protective measures for such in the design.

(c) Clearances at other Utilities

The requirements for horizontal and vertical clearances between interceptor sewers and other utilities shall be the same as those for collector sewers. See Section 8.2.E.1.c.

(d) Appurtenances

(i) Manholes

Manhole requirements for interceptor sewers shall be the same as those for collector sewers, Section 8.2.E.1.d.i, with the following modifications:

- Manholes will be required where collector sewers join the interceptor.
- Manholes need not be used at changes of horizontal alignment if a long radius bend is approved by the County.
- Precast concrete manholes constructed in these areas shall meet the standard ASTM C478 criteria.

Long radius horizontal pipe curves shall be permitted for concrete pipe 27 inches and larger. The minimum radius and degree of curvature for four foot and eight foot lengths of pipe with maximum joint opening of 1/2 inch shall be as recommended by the manufacture. If concrete pipe with mitered joints is used, deflection shall be limited to five degrees per joint (or less if recommended by the manufacture). For ductile iron pipe or PVC pipe, manufacture's recommendations shall be followed.

(ii) Frames and Covers

Frame and cover requirements for interceptor sewers shall be the same as those for collector sewers, Section 8.2.E.1.d.ii.

(e) Structural Considerations

Structural considerations shall be the same as for collector sewers. See Section 8.2.E.1.e.

F. Grinder Pumps/Pressure Sewer Systems/Step Systems

Alternative wastewater systems will be reviewed on a case by case basis, but will not be considered as a method of providing sewer service that could otherwise be furnished by conventional gravity systems (including pumping stations). Unless otherwise agreed to grinder pumps are to be privately operated and maintained and must adhere to the County Standard Specifications for Construction Manual.

G. Sewer House Connections

(1) Location

The County-owned portion of house connections shall be built to the right-of-way/property/easement line for all lots within proposed developments. All adjacent improved lots which are not a part of the proposed development, but which front and may be served by the service line, shall have the sewer service laterals, including cleanouts, constructed to the right-of-way/property/easement lines. Twin sewer house connections shall be allowed and encouraged.

(2) Size

Connections to large buildings such as apartments or factories shall be designed and sized in accordance with the criteria previously presented for collector sewers. The minimum connection size for smaller buildings shall be six (6) inch diameter from the main to the cleanout and four (4) inch from the cleanout to the building.

(3) Materials

House and building connections shall be in accordance with the latest County Standard Specifications for Construction Manual.

(4) Appurtenances

Cleanouts shall be provided on all house and building connections at the right-of-way/property/easement line. Cleanouts shall be shown and constructed in accordance with the latest County Standard Specifications for Construction Manual and Standard Detail Manual.

(5) Grades

House and building connections shall be designed such that service is provided for all lots to the mid-point of the lot at a two percent (2%) minimum grade, unless otherwise approved by the County. The maximum grade shall be six (6) percent. House and building connections may have

a one percent minimum grade as determined by the County on a case by case basis. Minimum cover at the right-of-way/property/easement line shall be 42 inches. Where storm drains have been designed, or have not been installed, house connections shall have a minimum cover within the street right-of-way of 6.5 feet.

(6) Clearance

(a) Parallel to Water House Service

Sewer house services shall ordinarily be placed 10 feet horizontally and 1 foot vertically under and from the water house connections. In cases where this is not achievable, deviation may be allowed on a case by case basis subject to County and/or state approval. Such deviation may allow a horizontal separation of 1.5 feet with at least a 6 foot vertical clearance (sewer being placed on the bottom). If schedule 40 PVC solvent weld pipe is utilized for the sewer house connection a 1.5 foot horizontal separation with at least a 1 foot vertical clearance (sewer being placed on the bottom) may be allowed if a passing pressure test with 10 foot of head of water or equivalent taken in the presence of a County representative is achieved.

(b) Crossing Storm Drains or other Utilities

Sewer house and building connections crossing storm drains and other utilities (existing or future) shall have a minimum clearance of 12 inches from these utilities.

(7) Structural Considerations

Structural considerations shall be the same as for collector sewers. See Section 8.2.E.1.e.

H. Grease Interceptors

(1) Are required for all food preparation facilities.

(2) To be located outside and constructed in accordance with the County Standard Detail Manual.

(3) Sized a minimum 2,000 gallons.

(4) To be show in plan and profile with inverts and elevations.

I. Oil and Flammable Liquids Separators

Oil and flammable liquids separators are required in accordance with COMAR requirements.

J. Flag Lot Sewer Utilities

(1) For a two flag lot maximum, service laterals will be provided off of the main and include a cleanout at the right-of-way or easement line. Sewer service for each lot shall be located on each side of the driveway. Adequate easements are to be provided outside of the common access easement if necessary. The sewer service must be constructed in conjunction with the main from the cleanout to the building lot and capped for future connection. The end of the service should be marked in accordance with the County Standard Detail Manual. Cleanouts are to be provided every 75 feet and at the end of the lateral. Extension of the service as indicated above will prevent problems associated with the construction of the driveway prior to the construction of all sewer services.

(2) For three (3) or more flag lots, provide an extension of the sewer main to the last lot and terminate with a manhole. Provide service connections to all adjacent lots, with cleanouts located at the easement line. Adequate easements are to be provided on both sides of the sewer main and services and must extend outside of the common access easement if necessary.

8.3 MINIMUM DESIGN GUIDELINES AND REQUIREMENTS FOR WASTEWATER PUMP STATIONS

A. General

(1) In addition to the criterion contained herein, the design of wastewater pumping stations shall meet the requirements of the 1978 edition of the State of Maryland "Design Guidelines for Sewage Facilities" or shall be exceeded where specified by the County. The following additional manuals shall be consulted and applied to the design with the approval of the County:

(a) Water Environment Federation Manuals of Practice.

(b) Recommended Standards for Sewage Works, also known as the "Ten State Standards".

(2) All aspects of the facility shall maximize operator safety. The facility shall be designed to operate reliably and efficiently with a minimum of attention and have provisions for easy access and maintenance. Equipment shall be selected on the basis of durability, availability of replacement parts,

standardization, efficiency, and ease of maintenance and repair.

(3) The pumping station shall be designed for the maximum build out conditions of the sub-basin as approved by the County using flows approved by the County and yields as contained herein.

B. Design

(1) Pumping stations with ultimate designs of more than 500 gallons per minute (gpm) peak flow shall be constructed with concrete wet wells and dry wells. Dry wells, including their superstructure, shall be completely separated from the wet wells. To facilitate differential settling or unforeseen movement, flexible joints shall be placed in the piping between the structure. Also refer to Section 8.3.E.

(2) To help prevent overflows and maintain continuous operation during maintenance procedures, pumping stations with ultimate designs of more than 500 gpm peak flow shall have divided wet wells. A minimum cycle time of 15 minutes is to be provided. Wet well capacity (in gallons) from pump on to pump off shall be a minimum of 3.75 times the capacity of the largest pump (in gallons per minute); preferably 4 times the capacity. Gas tight lighting is to be provided inside the wet well. The wet well floor shall have a minimum slope of one to one to the hopper bottom. The horizontal area of the hopper bottom shall not be greater than necessary for proper installation and function of the inlet. Slope the hopper bottom between the inlets if necessary to prevent deposition of material between the inlets.

(3) A pump around configuration shall be provided for the use of portable pumps to prevent overflows during maintenance or repair of the pumping station. A manhole shall be provided within the fenced area of the station immediately upstream of the wet well. The gravity main between the manhole and wet well will be provided with a gate valve for the purpose of isolating the wet well. The force main will be provided with a connection on the outside of the pumping station for portable pumping from the upstream manhole directly to the force main. As an alternative, a partitioned wet well can be utilized such that the wastewater can be directed to either of the pump intakes while allowing safe maintenance of the opposite side of the wet well or intake. Enough room shall be provided on the pump site to park the portable pump while allowing vehicle access to the wet well and dry well.

(4) Only resilient seat gate valves in accordance with the Standard Specifications for Construction Manual are to be utilized. To prevent valve fouling locate the suction gate valve a minimum three (3) feet ahead of the reducers. In addition to the valving normally utilized within the pumping station provide an additional exterior isolation valve on each pump suction

line between the wet well and dry well.

(5) Coarse bar screens are to be provided ahead of the pumps to protect equipment from rags, cans, bottles, sticks, etc. Grit removal will be required in areas where the County has experienced or expects a collection of grit and debris as determined by the County engineer.

(6) A duplex bubbler system is required for pump control redundancy. Only local wet well levels indications are necessary via gauges reading in inches.

(7) Provide built-in lifting equipment rated for the expected loads. The equipment should be capable of transporting the equipment to the exterior of the building for loading onto service trucks.

(8) Provide wastewater pumps with mechanical seals in accordance with the County Standard Specifications for Construction Manual. To facilitate pump draining without flooding the building, pump intakes shall be drainable directly to the sump through piping or a channel drain.

(9) Dual sump pumps shall be provided for redundancy. Alternation shall be accomplished by means of a manual H-O-A selector switch rather than electrical alternators.

(10) Force main velocities shall be a minimum of 2.5 feet per second and a maximum of 5.0 feet per second.

(11) The system shall be designed to minimize water hammer for normal operational situations. The system shall also be designed to dissipate water hammer when it occurs in unusual circumstances such as power outages, etc.

(12) The system design shall consider the potential generation of hydrogen sulfide and include provisions for such generation such as odor control and corrosion prevention.

C. Building

(1) Adequate room is required for working around and above equipment. A minimum of two (2) feet of clearance between equipment and walls shall be provided.

(2) A potable water source shall be provided for wash down, maintenance, and sanitation purposes. The service shall include a backflow preventer.

(3) A restroom shall be provided onsite as determined on a case by case basis based on the anticipated number of man-hours of operation and the

remoteness of the site.

(4) Provide color coding for piping in accordance with the Standard Specifications for Construction Manual.

(5) The minimum floor slope toward the sump shall be 1/4 inch per foot. Water shall not pool in any areas of the floor.

(6) Stairs are to be provided with appropriate landings in lieu of ladders with cages.

(7) Provide above ground walk-in pumping station access. Hatch and ladder access is prohibited.

(8) Non-motorized mechanical dampers are required on ventilation equipment.

(9) Provide separate thermostats for heating and cooling which are tuned for specific applications. Provide cooling as necessary to maintain air temperatures below 95 degrees Fahrenheit inside electrical devices. Heating is to be proved to maintain a temperature above 40 degrees Fahrenheit inside electrical devices.

(10) Locate all auxiliary equipment above ground in an appropriate building which allows safe and efficient all-weather, all-hour, electrical and mechanical maintenance, including but not limited to motor controls, blowers, bubblers, meters, generators, etc.

(11) Buildings shall be constructed of materials and of colors as approved by the County.

D. Site

(1) Wet well access for a tanker truck of 40 foot minimum inside turning radius is to be provided and an area onsite for turning around. The site is to be configured to allow convenient and safe access for service equipment to the wet well and building.

(2) A six (6) foot high chain link fence with double gates, appropriately sized is to be provided in accordance with the County Standard Specifications for Construction Manual and Standard Detail Manual. The fence is to include three (3) strands of barbed wire around the top.

(3) The area within the fencing, and two (2) feet beyond the fence is to be covered with a minimum of six (6) inches of gravel over a weed barrier film. No proposed grassed areas are allowed.

(4) Sidewalks are to be provided between buildings or structures and from

paved areas to buildings or structures for access of equipment, dollies, etc.

E. Electrical

(1) The design report shall provide the correspondence with the Charles County local power company showing the consultant's load breakdown along with the local power company's assessment of the voltage available, their ability to serve the project, and the availability of a second independent source of power. Specific local power company permission to use across-the-line starters or requirement for reduced voltage starters is required.

(2) Power for the station shall be 480 volts, three phase.

(3) Lightning arresters are to be provided for the protection of pumps, and other equipment as directed, located on the load side of the starter. Provide phase failure and phase reversal protection for all equipment. A single phase condition shall not destroy motors, transformers, relays, etc. should the second source of power fail to take over.

(4) Appropriately designed dielectric rubber floor mats are to be provided for insulation at all motor controls for personnel safety. If water on the floor is a possibility, the design must eliminate such water. A situation of motor control maintenance in wet or unsafe conditions is unacceptable.

(5) European electrical components shall not be utilized. For replacement compatibility and availability, only full sized American UL listed electrical devices shall be used regardless of any equivalent UL ratings of European devices.

(6) Lockable safety disconnect switches are to be provided for all rotating equipment. Use lockable knife-switches rather than remote lockable start/stop button stations.

(7) Provide "push-to-test" type indicator lamps with screw-in type bulbs. Use of 120mb type bulbs is prohibited.

(8) Permanent, in-place, volt/amp meters are required for each pump or major piece of equipment.

(9) Due to compatibility and standardization needs, provide only "Square-D", "Furnas", or "Cutler-Hammer" electrical equipment; no alternatives allowed.

(10) Provide a magnetic flow meter on the discharge line (force main) with totalizer and chart recorder. Locate the transducer inside the pumping station building. Fisher-Porter magnetic meters are preferred due to

standardization.

(11) Use "Square-D", or County approved equal, Class 8501 Type "K" plug-in style relays to the maximum extent possible where appropriate. Provide integral power indicating lamps in the relays. The only exception to this should be where current requirements exceed contact ratings. Use plug-in style relays for timers, alternators, and latching as well. Octal or square relays are equally acceptable, although eight-pin octal relays are preferred. Use "Square-D" Type KP12P14 or KP13P14 or County approved for DPDT or 3PDT respectively.

(12) Provide non-resettable elapsed time meters for all rotating equipment. Meters are to be in hours and tenths of an hour, not minutes. Provide an elapsed time meter for parallel operation of main wastewater pumps; e.g. A meter for pump #1, pump #2, and pumps #1 and #2 together.

(13) A weather proof red exterior "Trouble Light" for visual indication of equipment failures/problems is to be provided. A horn is not to be provided.

(14) Provide only Motorola Intrac 2000 MRU for signal status and control. No alternatives are allowed due to compatibility with existing equipment. Potential signal conflicts with the Department of Navy Research Facilities and other facilities shall be specifically investigated with findings documented.

The following alarm conditions shall be detected and transmitted via the telemetry unit to the central receiving station:

(a) High water level

(b) Low water level

(c) Power failure

(d) Emergency generator power failure

(e) High water level in drywell

(f) Equipment failure : wastewater pumps, sump pumps, bubblers, etc.

(g) Intrusion

(h) Others as appropriate

(15) Interior and exterior quartz lighting, separately switched, for maintenance

purposes including auxiliary DC safety lighting is to be provided. Minimum lighting levels shall be 15 Foot Candles for stairways, 50 Foot Candles for operation, and 100 Foot Candles for electrical and mechanical maintenance.

(16) In addition to the proposed wiring diagrams, provide a narrative of the control sequence scenario which clearly explains the operational intent.

(17) Provide a junction pedestal(s) near, but outside, the wet well for power, lighting, and control cables leading to the wet well. Provide gas tight connections. No junction boxes are allowed inside the wet well.

(18) Telephone service is to be provided to the building with a "local" telephone number. Provide phones both at the ground level and at the pump level.

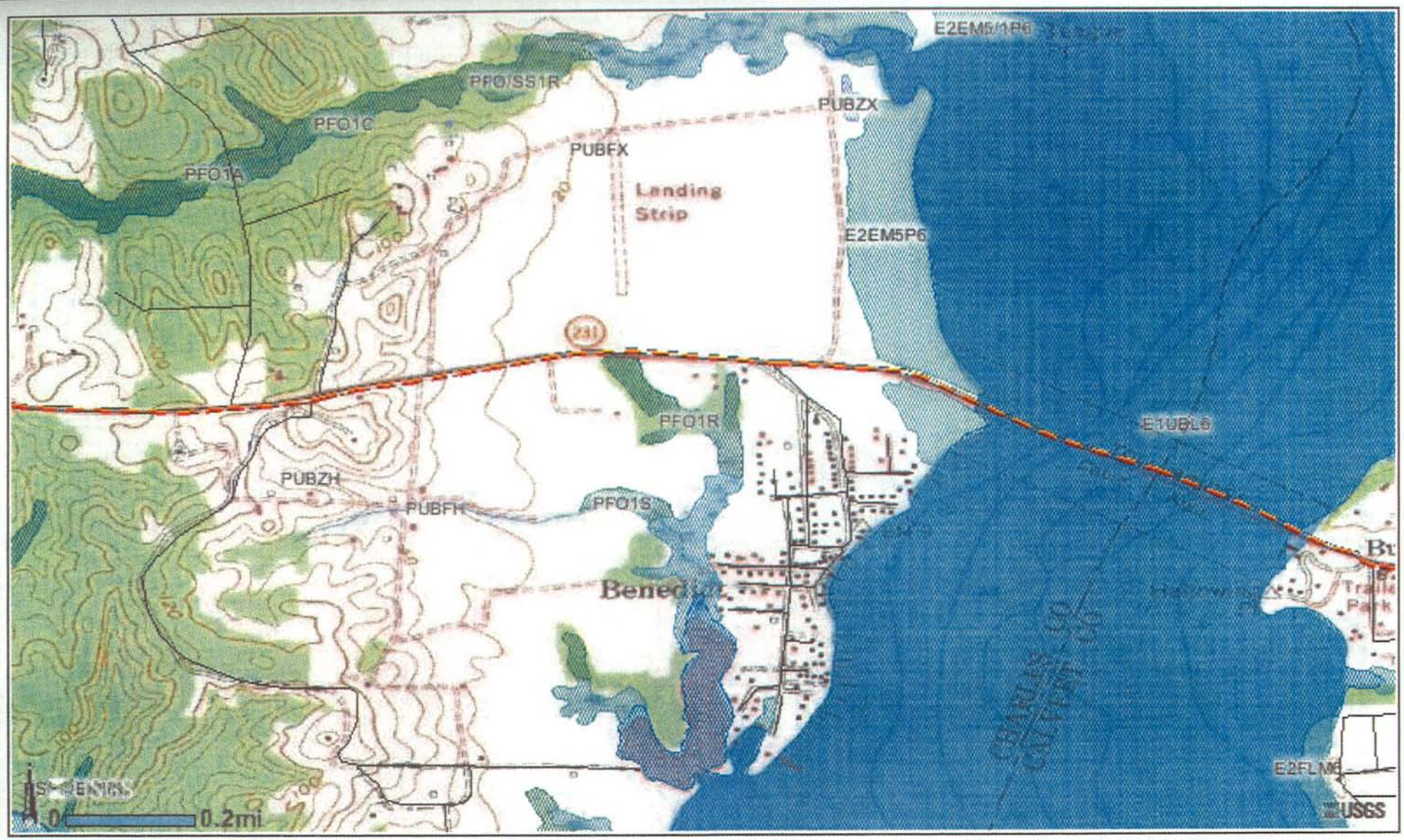
F. Safety

(1) Gas detection and annunciation shall be provided for the dry well in the form of low explosive levels, and oxygen level as a minimum.

(2) Appropriate emergency eye wash facilities shall be provided whenever chemical handling is proposed for the pumping station.

APPENDIX D

Wetlands Maps



USGS
science for a changing world

38.5267

-76.703445 | Map Extent | -76.6615

38.501743

The National Map
http://nmviewogc.cr.usgs.gov/

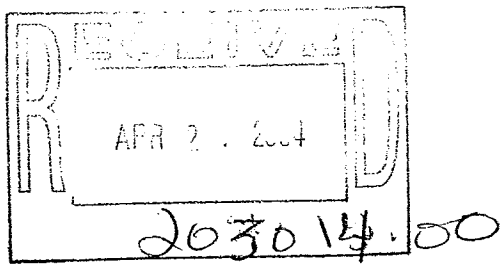
Geographic Coordinate System (NAD83)

APPENDIX E

Utility Letters

SMECO
Southern Maryland
Electric Cooperative
P.O. Box 248 White Plains, MD 20695-0248
301•645•3636, 301•843•6142, 301•934•2201
TOLL FREE: 1•888•440•3311 FAX: 301•705•8692

April 20, 2004



Mr. William C. Wallace
Wallace Montgomery & Associates, LLP
110 West Road, Suite 300
Towson, Maryland 21204

Re: Benedict sewer Feasibility Study

Dear Mr. Wallace:

Per your letter requests of April 5, 2004, SMECO is submitting two copies of our electric distribution AM/FM drawing, indicating the **approximate** location of the SMECO facilities within the limits of the above referenced area. The actual location of the facilities, shown on these SMECO drawings, will need to be field verified by your personnel. Site locations can be obtained through "Miss Utility", at (800) 257-7777. **These drawings are not to be used for design purposes.**

Should you have any questions, please feel free to contact me at (301) 396-4907.

Sincerely,

Charles J. Herbert

Charles J. Herbert
Assistant District Engineering Supervisor

Engineering - FMC

Verizon Communications
6205 Crain Hwy.
La Plata, MD 20646

Phone 301.934.5020
Fax 301.934.9946
1-800-492-3401

April 12, 2004

RECEIVED
APR 16 2004
2030114.00

Wallace, Montgomery & Associates, LLP
Attn: William C. Wallace
Suite 300
110 West Road
Towson, MD 21204

Re: Benedict Sewer Feasibility Study

Dear Mr. Wallace:

Enclosed please find a copy of Verizon's facility records within the vicinity map you provided for Benedict, MD (all streets west of the Patuxent River). There are no as-builts for this area and the records have no scale. Verizon has both aerial and buried facilities within the scope of this project. Typically, Verizon's buried cables are 36 inches below ground level. These records are for reference only and all utilities should be located and surveyed onto your plans.

If you need additional information or have any questions, please contact myself or Ray Harding at 301 932-2288.

Sincerely,

Anita Green

Anita Green
Facility Designer

Enclosures

Gary Wigfield
Engineering Supervisor
OSP Cable Maintenance
MD, DC, VA, WV

11026 Fingerboard Rd.
Monrovia, MD 21770
301 865-3877
FAX 301 865-3878
gwigfield@ems.att.com

April 7, 2004

Wallace, Montgomery & Associates, LLP
Mr. William C. Wallace
110 West Road, Suite 345
Towson, MD 21204

RE: Benedict Sewer Feasibility Study
WM&A No. 203014.00

Dear Mr. Wallace:

This is in reply to your correspondence dated April 1, 2004, for the above-referenced project.

AT&T has no facilities in the area of the proposed projects.

If there are any questions or additional information is needed, please contact me on (301) 865-3877.

Sincerely,

Gary Wigfield

Gary Wigfield
Supervisor, Outside Plant Engineering

Washington Gas

6801 Industrial Road
Springfield, Virginia 22151

RECEIVED
APR - 5 2004
203014.00

Date: 02-Apr-04

TO: William C. Wallace
110 West Road
Suite: 345
Towson MD 21204

RE: Benedict Sewer #203014.00
(Charles County)
Letter Dated: 02-Apr-04
WGL REF #: 04-0381

☒ It has been determined from available records that the location of our facilities have/ have not been properly shown on your drawings. Please revise your drawings.

☑ From available Company records, we have determined that this company has no existing or proposed facilities within the limits of this project as of this date.

☒ We are sending you the attached prints for your use: WG AV-055/056-SE

☒ The location of our facilities were obtained from available Company records. However, we do not guarantee these locations and require that you add the following notes to your drawing:

1. The Contractor shall hand dig test pits at all gas crossings to determine the exact location and depth well in advance of construction.
2. For marking locations of Washington Gas facilities, please notify "Miss Utility" at 1-800-257-7777, 48 hours in advance of construction.

☒ Please notify Washington Gas at (703) 750-4205, 48 hours prior to any excavation in the vicinity of our Transmission Main. For further information or problems, contact Mr. Chuck Whitley at Washington Gas at (703) 750-4205.

☒ Please provide a minimum of 5 ft. horizontal and 1 ft. vertical clearance between our 12" diameter and smaller distribution existing gas facilities and your prop. facilities.

☒ Please provide a minimum of 5 ft. horizontal and 2 ft. vertical clearance between our 16" diameter or greater transmission gas facilities and your prop. facilities.

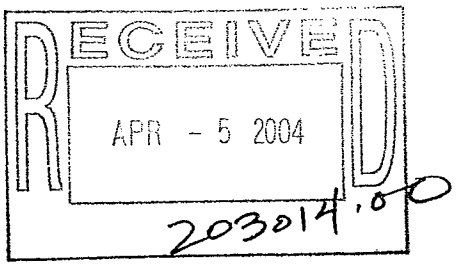
☑ Upon completion of your design, please forward a copy of your preliminary drawing for our review and comments to:

ATTN: Mrs. Theresa Avila Curtis, E.I.T.
Section Leader – MD Replacement
6801 Industrial Road
Springfield, VA 22151
TEL: (703) 750-4215

☑ We shall be glad to furnish any additional information if required.
Please direct all questions to Mr. Raymond Seaborn at (703) 750-4589.
IF ENCLOSURES ARE NOT AS NOTED NOTIFY US AT ONCE.

Dominion Transmission, Inc.
40620 Consolidated Lane, Leesburg, VA 20175

Dominion℠



Friday, April 02, 2004

William C. Wallace
Wallace, Montgomery & Associates, LLP
110 West Road
Suite 300
Towson, MD 21204

Re: Benedict Sewer Feasability Study
WM&A No.: 203014.00

Dear Mr. Wallace:

Please refer to your fax of April 02, 2004 (copy attached) concerning the above referenced subject. A review of the information supplied indicates that there are no existing or proposed Dominion Transmission, Inc. facilities within the boundaries of this property, and therefore we will not be impacted by your proposed project.

Should you have questions or require any additional information, please feel free to contact me at (703) 327-4163. Thank-you.

Sincerely,

Q. Wayne Burkhammer

Q. Wayne Burkhammer
Superintendent, Gas Transmission Operations

QWB
Attachments

xc: Jonell Ferda

APPENDIX F

Water Use Records

BENEDICT 2002 - DAILY WATER WITHDRAWALS

	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPT.	OCTOBER	NOV.	DEC.
DATE	BENEDICT	BENEDICT	BENEDICT	BENEDICT	BENEDICT	BENEDICT	BENEDICT	BENEDICT	BENEDICT	BENEDICT	BENEDICT	BENEDICT
1	17,000	15,000	22,000	22,000	28,000	28,000	26,000	23,000	25,000	20,000	19,000	19,000
2	20,000	20,000	13,000	14,000	21,000	40,000	41,000	17,000	22,000	24,000	22,000	18,000
3	20,000	23,000	25,000	24,000	22,000	22,000	22,000	42,000	13,000	20,000	21,000	18,000
4	20,000	16,000	21,000	20,000	21,000	34,000	40,000	29,000	20,000	21,000	16,000	16,000
5	20,000	18,000	22,000	17,000	29,000	38,000	35,000	21,000	20,000	21,000	18,000	22,000
6	21,000	18,000	21,000	33,000	13,000	23,000	45,000	29,000	23,000	25,000	17,000	15,000
7	19,000	21,000	16,000	10,000	20,000	20,000	50,000	21,000	24,000	17,000	18,000	18,000
8	21,000	18,000	16,000	20,000	17,000	32,000	19,000	28,000	33,000	21,000	18,000	21,000
9	21,000	22,000	17,000	10,000	20,000	42,000	32,000	22,000	18,000	21,000	25,000	11,000
10	25,000	21,000	27,000	25,000	21,000	24,000	24,000	32,000	20,000	16,000	19,000	20,000
11	18,000	20,000	17,000	21,000	20,000	35,000	29,000	42,000	24,000	20,000	11,000	16,000
12	19,000	19,000	18,000	21,000	28,000	26,000	28,000	27,000	21,000	15,000	15,000	14,000
13	21,000	24,000	19,000	14,000	15,000	27,000	53,000	25,000	22,000	23,000	20,000	21,000
14	20,000	17,000	19,000	34,000	21,000	18,000	21,000	30,000	35,000	29,000	16,000	17,000
15	27,000	27,000	18,000	15,000	15,000	24,000	29,000	29,000	27,000	16,000	17,000	25,000
16	20,000	12,000	26,000	18,000	16,000	32,000	19,000	30,000	22,000	23,000	20,000	17,000
17	17,000	24,000	27,000	19,000	28,000	25,000	20,000	37,000	18,000	20,000	21,000	16,000
18	15,000	22,000	19,000	19,000	20,000	17,000	45,000	27,000	20,000	16,000	12,000	21,000
19	15,000	20,000	18,000	23,000	18,000	21,000	25,000	36,000	22,000	27,000	17,000	15,000
20	30,000	16,000	20,000	17,000	20,000	27,000	41,000	32,000	16,000	20,000	17,000	17,000
21	23,000	18,000	18,000	22,000	15,000	19,000	41,000	30,000	34,000	10,000	17,000	18,000
22	21,000	22,000	20,000	17,000	25,000	21,000	30,000	48,000	22,000	20,000	19,000	21,000
23	21,000	20,000	21,000	18,000	17,000	49,000	22,000	26,000	11,000	14,000	18,000	22,000
24	27,000	24,000	27,000	12,000	23,000	39,000	22,000	29,000	19,000	25,000	25,900	17,000
25	27,800	11,000	21,000	19,000	23,000	26,000	21,000	27,000	23,000	15,000	16,000	16,000
26	19,200	15,000	18,000	20,000	29,000	33,000	22,000	21,000	21,000	21,000	15,000	13,000
27	29,000	10,000	21,000	24,000	30,000	28,000	20,000	16,000	17,000	27,000	22,000	20,000
28	21,000	38,000	21,000	6,000	25,000	17,000	30,000	17,000	15,000	16,000	13,000	19,000
29	16,000		21,000	17,000	37,000	32,000	20,000	20,000	20,000	19,000	20,000	18,000
30	32,000		34,000	4,000	28,000	33,000	28,000	15,000	13,000	18,000	23,000	16,000
31	24,000		15,000		26,000		28,000	27,000		13,000		16,000
TOTAL	667,000	551,000	638,000	555,000	691,000	852,000	928,000	855,000	640,000	613,000	547,900	553,000
AVERAGE	21,516	19,679	20,581	18,500	22,290	28,400	29,935	27,581	21,333	19,774	18,263	17,839
HIGHEST DAY	32,000	38,000	34,000	34,000	37,000	49,000	53,000	48,000	35,000	29,000	25,900	25,000
ROLLING	*** For 12 months PRIOR to this month.											
ANNUAL AVG	22,167	22,145	22,003	22,005	21,748	21,436	21,559	22,167	22,362	22,279	22,268	22,216
PERMIT	*** For average daily pumpage.											
LIMIT	56,000	56,000	56,000	56,000	56,000	56,000	56,000	56,000	56,000	56,000	56,000	56,000
PUMPING	*** If all drilled wells were to run 24 hours a day.											
CAPACITY	374,400	374,400	374,400	374,400	374,400	374,400	374,400	374,400	374,400	374,400	374,400	374,400
% OF PUMPING	*** Average day divided by pumping capacity.											
CAPACITY USED	5.7	5.3	5.5	4.9	6.0	7.6	8.0	7.4	5.7	5.3	4.9	4.8
SUGGESTED	*** If all drilled wells were to run 18 hours a day.											
CAPACITY	280,800	280,800	280,800	280,800	280,800	280,800	280,800	280,800	280,800	280,800	280,800	280,800
OF SUGGESTE	*** Average day divided by suggested capacity.											
CAPACITY USED	7.7	7.0	7.3	6.6	7.9	10.1	10.7	9.8	7.6	7.0	6.5	6.4

COMMENTS:

BENEDICT 2003 - DAILY WATER WITHDRAWALS

	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPT.	OCTOBER	NOV.	DEC.
DATE	BENEDICT	BENEDICT	BENEDICT	BENEDICT	BENEDICT	BENEDICT	BENEDICT	BENEDICT	BENEDICT	BENEDICT	BENEDICT	BENEDICT
1	21,000	21,000	33,000	26,000	23,000	29,000	16,000	18,000	27,000	19,000	24,000	14,000
2	23,000	25,000	21,000	30,000	17,000	21,000	28,000	25,000	20,000	17,000	19,000	22,000
3	15,000	25,000	36,000	23,000	22,000	17,000	22,000	24,000	20,000	20,000	19,000	14,000
4	15,000	23,000	25,000	26,000	24,000	21,000	27,000	45,000	23,000	17,000	20,000	13,000
5	18,000	18,000	28,000	17,000	17,000	24,000	29,000	24,000	27,000	21,000	15,000	13,000
6	24,000	11,000	33,000	36,000	16,000	25,000	28,000	32,000	21,000	15,000	21,000	23,000
7	18,000	23,000	20,000	20,000	14,000	34,000	23,000	19,000	28,000	19,000	18,000	20,000
8	16,000	20,000	44,000	32,000	21,000	29,000	25,000	26,000	28,000	17,000	19,000	16,000
9	14,000	18,000	36,000	19,000	25,000	24,000	22,000	27,000	21,000	18,000	23,000	16,000
10	25,000	19,000	17,000	25,000	10,000	24,000	23,000	19,000	17,000	18,000	17,000	13,000
11	15,000	21,000	27,000	14,000	48,000	38,000	26,000	15,000	23,000	23,000	15,000	17,000
12	18,000	18,000	27,000	23,000	20,000	14,000	36,000	28,000	16,000	29,000	20,000	13,000
13	15,000	15,000	23,000	22,000	20,000	21,000	24,000	24,000	21,000	25,000	14,000	17,000
14	20,000	23,000	28,000	31,000	21,000	35,000	26,000	25,000	21,000	25,000	20,000	18,000
15	24,000	16,000	33,000	29,000	19,000	23,000	22,000	36,000	27,000	24,000	24,000	14,000
16	13,000	21,000	34,000	24,000	20,000	26,000	27,000	17,000	17,000	26,000	19,000	17,000
17	16,000	25,000	19,000	17,000	24,000	18,000	22,000	20,000	18,000	24,000	18,000	13,000
18	16,000	22,000	23,000	16,000	20,000	20,000	28,000	26,000	16,000	17,000	19,000	18,000
19	22,000	24,000	28,000	22,000	20,000	26,000	30,000	24,000	36,000	29,000	17,000	14,000
20	38,000	25,000	21,000	23,000	25,000	25,000	29,000	25,000	25,000	22,000	11,000	18,000
21	32,000	21,000	28,000	28,000	20,000	21,000	30,000	27,000	17,000	20,000	18,000	21,000
22	34,000	23,000	32,000	15,000	24,000	24,000	18,000	16,000	22,000	16,000	21,000	9,000
23	39,000	28,000	40,000	23,000	22,000	24,000	24,000	33,000	13,000	22,000	23,000	18,000
24	28,000	27,000	29,000	24,000	26,000	24,000	34,000	27,000	17,000	29,000	35,000	20,000
25	23,000	28,000	27,000	20,000	24,000	27,000	29,000	24,000	19,000	21,000	23,000	15,000
26	27,000	25,000	28,000	22,000	29,000	25,000	24,000	22,000	18,000	22,000	39,000	18,000
27	22,000	27,000	27,000	28,000	22,000	32,000	36,000	21,000	25,000	21,000	33,000	18,000
28	20,000	29,000	25,000	19,000	20,000	26,000	21,000	24,000	22,000	16,000	28,000	19,000
29	19,000		32,000	18,000	20,000	26,000	26,000	26,000	18,000	15,000	24,000	14,000
30	20,000		31,000	23,000	20,000	51,000	22,000	24,000	19,000	20,000	18,000	18,000
31	24,000		34,000		30,000		22,000	27,000		16,000		27,000
TOTAL	674,000	621,000	889,000	695,000	683,000	774,000	799,000	770,000	642,000	643,000	634,000	520,000
AVERAGE	21,742	22,179	28,677	23,167	22,032	25,800	25,774	24,839	21,400	20,742	21,133	16,774
HIGHEST DAY	39,000	29,000	44,000	36,000	48,000	51,000	36,000	45,000	36,000	29,000	39,000	27,000
ROLLING ANNUAL AVG	22,167	22,186	22,378	23,065	23,449	23,427	23,213	22,860	22,627	22,633	22,715	22,951
PERMIT LIMIT	56,000	56,000	56,000	56,000	56,000	56,000	56,000	56,000	56,000	56,000	56,000	56,000
PUMPING CAPACITY	374,400	374,400	374,400	374,400	374,400	374,400	374,400	374,400	374,400	374,400	374,400	374,400
% OF PUMPING CAPACITY USED	5.8	5.9	7.7	6.2	5.9	6.9	6.9	6.6	5.7	5.5	5.6	4.5
SUGGESTED CAPACITY	280,800	280,800	280,800	280,800	280,800	280,800	280,800	280,800	280,800	280,800	280,800	280,800
OF SUGGESTED CAPACITY USED	7.7	7.9	10.2	8.3	7.8	9.2	9.2	8.8	7.6	7.4	7.5	6.0

COMMENTS:

APPENDIX G

Correspondence Establishing Planning Flow

Burt Curry

From: Jason Groth [GrothJ@charlescounty.org]
Sent: Wednesday, March 24, 2004 4:59 PM
To: Thak Bakhru; B_Curry@WallaceMontgomery.com
Cc: Jeffrey Goldhardt; Michael Hinchy; Jennifer Mattingly
Subject: Re: Benedict Central Sewer System (PGM # VCI 99-0053)

Thak,

1) In order to respond to Benedict Request For Information (RFI) #014, I have the following response:

Under the "Policies" portion of Section 1.2.2 - Growth Management Objectives, states that 'satellite treatment facilities are permitted outside the Mattawoman Sewage Service Area to address environmental or public health problems created by existing development. (see pg. 1-5, section "b)", sub-section "i)" -attached to this email).

2) Benedict Request For Information (RFI) #011, indicates that the consultant is asking the County to investigate the properties on the north side of MD 231 for ownership, availability, and conditions of use. Property ownership research should be done by the consultant through the Maryland Tax Assessors Website. Our staff assumes that this is part of the contract w/WM&A. Our staff would be happy to investigate certain properties for restrictive easements, such as agricultural preservation easements. However, land conditions should be investigated by the consultant, through mapping and possibly field investigations, if necessary. Again, we assume that this is part of their contractual obligations. If this is true, WM&A should provide you with a list of properties that are adequate in size, location an appropriate land use.
We will investigate those properties for Agricultural Easements or other preservation easements once those property listings are provided.
Please let us know when this is available, so we can assist you.

3. Today (3/24/04), we sent WM&A a copy of Planning's rough numbers on existing and estimated dwelling units to be served by this plant.
After reviewing existing lots of record, and any possible future subdivision of larger lots, planning staff determined that 243 lots may be served by the proposed plant. This was based on the current zoning, which we do not envision to be changed. All lots were within the Priority Funding Area.

When you multiply the 243 lots by the County's sewage flow factor of 333 gallons per day (gpd), total estimated flows equate to 80,919 gpd.
This flow factor is used for residential single family dwellings. The small number of commercial dwellings in Benedict were cross-checked with water meter flow data from the County's water and sewer billing office.
The flow data was higher for some properties and lower for other.
However, the flows averaged out overall, and were comparable on average to the 333 gpd flow factor. Please remember that the 333 gpd flow factor includes a high estimate of inflow & infiltration (I&I) estimate. Therefore, the number is already conservative. If you multiply the estimated total of 80,919 gpd by a peaking factor 1.2, you get a total average daily peak flow of 97,103 gpd (1.2 is a low peaking factor , since 333 is a high factor). Thus, 100,000 seems adequate, while not being excessive. This keeps us in line with building an adequate plant for failing septics and preparing for the small amount of build-out left in Benedict.

If you have any questions, please call me.

Thanks,

Jason Groth
Public Facilities Planner
Charles County Dept. of Planning
(301) 396-5814
<grothj@govt.co.charles.md.us>

FLOW

ADDRESS	OWNER	BLOCK	LOT	PARCEL	ZONING	AS BUILT USE	ACRES	FLOW gpd/AC (Base)	FLOW gpd (base)	FLOW gpd/AC (Cluster)	FLOW gpd (Cluster)
18508 A ST	MARTIN, RONALD P & CHARLENE F	1	13	0019	CV	Residential	0.115	2000	230.0	2000	230.0
18511 A ST	MURPHY, RICHARD F & MARY L	2	11	0019	CV	Residential	1.030	2000	2060.0	2000	2060.0
18516 A ST	MAGILL, RICHARD L JR & MICHELLE L	1	15	0019	CV	Residential Commercial	0.115	2000	230.0	2000	230.0
18517 A ST	WELCH, THOMAS L & MARGARET F	2	14	0019	CV	Residential	0.345	2000	690.0	2000	690.0
18522 A ST	WELCH, LOUIS S JR & JOYCE E	1	19	0019	CV	Commercial	0.115	2000	230.0	2000	230.0
18523 A ST	KOLLER, TERESA E	2	17	0019	CV	Residential	0.345	2000	690.0	2000	690.0
18528 A ST	RAWLINGS, MARILYN M	1	21	0019	CV	Residential	0.287	2000	574.0	2000	574.0
18611 BELLS HOTEL PL	OLUP, RUDOLPH W & VOLLIE M			0069	RV	Residential	1.460	468	683.3	884	1290.6
18617 BELLS HOTEL PL	OLUP, RUDOLPH W & VOLLIE M			0066	RV	Residential	0.570	468	266.8	884	503.9
18623 BELLS HOTEL PL	OLUP, RUDOLPH W & VOLLIE M			0068	RV	Residential	0.570	468	266.8	884	503.9
18629 BELLS HOTEL PL	HUMBERT, AUBREY L & MARY E			0067	RV	Residential	0.750	468	351.0	884	663.0
18630 BELLS HOTEL PL	LYLES, ERNA T			0072	RV	Residential	0.330	468	154.4	884	291.7
175 BENEDICT AVE	LATIMER, GUY B & LISA M			0049	RV	Residential	0.344	468	161.0	884	304.1
7100 BENEDICT AVE	LEYMEISTER, CURTIS A			0006	RV	Residential	0.660	468	308.9	884	583.4
7115 BENEDICT AVE	BROWN, TIM S & ELIZABETH A			0014	RV	Residential	3.000	468	1404.0	884	2652.0
7185 BENEDICT AVE	O'BOYLE, ARCHBISHOP PATRICK A			0047	RV	Exempt Commercial	0.320	468	149.8	884	282.9
7194 BENEDICT AVE	WARFIELD, BARNSLEY E & HAZEL		1	0018	RV	Residential	0.611	468	285.9	884	540.1
7197 BENEDICT AVE	HAST, MARSHA A		7	0045	RV	Residential	0.281	468	131.5	884	248.4
7203 BENEDICT AVE	ESTES, RICHARD K & JOANN J			0046	RV	Residential	0.404	468	189.1	884	357.1
7206 BENEDICT AVE	DEAN, RICHARD W & DIANE E		3	0018	RV	Residential	0.420	468	196.6	884	371.3
7210 BENEDICT AVE	WELCH, MARGARET F & DAVID B		4	0018	RV	Residential	0.305	468	142.7	884	269.6
7215 BENEDICT AVE	CORRELL, ROBERT P & DIANE D			0048	RV	Residential	0.310	468	145.1	884	274.0
7216 BENEDICT AVE	PYLES, HARVEY E JR		5	0018	RV	Residential	0.349	468	163.3	884	308.5
7229 BENEDICT AVE	DE MARR, MARGARET A & CALVIN E			0051	RV	Residential	0.260	468	121.7	884	229.8
7232 BENEDICT AVE	DOWELL, BARNEY L			0041	RV	Residential	0.351	468	164.3	884	310.3
7252 BENEDICT AVE	JORDAN, DENNIS M			0028	CV	Commercial	0.117	2000	234.0	2000	234.0
7255 BENEDICT AVE	WHITE, DAN M & LUCY M			0059	CV	Residential	0.285	2000	570.0	2000	570.0
7268 BENEDICT AVE	JORDAN, DENNIS M			0027	CV	Commercial Residential	0.173	2000	346.0	2000	346.0
7285 BENEDICT AVE	STUBLAREC, RAYMOND & ROSE MARIE			0061	CV	Apartments	0.520	2000	1040.0	2000	1040.0
7350 BENEDICT AVE	CHAPPELEAR, FRANCIS I ET AL		2	0020	CV	Commercial	0.240	2000	480.0	2000	480.0
7620 BENEDICT AVE	HOLMES, JOHN C & FELICIDAD B		15	0020	CV	Commercial	0.545	2000	1090.0	2000	1090.0
7050 BRIDGEVIEW PL	ROLEN, SHIRLEY A		13	0018	RV	Residential	0.502	468	234.9	884	443.8
7056 BRIDGEVIEW PL	DOVE, WILLIAM H & CHARLOTTE A		14	0018	RV	Residential	0.329	468	154.0	884	290.8
7057 BRIDGEVIEW PL	HOWARD, THELMA F		11	0018	RV	Residential	0.340	468	159.1	884	300.6
7057 BRIDGEVIEW PL	HOWARD, ROBERT D, THELMA & RICHARD		12	0018	RV	Residential	0.372	468	174.1	884	328.8
7057 BRIDGEVIEW PL	HOWARD, THELMA F		10	0018	RV	Residential	0.393	468	183.9	884	347.4
7062 BRIDGEVIEW PL	HENDERSON, CHARLES, JUNE & WILLIAM		15	0018	RV	Residential	0.394	468	184.4	884	348.3
7068 BRIDGEVIEW PL	HENDERSON, WILLIAM T & JANICE L		16	0018	RV	Residential	0.463	468	216.7	884	409.3
7074 BRIDGEVIEW PL	HUTCHINSON, SCOTT W & MARY ELLEN		17	0018	RV	Residential	0.193	468	90.3	884	170.6
7075 BRIDGEVIEW PL	HIGGS, JAMES D & LINDA R		8	0018	RV	Residential	0.643	468	300.9	884	568.4
19009 CREEKS END PL	WELCH, STEPHEN L, ERIN M & SHANNON			0021	RV	Residential	0.434	468	203.1	884	383.7
19015 CREEKS END PL	OLUP, MICHAEL J & SHARON R			0021	RV	Residential	0.379	468	177.4	884	335.0
19021 CREEKS END PL	CARRY, CHARLES A III ET AL			0021	RV	Residential	0.360	468	168.5	884	318.2
19029 CREEKS END PL	BROWN, CAROLINE L TRUSTEE		4	0021	RV	Residential	0.342	468	160.1	884	302.3
19037 CREEKS END PL	THERRES, EDWARD JOHN & MARY ROSE		5	0021	RV	Residential	0.342	468	160.1	884	302.3
19043 CREEKS END PL	PATTERSON, DAVID B		6	0021	RV	Residential	0.422	468	197.5	884	373.0
18100 DESOTO PL	JEWELL, DARREN M		6	0018	RV	Residential	0.215	468	100.6	884	190.1
18163 DESOTO PL	DESOTO, M JOHN & CECELIA T ET AL			0043	CV	Commercial Residential	2.100	2000	4200.0	2000	4200.0
18170 DESOTO PL	RAWLINGS, RAYMOND L & PATRICIA A		18	0018	CV	Commercial	1.410	2000	2820.0	2000	2820.0
19329 HORSMAN PL	MONTGOMERY, BENEDICT C & JUDITH A			0090	CV	Residential	0.520	2000	1040.0	2000	1040.0
19330 HORSMAN PL	SINYARD, MARGARET V TRUSTEE			0089	CV	Residential	0.830	2000	1660.0	2000	1660.0
18210 HYATT AVE	BENEDICT VOL FIRE DEPT INC	1		0058	CV	Exempt Commercial	0.490	2000	980.0	2000	980.0

BENEDICT CENTRAL SEWER
FEASABILIITY STUDY
PGM# VCI 03-0046

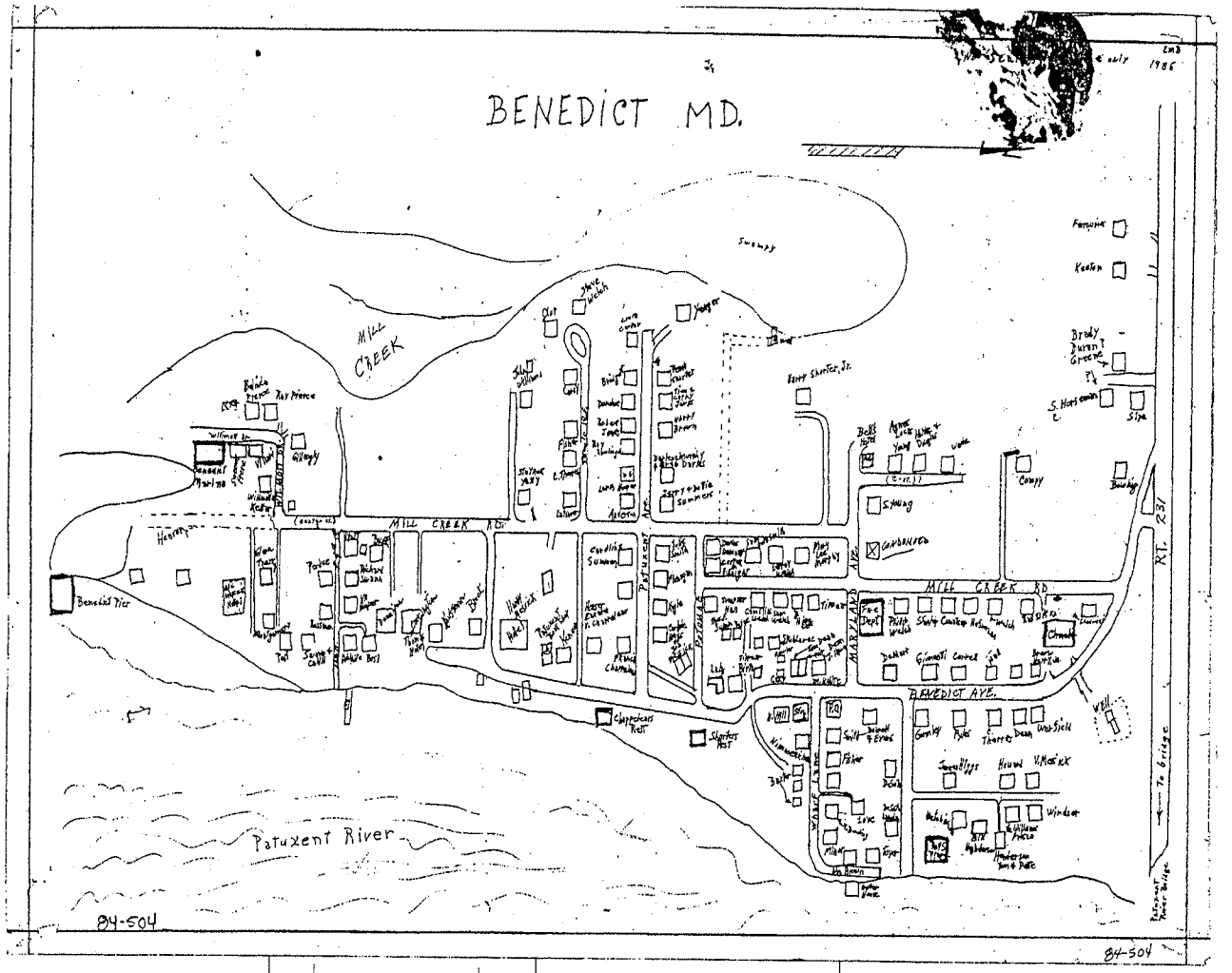
WMFLOW Base_Cluster # 203014.00
DATE: 03/03/04

ADDRESS	OWNER	BLOCK	LOT	PARCEL	ZONING	AS BUILT USE	ACRES	FLOW gpd/AC (Base)	FLOW gpd (base)	FLOW gpd/AC (Cluster)	FLOW gpd (Cluster)
18980 KENNON PL	CHAPPELEAR, MARY V ET AL		1	0020	CV	Residential	0.550	2000	1100.0	2000	1100.0
7556 MILL CREEK RD	SMITH, BELINDA W			0052	RV	Residential	0.174	468	81.4	884	153.8
7562 MILL CREEK RD	WELCH, ADOLPH F & DORIS G			0053	RV	Residential	0.230	468	107.6	884	203.3
7565 MILL CREEK RD	HOLMES, JOHN C & FELICIDAD B ET AL			0001	RV	Residential	10.660	468	4988.9	884	9423.4
7568 MILL CREEK RD	HUTCHINS, DAVID E & KIMBERLY A			0054	RV	Residential	0.230	468	107.6	884	203.3
7574 MILL CREEK RD	HOLMES, SUZANNE M & FLOYD E REID			0055	RV	Residential	0.262	468	122.6	884	231.6
7580 MILL CREEK RD	CARRINO, MICHAEL V & KELLY A		6	0056	RV	Residential	0.240	468	112.3	884	212.2
7586 MILL CREEK RD	BENEDICT VOLUNTEER FIRE DEPT &			0057	RV	Residential	0.284	468	132.9	884	251.1
7600 MILL CREEK RD	TARBOX, NANCY L	2	1	0019	CV	Commercial	0.574	2000	1148.0	2000	1148.0
7615 MILL CREEK RD	KAUFFMAN, LLOYD B SR & ALICE B	3	1	0019	RV	Residential	1.490	468	697.3	884	1317.2
7802 MILL CREEK RD	CLARKE, ANDREA			0077	CV	Residential	1.210	2000	2420.0	2000	2420.0
7814 MILL CREEK RD	JORDAN, JAMES M & MICHELLE R			0078	CV	Residential	0.922	2000	1844.0	2000	1844.0
7815 MILL CREEK RD	VENDEMIA, MICHAEL T & KAREN A		1A	0023	RV	Residential	2.330	468	1090.4	884	2059.7
7825 MILL CREEK RD	VENDEMIA, ROSEMARY P		1B	0023	RV	Residential	0.768	468	359.4	884	678.9
7831 MILL CREEK RD	FIELDS, GARY & MARY LOU		2A	0024	RV	Residential	1.230	468	575.6	884	1087.3
7835 MILL CREEK RD	FONES, WESTON & LOU		2B	0024	RV	Residential	1.870	468	875.2	884	1653.1
7868 MILL CREEK RD	DAVIDSON, DAVID & STEPHANIE			0092	CV	Commercial	6.400	2000	12800.0	2000	12800.0
28 PATUXENT AVE	ALEXANDER, HORACE C & B L MCDUFFIE		28	0020	RV	Residential	0.264	468	123.6	884	233.4
18800 PATUXENT AVE	GATEAU, GEORGE M			0020	RV	Residential	0.262	468	122.6	884	231.6
18808 PATUXENT AVE	MIDDLETON, FRANK M		29	0020	RV	Residential	0.618	468	289.2	884	546.3
18813 PATUXENT AVE	STEPHENS, WILLIAM H & ANN K		11	0020	RV	Residential	0.496	468	232.1	884	438.5
18814 PATUXENT AVE	ALEXANDER, HORACE C & B L MCDUFFIE		29	0020	RV	Residential	0.165	468	77.2	884	145.9
18819 PATUXENT AVE	CARRY, CHARLES A JR & MARYLINN B		9	0020	RV	Residential	0.496	468	232.1	884	438.5
18824 PATUXENT AVE	BROWN, CAROLINE L TRUSTEE		25	0020	RV	Residential	0.523	468	244.8	884	462.3
18827 PATUXENT AVE	PIATT, WAYNE		8	0020	RV	Residential	0.248	468	116.1	884	219.2
18835 PATUXENT AVE	RAWLINGS, RAYMOND L & PATRICIA A		7	0020	RV	Residential	0.248	468	116.1	884	219.2
18836 PATUXENT AVE	DAVIES, GREGORY A & DARLENE MURPHY		23	0020	RV	Residential	0.512	468	239.6	884	452.6
18841 PATUXENT AVE	HOOPER, GARY M		6	0020	RV	Residential	0.248	468	116.1	884	219.2
18844 PATUXENT AVE	SUMMERS, ALTON J & DOROTHY R		22	0020	RV	Residential	0.253	468	118.4	884	223.7
18847 PATUXENT AVE	ANDERSON, ROBERT W		5	0020	RV	Residential	0.248	468	116.1	884	219.2
18852 PATUXENT AVE	SMITH, WALTER		21	0020	CV	Residential	0.229	2000	458.0	2000	458.0
18858 PATUXENT AVE	STUMP, ROBERT F & DEBORA D		20	0020	CV	Commercial Residential	0.229	2000	458.0	2000	458.0
18863 PATUXENT AVE	NIMMERRICHTER, PAUL R		3	0020	CV	Commercial Residential	0.118	2000	236.0	2000	236.0
18864 PATUXENT AVE	MARTIN STACY L ET AL		19	0020	CV	Residential	0.226	2000	452.0	2000	452.0
18758 POTOMAC AVE	CUSTER, HOWARD R	2	33	0019	CV	Residential	0.384	2000	768.0	2000	768.0
18071 PRINCE FREDERICK RD	WYVILL, WILLIAM F III		PAR B	0005	RV	Residential	1.020	468	477.4	884	901.7
18093 PRINCE FREDERICK RD	KEETON, DONALD G & JANE B		PAR A	0016	RV	Residential	10.410	468	4871.9	884	9202.4
19110 WATERVIEW PL	WILLIAMS, JOHN T & JEANETTE M		2	0022	RV	Residential	0.780	468	365.0	884	689.5
19148 WATERVIEW PL	GOTT, WARREN D & LINDA L		1	0022	RV	Residential	0.780	468	365.0	884	689.5
18305 WHARF LANE	NIMMERRICHTER, PAUL R			0029	CV	Commercial	0.380	2000	760.0	2000	760.0
18306 WHARF LANE	HUMBERT, AUBREY L & MARY E			0038	CV	Residential	0.207	2000	414.0	2000	414.0
18312 WHARF LANE	HUMBERT, AUBREY L & MARY			0037	CV	Commercial Residential	0.165	2000	330.0	2000	330.0
18318 WHARF LANE	HITCH, GEORGE R SR & PEGGY J			0036	CV	Commercial Residential	0.290	2000	580.0	2000	580.0
18324 WHARF LANE	HITCH, G RAYMOND & PEGGY J			0035	CV	Commercial Residential	0.115	2000	230.0	2000	230.0
18336 WHARF LANE	BROWN, WILLIAM T & DONNA M			0033	CV	Residential	0.240	2000	480.0	2000	480.0
18342 WHARF LANE	FITZGERALD, BRIAN & PATRICK TRST			0032	CV	Residential Commercial	0.407	2000	814.0	2000	814.0
18352 WHARF LANE	HIGGS, JAMES D			0031	CV	Commercial	0.164	2000	328.0	2000	328.0
19305 WILMOTT DR	BENEDICT MARINA AND RESTAURANT INC			0093	CV	Commercial	3.100	2000	6200.0	2000	6200.0
19317 WILMOTT DR	PIERCE, RAYMOND E & JUDITH A		4	0025	CV	Residential Commercial	0.420	2000	840.0	2000	840.0
19318 WILMOTT DR	PIERCE, RAYMOND E & JUDITH A		2	0025	RV	Residential	0.660	468	308.9	884	583.4
19326 WILMOTT DR	PIERCE, RAYMOND E & JUDITH A		1	0025	RV	Residential	0.790	468	369.7	884	698.4
19332 WILMOTT DR	GILLOEGLY, OLGA T			0094	RV	Residential	0.840	468	393.1	884	742.6
19333 WILMOTT DR	FOARD, JOY LYNN		5	0025	CV	Residential	0.670	2000	1340.0	2000	1340.0
5200 WOLFE DR	TOTTEN, AMPARING K	2	37	0019	CV	Residential	0.120	2000	240.0	2000	240.0
19200 ZACK PL	DEMARR, DALLAS & KRISTEN FRANKLIN			0081	CV	Residential	0.410	2000	820.0	2000	820.0

BENEDICT CENTRAL SEWER
FEASABILIITY STUDY
PGM# VCI 03-0046

WMFLOW Base_Cluster # 203014.00
DATE: 03/03/04

ADDRESS	OWNER	BLOCK	LOT	PARCEL	ZONING	AS BUILT USE	ACRES	FLOW gpd/AC (Base)	FLOW gpd (base)	FLOW gpd/AC (Cluster)	FLOW gpd (Cluster)
19205 ZACK PL	HYATT, KIMBERLY J & MICHAEL S			0088	CV	Residential	0.155	2000	310.0	2000	310.0
19206 ZACK PL	SWANN, RICHARD H & MARTHA L		16	0080	CV	Residential	0.197	2000	394.0	2000	394.0
19212 ZACK PL	HOOPER, HOWARD R & CAROL L			0082	CV	Residential	0.131	2000	262.0	2000	262.0
19218 ZACK PL	BUSL, KARL R			0083	CV	Residential	0.248	2000	496.0	2000	496.0
19219 ZACK PL	STAPLES, STEPHANIE A			0087	CV	Residential	0.086	2000	172.0	2000	172.0
19226 ZACK PL	WHITE, DAN P & SARAH J		3	0084	CV	Residential	0.321	2000	642.0	2000	642.0
19229 ZACK PL	CONNICK, JUANITA M ET AL			0086	CV	Commercial Residential	0.110	2000	220.0	2000	220.0
	CARRY, CHARLES A JR		4	0020	CV	Commercial Residential	0.118	2000	236.0	2000	236.0
	BRIDGETT, BETTY JANE & WANDA M		13	0020	RV	Residential	0.496	468	232.1	884	438.5
	SWANN, RICHARD H & MARTHA L			0085	CV	Commercial	0.161	2000	322.0	2000	322.0
	MATHEWS, GEORGE J			0002	RV	Residential	5.240	468	2452.3	884	4632.2
	WILBANKS, JOANNE E ET AL			0076	CV	Commercial	4.370	2000	8740.0	2000	8740.0
	BROWN, HARRY W III		27	0020	RV	Residential	0.248	468	116.1	884	219.2
	HENDERSON, WILLIAM T & JANICE L		16	0018	RV	Residential	0.557	468	260.7	884	492.4
	HIGGS, JAMES D & LINDA R		7	0018	RV	Residential	0.371	468	173.6	884	328.0
	MAHANEY, JOHN W			0060	CV	Residential Commercial	0.447	2000	894.0	2000	894.0
	SMOLINSKI, DONALD E & MARY R		2	0075	CV	Commercial	1.300	2000	2600.0	2000	2600.0
	PHIPPS, GLENN & LINDA			0091	CV	Commercial Residential	1.330	2000	2660.0	2000	2660.0
	FEDERAL HOME LOAN MORTGAGE CORP		17	0012	RV	Residential	0.960	468	449.3	884	848.6
	NORTHAM, JOHN C			0026	CV	Commercial Residential	1.920	2000	3840.0	2000	3840.0
	SHORTER'S PLACE INC			0040	CV	Commercial	0.099	2000	198.0	2000	198.0
	WELCH, PEGGY L & SALLY J WEBSTER			0074	CV	Commercial	0.650	2000	1300.0	2000	1300.0
	COUNTY COMMISSIONERS OF CHAS CO MD			0004	RV	Exempt	14.640	468	6851.5	884	12941.8
	SUMPTER, DENNIS L & JUANITA M	1	26	0019	CV	Residential Commercial	0.344	2000	688.0	2000	688.0
	SWANN, RICHARD H & MARTHA L		18	0020	CV	Commercial Residential	0.290	2000	580.0	2000	580.0
	SHORTER, HENRY A JR		1	0019	RV	Residential	1.910	468	893.9	884	1688.4
	SHORTER, HARRY A JR & MARY ANNA		11	0019	RV	Residential	1.520	468	711.4	884	1343.7
	SHAW, WILLIAM & ELIZABETH M			0063	CV	Commercial	0.896	2000	1792.0	2000	1792.0
	SHORTER, HENRY A JR & MARY ANNA	2	7	0019	CV	Commercial	0.115	2000	230.0	2000	230.0
	LYLES, ERNA			0065	RV	Residential	0.690	468	322.9	884	610.0
	LATIMER, GUY B & LISA M			0050	RV	Residential	0.274	468	128.2	884	242.2
	PIERCE, RAYMOND E & JUDITH A		3	0025	RV	Residential	0.800	468	374.4	884	707.2
	PLATER, HARRIET HEIRS			0070	RV	Residential	0.500	468	234.0	884	442.0
	WELCH, LOUIS S JR & JOYCE E	1	17	0019	CV	Residential	0.115	2000	230.0	2000	230.0
	WELCH, PHILIP L SR ET AL			0064	CV	Commercial	0.310	2000	620.0	2000	620.0
	GREENFIELD, DONALD F SR			0062	CV	Residential	0.498	2000	996.0	2000	996.0
	WELCH, DENNIS R			0039	CV	Residential Commercial	0.250	2000	500.0	2000	500.0
	HARRISON, MARIA	2	20	0019	CV	Commercial	0.115	2000	230.0	2000	230.0
	HERSHON, EDDY G & EDWIN A & LIBUSE			0034	CV	Residential Commercial	0.211	2000	422.0	2000	422.0
	ST FRANCIS DESALES CATHOLIC CHURCH			0044	RV	Exempt Commercial	1.690	468	790.9	884	1494.0
	SHORTER, HENRY A JR	5	1	0019	RV	Residential	0.990	468	463.3	884	875.2
	WELCH, ADOLPH F & THOMAS L			0030	CV	Commercial	0.206	2000	412.0	2000	412.0
	COUNTY COMMISSIONERS OF CHAS CO MD	5	14	0019	RV	Exempt	0.086	468	40.2	884	76.0
									Total Flow	125403	Total Flow	162019
									+ Infiltration	2240	+ Infiltration	2240
										127643		164259


BENEDICT MD.
MILL CREEK
MILL CREEK RD.
MILL CREEK RD
BENEDICT AVE.
Patuxent River
Rt. 231
To Bridge
84-504
84-504

Burt Curry

From: Thak Bakhru [BakhruT@charlescounty.org]
Sent: Tuesday, March 16, 2004 10:06 AM
To: B_Curry@WallaceMontgomery.com
Cc: Jeffrey Goldhardt; Jason Groth; Michael Hinchy; Jennifer Mattingly
Subject: Land Acquistion Costs (PGM # VCI 03-0046) RFI 010

Burt:

The unit price for land acquistion cost is $3.40/sq ft for Fee Simple. Temp easement unit price is $ 0.34/sq ft Permanent easement unit price is $ 0.89/sq ft.

Also Jason is going to come up with Flow numbers for your use. You can e- mail and talk to Jason on any planning issues and just copy me.

We still are shooting for April 2. 2004 for 60% submission.

Formal Review letter on 30% submission shall be sent out this week. But you still can go ahead with 60% submission as the only comments we got were from Jason and I handed them informally to you on our last progress meeting

Thak

ADDRESS	OWNNAME1	LEGAL1	LEGAL2	BLOCK	LOT	MAP	GRID	PARCEL	ZONING	DESCLU	ACRES	DESCSTRY	DESCDWEL
18508 A ST	MARTIN, RONALD P & CHARLENE F	IMPSLOTS 13-14		1	13	0049	0009	0019	CV	Residential	0.115	1 story no basement	standard single family unit 1, 2 or 3 story
18511 A ST	MURPHY, RICHARD F & MARY L	IMPSP/O L 11-13	ALL L 24-26	2	11	0049	0015	0019	CV	Residential	1.030	1 1/2 story no basement	standard single family unit 1, 2 or 3 story
18516 A ST	MAGILL, RICHARD L JR & MICHELLE L	IMPSLOTS 15-16		1	15	0049	0009	0019	CV	Residential Commercial	0.115	1 story no basement	standard single family unit 1, 2 or 3 story
18517 A ST	WELCH, THOMAS L & MARGARET F	IMPS1/2 L 14-16 & 27-29	SEC 2	2	14	0049	0010	0019	CV	Residential	0.345	1 1/2 story no basement	standard single family unit 1, 2 or 3 story
18522 A ST	WELCH, LOUIS S JR & JOYCE E	LOTS 19 & 20 BLK 1		1	19	0049	0010	0019	CV	Commercial	0.115	no data	rental dwelling
18523 A ST	KOLLER, TERESA E	IMPSP/O L 17-19 L 30-32		2	17	0049	0010	0019	CV	Residential	0.345	1 story no basement	standard single family unit 1, 2 or 3 story
18528 A ST	RAWLINGS, MARILYN M	IMPSLTS 21-25 B-1		1	21	0049	0010	0019	CV	Residential	0.287	1 1/2 story no basement	standard single family unit 1, 2 or 3 story
18611 BELLS HOTEL PL	OLUP, RUDOLPH W & VOLLIE M	1.46 AC	BENEDICT			0049	0009	0069	RV	Residential	1.460		
18617 BELLS HOTEL PL	OLUP, RUDOLPH W & VOLLIE M	IMPS.57 AC	BENEDICT			0049	0009	0066	RV	Residential	0.570	1 story no basement	standard single family unit 1, 2 or 3 story
18623 BELLS HOTEL PL	OLUP, RUDOLPH W & VOLLIE M	IMPS.57 AC	BENEDICT			0049	0009	0068	RV	Residential	0.570	1 story no basement	standard single family unit 1, 2 or 3 story
18629 BELLS HOTEL PL	HUMBERT, AUBREY L & MARY E	.75 AC				0049	0009	0067	RV	Residential	0.750		
18630 BELLS HOTEL PL	LYLES, ERNA T	.33 AC				0049	0009	0072	RV	Residential	0.330		
175 BENEDICT AVE	LATIMER, GUY B & LISA M	IMPS.345 AC	BENEDICT			0049	0003	0049	RV	Residential	0.344	2 story no basement	standard single family unit 1, 2 or 3 story
7100 BENEDICT AVE	LEYMEISTER, CURTIS A	IMPS2/3 AC	ON RT 231 BENEDICT			0049	0007	0006	RV	Residential	0.660	1 story no basement	standard single family unit 1, 2 or 3 story
7115 BENEDICT AVE	BROWN, TIM S & ELIZABETH A	IMPS 3.001 AC	S/S RT 231			0049	0007	0014	RV	Residential	3.000	1 story with basement	standard single family unit 1, 2 or 3 story
7185 BENEDICT AVE	O'BOYLE, ARCHBISHOP PATRICK A	IMPS .32 AC				0049	0009	0047	RV	Exempt Commercial	0.320	no data	rental dwelling
7194 BENEDICT AVE	WARFIELD, BARNSLEY E & HAZEL	IMPSLOTS 1-2			1	0049	0003	0018	RV	Residential	0.611	split foyer	split foyer 2 levels of living area
7197 BENEDICT AVE	HAST, MARSHA A	IMPSL-8 & P/O L-7=.28 AC			7	0049	0009	0045	RV	Residential	0.281	1 story no basement	standard single family unit 1, 2 or 3 story
7203 BENEDICT AVE	ESTES, RICHARD K & JOANN J	IMPS.404 AC				0049	0007	0046	RV	Residential	0.404	2 story no basement	standard single family unit 1, 2 or 3 story
7206 BENEDICT AVE	DEAN, RICHARD W & DIANE E	IMPSLOT 3			3	0049	0003	0018	RV	Residential	0.420	1 1/2 story no basement	standard single family unit 1, 2 or 3 story
7210 BENEDICT AVE	WELCH, MARGARET F & DAVID B	IMPSLOT 4			4	0049	0003	0018	RV	Residential	0.305	1 story no basement	standard single family unit 1, 2 or 3 story
7215 BENEDICT AVE	CORRELL, ROBERT P & DIANE D	IMPS.31 AC	BENEDICT RD			0049	0003	0048	RV	Residential	0.310	2 story no basement	standard single family unit 1, 2 or 3 story
7216 BENEDICT AVE	PYLES, HARVEY E JR	IMPSLOT 5			5	0049	0003	0018	RV	Residential	0.349	1 story no basement	standard single family unit 1, 2 or 3 story
7229 BENEDICT AVE	DE MARR, MARGARET A & CALVIN E	IMPS0.26 AC	BENEDICT			0049	0003	0051	RV	Residential	0.260	2 story no basement	standard single family unit 1, 2 or 3 story
7232 BENEDICT AVE	DOWELL, BARNEY L	IMPS.35 AC	BENEDICT			0049	0003	0041	RV	Residential	0.351	2 story with basement	standard single family unit 1, 2 or 3 story
7252 BENEDICT AVE	JORDAN, DENNIS M	IMPS.117 AC	BENEDICT			0049	0003	0028	CV	Commercial	0.117	no data	rental dwelling
7255 BENEDICT AVE	WHITE, DAN M & LUCY M	IMPS .285 AC				0049	0003	0059	CV	Residential	0.285	1 story with basement	standard single family unit 1, 2 or 3 story
7268 BENEDICT AVE	JORDAN, DENNIS M	IMPS0.173 AC				0049	0003	0027	CV	Commercial Residential	0.173	1 1/2 story no basement	standard single family unit 1, 2 or 3 story
7285 BENEDICT AVE	STUBLAREC, RAYMOND & ROSE MARIE	IMPS0.52 AC				0049	0003	0061	CV	Apartments	0.520	1 story no basement	standard single family unit 1, 2 or 3 story
7350 BENEDICT AVE	CHAPPELEAR, FRANCIS I ET AL	IMPSLOT 2	CHAPPELEAR'S PLACE		2	0049	0010	0020	CV	Commercial	0.240	no data	rental dwelling
7620 BENEDICT AVE	HOLMES, JOHN C & FELICIDAD B	IMPSLOTS 15-17 PAR A & B	TONY'S RIVER HOUSE		15	0049	0004	0020	CV	Commercial	0.545	no data	rental dwelling
7050 BRIDGEVIEW PL	ROLEN, SHIRLEY A	IMPS L-13 & .17 AC			13	0049	0002	0018	RV	Residential	0.502	1 story no basement	standard single family unit 1, 2 or 3 story
7056 BRIDGEVIEW PL	DOVE, WILLIAM H & CHARLOTTE A	IMPSLOT 14			14	0049	0002	0018	RV	Residential	0.329	1 1/2 story no basement	standard single family unit 1, 2 or 3 story
7057 BRIDGEVIEW PL	HOWARD, THELMA F	IMPSLOT 11			11	0049	0002	0018	RV	Residential	0.340	1 story no basement	standard single family unit 1, 2 or 3 story
7057 BRIDGEVIEW PL	HOWARD, ROBERT D, THELMA & RICHARD	IMPSLOT 12			12	0049	0002	0018	RV	Residential	0.372	1 story no basement	standard single family unit 1, 2 or 3 story
7057 BRIDGEVIEW PL	HOWARD, THELMA F	LOT 10			10	0049	0003	0018	RV	Residential	0.393		
7062 BRIDGEVIEW PL	HENDERSON, CHARLES, JUNE & WILLIAM	IMPSLOT 15			15	0049	0003	0018	RV	Residential	0.394	1 story no basement	standard single family unit 1, 2 or 3 story
7068 BRIDGEVIEW PL	HENDERSON, WILLIAM T & JANICE L	IMPSLOT 16			16	0049	0002	0018	RV	Residential	0.463	1 1/2 story no basement	standard single family unit 1, 2 or 3 story
7074 BRIDGEVIEW PL	HUTCHINSON, SCOTT W & MARY ELLEN	IMPS L-17 + .193 AC			17	0049	0003	0018	RV	Residential	0.193	1 story no basement	standard single family unit 1, 2 or 3 story
7075 BRIDGEVIEW PL	HIGGS, JAMES D & LINDA R	IMPSPAR A = 0.6435 AC			8	0049	0003	0018	RV	Residential	0.643	1 story no basement	standard single family unit 1, 2 or 3 story
19009 CREEKS END PL	WELCH, STEPHEN L, ERIN M & SHANNON	IMPS.43 AC	IN BENEDICT			0049	0010	0021	RV	Residential	0.434	1 story no basement	standard single family unit 1, 2 or 3 story
19015 CREEKS END PL	OLUP, MICHAEL J & SHARON R	IMPS.38 AC				0049	0010	0021	RV	Residential	0.379	2 story no basement	standard single family unit 1, 2 or 3 story
19021 CREEKS END PL	CARRY, CHARLES A III ET AL	IMPSPART OF LOT 4				0049	0010	0021	RV	Residential	0.360	1 1/2 story no basement	standard single family unit 1, 2 or 3 story
19029 CREEKS END PL	BROWN, CAROLINE L TRUSTEE	IMPSLOT 4			4	0049	0010	0021	RV	Residential	0.342	1 story no basement	standard single family unit 1, 2 or 3 story
19037 CREEKS END PL	THERRES, EDWARD JOHN & MARY ROSE	IMPSL 5			5	0049	0010	0021	RV	Residential	0.342	1 story with basement	standard single family unit 1, 2 or 3 story
19043 CREEKS END PL	PATTERSON, DAVID B	IMPSLOTS 6-7			6	0049	0010	0021	RV	Residential	0.422	1 story no basement	standard single family unit 1, 2 or 3 story
18100 DESOTO PL	JEWELL, DARREN M	IMPSLOT 6			6	0049	0003	0018	RV	Residential	0.215	1 story no basement	standard single family unit 1, 2 or 3 story
18163 DESOTO PL	DESOTO, M JOHN & CECELIA T ET AL	IMPS2.1106 ACRE				0049	0003	0043	CV	Commercial Residential	2.100		
18170 DESOTO PL	RAWLINGS, RAYMOND L & PATRICIA A	IMPSLOTS 18-19			18	0049	0003	0018	CV	Commercial	1.410		
19329 HORSMAN PL	MONTGOMERY, BENEDICT C & JUDITH A	IMPS .52 AC	BENEDICT AVE-OPP WILMOTT			0049	0011	0090	CV	Residential	0.520	2 story no basement	split level 3 or more levels of living area
19330 HORSMAN PL	SINYARD, MARGARET V TRUSTEE	IMPS .83 AC	BENEDICT			0049	0011	0089	CV	Residential	0.830	2 story no basement	standard single family unit 1, 2 or 3 story
18210 HYATT AVE	BENEDICT VOL FIRE DEPT INC	IMPS.49 AC LTS 1-12		1		0049	0003	0058	CV	Exempt Commercial	0.490	no data	rental dwelling
18980 KENNON PL	CHAPPELEAR, MARY V ET AL	IMPSLOT 1			1	0049	0010	0020	CV	Residential	0.550	1 1/2 story no basement	standard single family unit 1, 2 or 3 story
7556 MILL CREEK ROAD	SMITH, BELINDA W	IMPS0.174 AC	MILL CREEK ROAD			0049	0009	0052	RV	Residential	0.174	1 story no basement	standard single family unit 1, 2 or 3 story
7562 MILL CREEK ROAD	WELCH, ADOLPH F & DORIS G	IMPS.23 AC	MILL CREEK SUB			0049	0009	0053	RV	Residential	0.230	1 story no basement	standard single family unit 1, 2 or 3 story
7565 MILL CREEK ROAD	HOLMES, JOHN C & FELICIDAD B ET AL	IMPS10.6679 AC	MILL CREEK RD BENEDICT			0049	0017	0001	RV	Residential	10.660	1 story with basement	standard single family unit 1, 2 or 3 story
7568 MILL CREEK ROAD	HUTCHINS, DAVID E & KIMBERLY A	IMPS0.23 AC	BENEDICT MILL CREEK RD			0049	0009	0054	RV	Residential	0.230	1 story no basement	standard single family unit 1, 2 or 3 story
7574 MILL CREEK ROAD	HOLMES, SUZANNE M & FLOYD E REID	IMPS0.262 AC	BENEDICT MILL RUN RD			0049	0009	0055	RV	Residential	0.262	1 1/2 story no basement	standard single family unit 1, 2 or 3 story
7580 MILL CREEK ROAD	CARRINO, MICHAEL V & KELLY A	IMPS.24 AC	BENEDICT		6	0049	0009	0056	RV	Residential	0.240	1 story no basement	standard single family unit 1, 2 or 3 story
7586 MILL CREEK ROAD	BENEDICT VOLUNTEER FIRE DEPT &	IMPS.28 AC				0049	0009	0057	RV	Residential	0.284	1 story with basement	standard single family unit 1, 2 or 3 story
7600 MILL CREEK ROAD	TARBOX, NANCY L	LTS 1-6, 9-10-22-23	BLK 2	2	1	0049	0009	0019	CV	Commercial	0.574	no data	rental dwelling
7615 MILL CREEK ROAD	KAUFFMAN, LLOYD B SR & ALICE B	IMPSLOTS 1-26 BLK 3		3	1	0049	0009	0019	RV	Residential	1.490	1 story no basement	standard single family unit 1, 2 or 3 story
7802 MILL CREEK ROAD	CLARKE, ANDREA	IMPS1.21 AC				0049	0011	0077	CV	Residential	1.210	2 1/2 story no basement	standard single family unit 1, 2 or 3 story
7814 MILL CREEK ROAD	JORDAN, JAMES M & MICHELLE R	IMPS.93 AC	CENTER STREET BENEDICT			0049	0005	0078	CV	Residential	0.922	2 story no basement	standard single family unit 1, 2 or 3 story
7815 MILL CREEK ROAD	VENDEMIA, MICHAEL T & KAREN A	IMPSLOT 1 A = 2.33 AC	S SI CENTER STREET		1A	0049	0011	0023	RV	Residential	2.330	1 1/2 story no basement	standard single family unit 1, 2 or 3 story
7825 MILL CREEK ROAD	VENDEMIA, ROSEMARY P	IMPSLOT 1 B = 0.767 AC			1B	0049	0011	0023	RV	Residential	0.768	1 1/2 story no basement	standard single family unit 1, 2 or 3 story
7831 MILL CREEK ROAD	FIELDS, GARY & MARY LOU	IMPSLOT 2A = 1.239 AC	S SI CENTER ST W WILMOTT		2A	0049	0011	0024	RV	Residential	1.230	2 story no basement	standard single family unit 1, 2 or 3 story
7835 MILL CREEK ROAD	FONES, WESTON & LOU	IMPSLOT 2B = 1.8791 AC	S CENTER ST W WILMOTT DR		2B	0049	0011	0024	RV	Residential	1.870	1 story no basement	standard single family unit 1, 2 or 3 story
7868 MILL CREEK ROAD	DAVIDSON, DAVID & STEPHANIE	IMPS6.406 AC	CENTER ST BENEDICT PIER			0049	0012	0092	CV	Commercial	6.400	no data	rental dwelling
28 PATUXENT AVE	ALEXANDER, HORACE C & B L MCDUFFIE	IMPSLOT 28			28	0049	0010	0020	RV	Residential	0.264	1 story with basement	standard single family unit 1, 2 or 3 story
18800 PATUXENT AVE	GATEAU, GEORGE M	IMPSLOT 32				0049	0010	0020	RV	Residential	0.262	1 story with basement	standard single family unit 1, 2 or 3 story
18808 PATUXENT AVE	MIDDLETON, FRANK M	IMPSPT L 29 ALL L 30&31			29	0049	0010	0020	RV	Residential	0.618	1 story with basement	standard single family unit 1, 2 or 3 story
18813 PATUXENT AVE	STEPHENS, WILLIAM H & ANN K	IMPSLOTS 11-12			11	0049	0010	0020	RV	Residential	0.496	1 1/2 story no basement	standard single family unit 1, 2 or 3 story

18814 PATUXENT AVE	ALEXANDER, HORACE C & B L MCDUFFIE	IMPSPART OF LOT 29			29	0049	0010	0020	RV	Residential	0.165		
18819 PATUXENT AVE	CARRY, CHARLES A JR & MARYLINN B	IMPSLOTS 9-10			9	0049	0010	0020	RV	Residential	0.496	1 story no basement	standard single family unit 1, 2 or 3 story
18824 PATUXENT AVE	BROWN, CAROLINE L TRUSTEE	IMPSLOTS 25-26			25	0049	0010	0020	RV	Residential	0.523	1 story with basement	standard single family unit 1, 2 or 3 story
18827 PATUXENT AVE	PIATT, WAYNE	IMPSLOT 8			8	0049	0010	0020	RV	Residential	0.248	1 story no basement	standard single family unit 1, 2 or 3 story
18835 PATUXENT AVE	RAWLINGS, RAYMOND L & PATRICIA A	IMPSLOT 7			7	0049	0010	0020	RV	Residential	0.248	1 story no basement	standard single family unit 1, 2 or 3 story
18836 PATUXENT AVE	DAVIES, GREGORY A & DARLENE MURPHY	IMPSLOTS 23-24			23	0049	0010	0020	RV	Residential	0.512	1 story with basement	standard single family unit 1, 2 or 3 story
18841 PATUXENT AVE	HOOPER, GARY M	IMPSLOT 6			6	0049	0010	0020	RV	Residential	0.248	2 story no basement	standard single family unit 1, 2 or 3 story
18844 PATUXENT AVE	SUMMERS, ALTON J & DOROTHY R	IMPSLOT 22			22	0049	0010	0020	RV	Residential	0.253	1 1/2 story no basement	standard single family unit 1, 2 or 3 story
18847 PATUXENT AVE	ANDERSON, ROBERT W	IMPSLOT 5			5	0049	0010	0020	RV	Residential	0.248	1 story no basement	standard single family unit 1, 2 or 3 story
18852 PATUXENT AVE	SMITH, WALTER	IMPSLOT 21			21	0049	0010	0020	CV	Residential	0.229	1 1/2 story no basement	standard single family unit 1, 2 or 3 story
18858 PATUXENT AVE	STUMP, ROBERT F & DEBORA D	IMPSLOT 20			20	0049	0010	0020	CV	Commercial Residential	0.229	1 1/2 story with basement	standard single family unit 1, 2 or 3 story
18863 PATUXENT AVE	NIMMERRICHTER, PAUL R	IMPSLOT 3			3	0049	0010	0020	CV	Commercial Residential	0.118	1 story no basement	standard single family unit 1, 2 or 3 story
18864 PATUXENT AVE	MARTIN STACY L ET AL	IMPSLOT 19			19	0049	0004	0020	CV	Residential	0.226	1 story no basement	standard single family unit 1, 2 or 3 story
18758 POTOMAC AVE	CUSTER, HOWARD R	IMPSLTS 33-34-40-41-42	P/039 SEC 2	2	33	0049	0000	0019	CV	Residential	0.384	1 story no basement	standard single family unit 1, 2 or 3 story
18071 PRINCE FREDERIC	WYVILL, WILLIAM F III	IMPSPARCEL B 1.023 AC	RT 231 NR BENEDICT		PAR B	0049	0007	0005	RV	Residential	1.020	1 story no basement	standard single family unit 1, 2 or 3 story
18093 PRINCE FREDERIC	KEETON, DONALD G & JANE B	IMPSPAR A 10.418 AC	RT 231 - W BENEDICT AVE		PAR A	0049	0007	0016	RV	Residential	10.410	1 story no basement	standard single family unit 1, 2 or 3 story
19110 WATERVIEW PL	WILLIAMS, JOHN T & JEANETTE M	IMPSLOT 2			2	0049	0010	0022	RV	Residential	0.780	1 story with basement	standard single family unit 1, 2 or 3 story
19148 WATERVIEW PL	GOTT, WARREN D & LINDA L	IMPSLOT 1			1	0049	0010	0022	RV	Residential	0.780	1 story no basement	standard single family unit 1, 2 or 3 story
18305 WHARF LANE	NIMMERRICHTER, PAUL R	IMPS.38 AC	BENEDICT			0049	0003	0029	CV	Commercial	0.380	no data	rental dwelling
18306 WHARF LANE	HUMBERT, AUBREY L & MARY E	IMPS.20 AC	BENEDICT			0049	0003	0038	CV	Residential	0.207	1 story no basement	standard single family unit 1, 2 or 3 story
18312 WHARF LANE	HUMBERT, AUBREY L & MARY	IMPS .185 AC	BENEDICT			0049	0003	0037	CV	Commercial Residential	0.165	2 story no basement	standard single family unit 1, 2 or 3 story
18318 WHARF LANE	HITCH, GEORGE R SR & PEGGY J	IMPS.29 AC	N SI WHARF LANE			0049	0003	0036	CV	Commercial Residential	0.290	1 story no basement	standard single family unit 1, 2 or 3 story
18324 WHARF LANE	HITCH, G RAYMOND & PEGGY J	IMPS0.1148 AC				0049	0003	0035	CV	Commercial Residential	0.115	1 1/2 story no basement	standard single family unit 1, 2 or 3 story
18336 WHARF LANE	BROWN, WILLIAM T & DONNA M	IMPS .24 AC	END WHARF LANE BENEDICT			0049	0003	0033	CV	Residential	0.240	1 story no basement	standard single family unit 1, 2 or 3 story
18342 WHARF LANE	FITZGERALD, BRIAN & PATRICK TRST	IMPS.393 AC	BENEDICT			0049	0003	0032	CV	Residential Commercial	0.407	no data	rental dwelling
18352 WHARF LANE	HIGGS, JAMES D	IMPS .164 AC	END OF WHARF LANE			0049	0003	0031	CV	Commercial	0.164	no data	rental dwelling
19305 WILMOTT DR	BENEDICT MARINA AND RESTAURANT INC	IMPS 3.10 AC	BENEDICT			0049	0012	0093	CV	Commercial	3.100	no data	rental dwelling
19317 WILMOTT DR	PIERCE, RAYMOND E & JUDITH A	IMPSLOT 4 = 0.419 AC			4	0049	0012	0025	CV	Residential Commercial	0.420	1 story no basement	standard single family unit 1, 2 or 3 story
19318 WILMOTT DR	PIERCE, RAYMOND E & JUDITH A	IMPSLOT 2 = 0.659 AC			2	0049	0012	0025	RV	Residential	0.660	1 story no basement	standard single family unit 1, 2 or 3 story
19326 WILMOTT DR	PIERCE, RAYMOND E & JUDITH A	IMPSLOT 1 = 0.789 AC			1	0049	0011	0025	RV	Residential	0.790	1 story no basement	standard single family unit 1, 2 or 3 story
19332 WILMOTT DR	GILLOEGLY, OLGA T	IMPS0.839 AC	BENEDICT			0049	0011	0094	RV	Residential	0.840	1 story no basement	standard single family unit 1, 2 or 3 story
19333 WILMOTT DR	FOARD, JOY LYNN	IMPSLOTS 5 & 6 = 0.67 AC			5	0049	0012	0025	CV	Residential	0.670	1 story no basement	standard single family unit 1, 2 or 3 story
5200 WOLFE DR	TOTTEN, AMPARING K	IMPSP/O L 37-39		2	37	0049	0010	0019	CV	Residential	0.120	1 story no basement	standard single family unit 1, 2 or 3 story
19200 ZACK PL	DEMARR, DALLAS & KRISTEN FRANKLIN	IMPS.41 AC	BENEDICT			0049	0011	0081	CV	Residential	0.410	1 story no basement	standard single family unit 1, 2 or 3 story
19205 ZACK PL	HYATT, KIMBERLY J & MICHAEL S	IMPSL 2 & 8 P/O L 7	BENEDICT CENTER STR			0049	0005	0088	CV	Residential	0.155	2 story no basement	standard single family unit 1, 2 or 3 story
19206 ZACK PL	SWANN, RICHARD H & MARTHA L	IMPS0.196 AC			16	0049	0000	0080	CV	Residential	0.197	1 story no basement	standard single family unit 1, 2 or 3 story
19212 ZACK PL	HOOPER, HOWARD R & CAROL L	IMPS0.130 AC				0049	0011	0082	CV	Residential	0.131	1 story no basement	standard single family unit 1, 2 or 3 story
19218 ZACK PL	BUSL, KARL R	IMPS.248 AC	BENEDICT			0049	0005	0083	CV	Residential	0.248	1 1/2 story with basement	standard single family unit 1, 2 or 3 story
19219 ZACK PL	STAPLES, STEPHANIE A	IMPS.08 AC				0049	0011	0087	CV	Residential	0.086	1 story no basement	standard single family unit 1, 2 or 3 story
19226 ZACK PL	WHITE, DAN P & SARAH J	IMPSLOTS 3-4 = 0.321 AC			3	0049	0005	0084	CV	Residential	0.321	1 1/2 story no basement	standard single family unit 1, 2 or 3 story
19229 ZACK PL	CONNICK, JUANITA M ET AL	IMPS0.110 AC	BENEDICT			0049	0005	0086	CV	Commercial Residential	0.110	1 story no basement	standard single family unit 1, 2 or 3 story
	CARRY, CHARLES A JR	IMPSLOT 4			4	0049	0010	0020	CV	Commercial Residential	0.118	1 story no basement	standard single family unit 1, 2 or 3 story
	BRIDGETT, BETTY JANE & WANDA M	IMPSLOTS 13-14			13	0049	0010	0020	RV	Residential	0.496	1 story no basement	standard single family unit 1, 2 or 3 story
	SWANN, RICHARD H & MARTHA L	.17 AC	BENEDICT			0049	0005	0085	CV	Commercial	0.161	no data	rental dwelling
	MATHEWS, GEORGE J	5.241 AC	S RT 231 NR BENEDICT			0049	0007	0002	RV	Residential	5.240		
	WILBANKS, JOANNE E ET AL	IMPS 4.37 AC	BENEDICT			0049	0011	0076	CV	Commercial	4.370	no data	rental dwelling
	BROWN, HARRY W III	LOT 27			27	0049	0010	0020	RV	Residential	0.248		
	HENDERSON, WILLIAM T & JANICE L	IMPSP/O LOT 16=.557 AC			16	0049	0003	0018	RV	Residential	0.557		
	HIGGS, JAMES D & LINDA R	LOT 7			7	0049	0003	0018	RV	Residential	0.371		
	MAHANEY, JOHN W	IMPS.447 AC	BENEDICT AVE IN BENEDICT			0049	0003	0080	CV	Residential Commercial	0.447	2 story no basement	standard single family unit 1, 2 or 3 story
	SMOLINSKI, DONALD E & MARY R	IMPS1.30 AC	BENEDICT		2	0049	0010	0075	CV	Commercial	1.300	no data	rental dwelling
	PHIPPS, GLENN & LINDA	IMPS1.32 AC	IN BENEDICT			0049	0011	0091	CV	Commercial Residential	1.330	1 story no basement	standard single family unit 1, 2 or 3 story
	FEDERAL HOME LOAN MORTGAGE CORP	IMPSLOTS 17-18			17	0049	0013	0012	RV	Residential	0.960	1 story no basement	standard single family unit 1, 2 or 3 story
	NORTHAM, JOHN C	IMPS1.925 AC	IN BENEDICT			0049	0003	0026	CV	Commercial Residential	1.920	1 story no basement	standard single family unit 1, 2 or 3 story
	SHORTER'S PLACE INC	IMPS.098 AC	BENEDICT			0049	0003	0040	CV	Commercial	0.099	no data	rental dwelling
	WELCH, PEGGY L & SALLY J WEBSTER	IMPS.65 AC	BENEDICT			0049	0000	0074	CV	Commercial	0.650	no data	rental dwelling
	COUNTY COMMISSIONERS OF CHAS CO MD	IMPS14.649 AC	S SI RT 231 BENEDICT			0049	0007	0004	RV	Exempt	14.640		
	SUMPTER, DENNIS L & JUANITA M	IMPSLTS 26- 31 B 1		1	26	0049	0004	0019	CV	Residential Commercial	0.344	1 story no basement	standard single family unit 1, 2 or 3 story
	SWANN, RICHARD H & MARTHA L	IMPSLOT 18			18	0049	0004	0020	CV	Commercial Residential	0.290	1 story no basement	standard single family unit 1, 2 or 3 story
	SHORTER, HENRY A JR	LOTS 1-29 SEC 4			1	0049	0009	0019	RV	Residential	1.910		
	SHORTER, HARRY A JR & MARY ANNA	IMPSL 11-13, 15-22 &	P/O L-14, 23, & 24 S-5		11	0049	0010	0019	RV	Residential	1.520	1 story no basement	standard single family unit 1, 2 or 3 story
	SHAW, WILLIAM & ELIZABETH M	IMPS.896 AC	BENEDICT AVE BENEDICT			0049	0004	0063	CV	Commercial	0.896	no data	rental dwelling
	SHORTER, HENRY A JR & MARY ANNA	LOTS 7 & 8 BLK 2		2	7	0049	0009	0019	CV	Commercial	0.115	no data	rental dwelling
	LYLES, ERNA	.69 AC	BENEDICT			0049	0009	0065	RV	Residential	0.690		
	LATIMER, GUY B & LISA M	.27 AC	IN BENEDICT			0049	0003	0050	RV	Residential	0.274		
	PIERCE, RAYMOND E & JUDITH A	LOT 3 = 0.80 AC			3	0049	0012	0025	RV	Residential	0.800		
	PLATER, HARRIET HEIRS	.50 AC	BENEDICT			0049	0009	0070	RV	Residential	0.500		
	WELCH, LOUIS S JR & JOYCE E	IMPSLOTS 17-18		1	17	0049	0009	0019	CV	Residential	0.115	1 1/2 story no basement	standard single family unit 1, 2 or 3 story
	WELCH, PHILIP L SR ET AL	IMPS.31 AC	BENEDICT			0049	0004	0064	CV	Commercial	0.310	no data	rental dwelling
	GREENFIELD, DONALD F SR	IMPS0.498 AC	BENEDICT AVE			0049	0004	0062	CV	Residential	0.498	2 story with basement	standard single family unit 1, 2 or 3 story
	WELCH, DENNIS R	IMPS.25 AC	BENEDICT			0049	0003	0039	CV	Residential Commercial	0.250	1 story no basement	standard single family unit 1, 2 or 3 story
	HARRISON, MARIA	L-20 & 21 BLK 2		2	20	0049	0005	0019	CV	Commercial	0.115	no data	rental dwelling
	HERSHON, EDDY G & EDWIN A & LIBUSE	IMPS0.211 AC	BENEDICT WHARF LN			0049	0003	0034	CV	Residential Commercial	0.211	1 story no basement	standard single family unit 1, 2 or 3 story
	ST FRANCIS DESALES CATHOLIC CHURCH	IMPS169 AC				0049	0008	0044	RV	Exempt Commercial	1.690	no data	rental dwelling

	SHORTER, HENRY A JR	LTS 1-10 BLK 5		5	1	0049	0009	0019	RV	Residential	0.990		
	WELCH, ADOLPH F & THOMAS L	.206 AC	END OF WHARF LANE			0049	0003	0030	CV	Commercial	0.206	no data	rental dwelling
	COUNTY COMMISSIONERS OF CHAS CO MD	IMPS0.086 AC	P/O L-14-23 24 BLK 5	5	14	0049	0010	0019	RV	Exempt	0.086		

APPENDIX H

MDE Effluent Limits Letter

MDE
MARYLAND DEPARTMENT OF THE ENVIRONMENT
1800 Washington Boulevard • Baltimore MD 21230
410-537-3000 • 1-800-633-6101

Robert L. Ehrlich, Jr.
Governor

Michael S. Steele
Lt. Governor

Kendl P. Philbrick
Secretary

Jonas A. Jacobson
Deputy Secretary

July 22, 2004

Mr. Bruce B. Burns, P.E., President
MAR ENGINEESRING, INC
2453 Kingston Court, Suite 101
York, PA 17402

RE: Planning Discharge Limits for the Proposed Benedict Wastewater Treatment Facility, Charles County, MAR Job No. 03-013

Dear Mr. Burns:

Please refer to your letter dated May 09, 2004, requesting planning limits for NPDES discharge permit for the above facility. We have completed the technical evaluation and can further process the permit with the following limitations, if the facility can be included in the Charles County Water and Sewer Plan:

For a discharge flow rate of 0.081 MGD with outfall at the Patuxent River:

BOD_5:	30 mg/l monthly average 45 mg/l maximum weekly average
TSS:	30 mg/l monthly average 45 mg/l maximum weekly average
TN:	8.0 mg/l maximum monthly average 12 mg/l maximum weekly average
TP:	2.0 mg/l maximum monthly average 3.0 mg/l maximum weekly average
DO:	Not less than 5 mg/l at anytime
pH:	Not less than 6.5 and not greater than 8.5

TRC:	Dechlorination to non-detectable level (Concentration measured below 0.1 mg/l is reported as non-detectable).
Fecal Coliforms:	14 MPN/100 ml monthly median

To avoid increasing the nutrient loading to Chesapeake Bay, new treatment plants, which were not permitted in 2000, are expected to install an advanced level of BNR, and also offset their remaining nutrient load by obtaining at least an equal amount of nutrient reduction at other point or non-point source. Another alternative would be to avoid a surface discharge entirely by using spray irrigation or another on-site option.

If you decide that surface discharge is the only option left and the facility can be included in the Charles County Water and Sewer Plan, please contact Municipal Surface Discharge Permit Division of MDE for an application appropriate for facility this size. Please be aware that any permitting action is subject to the public participation process.

If you have any questions or need any additional information, please do not hesitate to contact me at 410-537- 3672 or Ms. Simin Rezai at 410-537-3694.

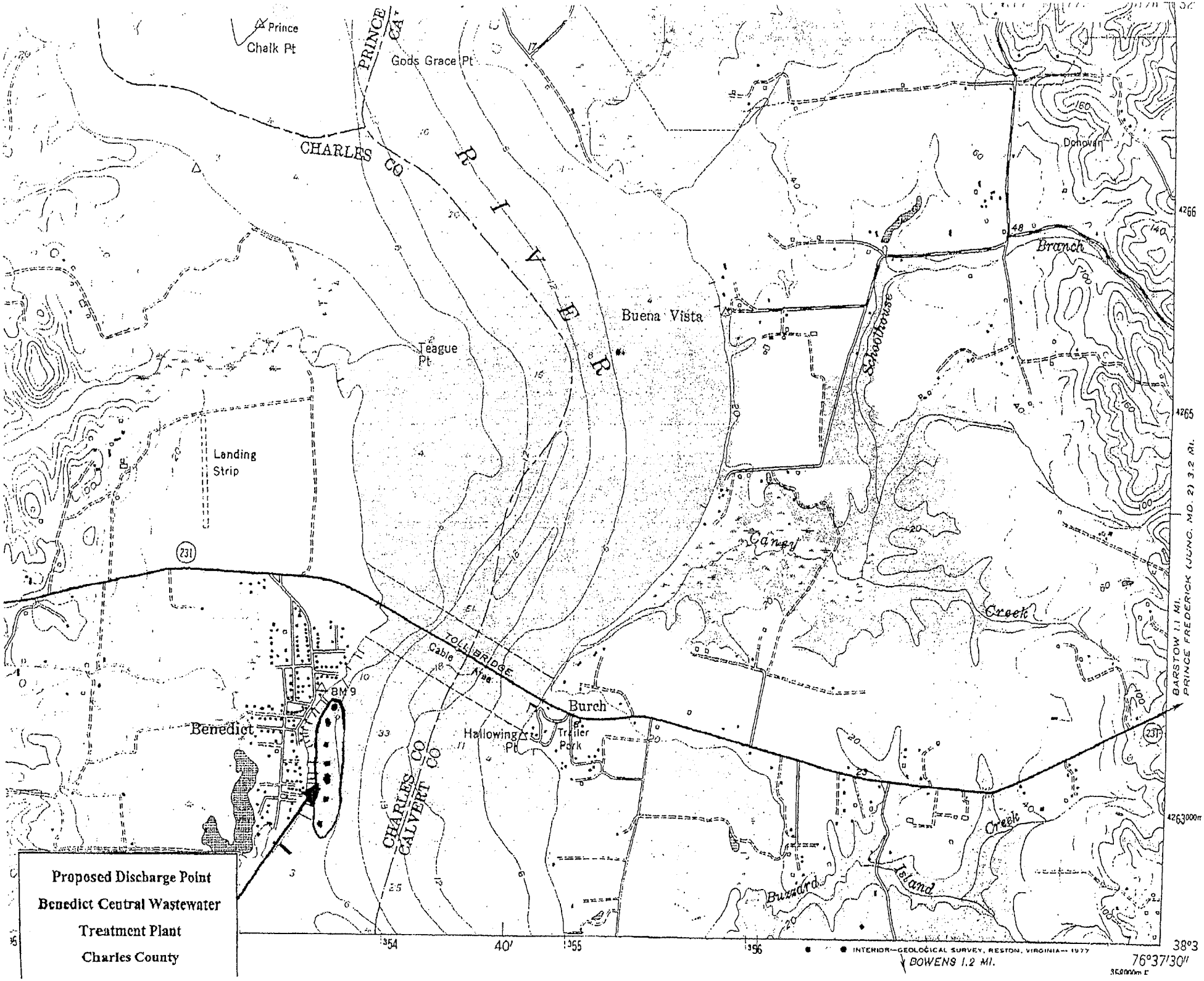
Yours truly,

Stephen Luckman, Chief
Municipal Surface Discharge Permits Division

Attachment: USGS Map showing possible WWTP discharge location

CC:

Charles County Commissioners
P.O.Box 2150
La Plata, MD 20646



Proposed Discharge Point
Benedict Central Wastewater Treatment Plant
Charles County

APPENDIX I

Charles County USDA Soil Survey (excerpt)


(Joins inset)
ShA
1 890 000 FEET
Teague Point
Town Point
BENEDICT
PATUXENT RIVER
CALVERT COUNTY
ST MARYS COUNTY
INDIAN CREEK
231
ErE
WaB2
MnB2
ShC2
Tm
ShB2
Ek
ShA
MtA
EvB
MlB2
WaC2
WaD3
WaD2
KpA
KtC3
Bo
WaC3
EwB
Os
WaC2
MuA
Fs
WeC2
SbE
ShC3

PPING UNITS

s to which the mapping unit belongs. In referring to a capability unit, a woodland subclass, or any other group, cate that the mapping unit is too variable for grouping. Other information is given in tables as follows:

Suitability of soils for wildlife, table 4, p. 56.
Engineering uses of soils, tables 5, 6, and 7, pp. 58 through 72.

Map symbol	Mapping unit	Described on page	Capability unit		Woodland subclass	
			Symbol	Page	Symbol	Page
MkC3	Magnolia clay loam, 5 to 12 percent slopes, severely eroded	24	IVe-3	41	2o	52
MlB2	Marr fine sandy loam, 2 to 5 percent slopes, moderately eroded	25	IIe-5	36	3o	52
MmA	Matapeake fine sandy loam, 0 to 2 percent slopes	25	I-5	35	3o	52
MmB2	Matapeake fine sandy loam, 2 to 5 percent slopes, moderately eroded	25	IIe-5	36	3o	52
MnA	Matapeake silt loam, 0 to 2 percent slopes	25	I-4	35	3o	52
MnB2	Matapeake silt loam, 2 to 5 percent slopes, moderately eroded	25	IIe-4	35	3o	52
MnC2	Matapeake silt loam, 5 to 10 percent slopes, moderately eroded	26	IIIe-4	38	3o	52
MnC3	Matapeake silt loam, 5 to 10 percent slopes, severely eroded	26	IVe-3	41	3o	52
Ms	Matawan loamy sand	26	IIw-10	38	2o	52
MtA	Mattapex fine sandy loam, 0 to 2 percent slopes	27	IIw-5	37	3o	52
MtB2	Mattapex fine sandy loam, 2 to 5 percent slopes, moderately eroded	27	IIe-36	36	3o	52
MuA	Mattapex silt loam, 0 to 2 percent slopes	27	IIw-1	37	3o	52
MuB2	Mattapex silt loam, 2 to 5 percent slopes, moderately eroded	27	IIe-16	36	3o	52
MxC	Mattapex soils, 5 to 12 percent slopes	27	IIIe-16	39	3o	52
OcB	Ochlockonee fine sandy loam, local alluvium, 0 to 5 percent slopes	28	IIe-6	36	1o	52
Or	Osier loamy sand	28	IVw-6	42	2w	52
Os	Othello fine sandy loam	29	IIIw-6	40	3w	53
Ot	Othello silt loam	29	IIIw-7	40	3w	53
RdB2	Rumford loamy sand, 0 to 5 percent slopes, moderately eroded	29	IIs-4	38	3o	52
RdC2	Rumford loamy sand, 5 to 10 percent slopes, moderately eroded	29	IIIe-33	40	3o	52
RgB2	Rumford gravelly sandy loam, 0 to 5 percent slopes, moderately eroded	29	IIs-4	38	3o	52
RgC2	Rumford gravelly sandy loam, 5 to 10 percent slopes, moderately eroded	29	IIIe-33	40	3o	52
SaE	Sandy land, steep	30	VIIs-1	43	3s	53
ShA	Sassafras sandy loam, 0 to 2 percent slopes	30	I-5	35	3o	52
ShB2	Sassafras sandy loam, 2 to 5 percent slopes, moderately eroded	30	IIe-5	36	3o	52
ShC2	Sassafras sandy loam, 5 to 10 percent slopes, moderately eroded	30	IIIe-5	39	3o	52
ShC3	Sassafras sandy loam, 5 to 10 percent slopes, severely eroded	30	IVe-5	41	3o	52
ShD2	Sassafras sandy loam, 10 to 15 percent slopes, moderately eroded	31	IVe-5	41	3o	52
ShD3	Sassafras sandy loam, 10 to 15 percent slopes, severely eroded	31	VIe-2	43	3o	52
Sx	Swamp	31	VIIw-1	43	--	--
Tm	Tidal marsh	31	VIIIw-1	43	--	--
WaB2	Westphalia fine sandy loam, 2 to 6 percent slopes, moderately eroded	31	IIe-5	36	3o	52
WaC2	Westphalia fine sandy loam, 6 to 12 percent slopes, moderately eroded	31	IIIe-5	39	3o	52
WaC3	Westphalia fine sandy loam, 6 to 12 percent slopes, severely eroded	32	IVe-5	41	3o	52
WaD2	Westphalia fine sandy loam, 12 to 20 percent slopes, moderately eroded	32	IVe-5	41	3r	53
WaD3	Westphalia fine sandy loam, 12 to 20 percent slopes, severely eroded	32	VIe-2	43	3r	53
WeB2	Westphalia-Evesboro complex, 2 to 6 percent slopes, moderately eroded	32	IIe-5	36	3o	52
WeC2	Westphalia-Evesboro complex, 6 to 12 percent slopes, moderately eroded	33	IIIe-5	39	3o	52
WeC3	Westphalia-Evesboro complex, 6 to 12 percent slopes, severely eroded	33	IVe-5	41	3o	52
WkB2	Wickham fine sandy loam, 2 to 5 percent slopes, moderately eroded	33	IIe-5	36	2o	52
WkC2	Wickham fine sandy loam, 5 to 10 percent slopes, moderately eroded	33	IIIe-5	39	2o	52
WkD2	Wickham fine sandy loam, 10 to 15 percent slopes, moderately eroded	33	IVe-5	41	2o	52
WmC3	Wickham sandy clay loam, 5 to 10 percent slopes, severely eroded	33	IVe-5	41	2o	52
WmD3	Wickham sandy clay loam, 10 to 15 percent slopes, severely eroded	33	VIe-2	43	2o	52
WoA	Woodstown sandy loam, 0 to 2 percent slopes	34	IIw-5	37	2o	52
WoB2	Woodstown sandy loam, 2 to 5 percent slopes, moderately eroded	34	IIe-36	36	2o	52
WoC2	Woodstown sandy loam, 5 to 10 percent slopes, moderately eroded	34	IIIe-36	40	2o	52

places the remaining surface layer is 6 to 10 inches thick. Also, in places pebbles left behind by erosion are on the surface and in shallow gullies that have cut through the soil. This soil otherwise has a profile similar to that of the soil described as representative of the series. It generally is more gravelly than similar soils that are more gently sloping. The hazard of further erosion is severe in places where the soil is tilled. Under careful management, however, this soil is suited to cultivated crops, pasture, and trees. Capability unit IIIe–33; woodland subclass 3o.

Sandy Land

Sandy land consists of exposures of very sandy soils along the steep ravines and stream valleys, mainly in the eastern part of the county. Most of the sediment is similar to the sandy material that underlies the Evesboro, Galestown, and Westphalia soils.

The only mapping unit is Sandy land, steep (SaE). It is mostly sand or fine sand containing gravel that is pale yellow to yellowish brown. In places finer material extends to a moderate depth. Slopes range from about 12 percent to more than 40 percent. Some areas are severely eroded but are still in use. Most areas are rewooded, but others are idle, and still others are in brush. Sandy land, steep, is not well suited to farming. Limitations are severe for most nonfarm uses. Capability unit VIIs–1; woodland subclass 3s.

Sassafras Series

The Sassafras series consists of nearly level to moderately sloping, deep, well-drained soils on uplands. These soils formed in loose deposits of loamy and sandy sediment of marine and alluvial origin. The native vegetation is mixed hardwoods, mainly oaks, but Virginia pine and loblolly pine grow in some places.

In a representative profile the surface layer is sandy loam about 8 inches thick. This layer is grayish brown in the thinner upper part and brown in the lower part. The upper part of the subsoil, about 4 inches thick, is yellowish-brown fine sandy loam. The lower part, about 26 inches thick, is strong-brown sandy clay loam that is friable. The underlying material to a depth of 60 inches is loose loamy sand of various colors.

Sassafras soils are easy to work. They have moderate available moisture capacity and are moderately permeable. Slope and the hazard of further erosion are the chief limitations to farming and nonfarm uses.

Representative profile of Sassafras sandy loam, 0 to 2 percent slopes, in a wooded area about one-half mile west of Malcolm:

A1—0 to 3 inches, grayish-brown (10YR 5/2) sandy loam; weak, fine, granular structure; friable, many roots; strongly acid; clear, wavy boundary.

A2—3 to 8 inches, brown (10YR 5/3) sandy loam; weak, fine, granular structure; friable; many roots; strongly acid; clear, wavy boundary.

B1—8 to 12 inches, yellowish-brown (10YR 5/4) heavy fine sandy loam; weak, medium, subangular blocky structure; friable, slightly sticky; common roots; strongly acid; gradual, wavy boundary.

B21t—12 to 28 inches, strong-brown (7.5YR 5/6) sandy clay loam; moderate, medium, subangular blocky structure; friable, slightly sticky and slightly plastic; common roots; thin, almost continuous clay films; stroı acid; gradual, wavy boundary.

B22t—28 to 38 inches, strong-brown (7.5YR 5/6) light sa clay loam; weak, medium and coarse, subangı blocky structure; friable, slightly sticky; a few ro thin, discontinuous clay films; strongly acid; grad wavy boundary.

C—38 to 60 inches, variegated yellowish-brown (10YR 5, strong-brown (7.5YR 5/6), and grayish-brown (1(5/2) loamy sand; single grain; loose; very stroı acid.

The solum ranges from about 30 to 40 inches in thickn The profile contains fine, smooth quartz pebbles, but tl pebbles are abundant only in the C horizon. The A horizo 10YR in hue, 3 to 5 in value, and 1 to 4 in chroma. The lov value and chroma are confined to some A1 horizons less tha inches thick. The B horizon is 10YR to 5YR in hue, 5 or (value, and 4 to 8 in chroma. The Bt horizon generally sandy clay loam, but it ranges to heavy sandy loam and he loam. The clay content is 18 to 27 percent and the silt con is 20 to 35 percent. The C horizon is similar to the B hori in color, but it is variegated in places and is coarser textu The C horizon is as coarse or coarser than the A horizon some places the C horizon is moderately hard and brittle w dry.

Sassafras soils resemble Chillum, Marr, Matapeake, R ford, and Wickham soils, but they contain less silt and m sand in the solum than Chillum and Matapeake soils. Sassa soils have more clay in the Bt horizons than Rumford s(and they contain more medium and coarse sand and weatl able minerals than Marr soils. Sassafras soils have a thin solum than Wickham soils and commonly have less clay more sand in the Bt horizon than those soils.

Sassafras sandy loam, 0 to 2 percent slopes (ShA) The profile of this soil is the one described as represen tive of the series. Included with this soil in mapping small areas where the surface layer is siltier than that this soil. Also included are areas where the surface la and the subsoil are redder than those of this soil. Un good management, this soil is suited to farming and many nonfarm uses, and limitations to use are few. Ca bility unit I–5; woodland subclass 3o.

Sassafras sandy loam, 2 to 5 percent slopes, mod ately eroded (ShB2).—This soil has a thinner surface la than that of the soil described as representative of series but the two profiles otherwise are similar. In pla this soil is severely eroded or is cut by shallow gull Included with this soil in mapping are silty areas wh the surface layer and subsoil are redder than those of t soil. Also included are spots where the underlying mate is hard and brittle. This soil is suited to cultivated cro pasture, trees, and most other uses. The hazard of furtl erosion is moderate. Capability unit IIe–5; woodland s class 3o.

Sassafras sandy loam, 5 to 10 percent slopes, mod ately eroded (ShC2).—This soil has lost most of its origi surface layer through erosion, and in many places plow exposes small amounts of subsoil, which gives the area spotty appearance. Under good management the soil suited to most uses. The hazard of further erosion severe in places where the soil is tilled. Capability u IIIe–5; woodland subclass 3o.

Sassafras sandy loam, 5 to 10 percent slopes, sever eroded (ShC3).—This soil has lost most of its origi surface layer, and in places some of its subsoil. The pres surface layer is yellowish brown to strong brown a somewhat sticky. It is difficult to cultivate. This soil marginal for tillage and should seldom be cultivated. is better suited to pasture, hay crops, or trees. Capabil unit IVe–5; woodland subclass 3o.

crops of seeds or make good cover, or both. These plants include dogwood, persimmon, sumac, sassafras, hazelnut, shrub lespedezas, autumn-olive, multiflora rose, wild cherry, black walnut, hickory, bayberry, blueberry, huckleberry, blackhaw, sweetgum, and various species of oak and holly.

Coniferous woody plants are cone-bearing evergreens and shrubs that are used by wildlife primarily as cover, but they also furnish browse and seeds. They include Virginia pine, white pine, loblolly pine, pond pine, Scotch pine, Norway spruce, redcedar, and Atlantic whitecedar.

Wetland food and cover plants consist of vegetation that provides food and cover for waterfowl and furbearing animals. They include smartweed, wildrice, barnyard grass, bulrush, pondweed, duckweed, duckmillet, arrowarum, pickerelweed, cattail, waterwillow, wetland grasses, and various sedges, including especially three-square in marshy areas.

Shallow-water developments are impoundments in which shallow water is maintained very close to the natural ground level. They are of special importance as habitat for waterfowl because they are shallow and support many kinds of vegetation that produce food for this kind of wildlife. They generally are too shallow to produce fish.

Excavated ponds are dug-out ponds that depend not on runoff, but on ground water. They furnish water for many kinds of wildlife. Migratory waterfowl are especially attracted to these ponds. Farm ponds of the impounded type are not considered in table 4, but they are important for warm water fish and recreational activities. Such ponds should be at least 6 feet deep in most places. Table 4 gives features of each soil in the county that affect the construction and maintenance of ponds.

Classes of wildlife

Table 4 lists the soils of the county that are rated according to their suitability for three classes of wildlife in the county: open-land, woodland, and wetland wildlife.

Open-land wildlife includes quail, pheasant, meadowlark, field sparrow, dove, cottontail rabbit, red fox, and woodchuck. These birds and mammals generally make their home in areas of cropland, pasture, meadow, and grains and in areas overgrown with grasses, herbs, and shrubs.

Woodland wildlife includes ruffed grouse, woodcock, thrush, vireo, scarlet tanager, gray and red squirrels, gray fox, white-tailed deer, raccoon, and wild turkey. They obtain food and cover in stands of hardwoods, coniferous trees, shrubs, or a mixture of these.

Wetland wildlife includes ducks, geese, rails, herons, shore birds, and muskrat that generally make their home in wet areas, such as ponds, marshes, and swamps.

Each rating under "Kinds of Wildlife" in table 4 is based on the suitability of the soil for the habitat elements indicated in the first part of the table.

For open-land wildlife, the rating is based on the ratings shown for grain and seed crops, grasses and legumes, wild herbaceous upland plants, hardwood plants, and coniferous woody plants. For woodland wildlife, it is based on the ratings listed for grasses and legumes, wild herbaceous upland plants, hardwood woody plants, and coniferous woody plants. For wetland wildlife, it is based on the ratings for wetland food and cover plants, shallow-water developments, and excavated ponds.

Engineering Uses of the Soils [3]

This section is useful to those who need information about soils used as structural material or as foundation upon which structures are built. Some of those who can benefit from this section are planning commissions, town and city managers, land developers, engineers, contractors, and farmers.

Among properties of soils highly important in engineering are permeability, strength, compaction characteristics, drainage, shrink-swell potential, grain size, plasticity, and reaction. Also important are slope and depth to the water table and to bedrock. These properties, in various degrees and combinations, affect construction and maintenance of roads, airports, pipelines, foundations for small buildings, irrigations systems, ponds and small dams, and systems for disposal of sewage and refuse.

Information in this section of the soil survey can be helpful to those who—

1. Select potential residential, industrial, commercial, and recreational areas.
2. Evaluate alternate routes for roads, highways, pipelines, and underground cables.
3. Seek sources of gravel, sand, or clay.
4. Plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for controlling water and conserving soil.
5. Correlate performance of structures already built with properties of the kinds of soil on which they are built, for the purpose of predicting performance of structures on the same or similar kinds of soil in other locations.
6. Predict the trafficability of soils for cross-country movement of vehicles and construction equipment.
7. Develop preliminary estimates pertinent to construction in a particular area.

Most of the information in this section is presented in tables 5, 6, and 7, which show, respectively, several estimated soil properties significant to engineering; interpretations for various engineering uses; and results of engineering laboratory tests on soil samples. This information, along with the soil map and other parts of this survey, can be used to make interpretations in addition to those given in tables 5, 6, and 7. It also can be used to make other useful maps.

The engineering interpretations reported in this survey do not eliminate the need for sampling and testing at the site of specific engineering works involving heavy loads and where the excavations are deeper than the depths of layers here reported. Estimates generally are made to a depth of about 5 feet and interpretations do not apply to greater depths. Investigation of each site is needed because many delineated areas of a given soil mapping unit may contain small areas of other kinds of soil that have strongly contrasting properties and different suitabilities or limitations for soil engineering. Even in these situations, however, the soil map is useful in planning more de-

[3] By THEODORE IFFT, conservation engineer, Soil Conservation Service.

TABLE 8.—*Limitations of soils for town and country planning*—Continued

Soil series and map symbols	Sewage disposal		Homesites (three stories or less)		Streets and parking lots	Home gardens
	Filter fields	Lagoons	With basements	Without basements		
Lumford:						
RdB2, RgB2	Slight	Severe: rapidly permeable.	Slight	Slight	Slight to moderate: slope.	Moderate: moderately droughty.
RdC2, RgC2	Slight	Severe: rapidly permeable; slope.	Slight	Slight	Severe: slope	Severe: slope.
Sandy land, steep: SaE.	Severe: slope [1]	Severe: rapidly permeable; slope.[1]	Severe: slope	Severe: slope	Severe: slope	Severe: slope; droughtiness.
Sassafras:						
ShA	Slight	Moderate: moderate permeability.	Slight	Slight	Slight	Slight.
ShB2	Slight	Moderate: moderate permeability; slope.	Slight	Slight	Moderate: slope.	Moderate: slope.
ShC2, ShC3	Slight	Severe: slope; moderate permeability.	Slight	Slight	Severe: slope	Severe: slope; ShC3 severely eroded.
ShD2, ShD3	Moderate: slope.	Severe: slope; moderate permeability.	Moderate: slope.	Moderate: slope.	Severe: slope	Severe: slope; ShD3 severely eroded.
Swamp: Sx	Severe: ponding.[1]	Severe: ponding.[1]	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Tidal marsh: Tm	Severe: tidal high water table.[1]	Severe: tidal high water table; instability.[1]	Severe: tidal high water table; instability.	Severe: tidal high water table; instability.	Severe: tidal high water table; instability.	Severe: tidal high water table; salinity.
Westphalia:						
WaB2	Slight	Moderate to severe: moderate to moderately rapid permeability; slope.	Slight	Slight	Moderate: slope.	Moderate: slope.
WaC2, WaC3	Slight to moderate: slope.	Severe: slope	Slight to moderate: slope.	Slight to moderate: slope.	Severe: slope	Severe: slope; WaC3 severely eroded.
WaD2, WaD3	Moderate to severe: slope.	Severe: slope	Moderate to severe: slope.	Moderate to severe: slope.	Severe: slope	Severe: slope; WaD3 severely eroded.
Westphalia-Evesboro:						
WeB2	Slight	Moderate to severe: slope; moderate to rapid permeability.	Slight	Slight	Moderate: slope.	Moderate to severe: slope; low available water capacity and fertility in Evesboro.
WeC2, WeC3	Slight to moderate: slope.	Severe: slope; rapid permeability in Evesboro.	Slight to moderate; slope.	Slight to moderate: slope.	Severe: slope	Severe: slope; low available water capacity and fertility in Evesboro.

See footnote at end of table.

APPENDIX J

Process Kinetics, Mass Balances & Installation Lists

SUNLIGHTSYSTEMS

PROPOSAL Ultraviolet "UV" Disinfection	September 1, 2004 Proposal # SQ002630

PROJECT NAME: Benedict East Shore WWTP

SUPPLIED SYSTEM: SUN-4L-HO-AW or MW

LAMP TECHNOLOGY: Low-pressure high output

AUTHORIZED REPRESENTATIVE:

Glenn Quinn
Ames, Inc.
8918 Herrman Drive
Columbia, MD 21045
410-995-6971

DELIVERABLES:

SUN-4L-HO	$6,962.00
OPTIONS PER SYSTEM	
Automatic cleaning system[1]:	$2,350.00
Manual cleaning system:	$800.00
UV Monitor:	$1,000.00
High heat shut off:	$495.00
Spare parts package:	$210.00

FOB PLANT

All pricing is in US Dollars. Sunlight Systems' standard terms and conditions apply.

Please see attached scope of supply for details.

By:

Adam Donnellan

Sunlight Systems

[1] Requires air compressor

SUNLIGHTSYSTEMS

SCOPE OF SUPPLY Ultraviolet "UV" Disinfection	September 1, 2004 Proposal # SQ002630

PROJECT NAME: Benedict East Shore WWTP

SUPPLIED SYSTEM: SUN-4L-HO-AW or MW

LAMP TECHNOLOGY: Low-pressure high output

AUTHORIZED REPRESENTATIVE:

Glenn Quinn
Ames, Inc.
8918 Herrman Drive
Columbia, MD 21045
410-995-6971

DESIGN OVERVIEW:

Water type	Wastewater
Flow rate (peak)	110,000 GPD
Flow rate (average)	81,000 GPD
Flow rate (minimum)	TBD
Transmission @ 254 nm	65%
Total suspended solids TSS	<25 mg/liter
Biological oxygen demand	<25 mg/liter
Temperature	5/30 C
Influent (per 100 ml sample)	TBD
Discharge permit	200/100 ml
UV Dosage[1]	>45,000

System type	Chambered
UV monitoring system	Yes
Lamp type	High output
Vessel material	316 L stainless
Operating pressure	100 PSI
Electrical enclosure	Remote NEMA 4x ss
Running time meter	Yes
Individual lamp indicators	Yes
Temperature shut-off	Yes
Connections (FLANGE)	TBD
Quartz cleaning system	Automatic or manual

This UV disinfection system is designed to provide maximum dosage using low-pressure high output technology at peak flow at end of lamp life. System has been designed based on calculations as outlined in the EPA design manual.

The system will provide > 45,000 uWs/cm2 at end of lamp life. This insures that the system will be capable of meeting and exceeding dosage requirements.

System is an enclosed chamber. The chambered design allows operators to change lamps without system shutdown. Configuration allows system to be piped using a variety of client defined sizes.

The closed vessel provides user safety as well as some optional features such as manual or automatic quartz cleaning. This insures that the protective quartz sleeves will be cleaned without having to breakdown the system.

[1] As calculated by Point Source Summation Method at end of lamp life. Expressed in uWs/cm2 (microwatts).

SCOPE

One (1) UV System as Follows:

System Specification:

TYPE	Horizontal
CHAMBER MATERIAL	316L Stainless Steel
NUMBER CHAMBERS	1
LAMPS PER CHAMBER	4
TOTAL LAMPS	4

Lamps will be oriented parallel to the water flow.

The chamber will be connected to a remote NEMA 4x Power Control Center (PCC). The PCC will contain L.E.D. lamp on/off indicators, elapsed running time meter and On/Off switch. The PCC may also contain the UV monitor, temperature shut-off and other controls and displays.

All materials exposed to the water will be 316L stainless steel and quartz. All other materials will be stainless steel, quartz, Teflon and EPDM.

The location of the inlet/outlet can be changed depending on installation requirement.

CHAMBER

Chamber material:	316 ss
Chamber length:	64"
Chamber diameter:	8"
Pressure rating:	150 psi
Inlet/outlet:	Optional depending on piping in plant
Pressure loss:	0.1
Rating:	IP65
Removable heads:	2
Monitor port:	1
Drain port:	1
Sample ports:	2
Mounting legs:	2

ELECTRICAL

Power:	120 volt 50/60 Hz 5 Amp
Power consumption per system:	.68 kVA
Power Control Center:	1
Type:	>IP65
Lamp indicators:	LED per lamp
Timer:	Running time meter
On/Off:	Yes

SYSTEM CONTROLS AND DISPLAYS

UV monitors:	One (1) per vessel
High heat shut off:	One (1) per vessel

UV LAMPS

Part #:	LP4440
Lamp watts:	155
UV watts @ 254 nm:	52
Quantity per vessel:	4
Lamp life:	12,000 hours
Lamp treatment:	Internal coating

QUARTZ SLEEVES

Material:	Pure fused quartz
Seals:	Viton
Transmission:	94%
Type:	GE TYPE 214
Style:	Open on each end

WARRANTY

All metal components will be guaranteed for a period of five (5) years. All electrical components will be guaranteed for a period of one (1) year. Lamps have a pro-rated warranty of one (1) year.

ESTIMATED SHIPMENT

Based upon present conditions, it is estimated shipment of the system can be made within six (6) to ten (10) weeks after receipt of approved drawings.

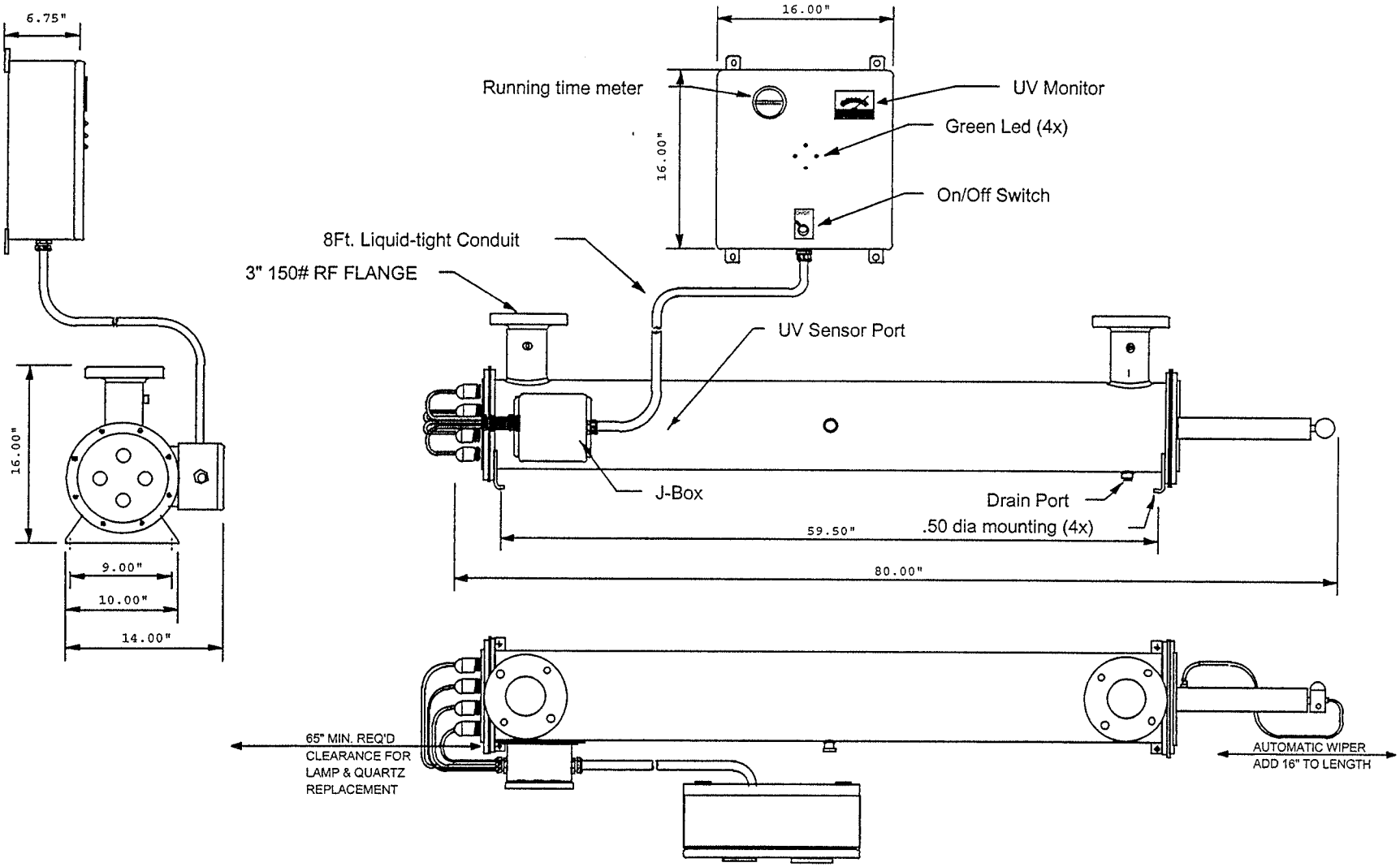
Sunlight Systems, LLC

By: *Adam Donnellan*

Adam Donnellan

4 D Pearl Court - Allendale NJ 07401

www.sunlightsystems.com info@sunlightsystems.com


6.75"
16.00"
Running time meter
UV Monitor
Green Led (4x)
16.00"
On/Off Switch
8Ft. Liquid-tight Conduit
3" 150# RF FLANGE
UV Sensor Port
16.00"
J-Box
Drain Port
.50 dia mounting (4x)
59.50"
80.00"
9.00"
10.00"
14.00"
65" MIN. REQ'D
CLEARANCE FOR
LAMP & QUARTZ
REPLACEMENT
AUTOMATIC WIPER
ADD 16" TO LENGTH

BIOREM

Mr. James Havey
MAR Engineering

Reference: Odor control for proposed Red Cedar WWTP

Jim

Thank you for the opportunity to work with you on this project. Based on our discussion, we have provided two options based on how you would like to approach the project.

Project Details

Air flow from Screening Chamber and from covered side of equalization tank would equal roughly 374 CFM. That flow rate could be addressed by our smallest unit, a BASYS 500 system. If you wish to treat the air in the headspace above the uncovered tank, the total airflow would be about 850 CFM. This airflow would be easily addressed by one of our BASYS 12 units.

A proposal for each of the systems mentioned above is below. A BASYS™ modular unit will provide sufficient residence time to adsorb and biologically remove your H_2S and other odors– GUARANTEED. BIOREM has a vast number of installations on similar applications and are proud of our 100% track record of success. We are the only biofilter to fully address odors and not to focus purely on H2S. Though we are the most efficient at addressing this most noxious of the odorous gases, we realize that your goal is total odor control; and so is ours.

The BASYS™ system proposed here is North America's FIRST fully integrated enclosed biofilter with humidification and controls built in to the compact unit. Please see the picture to the right for our latest example. Our system contains high-performance biofilter media, BIOSORBENS™, which is provided with a 10 year warrantee and it is guaranteed not to degrade, decompose or require replacement within that time period.

Regards,

George Federico

George Federico
TDM – local representative

Regards,

Jeff Dobbin

Jeff Dobbin
Biorem Technologies

Biorem Technologies Inc. 7496 Wellington Road 34, RR#3, Guelph, ON, N1H 6H9
Tel:(519)767-9100 FAX:(519) 767-1824 Email: info@biorem.biz www.biorem.biz

BIOREM

BASYS™ 12 – NORTH AMERICA'S MOST EFFICIENT BIOFILTER!

YOUR QUOTATION # 04-3494. RED CEDAR WTP, LOUDOUN COUNTY, VA.

Qty	Item Description	Units	Budget Price (US$)
01	**BASYS™ 12 Modular Biofilter – *CLOSED-TOP SYSTEM*** *Includes:* 1. *One 16ft x 10ft(wide) x 8ft Biofilter Vessel* 2. *Integrated air pretreatment & humidification* 3. *Design drawings and specifications for BASYS™ unit* 4. *304 Stainless Steel Construction* 5. *Process engineering* 6. *Level I Instrumentation for Biofilter Vessel* 7. *Manual – for Installation, Start-up and Maintenance* 8. *5 HP Fan with VFD* 9. *BIOSORBENS™ 10-Year biofilter Media* 10. *Treatment of 1000 CFM at 30 seconds EBRT*		***$109,000***
01	*Commissioning and Training*		***INCLUDED***
01	*1 year service & maintenance package* *(First Year is Included)*	***$3,600/Yr***	

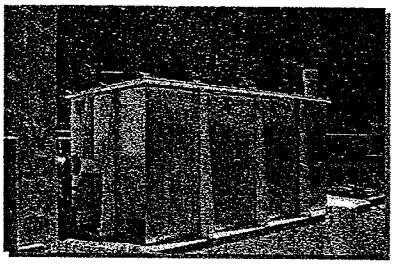
NOTES:

1. Fan motor will be 480 volts.
2. All components are FOB Guelph, Ontario, Canada
3. Payment Terms: 30% upon placement of Order, 60% 6 weeks after placement of order and 10% upon installation and commissioning.
4. Applicable taxes are extra.

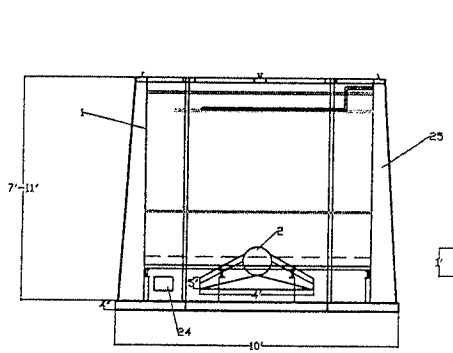
Items to be provided by client:

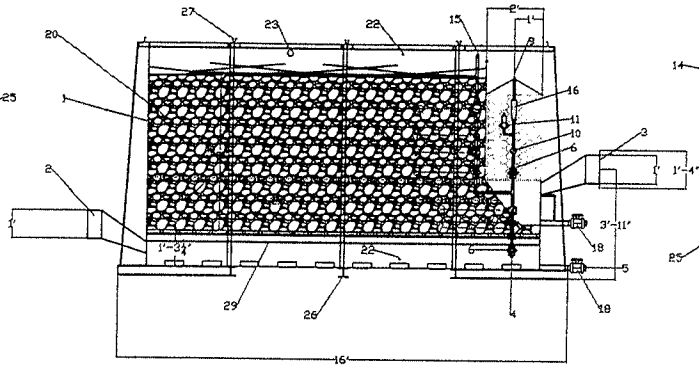
- *Power supply*
- *Supply and installation of all ducting*
- *Installation of instruments*
- *Installation of media*
- *Service and maintenance*
- *Fan motor starter (If Required)*
- *Water supply*
- *Utility connections and piping to unit*
- *Supply and installation of concrete pad*
- *Supply and installation of heat tracing and insulation of all piping (If Required).*

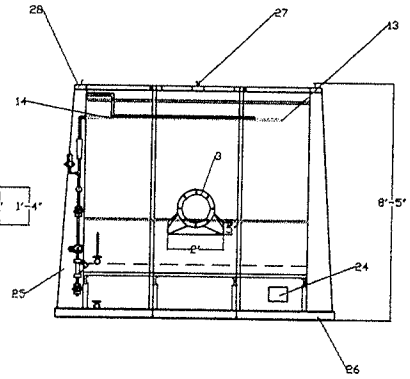
Prices listed are budgetary and are subject to change without notice.

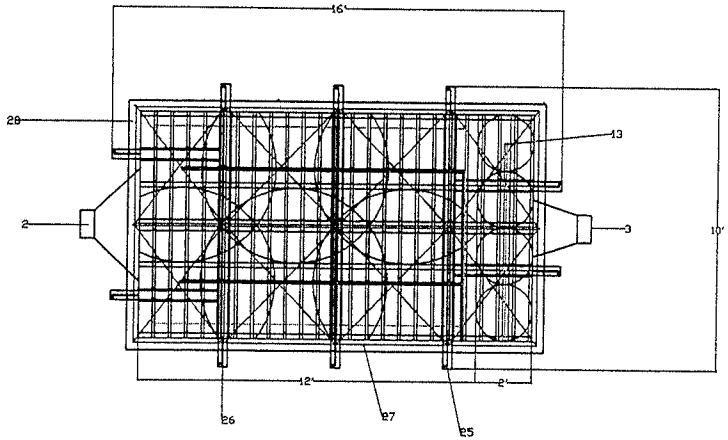


Biorem Technologies Inc. *7496 Wellington Road 34, RR#3, Guelph, ON, N1H 6H9*
Tel:(519)767-9100 **FAX:**(519) 767-1824 **Email:** info@biorem.biz www.biorem.biz









ITEM	DESCRIPTION
1	WALL AND FLOOR MATERIAL: 3/16" 304L STAINLESS STEEL
2	12-INCH DIAMETER OUTLET TRANSITION SLIP
3	12-INCH DIAMETER INLET TRANSITION FLANGE
4	1-INCH FNPT WATER SUPPLY CONNECTION
5	2-INCH NPT DRAIN LINE CONNECTION
6	1-INCH NPT BALL VALVE (QTY. 3)
7	1-INCH DIAMETER NPT Y-STRAINER
8	1-INCH DIAMETER NC SOLENOID VALVE, 120V (QTY. 2)
9	1-INCH FULL COUPLING (HUMIDIFICATION LINE)
10	1-INCH DIAMETER WATER PRESSURE INDICATOR (QTY. 2)
11	1-INCH DIAMETER WATER PRESSURE SWITCH
12	1-INCH DIAMETER WATER FLOW TOTALIZER
13	1-INCH DIAMETER STAINLESS STEEL HUMIDIFICATION LANCE
14	WIDE SPRAY HUMIDIFICATION NOZZLES (QTY. 4)
15	1-INCH FULL COUPLING (IRRIGATION LINE)
16	1-INCH DIAMETER WATER FLOW INDICATOR
17	1-INCH WATER SUPPLY PIPING MANIFOLD
18	2-INCH BALL VALVES (QTY. 2)
19	2FT x 8FTx 5FT HUMIDIFICATION CHAMBER
20	12FT X 8FT X 8FT BIOFILTER WITH MEDIA
21	1/2-INCH HALF FNPT COUPLING (WT101)
22	1/4-INCH FNPT HALF COUPLING, TUBING TO PANEL (QTY. 2)
23	2 1/2 -INCH HALF COUPLING WITH PLUG FOR SAMPLING
24	8 X 6-INCH ACCESS HATCHES (QTY. 3)
25	EXTERIOR BRACING: 1/4-INCH MILD STEEL
26	EXTERIOR I-BEAM SUPPORTS: 4-INCH MILD STEEL
27	14 GUAGE STAINLESS STEEL REMOVABLE LIDS
28	STAINLESS STEEL COVER SUPPORT BRACING
29	MEDIA SUPPORT FLOOR
30	INTERNAL BAFFLE

REV.	DATE:	DESCRIPTION

DRAWING FOR:
LOUDOUN COUNTY

TITLE/DESCRIPTION:
BASYS 12

PROPERTY OF:
BIOREM TECHNOLOGIES INC.

BIOREM

DRAWN BY: MT	DATE: APRIL 15TH, 2004
DWG. NUMBER:	REVISION:

BIOREM

Install it and forget it: - Unlike Scrubbers and Activated Carbon, Bio-filtration systems require very little cost or effort to maintain once they are installed. We would be happy to prepare an economic comparison based on your site conditions

Why Use Biofiltration??

-Removal and Complete destruction (not phase transfer) of odorous compounds .
-The microbes metabolize the odors and convert them into CO2 and water
-A proven technology which continually improves with new materials and benefits from innovations like synthetic media.
-Very low operation costs and very little maintenance relative to other technologies
- New media from Biorem allows for ten year or longer media life without having to do anything to the media. No disruptions caused by regenerating or changing out of media, no unexpected shutdowns, no reductions in performance.

Why Use BioRem ???

Bio-Filtration is here and it works. We do not believe that is good enough. Through innovations like our Synthetic Biosorbens Media, we have brought this technology more into the mainstream. This media is guaranteed for a minimum of a ten year service life. Because it will not degrade, we offer optimum performance now and for a long time to come. Best of all, you and/or your customer will not have to do any maintenance. That's right, no watering, no turning, no feeding it. The media and the system take care of everything for you. All that we asks is that you take a sample once a quarter to make absolute sure that the media is at optimum performance. We also make it easy on you and your staff by providing a very simple design. Not many parts or things to go wrong. We accomplished this simplicity the same way we did our superior performance, better media.

Unlike our competitors, we can handle organic odors, forever, and at almost any level.

We offer modular units and a smaller footprint to fit your space and your budget. Our operating costs are considerably lower than other Biofiltration technologies. Of course we also offer larger units to handle any flow-rate (largest to date has been 160,000 CFM with a single unit).

Advantages

Shorter Retention time required = ¼ the footprint of other Biofilters
Extended warrantee – ten years on Biosorbens
No Degradation or compaction of media means:
- Consistent excellent performance for ten years or more
- No replacement of media for at least ten years
- Consistent pressure drop means consistent flow through bed
- No channeling or short circuiting of bed

Synthetic media means
- Lower pressure drop means energy savings from the start

Little or no maintenance required
No turning required = no damage caused during this process
Better environment for the bacteria culture
No background odor like with natural media
Better moisture control thus less drying out of bed

-Greater capability to handle seasonal load variations and contaminant concentration, swings
-Limited monitoring required
-Simple, fool-proof design
-Low disposal costs – media is recyclable
-Media is pH neutral eliminating need for neutralization system

Biosorbens Media – What is it ????

BIOREMs BIOSORBENS™ synthetic granular biofilter media is the "best available media technology" in North America. Introduced in 1999 BIOSORBENS™ marks a significant development in biofilter technology. BIOSORBENS™ is a processed hydrophilic mineral-based core manufactured with hydrophobic sorption and nutrient ingredients that dramatically enhance odor and VOC removal from contaminated air streams. The residence time required with BIOSORBENS™ is proven at one half to one third that of an organic media, so the **volume of media required is one half to one third** as well. So with BIOSORBENS™ in your Biofilter you will **save space**. As well, **BIOSORBENS™ exhibits no residual odor** common to wood-chip based media.

BIOSORBENS™ is a proven product with demonstrated superior performance in over 40 different European and numerous North American applications for up to eleven years. Several US and Canadian installation are already commissioned. The largest single BIOSORBENS™ odor control installation is at a 100,000 cfm biofilter treating waste air from North America's largest poultry by-product rendering plant in Alabama. The system is demonstrating excellent results removing a huge range of organic and quasi-organic compounds. At low residence times. BIOSORBENS™ is also in use on sewage plants, pumping stations and chemical VOC and hydrocarbon emissions.

System Configurations: Two Basic Types of System

1) BASYS – The only truly modular System.

The BASYS biofilter is one, single, fully integrated unit. It is easily hooked up at the site. It can be easily transported or moved to alternate locations. ie: If you close this pump station in the future you can pick up the BASYS™ unit and move it somewhere else too!

2) Biofiltair – simple, less expensive, and able to handle your largest applications

The Biofiltair System is a concrete structure built on site which is a complete turnkey system. These systems can be configured to accommodate the space available on site. The Biofiltair, since it is built in site from concrete, is less expensive than the BASYS systems, and significantly smaller than conventional Biofilters

Sampling and monitoring

The BASYS™ system is provided with a complete service and laboratory monitoring package at no cost in the first year and available for the entire life of the system. This process-monitoring package is crucial to the continued successful operation of any biofilter system. As biotechnologists, and with full chemical and microbiological laboratory facilities, BIOREM is able to offer this important service where our competitors cannot without incurring additional costs.

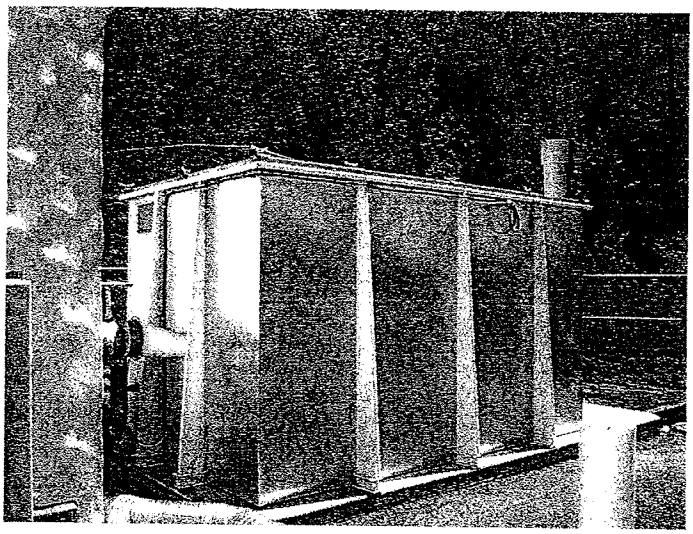
Most Experienced Biofilter Company

Over 30 Installations for VOC's & Odors of Exclusively Biofiltration
Committed to Long-Term Relationship Value & After Sales Support
Resources:

-Full Biotech Laboratory
-Monitoring & Service Program

Conclusion

The top engineering consulting firms in the country have performed comparative 10 and 20 year lifecycle evaluations and concluded that the BASYS™ biofilter system with BIOSORBENS™ media is by far the most cost effective biofilter solution, and that BIOREM is the most respected, experienced and resourceful biofilter company in North America



Jim Havey

From: Robert A. Kershner [r.kershner@ketllc.com]
Sent: Tuesday, September 07, 2004 9:56 AM
To: Jim Havey
Cc: Jean Grenier
Subject: Village of Benedict WWTP - DynaSand Denite Filter
AddedToSFDC: -1

Dear Jim,

Per our discussions, we are pleased to offer a budgetary price for a Denite DynaSand Filter for the Village of Benedict WWTP project.

Following the ISAM SBR with integral pre and post equalization, we suggest that for the 81,000 gpd flow rate, we need one (1) DSF-19 DynaSand. The unit, at design flow of 56 gpm will be loaded at a conservative loading of 2.9 gpm/sq ft.

Budgetary price of one DSF-19 DBTF with ladder, platform, air compressor package and freight/start-up is $55,000. Add $5,500 for a sugar feed system consisting of a Neptune 100 gallon tank, mixer and electronic metering pump with accessories.

Please see the attached DSF-19 drawing. Call with any questions.

Regards,

Rob

Robert A. Kershner
Kershner Environmental Technologies, LLC
410-581-0555
410-581-0551 fax
410-458-3586 cellular
r.kershner@ketllc.com
www.ketllc.com

NOZZLE SCHEDULE				
LTR	SIZE INCHES	FACE	SERVICE	REMARKS
A	6	RF	INLET	FEED
B	6	RF	OUTLET	FILTRATE
C	3	RF	OUTLET	REJECT
D	1	NPT	INSIDE DRAIN	VALVE
E	3	NPT	VENT	PIPE
F	1/4	NPT	CUSTOMER AIR	

NOTES:

1. THIS DRAWING TO BE USED FOR GENERAL INFORMATION ONLY. NOT FOR CONSTRUCTION.
2. MATERIAL OF CONSTRUCTION:
   TANK : 11 GA., 304 S.S.
   AIRLIFT: 304 S.S.
3. WEIGHTS
   TANK EMPTY: 2,300#
   TANK W/WET SAND: 21,300#
   TANK W/SAND & WATER: 26,910#
4. 7.6 TONS SILICA SAND REQUIRED.

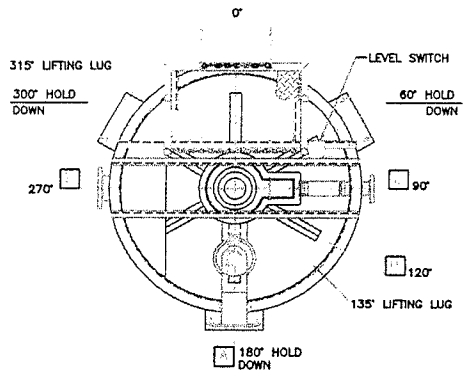
SPECIAL NOTES

1. THE SUPPORTING CONCRETE PAD MUST BE LEVEL.
2. APPLY (1 IN.) MIN. GROUT UNDER EACH BASE PLATE AND UNDER THE CONE AT CENTER.
3. SEE INSTALLATION INSTRUCTIONS BEFORE SETTING GROUT.
4. CUSTOMER ANCHOR BOLT PROJECTION TO INCLUDE GROUT, BASE PLATE (1 IN.) THICK, PLUS WASHER AND NUT.

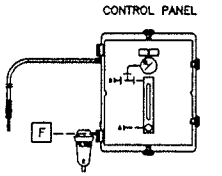
LOADING CONDITIONS
STATIC LOADING

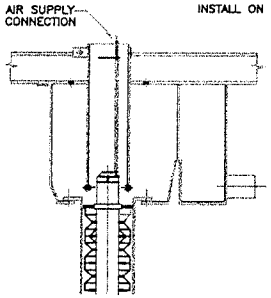
FILTER FULL OF WATER AND SAND:
LOAD UNDER EACH BASE PLATE IS APPROX. 6.7 KIPS
LOAD UNDER CONE AT CENTER IS APPROX. 6.7 KIPS

SEISMIC FORCES FROM ZONE 4 MAY CREATE AN OVERTURNING MOMENT OF 42.2 FT.-KIPS AT THE BASE OF THE UNIT. THE LOADS ACTING ON EACH ANCHOR BOLT WILL THEN BE -1150# IN TENSION AND 1250# IN SHEAR.

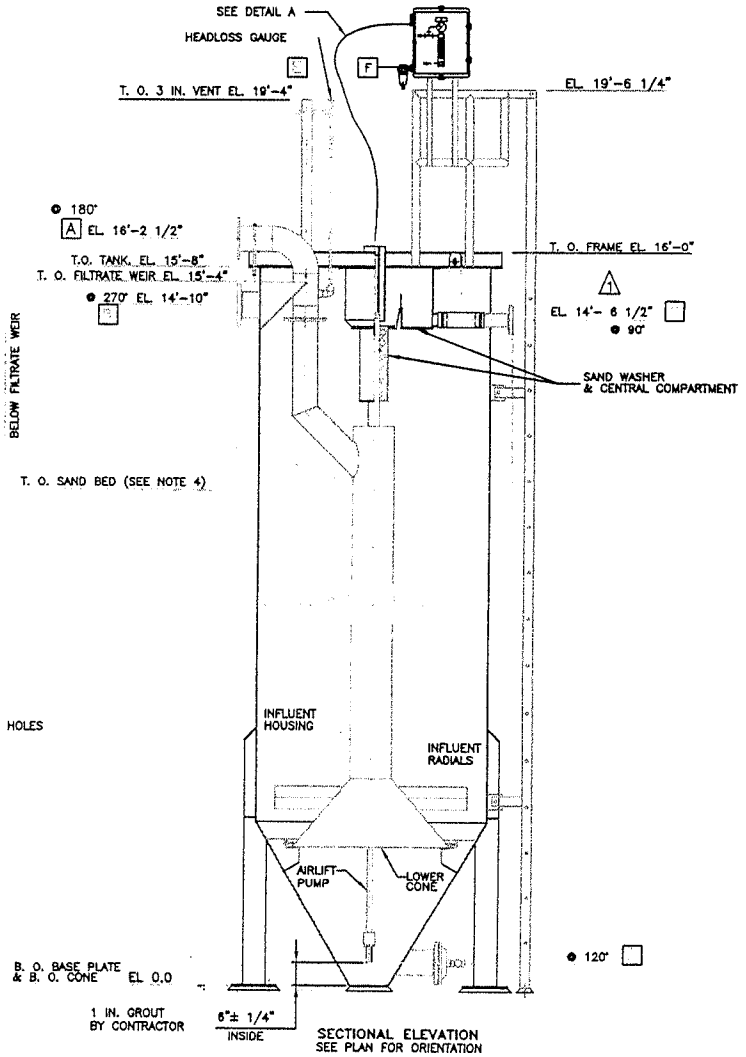


PLAN

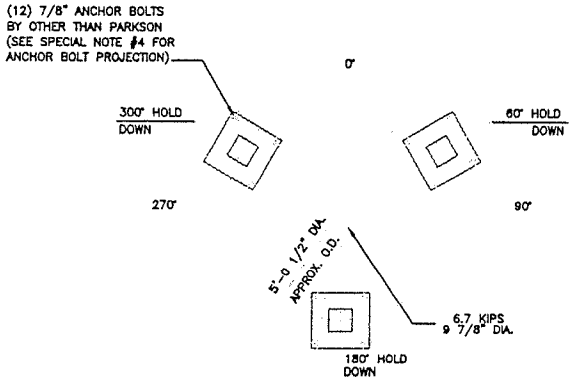




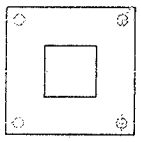
DETAIL A
INST. PANEL TO AIRLIFT CONN.
SCHEMATIC



SECTIONAL ELEVATION
SEE PLAN FOR ORIENTATION



1 LOADING DIAGRAM



1 BASE PLATE DETAIL

PARKSON CORPORATION
DynaSand Filter

DSF 19FT2 DBTF SS
SALES DRAWING

PROJECT NUMBER:
PROJECT NAME:

DRAWING FILE NUMBER: 003758-01
SHEET NUMBER: 1 OF 1
REVISION: 1

MODIFIED BASE PLATE AS SHOWN
EL. OF NOZZLE "C" WAS 16'-6 1/2"

SIGNATURES		DATE
DRAWN:	F. J. CAMARGO	11-2-98
CHECKED:	P. TATASCIORE	10-2-98
APPROVED:	P. TATASCIORE	10-2-98
SIZE: B	SCALE: 3/8"=1'-0"	

REVISION			
DATE:	BY:	CHECKED:	DESCRIPTION
3-22-99	F. J. CAMARGO	P. TATASCIORE	
APPROVED: P. TATASCIORE			

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN FEET AND INCHES
TOLERANCE: ±

THE OWNER, PROJECT ENGINEER, AND ALL OTHERS INVOLVED WITH THE PROJECT DESIGN MUST BE FAMILIAR WITH AND FOLLOW ALL SAFETY STANDARDS REQUIRED BY LOCAL, STATE AND FEDERAL LAWS WHEN INCORPORATING PARKSON CORPORATION EQUIPMENT INTO THE OVERALL PROJECT DESIGN. PARKSON CORPORATION WILL NOT BE RESPONSIBLE FOR LOCATION AND/OR PLACEMENT OF EQUIPMENT IN THE PLANT DESIGN, NOR IS PARKSON RESPONSIBLE FOR PLANT SAFETY DESIGN AND FOR THE FAILURE TO FOLLOW APPROPRIATE SAFETY PRECAUTIONS IN THE OPERATION AND MAINTENANCE OF PARKSON CORPORATION EQUIPMENT.

NOZZLE SCHEDULE				
LTR	SIZE INCHES	FACE	SERVICE	REMARKS
A	6	RF	INLET	FEED
B	6	RF	OUTLET	FILTRATE
C	3	RF	OUTLET	REJECT
D	1	NPT	INSIDE DRAIN	VALVE
E	3	NPT	VENT	PIPE
F	1/4	NPT	CUSTOMER AIR	

NOTES:

1. THIS DRAWING TO BE USED FOR GENERAL INFORMATION ONLY. NOT FOR CONSTRUCTION.
2. MATERIAL OF CONSTRUCTION:
   - TANK : 11 GA., 304 S.S.
   - AIRLIFT: 304 S.S.
3. WEIGHTS
   - TANK EMPTY: 2,300#
   - TANK W/WET SAND: 21,300#
   - TANK W/SAND & WATER: 26,910#
4. 7.6 TONS SILICA SAND REQUIRED.

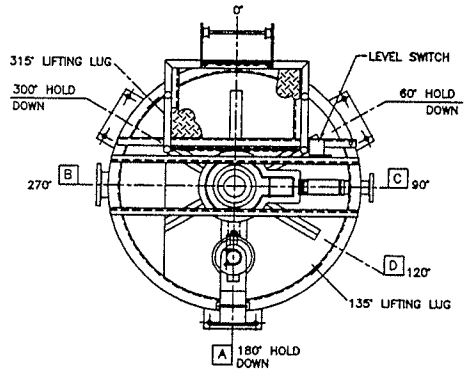
SPECIAL NOTES

1. THE SUPPORTING CONCRETE PAD MUST BE LEVEL.
2. APPLY (1 IN.) MIN. GROUT UNDER EACH BASE PLATE AND UNDER THE CONE AT CENTER.
3. SEE INSTALLATION INSTRUCTIONS BEFORE SETTING GROUT.
4. CUSTOMER ANCHOR BOLT PROJECTION TO INCLUDE GROUT, BASE PLATE (1 IN.) THICK, PLUS WASHER AND NUT.

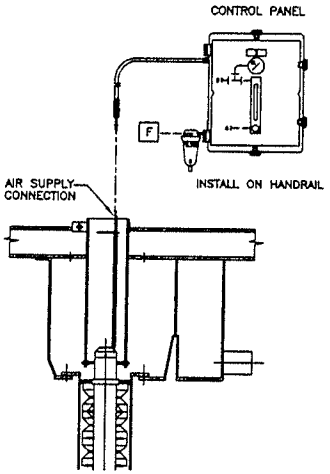
LOADING CONDITIONS
STATIC LOADING

FILTER FULL OF WATER AND SAND:
LOAD UNDER EACH BASE PLATE IS APPROX. 6.7 KIPS
LOAD UNDER CONE AT CENTER IS APPROX. 6.7 KIPS

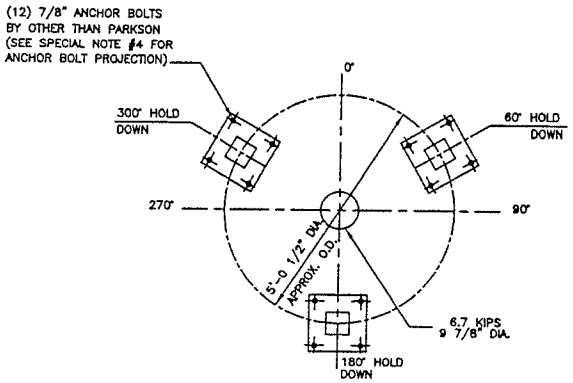
SEISMIC FORCES FROM ZONE 4 MAY CREATE AN OVERTURNING MOMENT OF 42.2 FT.-KIPS AT THE BASE OF THE UNIT. THE LOADS ACTING ON EACH ANCHOR BOLT WILL THEN BE -1150# IN TENSION AND 1250# IN SHEAR.



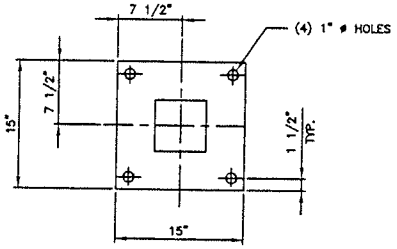
PLAN



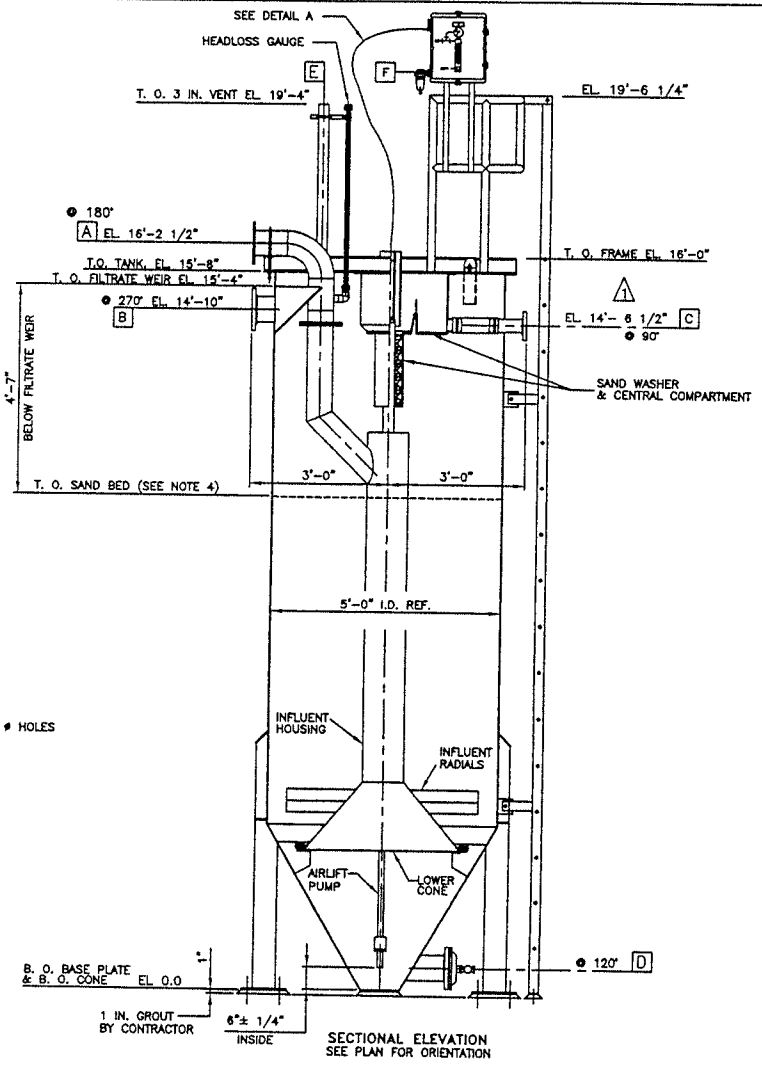
DETAIL A
INST. PANEL TO AIRLIFT CONN.
SCHEMATIC



1 LOADING DIAGRAM



1 BASE PLATE DETAIL



SECTIONAL ELEVATION
SEE PLAN FOR ORIENTATION

PARKSON CORPORATION
DynaSand® Filter

DSF 19FT2 DBTF SS
SALES DRAWING

PROJECT NUMBER:
PROJECT NAME:

DRAWING FILE NUMBER: 003758-01
SHEET NUMBER: 1 of 1
REVISION: 1

SIGNATURES		DATE
DRAWN:	F. J. CAMARGO	11-2-98
CHECKED:	P. TATASCIORE	10-2-98
APPROVED:	P. TATASCIORE	10-2-98

SIZE: B SCALE: 3/8"=1'-0"

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN FEET AND INCHES
TOLERANCE: ±

REVISION	DESCRIPTION	BY:	CHECKED:
DATE: 3-22-99		F. J. CAMARGO	P. TATASCIORE
APPROVED: P. TATASCIORE			

MODIFIED BASE PLATE AS SHOWN
EL. OF NOZZLE "C" WAS 16'-6 1/2"

THE OWNER, PROJECT ENGINEER, AND ALL OTHERS INVOLVED WITH THE PROJECT DESIGN MUST IMPLEMENT AND FOLLOW ALL SAFETY STANDARDS REQUIRED BY LOCAL, STATE AND FEDERAL LAWS WHEN INCORPORATING PARKSON CORPORATION EQUIPMENT INTO THE OVERALL PROJECT DESIGN. PARKSON CORPORATION WILL NOT BE RESPONSIBLE FOR LOCATION AND/OR PLACEMENT OF EQUIPMENT IN THE PLANT DESIGN, NOR IS PARKSON RESPONSIBLE FOR PLANT SAFETY DESIGN AND FOR THE FAILURE TO FOLLOW APPROPRIATE SAFETY PRECAUTIONS IN THE OPERATION AND MAINTENANCE OF PARKSON CORPORATION EQUIPMENT.

KA Engineered Systems

DATE: August 27, 2004

TO: Kappe Associates, Inc.
902 Southern Drive
Bel Air, Maryland 21014

ATTENTION: Ham Reed

SUBJECT: Subdivision Wastewater Treatment Plant
Charles County, Maryland

PROJECT NO.: KA 04-144
Please refer to this number when corresponding.

Dear Ham:

We are pleased to present for your use and information the following budget proposal for the Subdivision wastewater treatment plant for Charles County, Maryland.

Please note the following design considerations:

1. The *KA Engineered Systems* Pre-Engineered, Factory Built Wastewater Treatment System proposed is complete as herein specified and designed to treat domestic wastewater having the given and assumed average influent parameters and effluent requirements as specified below. The basic system consists of Secondary Treatment and Sludge Holding. The design of the equipment is based on the Continuous Influent Sequential Reactor System (CSBR) Process for the following parameters:

Parameter	Influent	Effluent
Av. Daily Flow	81,000 GPD	--
Peak Flow Rate	162,000 GPD	--
BOD_5 Avg.	240 mg/l	30.0 mg/l
Suspended Solids (TSS)	240 mg/l	30.0 mg/l
NH_3N	35.0 mg/l	1.0 mg/l
Total Nitrogen (TN)	30.0 mg/l	8.0 mg/l
Phosphorus	8.0 mg/l	3.0 mg/l
Dissolved Oxygen	--	--
Site Elevation	500 ft.	--
pH	6-9 S.u.	--
Alkalinity (min)	273 mg/l	--
Wastewater Temp., Min.	10°C	--
Wastewater Temp., Max.	28°C	--
Air Temp., Winter	0-40°F	--

Air Temp., Summer	80-100°F	--

NOTE: Influent sewage contains no industrial and/or toxic wastes.

2. The proposed treatment plant has two (2) separate tanks which allow one (1) tank to operate during low flows (i.e. start-up). One (1) tank can also take the entire plant flow if the other tank is out of service for maintenance, repair, etc.

3. We are providing submersible mixers for an anoxic phase which will allow the treatment system to meet and/or exceed the initial total nitrogen effluent limit of 8.0 mg/l. In order to meet the ultimate total nitrogen effluent limit of 3.0 mg/l, a denitrification tertiary filter will have to be added.

4. A 3-in. supernatant decanter airlift will be provided for decanting the sludge holding tank. Each sludge holding tank is proposed for a minimum 30 days holding time and has a minimum volume of 8,500 gallons.

5. The aeration system in each CSBR tank and sludge holding tank will be stainless steel coarse bubble diffusers.

6. We are recommending two (2) CSBR aeration blowers, one (1) will be the duty blower and one (1) will be a complete stand-by blower. A separate blower will be furnished for the sludge holding tank.

   KA Engineered Systems will provide blowers with a noise level as low as possible. However, noise is very subjective and what we consider a low noise level might not be considered low by a close neighbor to the treatment plant. Therefore, if noise is considered a problem, we strongly suggest that consideration be given to furnishing a blower building. *KA Engineered Systems* will have to work closely with you in the design stage in order to assure a reasonable blower system as it applies to noise levels.

   The air blowers can be mounted either on or off the treatment plant. We recommend that they be mounted off the plant on a separate concrete pad.

7. If the alkalinity of the incoming sewage is less than 273 mg/l, then it will be necessary to use chemicals to increase the alkalinity. We have not included an alkalinity feed system in our proposal.

8. We recommend that a UV system be furnished for disinfection. If a chlorination/dechlorination is required let us know and we can provide a design.

9. When designing the effluent structures, note that each CSBR tank only discharges five (5) hours per day and has an effective discharge rate per tank equivalent to a 388,800 GPD plant.

10. We are proposing a plant that will be mounted below ground level. We will provide full galvanized walkway grating for safety.

11. We are recommending that the blowers and control panel be mounted off plant as shown in the attached layout drawing. The electrical contractor is responsible to provide all wire, wiring, conduit, junction boxes etc. from the plant control panel to each motor off or on the plant. *KA Engineered Systems* is not furnishing any wiring, conduit or junction boxes within the plant.

The following is the estimated proposal for the various items of equipment for the above subject project.

ITEM 1 – SINGLE TRAIN CSBR TREATMENT SYSTEM (STEEL TANK)

Two (2) *KA Engineered Systems* Pre-Engineered, Factory Built Wastewater Treatment Systems, Model CSBR 40.5 Single Train System designed to treat 81,000 GPD of domestic wastewater having the given and assumed average influent parameters and effluent limits listed above. Each single train system complete with the following:

a. SBR Reactor Tank

One (1) *KA Engineered Systems* Single Train Factory Built Wastewater Treatment System, CSBR Model 40.5, complete as herein specified and designed for the above stated parameters. CSBR Treatment Unit of A-36 steel construction will be 12-ft. 0-in. wide, 58-ft. 6-in. long and 11-ft. 0-in. high. The tank will be complete with the following:

Aeration Manifold
Aeration Drop Pipes
Aeration Diffusers
Decanter Assembly & Drive Unit
Decanter Discharge Piping
Waste Sludge Pump with Slide Rails
Waste Sludge Pump Piping
Submersible Mixers
Mixer Removal Support System Hoist

NOTE: Each CSBR Reactor Tank is 58-ft. 6-in. long × 12-ft. 0-in. wide × 11-ft. 0-in. high and each with a total working volume of 49,800 gallons.

b. Sludge Holding Tank (Integral)

One (1) Sludge Holding Tank of A-36 steel construction will be 12-ft. 0-in. in wide, 10-ft. 0-in. long, and 11-ft. 0-in. high.

Each Sludge Holding Tank will have a total working volume of 8,500 gallons. Tank based on 30-day retention time and each complete with the following:

Aeration Manifold
Aeration Drop Pipes
Aeration Diffusers
Supernatant Decant 3-in. Air Lift Unit

c. Air Blowers

1. CSBR Air Blowers

Two (2) *Sutorbilt/Roots* Air Blower Assemblies each rated to deliver 371 CFM at 4.0 PSIG. Each blower assembly complete with the following:

One (1)	15.0 HP, 1750 RPM, 460 volt, 3 phase, 60 HZ horizontal ODP motor.
One (1)	Fabricated steel baseplate with a metal weatherproof enclosure.
One (1)	Motor slide base.
One (1)	V-belt drive assembly with belt guard.
One (1)	Inlet filter.
One (1)	Inlet silencer.
One (1)	Discharge silencer.
One (1)	Butterfly shut-off valve.
One (1)	Check valve.
Two (2)	Flexible connectors.
One (1)	Pressure relief valve.
One (1)	Pressure gauge.

2. Sludge Holding Tank Air Blower

One (1) *Sutorbilt/Roots* Air Blower Assembly rated to deliver 34 CFM at 5.0 PSIG. Blower assembly is complete with the following:

One (1)	2.0 HP, 1750 RPM, 460 volt, 3 phase, 60 HZ horizontal ODP motor.
One (1)	Fabricated steel baseplate with a metal weatherproof enclosure.
One (1)	Motor slide base.
One (1)	V-belt drive assembly with belt guard.
One (1)	Inlet filter.
One (1)	Inlet silencer.
One (1)	Discharge silencer.
One (1)	Butterfly shut-off valve.
One (1)	Check valve.
Two (2)	Flexible connectors.
One (1)	Pressure relief valve.
One (1)	Pressure gauge.

d. Control System

One (1) Electrical Control Panel, NEMA 4X enclosure with main disconnect, branch circuit breakers, motor starters with overload protection, selector switches, indicating lights, lighting arrestor, three phase monitor control and an alarm system all controlled by Programmable Logic Controller (PLC). Manual control of all equipment shall also be provided. A transformer for the 120-volt, single-phase power shall be provided for control voltage and operation of the items and equipment requiring the same. Control Panels for:

CSBR Units (Two)
Sludge Holding Tank (Two)

e. Miscellaneous

One (1) Item of tank fabrication consists of ASTM A-36 steel plate and shapes of 1/4-in. minimum thickness.

One (1) Item of tank protective coating consisting of the following:

- One (1) Item of tank preparation consisting of sand blasting to specification SPCC SP-10.
- One (1) Coat of Epoxy Paint, 8-10 mils DFT.

One (1) Item of all piping, valves, and fittings located in the tanks as specified.

One (1) Item of galvanized 18-gauge perforated, 9-in. wide x 2 1/2-in. deep walkway grating to cover all plant openings.

One (1) Item anodes for cathodic protection.

One (1) Start-up instruction service consisting of two (2) days with one (1) trip to the job site.

Four (4) Operation and Maintenance Manuals.

20' DR 15'T
AQUATRONE $55,000

SELLING PRICE (FREIGHT INCLUDED)

UV $21,000

(2) ITEM 1:
Single Tank Wastewater Treatment System (Steel Tank) $339,000

Approximate Shipping Weight/Tank 45,000 lbs.

Manual Room R4 Plans 9/2/04

GENERAL NOTES

1. Each CSBR Treatment steel tank will be shipped as a complete unit with one (1) splice to be field welded.

2. The equipment such as blowers, control panels, grating and any other loose items will be shipped separately with the tankage for field mounting by others.

3. Crane for unloading by Contractor.

4. The crane and any other tools required to properly install the equipment shall be furnished by others.

We hope the above, along with the attached data, meets your current needs. Please do not hesitate to contact us if we can be of any additional assistance, or if you require any additional data.

Respectfully yours,

KA Engineered Systems

KA Engineered Systems **TECHNICAL DATA**

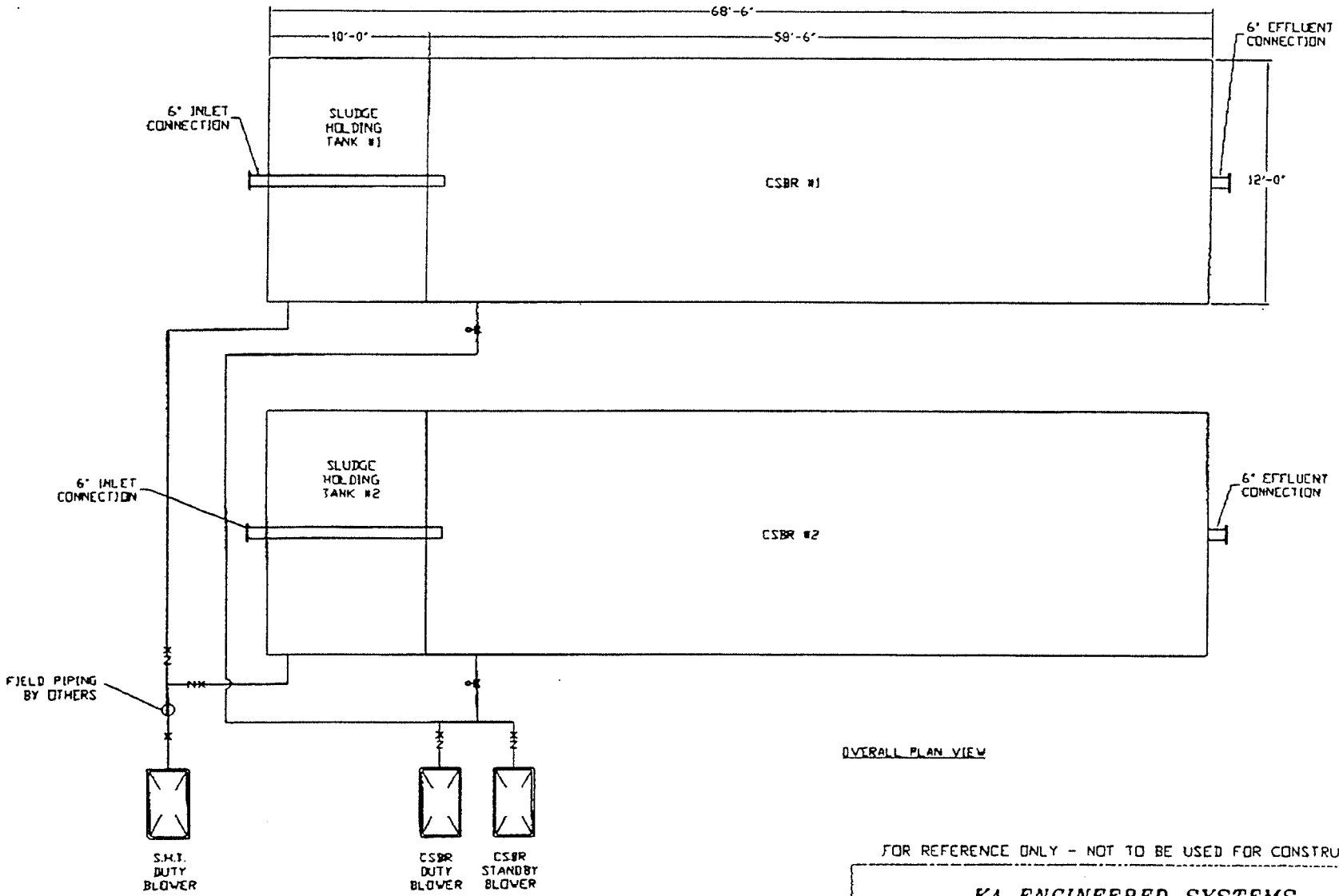
TITLE: DESIGN CRITERIA CSBR TREATMENT SYSTEM PREFABRICATED STEEL PACKAGE	PROJECT: KA 04-144 SUBDIVISION WWTP CHARLES COUNTY, MARYLAND

KA Engineered Systems Model Number:	CSBR 40.5 Single
Number of Tanks:	Two (2)
Design Flow:	81,000 GPD
SBR Volume (Total):	99,600 gal.
SBR Volume / Tank:	49,800 gal.
Sludge Holding Tank Volume / Tank:	8,500 gal.
Decanter Discharge Rate:	270 GPM
Waste Sludge Pump Rate:	43.5 GPM
CSBR Aeration Blowers:	371 CFM @ 4.0 PSI, 15.0 HP
Sludge Holding Tank Blower:	34 CFM @ 5.0 PSI, 2.0 HP

DIMENSIONS

A.	58-ft.	6-in.	(SBR Length)
B.	10-ft.	0-in.	(Sludge Holding Length)
C.	9-ft.	6-in.	(Maximum W/L)
D.	9-ft.	6-in.	(Top W/L)
E.	7-ft.	0-in.	(Minimum W/L)
F.	6-ft.	8-in.	(Tank Effluent Height)
G.	12-ft.	0-in.	(Width)
H.	11-ft.	0-in.	(Height)
I.		6-in.	(Effluent Connection)
J.		6-in.	(Inlet Connection)
K.	68-ft.	6-in.	(Plant Overall Length)

08/27/04



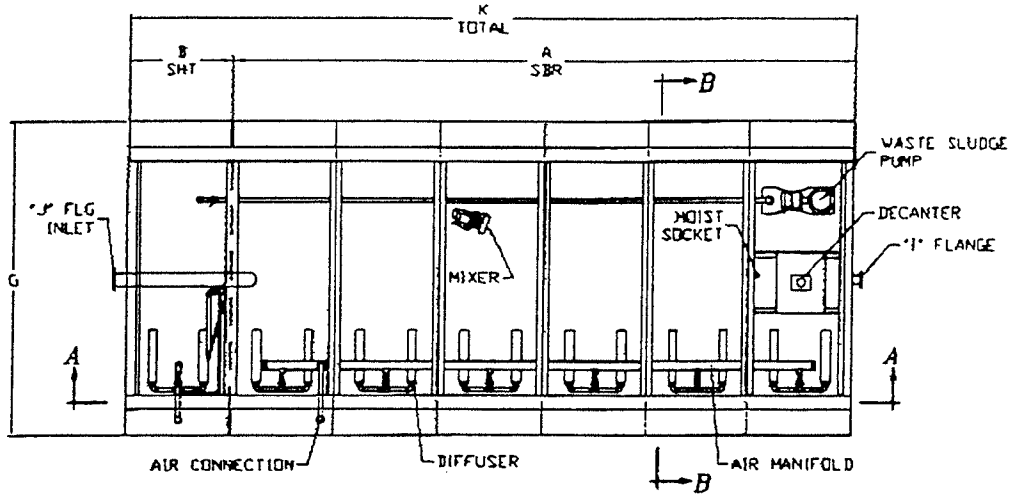
OVERALL PLAN VIEW

FOR REFERENCE ONLY - NOT TO BE USED FOR CONSTRUCTION

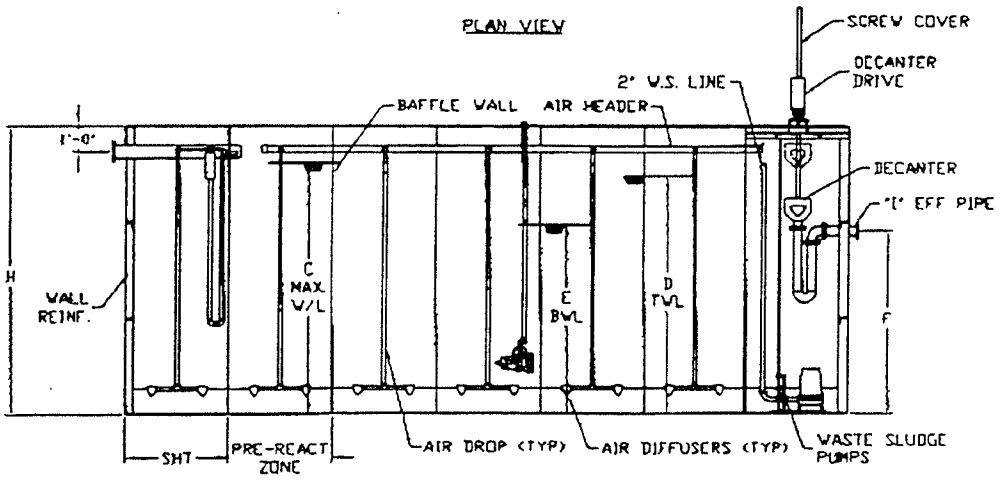
NOTE: ALL WIRE, WIRING, CONDUIT AND JUNCTION BOXES FROM THE CONTROL PANEL TO THE EQUIPMENT MOTORS ON AND OFF THE PLANT SHALL BE FURNISHED AND INSTALLED BY ELECTRICAL CONTRACTOR.

KA ENGINEERED SYSTEMS

Revision	RFQ No: 04-144	Project Name: SUBDIVISION WWTP CHARLES COUNTY, MARYLAND
	Date: 08/27/04	Drawing Name: OVERALL PLAN VIEW
	Designed	

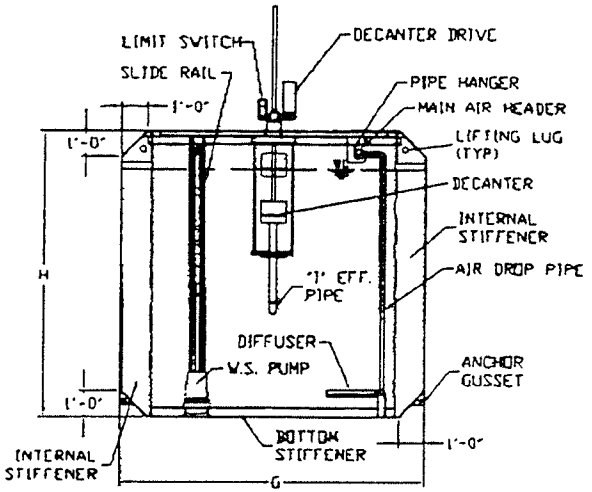


PLAN VIEW



SECTION A-A

AIR BLOWERS ARE NOT SHOWN -
CAN BE MOUNTED ON OR OFF PLANT.



SECTION B-B

FOR REFERENCE ONLY - NOT TO BE USED FOR CONSTRUCTION

DIMENSIONS					
A	B	C	D	E	F
58'-6"	10'-0"	9'-6"	9'-6"	7'-0"	6'-8"
G	H	I	J	K	

OPTIONS	
☒ BELOW GROUND INSTALLATION	☒ FULL SURFACE GRATING
☐ ABOVE GROUND INSTALLATION	☐ PARTIAL GRATING
☐ BITUMASTIC COAL TAR PAINT	☐ HANDRAIL
☒ EPOXY COAL TAR PAINT	☒ MAGNESIUM ANODE PACKS
☒ STANDBY BLOWER	☐ ACCESS LADDER

KA ENGINEERED SYSTEMS

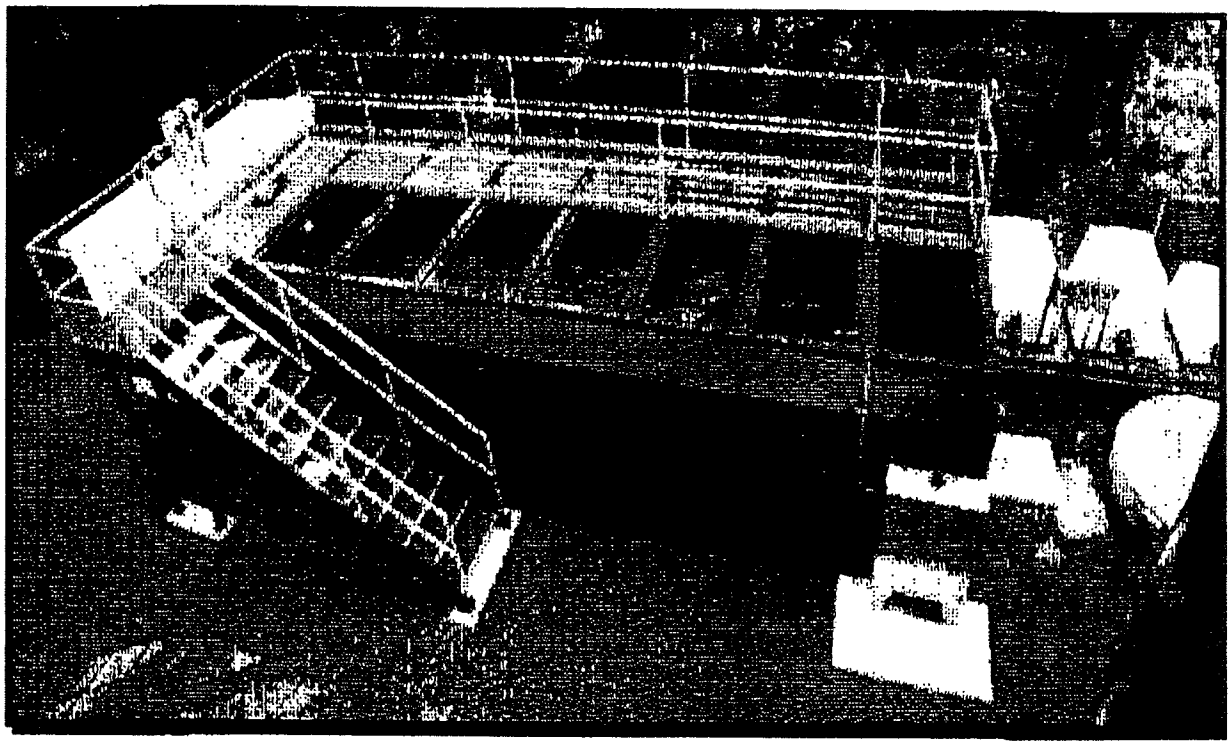
Revision	RFQ No	Project Name:	SUBDIVISION WWTP CHARLES COUNTY, MARYLAND
	04-144		
	Date: 08/27/04	Drawing Name:	SINGLE TRAIN CSBR WITH SLUDGE HOLDING TANK
	Designed	Drawn	Scale: DWG No:

KA Engineered Systems

Continuous Flow Sequencing Batch Reactor (CSBR)

AERATION SEQUENCE - SETTLING SEQUENCE - DECANT SEQUENCE

ALL UNIT PROCESSES CARRIED OUT IN A SINGLE TANK



ADVANTAGES . . .

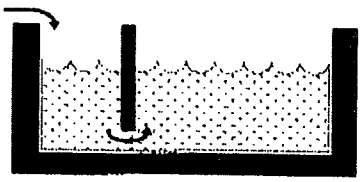
- HIGH TREATMENT EFFICIENCY
- SETTLING CONDITIONS ARE OPTIMIZED
- ELIMINATES NEED FOR EXTERNAL CLARIFIERS
- POSITIVE AND AUTOMATIC CONTROL OF SRT & MLSS
- REDUCES AMOUNT OF SPACE REQUIRED FOR TREATMENT PLANT
- EXISTING FACILITIES ARE EASILY RETROFITTED TO USE CSBR PROCESS
- CONTINUOUS FILLING GENERALLY INHIBITS FILAMENTOUS GROWTH
- PROVIDES HYDRAULIC FLOW AND ORGANIC LOADING EQUALIZATION
- CAPACITY CAN BE EASILY EXPANDED USING MODULAR TANK ADDITIONS
- OPERATION IS AUTOMATIC REQUIRING MINIMAL OPERATOR ATTENTION

P.O. Box 89 ♦ Cicero, IN 46034 ♦ TEL: (317) 984-2788 ♦ FAX: (317) 984-1739

KA Engineered Systems

Continuous Flow Sequencing Batch Reactor (CSBR)

FILL / REACT



1) AERATION PROVIDED FOR MICROORGANISM RESPIRATION & OXIDATION

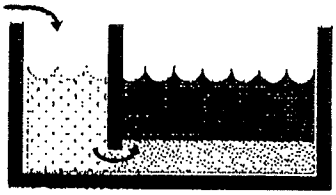
PRE-DETERMINED, ADJUSTABLE VOLUME OF WASTE SLUDGE AUTOMATICALLY WASTED AT BEGINNING OF EACH DECANT CYCLE

CONTINUOUS INFLUENT

TIME BASED

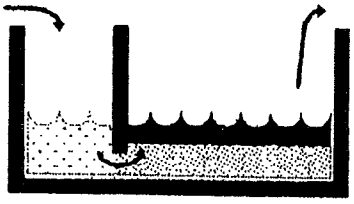
ALL UNIT PROCESSES CARRIED OUT IN A SINGLE TANK

FILL / SETTLE



2) NO MIXING OCCURS MLSS ALLOWED TO SETTLE

FILL / DECANT



3) TREATED, CLARIFIED EFFLUENT REMOVED FROM TANK BY SURFACE SKIMMING

TREATMENT FLEXIBILITY . . .

Depending on effluent requirements, the Continuous Flow Sequencing Batch Reactor can be designed to achieve four different levels of treatment. Each of these levels is achieved without the addition of chemicals or filters. The four levels are:

- BIOCHEMICAL OXYGEN DEMAND REMOVAL (BOD)
- NITRIFICATION (NIT)
- NITRIFICATION - DENITRIFICATION (NIT-DNIT)
- PHOSPHOROUS REMOVAL (P)

P.O. Box 89 ♦ Cicero, IN 46034 ♦ TEL: (317) 984-2788 ♦ FAX: (317) 984-1739

CSBR: Beyond SBR

KA Engineered Systems has taken the superior technology of SBR and improved it. The *KA Engineered* Continuous Flow Sequencing Batch Reactor (CSBR) allows continuous inflow of wastewater while utilizing a single basin. Flow to the CSBR basin is not interrupted at any time. Essentially, this design combines continuous inflow with intermittent decant which minimizes basin size and/or the need for multiple basins and contact absorption.

Like a typical SBR, CSBR is a process controlled through time. It carries out all the steps of flow equalization, biological oxidation, nitrification, denitrification and solids-liquid separation in the same basin. *All of the advantages of the SBR compared to the Conventional Activated Sludge system apply to CSBR as well.*

Unlike a typical SBR, CSBR does not require an influent control valve or another basin to hold diverted flow. Since CSBR fills continuously, it does not require a separate Fill or Idle phase, thereby simplifying the process.

The CSBR process is a repetition of a cycle which is comprised of three sequential phases: *Aeration, Settle,* and *Decant.* The length of the cycle is specific to each CSBR design.

A microprocessor controls the entire CSBR process. It automatically coordinates all the equipment and phases of the cycle. The system is pre-programmed to automatically switch to a storm cycle when the inflow reaches a certain level. CSBR can accommodate up to six times the average daily flow without effluent degradation. In addition, a CSBR operator can manually adjust the controls to respond to varying load conditions. This operational flexibility is especially useful during start-up when there is usually a light influent load.

CONTINUOUS INFLUENT AND THE BAFFLE WALL

The CSBR system allows continuous flow into the basin without hydraulic short-circuiting during decant. In order to accomplish this, a baffle wall separates the CSBR basin into two sections - the Pre-React Zone and the Main Chamber. The pre-react zone occupies roughly twelve to fifteen percent of the total basin size.

Wastewater flows continuously into the pre-react zone and is directed down through the openings at the bottom of the baffle wall into the sludge blanket at the bottom of the main chamber. The sludge blanket absorbs BOD during clarification and decant. Also the hydraulic force will cause the incoming flow to move upward at a very slow rate thus prevent short-circuiting during decant.

In addition to providing for continuous influent, the pre-react zone also provides pre-**treatment** of the wastewater before it enters the main chamber. There is a high amount of BOD in a small volume in the pre-react zone. This situation creates a high "Food to Microorganism Ratio" (F:M). The high F:M encourages the maximum biosorption of food by the microorganisms. The pre-react zone therefore acts as an "organic selector" increasing the proliferation of the most desirable microorganisms. This organic selection process inhibits the filamentous growth that causes sludge bulking.

P.O. Box 89 ♦ Cicero, IN 46034 ♦ TEL: (317) 984-2788 ♦ FAX: (317) 984-1739

THE CSBR CYCLE

Influent flows into the CSBR basin throughout each phase of the cycle.

The CSBR cycle is illustrated in Figure A.

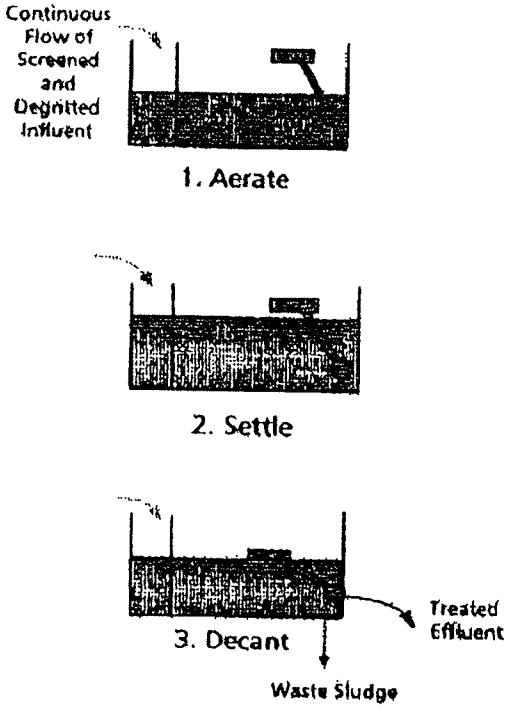


Figure A

During AERATE air is supplied to the basin and used by the microorganisms to consume the organics in the wastewater.

During SETTLE solids-liquid separation occurs. The solids settle to the bottom of the basin and the clear water rises to the top.

During DECANT the *KA Engineered System* decanter lowers into the basin and skims off the uppermost liquid in the basin and discharges it. Sludge wasting typically occurs during the decant phase.

Influent is received continuously during all phases of the cycle, including settle and decant. This allows the CSBR process to be controlled on a time, rather than flow basis and ensures equal loading and flow to all basins. Use of a time-based control system in CSBR facilitates simple changes to the process control program. Changes to the process are made simply by changing the duration of individual segments.

Each phase of the CSBR cycle is associated with particular reactor conditions - turbulent, quiescent, oxic, anoxic - that promote changes in the chemical and physical nature of the wastewater. Depending on effluent requirements, CSBR can be designed to achieve four different levels of treatment. Each of these levels is achieved without the addition of chemicals or filters. The four levels are biochemical oxygen demand removal (BOD), nitrification (NIT), nitrification-denitrification (NDN), and phosphorous removal (DNP).

FLUIDYNE CORPORATION

2816 West First Street
Cedar Falls, Iowa 50613
Phone: (319) 266-9967
Fax: (319) 277-6034

Reply to: 2202 Gold Oak Lane
Sarasota, Florida 34232
Phone: (941) 342-8915
Fax: (941) 342-9765

ISAM™ SBR with Aspirating Jet Aeration System

Design Calculations For

Village of Benedict, MD WWTP

Sep. 1, 2004

I. DESIGN CONDITIONS:

Design flow	=	81,000	GPD
Peak daily flow	=	150,000	GPD
Peak hourly flow	=	141	GPM (Assumed)
Influent BOD_5	=	240	mg/l
	=	162	lbs./day
Effluent BOD_5	=	10	mg/l
Influent TSS	=	240	mg/l
Removal in anaerobic chamber	=	65%	
TSS to SBR	=	84	mg/l
Effluent TSS	=	10	mg/l
Influent TKN	=	40	mg/l
	=	27	lbs./day
Effluent NH_3-N	=	1	mg/l
Effluent total N	=	3	mg/l
Design MLSS (Full reactor)	=	3,000	mg/l
Design F:M	=	0.08	
SRT (SBR)	=	17	days
SRT (SBR plus SAM))	=	25	days
Elevation	=	200	ft. MSL (Assumed)
Average barometric pressure	=	14.58	psia

II. BASIN DESIGN:

SBR basin	=	2	
Length	=	28 ft.	0 in.
Width	=	11 ft.	10 in.
TWL	=	10 ft.	6 in.
BWL	=	8 ft.	0 in.
Volume	=	52,046	Gallons
Retention time	=	15.4	hrs.

FLUIDYNE CORPORATION
2816 West First Street
Cedar Falls, Iowa 50613
Phone: (319) 266-9967
Fax: (319) 277-6034

Reply to: 2202 Gold Oak Lane
Sarasota, Florida 34232
Phone: (941) 342-8915
Fax: (941) 342-9765

SAM™ reactor basin	=	2	
Length	=	14 ft.	0 in.
Width	=	11 ft.	10 in.
Maximum SWD	=	10 ft.	6 in.
Minimum SWD	=	2 ft.	6 in.
Working volume	=	19,827	Gallons
Anaerobic chamber	=	2	
Length	=	14 ft.	0 in.
Width	=	11 ft.	10 in.
SWD	=	10 ft.	6 in.
Volume	=	26,023	Gallons
Effluent equalization/filter feed basin	=	1	
Length	=	24 ft.	0 in.
Width	=	11 ft.	10 in.
Maximum SWD	=	7 ft.	0 in.
Minimum SWD	=	2 ft.	0 in.
Working volume	=	10,622	Gallons

III. OXYGEN REQUIREMENT:

lbs. O_2 / lb. BOD_5 removed	=	1.25	
lbs. O_2 / lb. TKN oxidized	=	4.6	
lbs. O_2 recovered/ lb. NO_3 denitrified	=	1.84	
Actual Oxygen Required	=	250	lbs./day

Actual to Standard Oxygen Conversion Formula:

$$SOR = \frac{AOR}{\alpha\theta^{(T-20)}\left\{\frac{\beta C_{SMID} - C_L}{C_S\left[1+\frac{0.5\,(D)}{34}\right]}\right\}}$$

Where:

α	=	0.85	β	=	0.95
T	=	20 ° C	θ	=	1.024
C_S	=	9.09	C_L	=	1.0 mg/l

C_{SMID} = Oxygen saturation concentration at 50 % depth at site elevation and temperature.

C_{SMID} = 10.43 mg/l

Therefore:

FLUIDYNE CORPORATION
2816 West First Street
Cedar Falls, Iowa 50613
Phone: (319) 266-9967
Fax: (319) 277-6034

Reply to: 2202 Gold Oak Lane
Sarasota, Florida 34232
Phone: (941) 342-8915
Fax: (941) 342-9765

Standard Oxygen Required	=	347	lbs./day
Peaking factor	=	1.50	
Peak SOR (Design)	=	520	lbs./day

IV. PROCESS DESIGN

Cycle time at design flow	=	3.67	hrs.
Fill time	=	0.08	hrs.
Interact time (Maximum)	=	2.50	hrs.
Interact time (Design)	=	2.06	hrs.
Settle time	=	0.75	hrs.
Decant time	=	0.34	hrs.
Total cycle time	=	3.67	hrs.
Total aeration time	=	2.14	hrs./cycle
	=	28	hrs./day
SOR for aeration design	=	18.6	lbs./hr.
Aspirating jets per basin	=	2	
BHp required per aspirator	=	5.81	
Aspirator model	=	SAA 7.5 /2	

VI. PUMP CALCULATIONS:

Jet motive/fill pump:

Pumps per basin	=	1	FM 6" 5433
Flow per pump	=	1,279	GPM
Total pump head	=	33	ft.
Assumed pump efficiency	=	80	%
BHp per pump	=	13.32	
Pump motor Hp	=	15	

VII. DECANTER SIZING:

Cycles per day	=	13.07	
Batch size	=	6,196	Gallons
Decant flow	=	300	GPM

VIII. SUMMARY:

Design Standard Oxygen Required	=	347	lbs./day
Avg. BHp for 24 hrs. @ design SOR	=	15.54	
Power usage (Avg. load)	=	191	KWH/day
Power usage (Peak load)	=	278	KWH/day

FLUIDYNE CORPORATION
2816 West First Street
Cedar Falls, Iowa 50613
Phone: (319) 266-9967
Fax: (319) 277-6034

Reply to: 2202 Gold Oak Lane
Sarasota, Florida 34232
Phone: (941) 342-8915
Fax: (941) 342-9765

IX. SLUDGE PRODUCTION CALCULATIONS:

Inert accumulation	=	0.21	lbs./lb. BOD_5 removed
VSS production	=	0.45	lbs./lb. BOD_5 removed
Total sludge yield	=	0.66	lbs./lb. BOD_5 removed
Anaerobic volatile sludge reduction	=	60%	
Waste sludge concentration	>	4%	
Sludge production	=	61	lbs. day
	=	182	GPD
Sludge storage	=	67	days

X. NITRIFICATION/DENITRIFICATION

Minimum mixed liquor temperature	=	10	° C
Mixed liquor dissolved oxygen	=	1.0	mg/l
Alkalinity required for nitrification	=	200	mg/l
Alkalinity recovered, denitrification	=	75	mg/l
Net influent alkalinity required	=	125	mg/l
Max. nitrifier growth rate	=	0.125	$days^{-1}$
Minimum SRT required for nitrification	=	7.99	days
Actual SRT (SBR)	=	16.90	days
Kn, half velocity constant	=	0.22	mg/l
Des. growth rate for heterotrophs/nitrifier	=	0.059	
Projected effluent soluble NH_3-N	=	0.20	mg/l
Specific utilization rate	=	0.20	lbs BOD_5/lb MLVSS
MLVSS required for BOD & NH_3 remova	=	817	lbs.
MLVSS	=	2,100	mg/l
Tank volume req. for BOD & NH_3 remov	=	0.047	MG
Denitrification rate	=	0.034	g/g/day
MLVSS required for denitrification	=	503	lbs.
Tank volume required for NO_3 removal	=	0.029	MG
Total tank volume required	=	0.0754	MG
Total tank volume provided	=	0.0781	MG

FLUIDYNE CORPORATION

2816 West First Street
Cedar Falls, Iowa 50613
Phone: (319) 266-9967
Fax: (319) 277-6034

FLUIDYNE REFERENCE LIST

ISAM™/ SAM™ WASTEWATER TREATMENT PLANTS

FACILITY/OPERATOR	TELEPHONE	FLOW (MGD)	TYPE
AVONDALE SCOUT CAMP AVONDALE, LA Eric Moore	225-933-1793	0.050	Camp
CONO CHRISTIAN SCHOOL WALKER, IA Andrew Belz	319-448-4395	0.025	School
BACARDI-MARTINI TORONTO, ONTARIO Alan Dyck	905-451-6100	0.070	Distillery
BARONA, CALIFORNIA James Matthews	714-843-5734	0.750	Casino
CHAPMAN'S ICE CREAM MARKDALE, ONTARIO Charlie Rheume	519-986-3131	0.132	Dairy
CORDAVALLE, CA William Marcum	831-915-5408	0.030	Golf Course
EL PASO, AR Scott Kemph	501-227-7001	0.0025	Store
GRANDHAVEN, MI Chuck Larsen	616-842-6355	0.0025	Power Plant
HIGHLANDS CAMP ALLENSPARK, CO Bob Alberts	970-215-8777	0.0157	Camp
INGHAM LAKE, IA Jim Sundae	712-867-4170	0.008	Camp
JOHN WOOD SCHOOL, IN Mark Keyes	219-650-5309	0.008	School

FLUIDYNE CORPORATION

2816 West First Street
Cedar Falls, Iowa 50613
Phone: (319) 266-9967
Fax: (319) 277-6034

FLUIDYNE REFERENCE LIST

ISAM™/ SAM™ WASTEWATER TREATMENT PLANTS

Facility/Operator	Telephone	Flow (MGD)	TYPE
LAKE AND FOREST CLUB BROWNSTOWN, IN Steve Lawrence	812-522-5351	0.040	Development
LIBERTY SCHOOL SPANGLE, WASHINGTON John Galow	509-622-2888	0.025	School
MCCAIN FOODS, ALBERTA John Fair	403-269-5311	0.020	Factory
MULGRAVE, NOVA SCOTIA Steve Wheller	902-478-4137	0.090	Municipal
PALM VALLEY, AZ Larry Johnson	623-935-3005	4.1	Municipal
POPLAR SPRINGS, VA Howard Foer	540-788-4600	0.012	Municipal
ST. PETERS, NS Tom Madden	305-258-7891	0.15	Municipal
SOUND OF THE SEA, NC Don O'Mara	252-247-9167	0.040	Municipal
SUNDANCE, AZ Arthur Faiello	623-393-9630	1.20	Municipal
VOLUSIA COUNTY, FL Bill Gilley	904-943-4905	0.008	Washwater

FLUIDYNE CORPORATION

2816 West First Street
Cedar Falls, Iowa 50613
Phone: (319) 266-9967
Fax: (319) 277-6034

Reply to: Fluidyne Florida
2202 Gold Oak Lane
Sarasota, FL 34232
Phone: (941) 342-8915
Fax: (941) 342-9765
E-mail: ptiflorida@aol.com

September 22, 2004

Jim Havey
MAR Engineering

Re: Village of Benedict, MD WWTP

Gentlemen:

Per your conversation with Mr. Rob Kershner of Kershner Environmental Technologies, Fluidyne Corporation is pleased to offer design calculations, layout drawing, and typical specifications, describing a complete ISAM™ Sequencing Batch Reactor process for the above referenced project. For the design flow of 81,000 GPD, we recommend two of our Model ISAM™ 50 packaged SBR systems.

Fluidyne's ISAM™ SBR is ideally suited to this type of small treatment facility. The ISAM™ process consists of a constant level anaerobic influent conditioning basin, followed by a SAM™ surge basin (influent equalization basin), and one or more SBR basins. In operation, all influent flow enters the anaerobic basin where influent solids are allowed to settle much like a primary clarifier. The influent flow then flows to the SAM™ surge basin (influent equalization basin). Mixed liquor is maintained in the SAM™ surge basin to immediately react with incoming raw sewage to suppress odors and initiate and accelerate carbon and nitrogen reactions. When the level in the surge basin reaches a predetermined level, the jet motive liquid/fill pump is started, and a batch is quickly fed to the reactor basin. When the SBR basin reaches top water level, mixed liquor overflows the proprietary flow and scum control system weir, and is returned to the SAM™ surge basin via the surge jet, and mixed with incoming wastewater in what is referred to as an "Interact" period. Aeration during the interact period is intermittent, and controlled by cycling the pump off and on to accomplish complete biodegradation of the wastewater in the SBR. In addition, during the interact phase, nitrates are recycled to the SAM™ tank for effective and rapid denitrification. Denitrification reactions are accelerated in the presence of the unreacted carbon from the raw sewage entering the SAM™ tank. Aeration and energy requirements are reduced as nitrates are fully reduced to nitrogen gas in the SAM™ tank.

The positive assurance of anoxic followed by aerobic microbial environments in the Fluidyne ISAM™ system conditions the mixed liquor, encouraging highly flocculent microorganisms with optimal settling, compaction, and dewatering characteristics. Since denitrification takes

place in the SAM™ tank the possibility of nitrogen gas bubbles attaching to and floating sludge during the settle cycle is eliminated.

A portion of the motive liquid is also recirculated to the anaerobic chamber. Biological solids settle as the recirculated flow passes through the anaerobic chamber. The recirculated aerobic mixed liquor also prevents the anaerobic chamber from entering the methane producing mode, and prevents the wide pH swings common to other anaerobic processes. The interact period continues until the liquid level in the surge basin rises to the control water level where the pump is stopped and a settle period is begun in the SBR. After the settle period, approximately 24% of the basin contents are decanted.

In addition to providing excellent treatment far exceeding the required standards, the system will also reduce the volume of waste sludge by approximately 80%, compared to a conventional SBR, **and eliminate the need for separate digesters**. Waste solids are stabilized in the anaerobic chamber, and the waste sludge concentration is over 3.5%. With the ISAM™ SBR we predict a total waste sludge volume of approximately 185 GPD of stabilized sludge. In practice, sludge production may be significantly lower; at the John Woods School in Ohio, sludge is wasted only once each school year.

Operating control is simplified: No influent valves are required as flow continually enters the SAM™ tank. Cycle times are reduced as mixed liquor is rapidly pumped from the SAM™ to the SBR tank at the appropriate time greatly reducing fill time.

For seasonal operation, the process is ideal; the interact period never ends until there is another full batch in the surge basin. That means that the system can go into an intermittently aerated holding mode for days, or weeks at a time. Many of our installations are at schools, and ski resorts where huge weekly and seasonal flow variations have no effect on treatment efficiency.

Our design uses our aspirating aerators to eliminate the need for blowers.

This proposal includes a complete ISAM™ SBR system, as described in the design calculations, including:

ISAM™ SBR Process Equipment

Two (2) Fluidyne Model ISAM™ 50 modular prepackaged sequencing batch reactor process system. Each flow train will consist of a three-chambered rectangular tank. The tank will consist of separate compartments for pre-treatment/sludge storage (trash trap tank), flow equalization (anoxic tank), and biological treatment (SBR tank). Each system will be shipped complete and ready for installation on a customer provided concrete pad.

Each ISAM™ 50 packaged plant will include:

Two (2) vertical submersible motive liquid/fill pumps (One is an on-line spare.). Each pump will provide motive liquid for a Model SAA7.5/2 aspirating aerator and be

furnished complete with discharge connection, retrieval assembly, guide bars, all accessories, and a 15 Hp submersible motor.

One (1) Fluidyne Model FED300 fixed solids excluding effluent decanter. Decanter will be rated for a maximum flow rate of 300 GPM.

All in-basin air and liquid piping is included.

One (1) Preprogrammed and prewired process control panel. The microprocessor based process control panel will be capable of controlling all of the normal operating requirements of the SBR system based on liquid level and time.

One (1) Float type level monitoring systems.

One (1) Lot of valves, including:

One (1) 4" electrically operated butterfly valve for the decant line.

One (1) 3" manual plug valve for WAS system.

Two (2) manual WAS control ball valves

One (1) SBR overflow weir/scum skimmer. The overflow weir will allow flow from the SBR compartment to flow back to the influent equalization tank during the interact cycle. The weir will also provide scum skimming of the SBR tank. The weir will also provide flow diffusion during periods of extremely high flow.

Supports. All necessary supports for the aeration system, in-basin air and liquid piping, backflush system, and decanter are included.

Hardware. All gaskets, flange hardware, and anchor bolts are included.

Six (6) days of startup and operator training. Provided in two (2) trips to the job site.

Budget price for two complete ISAM™ 50 SBR systems $315,300.00

Effluent equalization:

One (1) Model EQ24 Effluent equalization basin. The basin will be 24 ft. in length, and have a working volume of 10,622 gallons (1.70 batches), and be furnished complete with two (2) submersible filter feed pumps.

Budget price for Model EQ24 Effluent equalization basin. $35,000.00

Prices firm for . . . . . 30 days

Submittal drawings . . . . . 6 - 8 weeks

Shipment . . . . . 16 weeks after approval

FOB . . . . . Shipping points, freight allowed

It is our intention that this proposal includes one complete SBR process system. This proposal does not include:

Installation

Motor starters or related electrical controls except as described.

D.O. control system (optional)

Filter feed pumps

Out-of-basin piping

Sales or use taxes

I trust that the enclosed information will be sufficient for your needs at this time. If you have any questions, or need additional information, please do not hesitate to contact us. Thank you for considering Fluidyne.

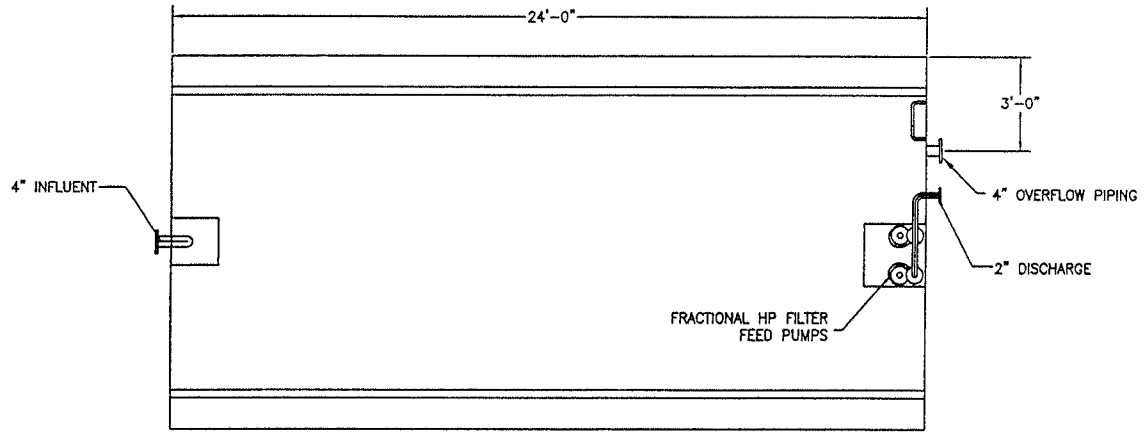
Very truly yours,

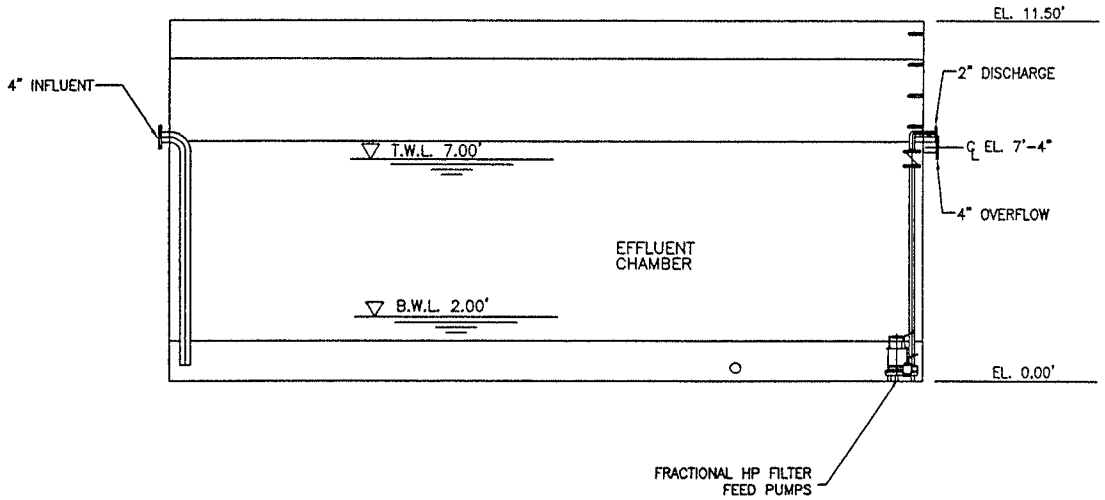
Fluidyne Corporation,

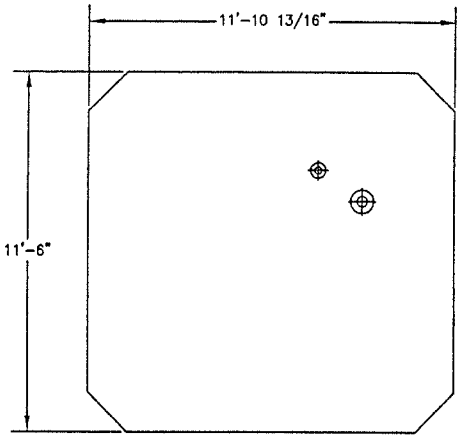
Glen R. Calltharp

cc: Mr. Erick Mandt
Fluidyne Corporation

Mr. Rob Kershner
Kershner Environmental Technologies





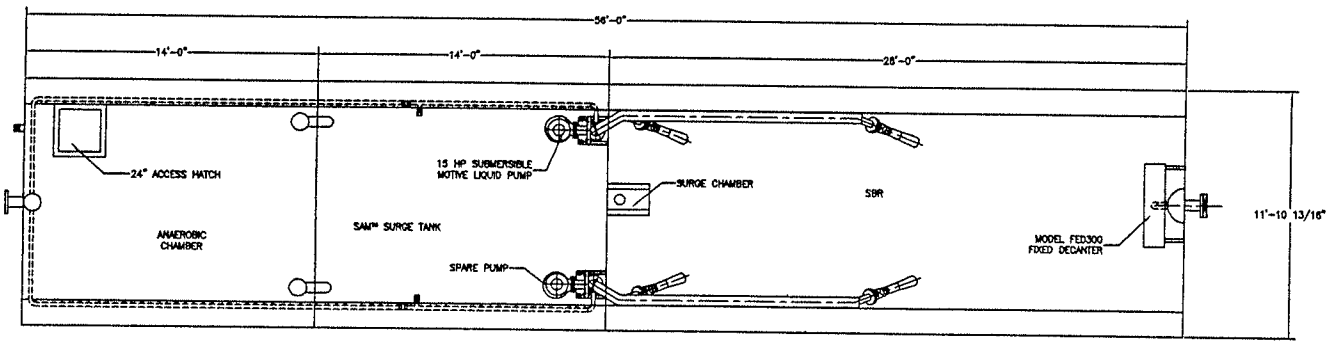


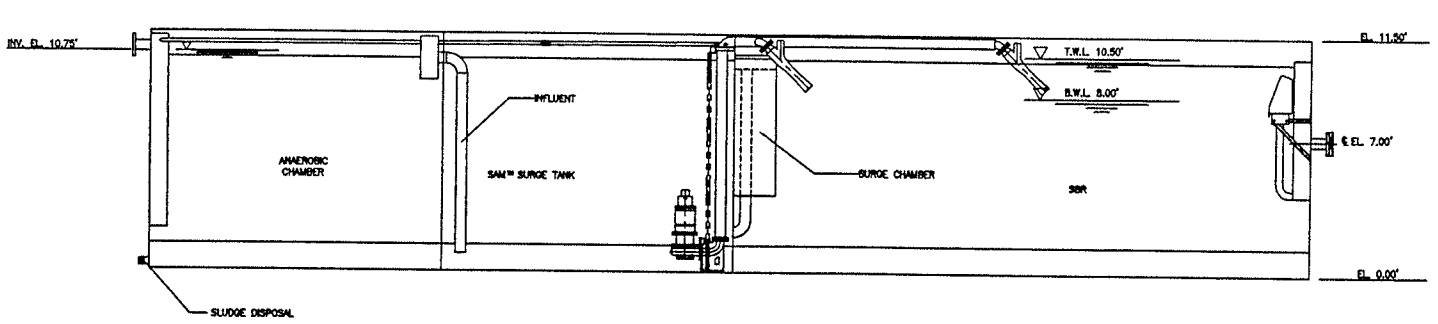
FLUIDYNE CORPORATION
2816 West First Street
Cedar Falls, Iowa 50613
Phone: (319) 266-9967
FAX: (319) 277-6034

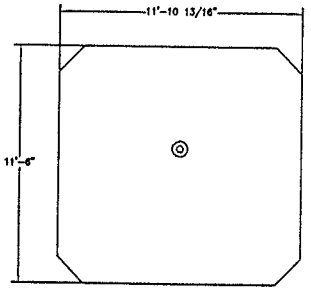
EFFLUENT EQUALIZATION BASIN

MODEL EQ24

DRAWN BY:	DWG NO.	REV
GRC	EQ-01	
DATE 09/01/04	SCALE 1/4" = 1'-0"	SHEET 1 OF 1







SIZE	DRAWN BY:	DWG NO.	REV
D	GRB	001	
SCALE		DATE	SHEET
NTS		9/27/99	1 OF 1

ISAM™ PACKAGED SBR
MODEL ISAM 50™

FLUIDYNE CORPORATION
2616 West First Street
Cedar Falls, Iowa 50613
Phone: (319) 266-9967
FAX: (319) 277-6034

Jim Havey

From: Glenn Quinn [glennq@amesinc.com]
Sent: Thursday, August 26, 2004 11:27 AM
To: jhavey@marengineering.net
Subject: FW: MAR Engineering Project; 08/25/04; Project Information

Non-mechanical Clarifier GR.zi...

-----Original Message-----
From: Jeff Holmes [mailto:jeff@schreiberwater.com]
Sent: Wednesday, August 25, 2004 5:08 PM
To: jhavey@marengineering.net
Cc: glennq@amesinc.com
Subject: MAR Engineering Project; 08/25/04; Project Information

Jim:

Budgetary pricing below per Glenn Quinn's request of yesterday. Please note that the dual train design would not contain mechanical clarifier equipment. I have included some reference drawings for the non-mechanical clarifier design. The single train design is the same size as College of Southern Maryland, so use those drawings for reference.

Also, Schreiber can provide equipment for an EQ basin, but we need detailed information as to what is required.

The current equipment sizing and pricing is as follows:

Single Train:

One (1) 42/20 ft diameter GR Aeration/Clarification Unit
including all necessary aeration assemblies, two (2) 7.5 hp

aeration blowers, a D.O. Process Control System, and all

necessary scraper assemblies, scum removal equipment,

effluent weirs, scum baffles and brackets??????????????????????$106,500.00
Concrete quantity estimate (not included in price)??216 CY

Estimated adder for freight of all equipment

to the jobsite??????????????????$4,100.00

Dual Train:

Two (2) 35/13 ft diameter GR Aeration/Clarification Units
including all necessary aeration assemblies, three (3) 5.0 hp

aeration blowers, a D.O. Process Control System, and effluent

weirs, scum baffles and brackets.??????????????????????$157,500.00
Concrete quantity estimate (not included in price)??330 CY

Estimated adder for freight of all equipment

to the jobsite??????????????????$4,100.00

The above pricing is our best estimate at this time. Due to current market conditions in the steel industry, which have led to price increases, the pricing is subject to change.

All pricing is in U.S. Dollars.

All above pricing includes supervision of installation, field services start-up, and training of personnel.

All above pricing does not include installation of equipment.

Budget pricing assumes standard materials of construction and electrical components.

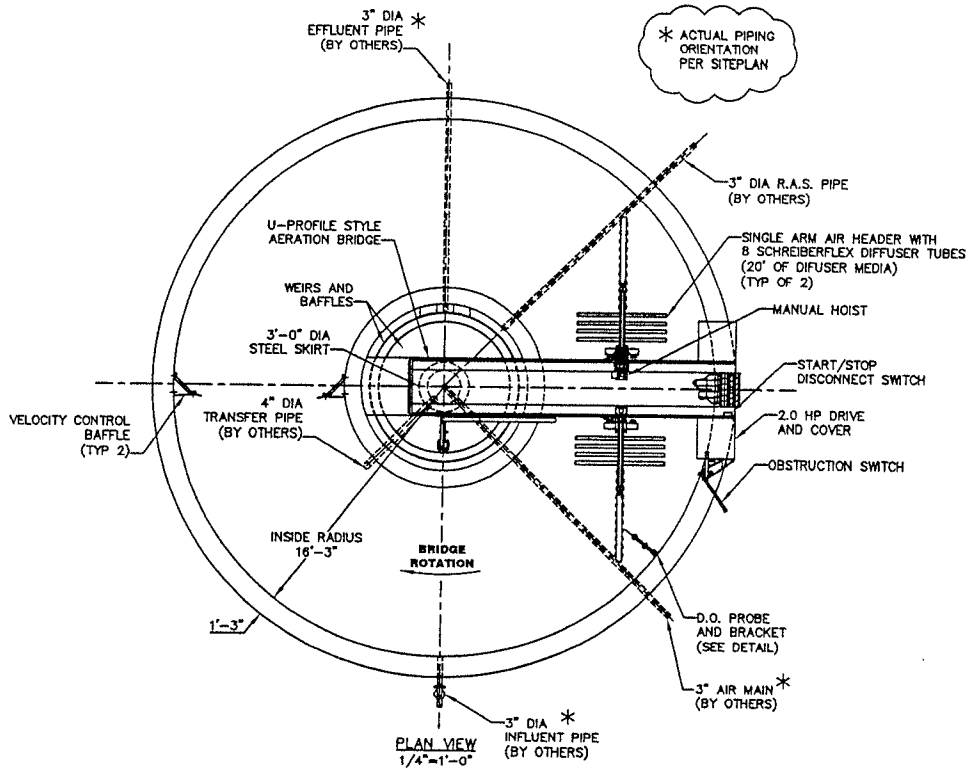
Should you have any questions, please do not hesitate to contact us.

Thanks,

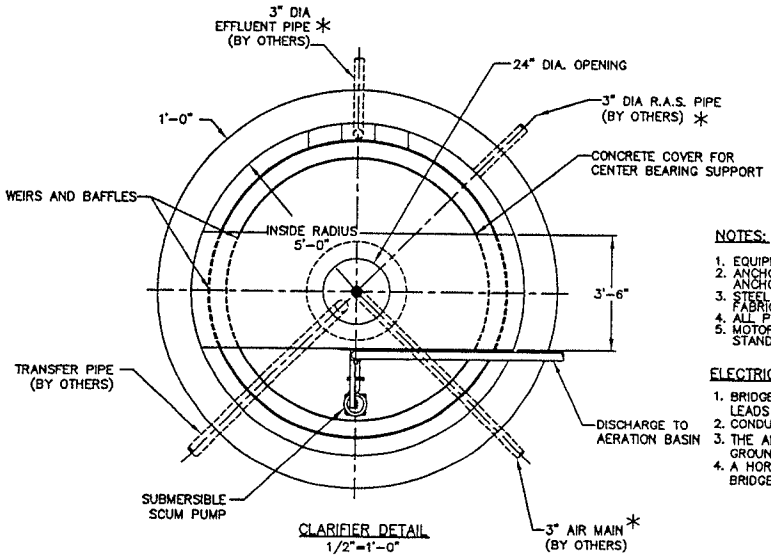
Jeff

Jeffrey A. Holmes
Technical Applications Engineer
Schreiber LLC

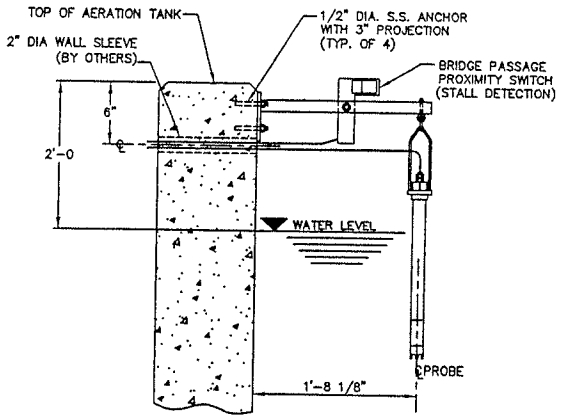
<<Non-mechanical Clarifier GR.zip>>
(See attached file: Non-mechanical Clarifier GR.zip)



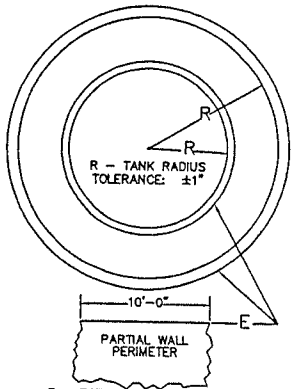
PLAN VIEW
1/4"=1'-0"



CLARIFIER DETAIL
1/2"=1'-0"



AERATION
D.O. PROBE BRACKET DETAIL
N.T.S.



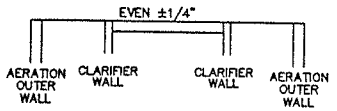
E - TOP-OF-WALL ELEVATION
TOLERANCES: ±1/2" ON TOTAL PERIMETER
±1/4" WITHIN 10' ON PERIMETER

NOTES:

1. EQUIPMENT ITEMS SHOWN SHALL BE FURNISHED BY SCHREIBER, UNLESS NOTED OTHERS (UNO).
2. ANCHORAGE FOR SCHREIBER EQUIPMENT SHALL BE FURNISHED AND SET AT TIME OF INSTALLATION. ANCHOAGE SHALL BE CHEMICAL BOND OR EXPANSION TYPE.
3. STEEL FABRICATED AND FURNISHED BY SCHREIBER SHALL BE HOT-DIP-GALVANIZED AFTER FABRICATION, UNO.
4. ALL PROCESS PIPING IS BY OTHERS, UNO.
5. MOTORS, GEARS, SWITCHES, VALVES, AND SIMILAR ITEMS SHALL BE PER THE MANUFACTURER'S STANDARD FINISHES.

ELECTRICAL NOTES:

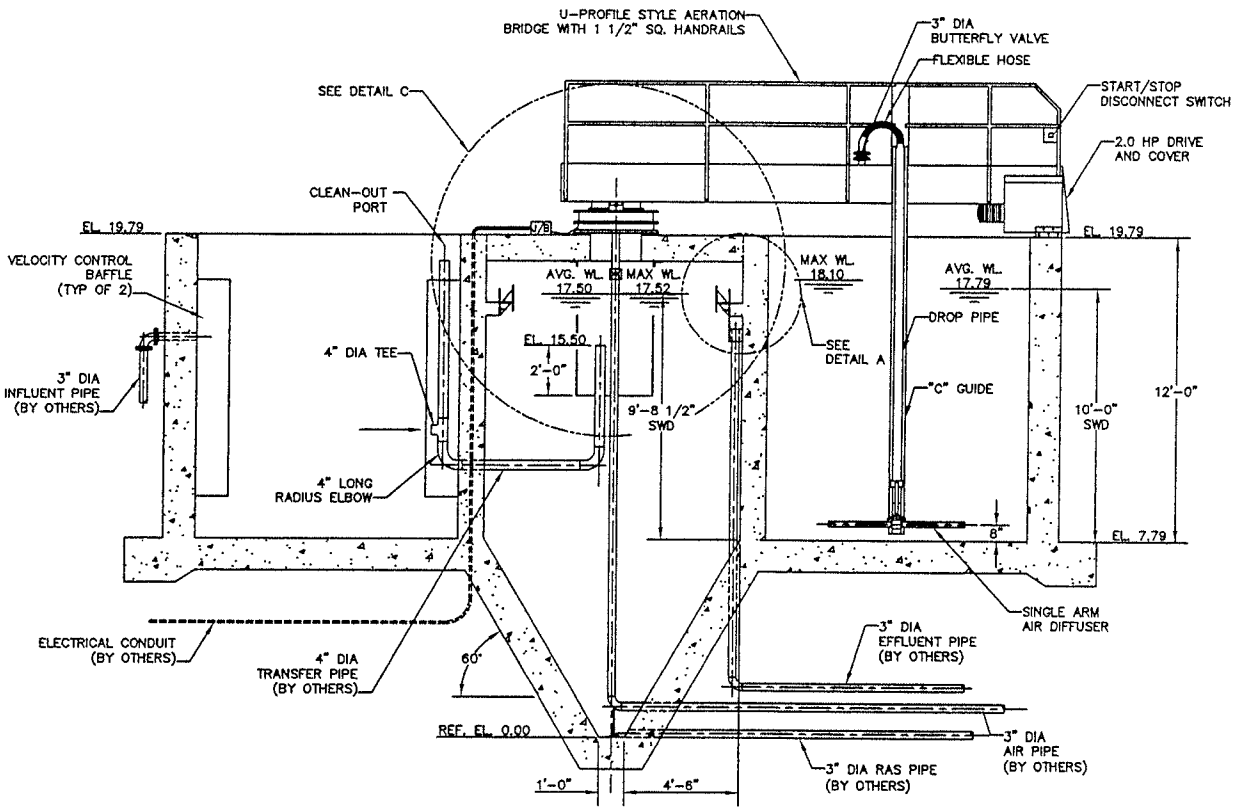
1. BRIDGE COMPONENTS ARE FACTORY PREWIRED, REQUIRING ONLY POINT-OF-SUPPLY CONNECTIONS. LEADS AND SEALTITE TO CONTRACTOR J-BOX MOUNTED ON CENTER PIER INCLUDED.
2. CONDUIT AND WIRING TO CENTER PIER, AND J-BOX ON CENTER PIER ARE BY OTHERS
3. THE AERATION BRIDGE ASSEMBLY INCLUDES SIX (6) CURRENT COLLECTOR RINGS AND ONE (1) COMMON GROUND IN THE CENTER BEARING TO SERVICE THE DRIVE MOTOR.
4. A HORSEPOWER RATED NEMA 4 DISCONNECT SWITCH IS MOUNTED ON THE ACCESS END OF THE BRIDGE TO SHUT OFF THE BRIDGE DRIVE.



CONSTRUCTION TOLERANCES

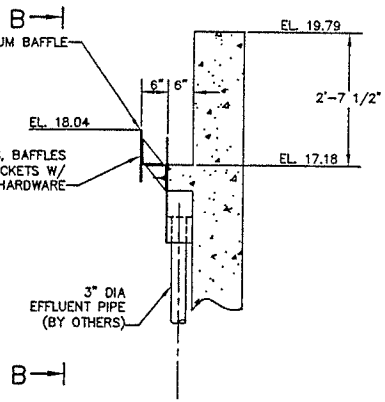
NOTE:

SITE ELEVATION UNKNOWN. REFERENCE ELEVATION 0.00 AT BOTTOM OF CLAIRIFIER BASIN.

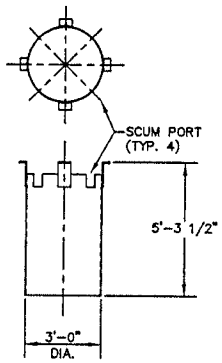


SECTION
3/8"=1'-0"

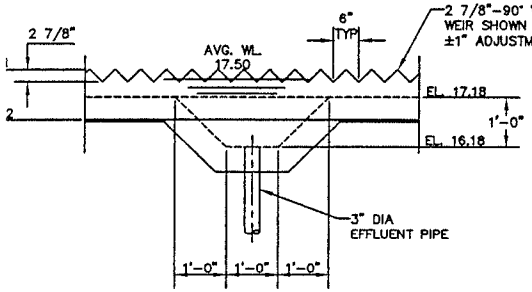
NOTE:
EFFLUENT LINE SHALL NOT BE SIZED SUCH THAT THE WATER LEVEL IN THE EFFLUENT DROP BOX SHALL NOT BE HIGHER THAN THE LAUNDER BOTTOM



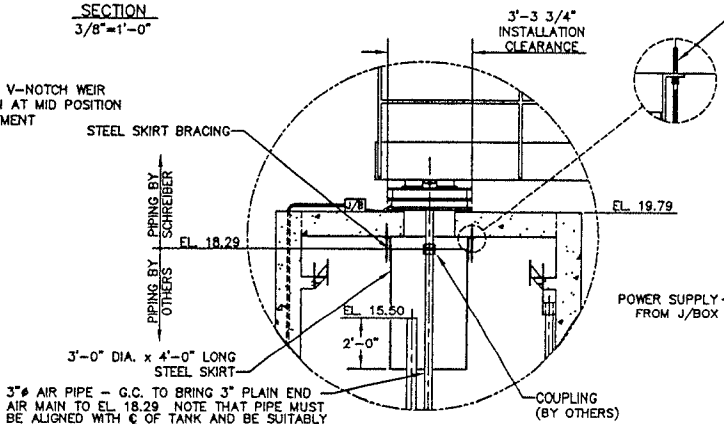
DETAIL A
3/4"=1'-0"



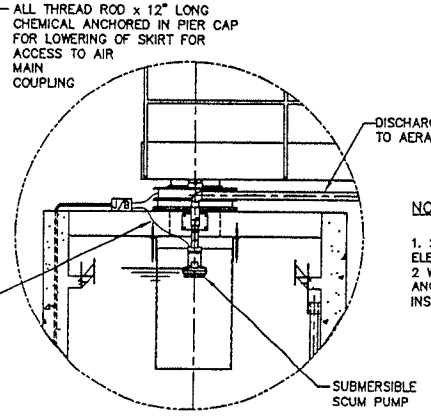
STILLING SKIRT DETAILS
3/8"=1'-0"



VIEW B-B
3/8"=1'-0"



DETAIL C
3/8"=1'-0"



VIEW @ SCUM PUMP
3/8"=1'-0"

NOTE:

1. SITE ELEVATION UNKNOWN REFERENCE ELEVATION 0.00 AT BOTTOM OF CLARIFIER HOPPER. 2 WEIRS AND BAFFLES MOUNTED WITH CHEMICAL ANCHORS. ANCHORS PROVIDED BY SCHREIBER INSTALLED BY OTHERS

LAKESIDE
Water Purification Since 1928

Bulletin #2315
Revised January 2002

LAKESIDE Complete Plant

Combines Screening and Grit Removal into One Unit

- Suitable for Municipal Wastewater and Septage Applications
- Screens, Compacts and Dewaters Solids that Pass through Other Units
- Removes and Dewaters Grit
- Available with Optional Grease Trap

LAKESIDE Complete Plant

The Complete Plant is the ideal way to screen inorganics and remove grit from municipal wastewater. The Complete Plant removes more solids than conventional units and removes grit as well. With more than 275 installations worldwide, the Complete Plant is accepted as a highly efficient preliminary treatment method.

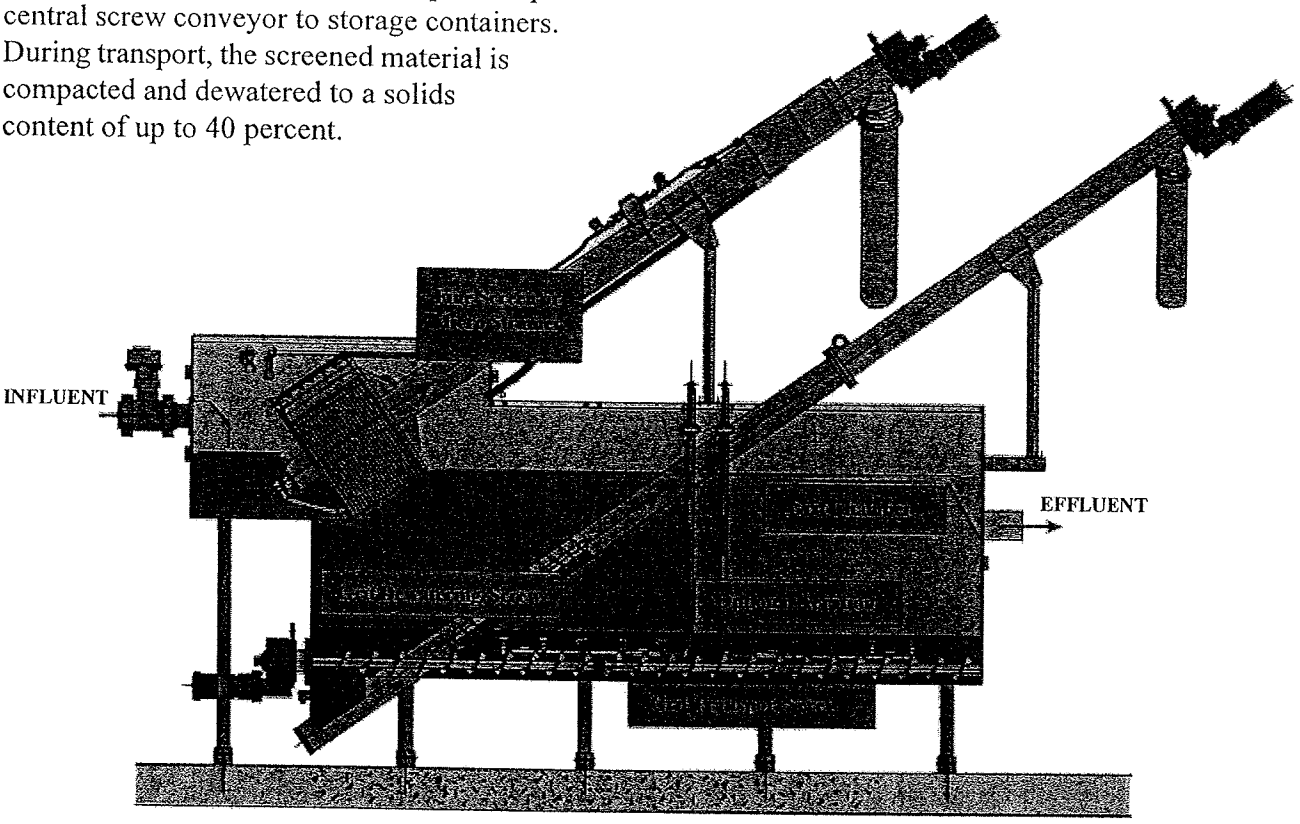
Design Features Screening and Grit Removal in One Unit

The Complete Plant is the only system that combines screening and grit removal into one self-contained unit. The fully automated unit is supplied in a pre-engineered stainless steel tank and equipped with a Lakeside Fine Screen or Micro Strainer plus grit dewatering and transport screws in the grit removal chamber. Designed for flow rates up to 4.0 mgd, the Complete Plant can be installed either above or below ground in its fabricated stainless steel tank.

Screening, Grit and Grease Collection for Efficient Preliminary Treatment

Screening

Wastewater flows into the plant's screening basket that retains solids without clogging. Screened material is removed from the screening basket and is spray washed to return organics to the waste flow. The screened material is then transported up the unit's central screw conveyor to storage containers. During transport, the screened material is compacted and dewatered to a solids content of up to 40 percent.

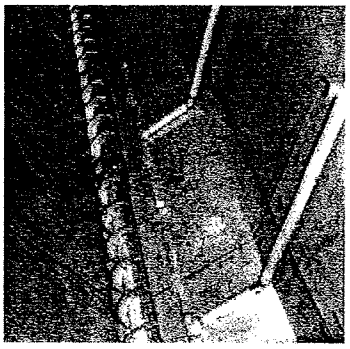


LAKESIDE Complete Plant Flow Diagram

Grit Collection

The wastewater that flows through the screening basket passes directly into a grit removal chamber. Grit removal is 90 percent of 65 mesh and larger material. Grit settles to the floor of the grit chamber and a grit transport screw moves the settled grit to a lateral sump. The transport screw moves the grit against the wastewater flow to create crosscurrents that help keep organics in suspension.

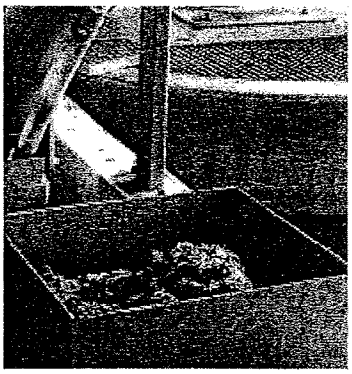
A grit dewatering screw transports the settled grit out of the lateral sump and dewaters the grit before it is discharged into storage containers. The grit can be disposed of with the inorganic solids collected by the Fine Screen or Micro Strainer, or the grit can be disposed of separately.



The grit chamber can be equipped with aeration to help keep organics in suspension (aeration shown on the right).

Aeration

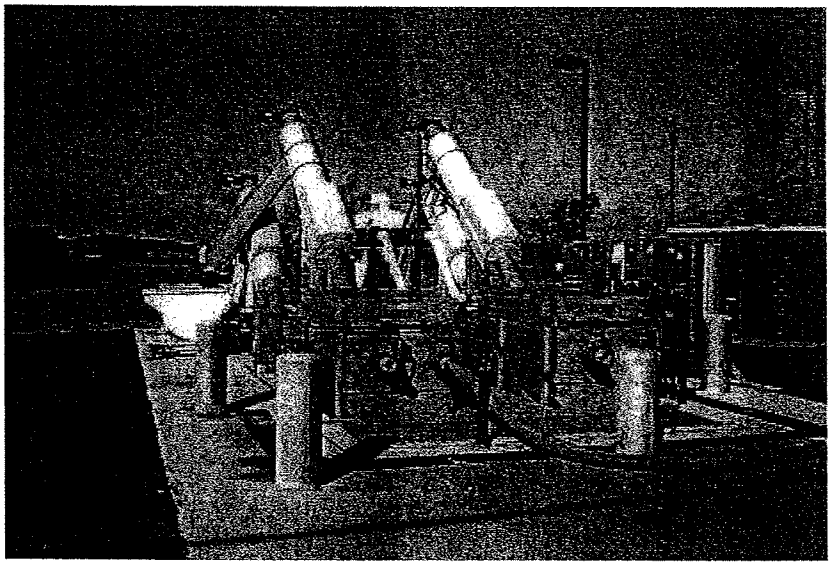
For treatment plants with wide variations in flow, the grit chamber can be equipped with aeration to help control circulation in the unit. The circulation keeps organics in suspension and allows grit to settle to the tank floor regardless of any variation in flow capacity.



Collected grit is dewatered before discharge into storage containers.

Grease Trap

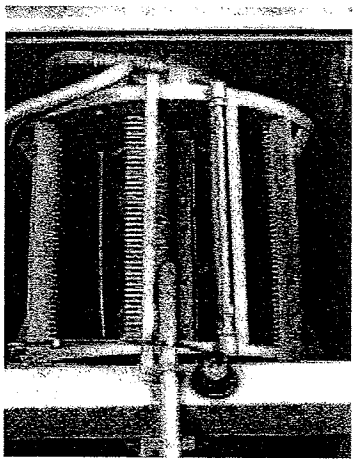
To improve the overall performance of the Complete Plant and to prevent equipment clogging, the grit chamber can also be equipped with an optional grease trap to remove excess grease. Grease can be removed manually or a motorized skimmer can be provided.



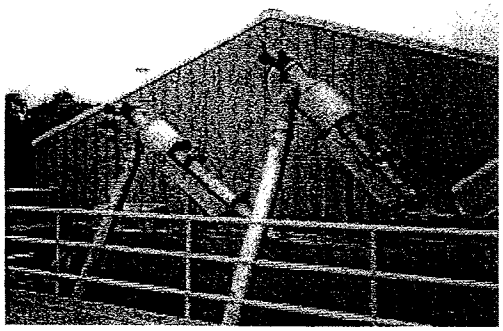
The Complete Plant can be designed with a hook-up for disposal of tankered septage.

Unique Design Features

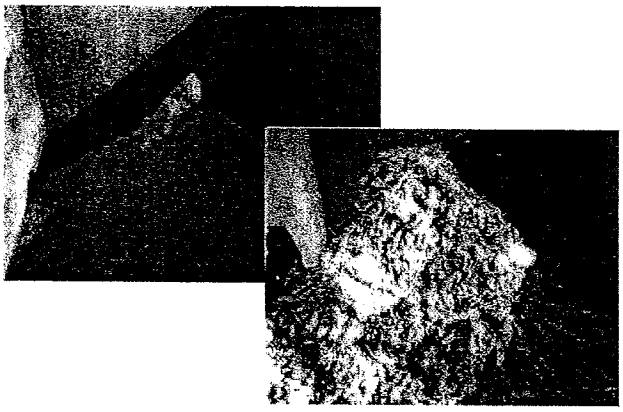
- Stainless steel construction resists corrosion and reduces wear, thereby increasing service life.
- Major components are assembled when shipped minimizing construction costs.
- An enclosed transport and optional bagging attachments reduce odors and ensure a clean work area.
- An optional insulation and heating system is available for cold weather operation.
- An optional grease trap for removal of excess grease improves performance and prevents equipment clogging.
- Simple design and operation minimize maintenance costs and extend the life of the unit.
- The single operational unit provides high removal efficiency and low head loss, increasing the treatment efficiency.



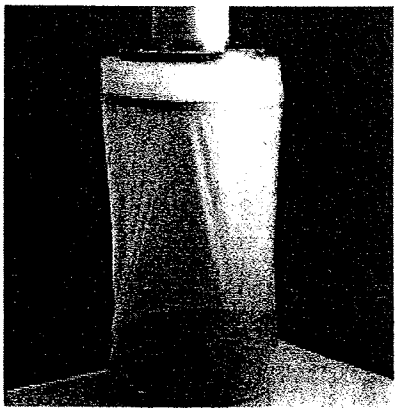
The unit is constructed of stainless steel for increased corrosion resistance.



An optional insulation and heating system is available for outdoor applications.



The Complete Plant compacts and dewaters materials to a solids content of up to 40 percent.



Optional bagging attachments reduce odors and offer a clean work area.

LAKESIDE
Water Purification Since 1928

Lakeside Equipment Corporation

1022 E. Devon • P.O. Box 8448 • Bartlett, IL 60103 • 630/837–5640 • FAX: 630/837–5647 • E-mail: sales@lakeside-equipment.com

LAKESIDE EQUIPMENT CORPORATION

1022 E. Devon Ave.! P.O. Box 8448 ! Bartlett, IL 60103
630/837-5640 ! Fax: 630/837-5647 ! E-Mail: sales@lakeside-equipment.com

RAPTOR® COMPLETE PLANT PARTIAL INSTALLATION LIST

PROJECT	LOCATION	EQUIPMENT	CONTACT
WESTPORT, WA 96-218 Start-up: 09/97	Westport WWT 100 West Bay Street Westport, WA 98595	1-16" dia. Micro Strainer in CP 0.20" bar spacing Model 16CPA-1.0 Raw wastewater screen	Mike Kitchell 360/268-0512
COHASSET, MA 99-130 Start-up: 03/01	Central Cohasset WWTP 43 Elm Street Cohasset, MA 02025	1-16" dia. Micro Strainer in CP 1.0" bar spacing Model 16CPA-1.0 Raw wastewater screen	Dick Nye 781/383-1519
TISBURY, MA 02-239 Start-up: 03/04	Tisbury WWTF 115 High Point Lane Tisbury, MA 02568	1-31" dia. Fine Screen in CP 1.0" bar spacing Model 31CPA-1.0 Raw wastewater screen	David Kahn, Chf. Opr. 508/696-4220
MARLTON, NJ 96-160 Start-up: 05/97	Woodstream STP Brandywine Drive Marlton, NJ 08053	1-40" dia. Fine Screen in CP 0.25" bar spacing Model 40CPAG-2.5 Raw wastewater screen	Rich Martin/Joe Rubins 856/983-2067

Note: The Complete Plant at Marlton, NJ is capable of a maximum capacity of 2.5mgd, but the unit has a grease collection system.

/dw
09/14/04

LAKESIDE EQUIPMENT CORPORATION
WATER PURIFICATION SINCE 1928
1022 E. DEVON AVE. ■ P.O. BOX 8448 ■ BARTLETT, IL 60103
PHONE: (630) 837-5640 ■ FAX: (630) 837-5647

07-Sep-04

Budget Price Quote

To: **Sherwood-Logan & Associates, Inc.**
2140 Renard Court
Annapolis, MD 21401

From: **Dan Widdel**

Attn: Bob Fairweather

Project: Unknown, Maryland

Lakeside Headworks Complete Plant (Model 16CPAG-0.5)

0.5 mgd Peak Flow
16MS-0.25 Micro Strainer
Grease Collection System with Skimmer

Unit Price: **$225,000**
Quantity: **1**
Total Package Cost: **$225,000**

Items Included In Pricing:

Headworks Complete Plant
Stainless steel tank
16MS stainless steel Micro Strainer (with 2 hp drive)
8-inch horizontal grit screw (with 1 hp drive)
8-inch grit dewatering screw (with 2 hp drive)
Air header with diffusers
Grease removal with mechanical skimmer
Screen and grit discharge chutes
Ultrasonic level sensor for screen
Anchor bolts (stainless steel)

Controls
Non-explosion proof design
NEMA 4X stainless steel main control panel
NEMA reversing starters
PLC – Allen Bradley Micrologix 1000
Fusible disconnect switch with door handle
Transformer
Overload control monitors
Selector switches
Indicator lights

FOB:	Chariton, Iowa	Approvals:	6 to 8 weeks
Warranty:	One (1) year	Shipment:	18 to 22 weeks
Start-up service:	2 days in 1 trip	Shipping weight per unit:	8,000 lbs

Full freight allowed to job site

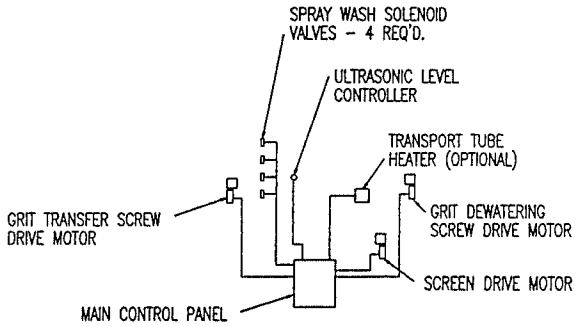
Items Not Included In Budget Pricing:
Erection of equipment
Piping and valves
Access stairway or platform
Electrical conduit and wiring
Spare parts or special tools
Grit Container

Optional Items:	**Unit Price:**
Bagger attachment (individual bagger design):	**$1,800 for screen & grit**
Blower package with 2.0 hp motor and fiberglass enclosure:	**$6,000**
Weather protection system (screen and grit transport tubes):	**$10,000 Non-explosion-proof design**
Explosion proof design:	**$5,000**

NOTE: Due to the current volatility of steel prices, budgetary cost of equipment may be subject to change.

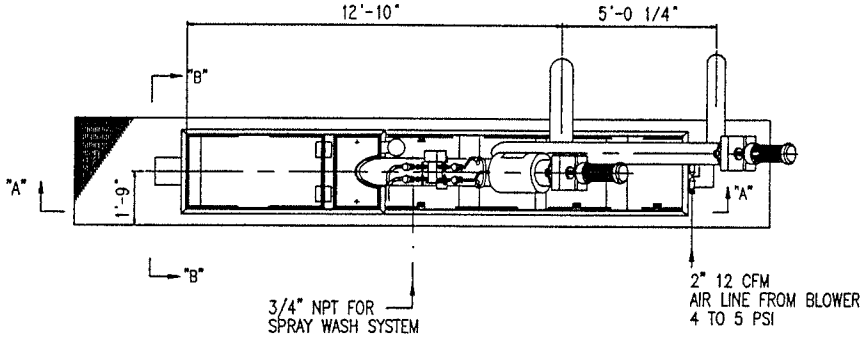
Dan Widdel (e-mail: dw@lakeside-equipment.com)

1:00p 3/18/103 DXF

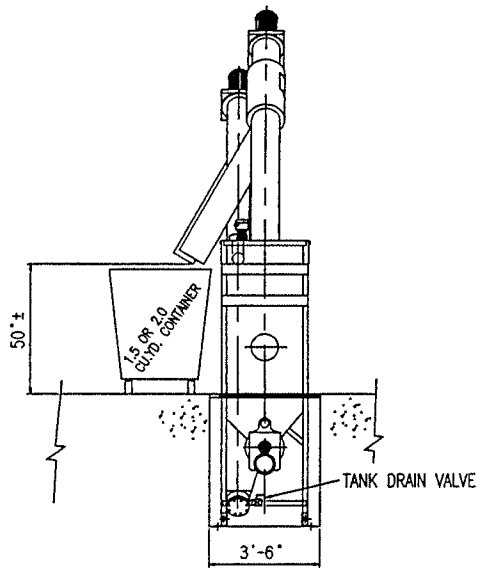


ELECTRICAL INTERCONNECTION DIAGRAM

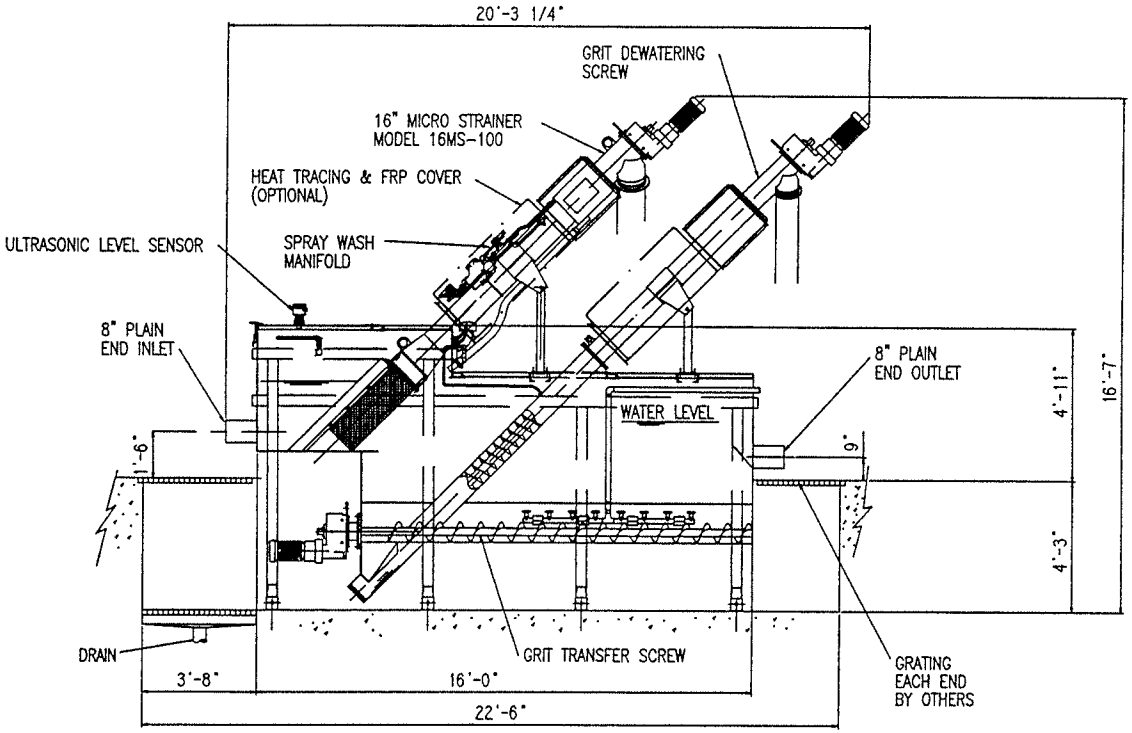
ALL CONDUIT AND WIRE CONNECTIONS BETWEEN CONTROL PANEL AND SCREEN COMPONENTS BY OTHERS.



PLAN



VIEW "B–B"



SECTION "A–A"

REVISIONS	DATE	BY	CHKD
REVISED	3-13-03	R.D.	
REVISED	3-27-96	RD	JS
REVISED	02-14-97	GS	JS

LAKESIDE EQUIPMENT CORPORATION

DR. SNYDER DATE 1-25-97
CHKD. RJS FILE NO. 250

MICRO STRAINER
COMPLETE PLANT MODEL 16CPA-0.5

DWG. NO. D-54735-S REV C

APPENDIX K

FEMA Coastal High Water Mark Survey, Nov. 19, 2003 (excerpt)

Hazard Mitigation Technical Assistance Program
Contract No. EMW-2000-CO-0247
Task Orders 276 and 279
Hurricane Isabel Rapid Response
Coastal High Water Mark (CHWM) Collection
FEMA-1492-DR-MD

Final Report

November 19, 2003

Submitted to:

Federal Emergency Management Agency

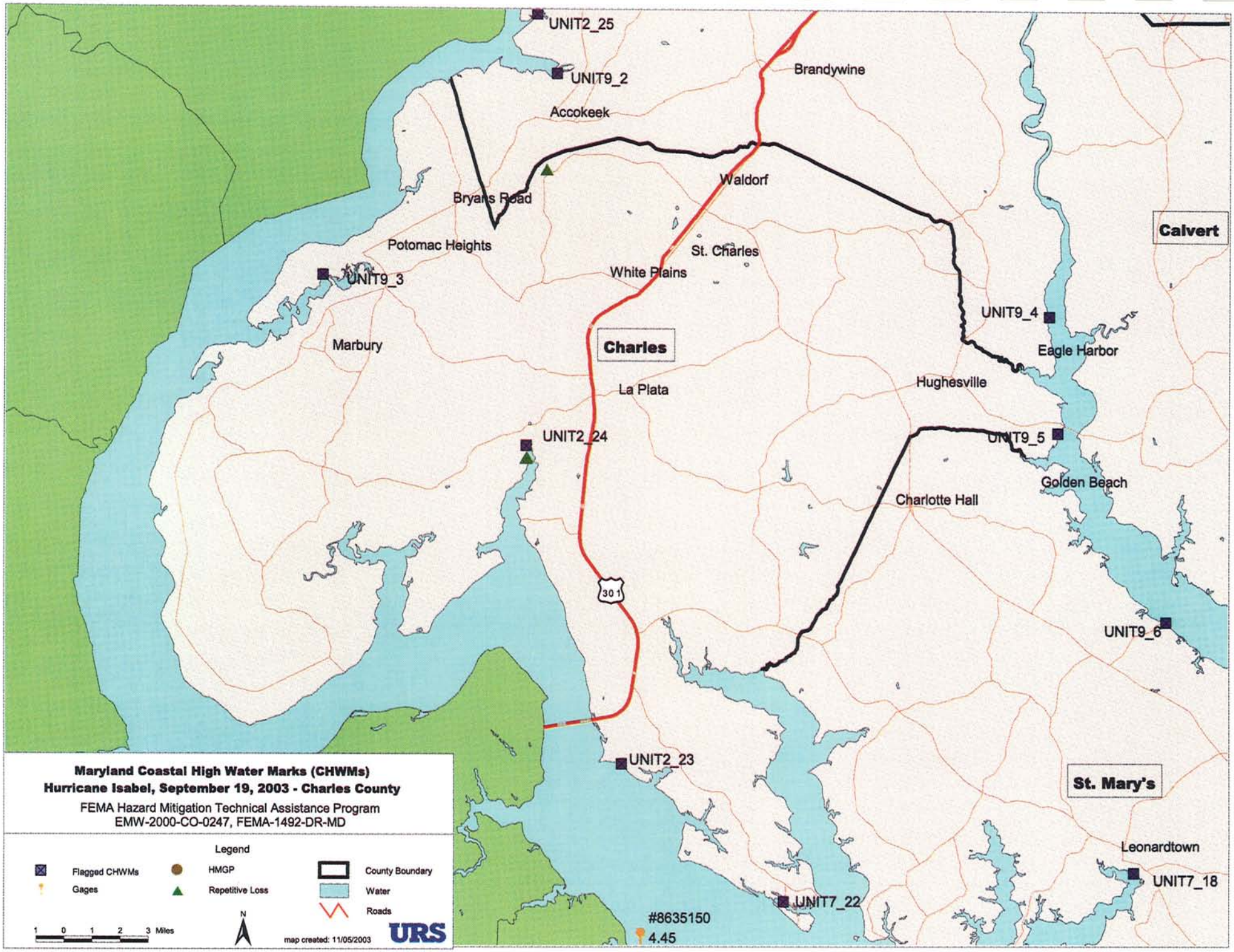
FEMA

Federal Emergency Management Agency
Region III
Philadelphia, PA

Prepared by:

URS

URS Group, Inc.
200 Orchard Ridge Drive
Suite 101
Gaithersburg, MD 20878


UNIT2_25
UNIT9_2
Brandywine
Accokeek
Waldorf
Bryans Road
Potomac Heights
St. Charles
White Plains
UNIT9_3
Calvert
UNIT9_4
Eagle Harbor
Marbury
Charles
La Plata
Hughesville
UNIT2_24
UNIT9_5
Golden Beach
Charlotte Hall
301
UNIT9_6
UNIT2_23
St. Mary's
Leonardtown
UNIT7_18
UNIT7_22
#8635150
4.45
Maryland Coastal High Water Marks (CHWMs)
Hurricane Isabel, September 19, 2003 - Charles County
FEMA Hazard Mitigation Technical Assistance Program
EMW-2000-CO-0247, FEMA-1492-DR-MD
Legend
Flagged CHWMs
Gages
HMGP
Repetitive Loss
County Boundary
Water
Roads
1 0 1 2 3 Miles
N
map created: 11/05/2003
URS

URS

PROJECT FEMA-1492-DR-MD High Water Mark Survey Project

COMM. NO. 240089

TYPE High Water Mark Survey **PREL.** 10/05/2003 **FINAL** 11/20/2003 **SHEET** E-5

CONTENTS Individual Historical High Water Mark Survey Report

Historical Mark:	UNIT9_5	**Mark Type:**	Coastal
Flood Event:	Hurricane Isabel	**Date of Flood:**	09/19/2003
Flooding Source:	Patuxent River	**Quality of Mark:**	Good
Flood Elevation:	**5.4 FT**	**Location:**	inside wall
Flooding Type:	Surge		

Mark Address: 7320 Benedict Ave (Tony's Riverhouse Restaurant)

Description of Mark: 21.75" above metal door frame

Type of Line: Mud/debris line

Description of Physical Structure: concrete building

Closest City: Benedict **County:** Charles **State:** Maryland

Flaggers: Ryan Carroll **Company/Agency:** Dewberry

Flagging Date: 10/6/2003

Surveyors: Weaver, Payabyab **Company/Agency:** Greenhorne & O'Mara, Inc.

Survey Date: 10/31/2003 **Survey Type:** N/A

Projection: Maryland **Vertical Datum:** NAVD 88 **Horizontal Datum:** NAD 83

Latitude: 38.5102 **Easting:** 1,406,762

Longitude: -76.6782 **Northing:** 307,300

Approx. First Floor Elevation (Based on Measurement from Mark): N/A

Approx. Distance to Shoreline: 120 FT

Comments:

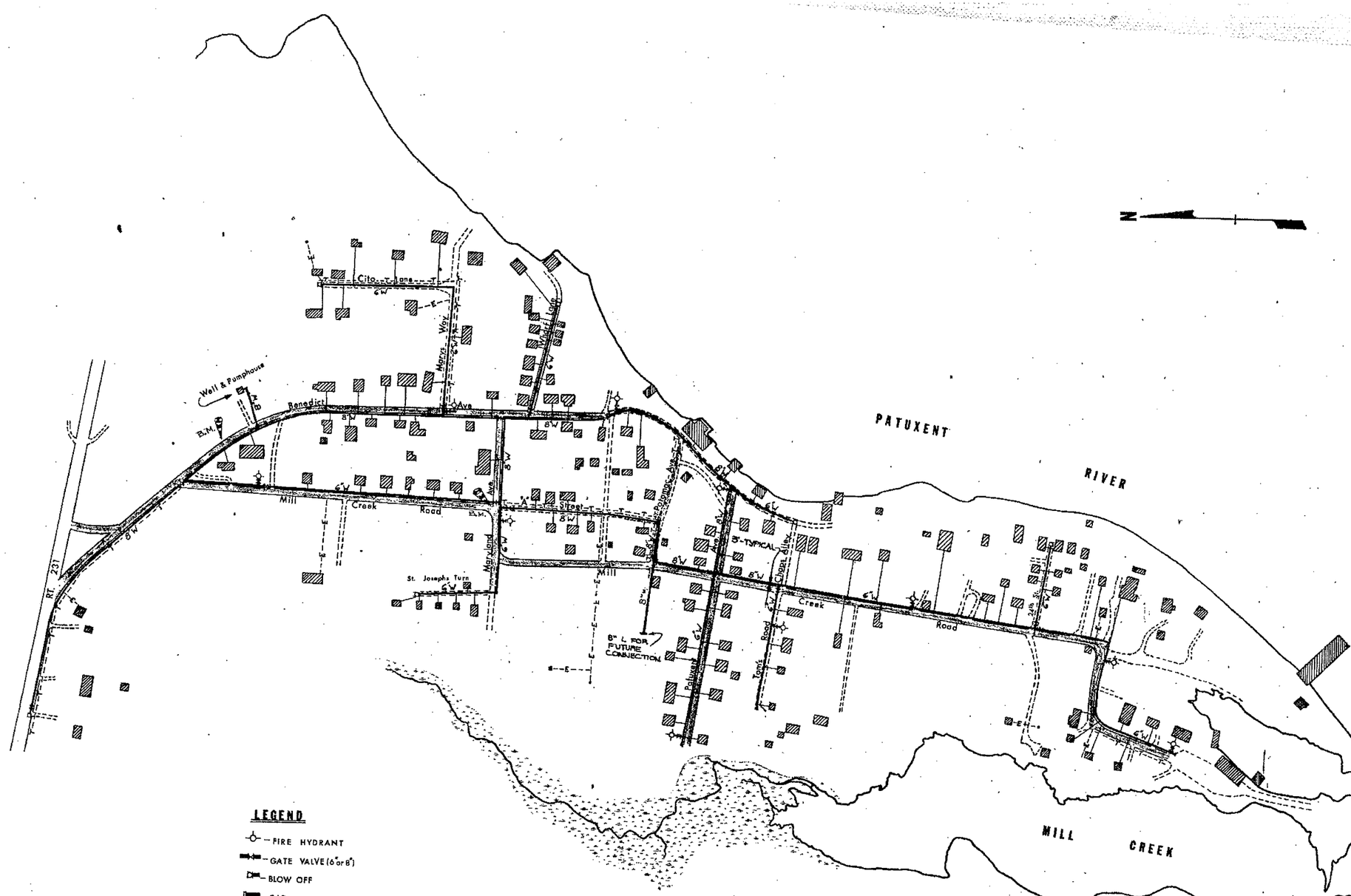
Other debris lines were evident in the building, most likely left behind while the surge was receding. Inside wall mark was transferred to glass door. SURVEYOR: construction/clean-up ongoing...proceed with caution.

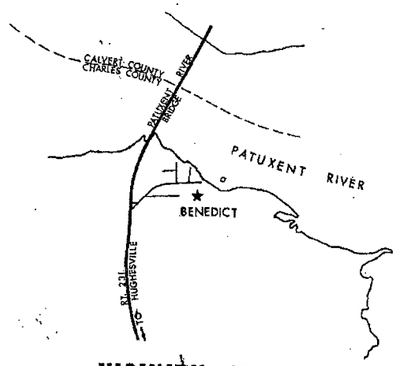
DSCN0074.jpg

Survey Certification: Coastal High Water Mark location survey is certified to 0.25 feet vertically and 10 feet horizontally with a 95% accuracy level.

APPENDIX L

Record Drawing of Benedict Water Distribution System





VICINITY MAP
NO SCALE

LEGEND

- FIRE HYDRANT
- GATE VALVE (6" or 8")
- BLOW OFF
- CAP
- DWELLING OR OTHER STRUCTURE
- W — WATER MAIN
- PAVED ROAD
- GRAVEL ROAD OR DETERIORATED PAVED ROAD
- E — BURIED ELECTRIC CABLE
- T — BURIED TELEPHONE CABLE

PLAN
BENEDICT WATER DISTRIBUTION SYSTEM
CHARLES CO., MARYLAND

NOTE
1) STREET NAMES ARE UNOFFICIAL AND ARE SHOWN FOR SHEET CORRELATION ONLY.
2) THE CONTRACTOR IS RESPONSIBLE FOR LOCATING ALL BURIED UTILITIES. CHECK WITH ALL UTILITY COMPANIES PRIOR TO BEGINNING CONSTRUCTION.
3) WATER MAIN WILL BE P.V.C. SDR 18 AND WILL HAVE A MINIMUM COVER OF 42" INCHES

NOTES CONCLUDED
4) BENCH MARK: P.K. NAIL IN LEANING GUM TREE 10'± OFF RD. ELEV. 104.12'
5) BENCH MARK: P.K. NAIL IN ℄ INTERSECTION OF MILL CREEK RD & MARYLAND AVE. ELEV. 100.02'
6) SOIL IS SANDY LOAM, SASSAFRAS SERIES.
7) 130 HOUSE SERVICES WILL BE LOCATED IN FIELD BY CONTRACTING OFFICER. SERVICES WILL TERMINATE 5' FROM THE EDGE OF ROAD AT CURB STOP

3

CHARLES COUNTY DEPARTMENT OF PUBLIC WORKS

DESIGNED	SCALE 1" = 200'	
DRAWN BY RV	DATE 11-28-80	
APPROVED		SHEET 1 OF 3