ENGINEERING REPORT

Capacity and Performance Evaluation
Marlboro Wastewater Treatment Facility

Marlboro Sewer Improvement Area
Town of Marlborough
Ulster County, New York

FINAL REPORT - MAY 2007

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I. BACKGROUND & SUMMARY OF RECENT OPERATING HISTORY

A. BACKGROUND

The establishment and construction of the Marlboro Sewer Improvement Area occurred in 1980-82. This project included the installation of a wastewater collection system throughout the Hamlet of Marlboro and the construction of a wastewater treatment facility on Dock Road. The project was funded largely (75%) by USEPA Clean Water Act funds, with the balance of funding coming from a Sewer Improvement Area(SIA) bond issue. In addition, a small portion of the treatment facility (12.5%) was funded by a state grant. Extensions were constructed in 1990-1992 for Jackson Avenue and a portion of Western Avenue. A later extension was constructed on Prospect Street. An extension was also granted for the Pine View Corners Development (Diorio Property) in 2004. This project is currently under construction.

The Marlboro Sewer Improvement Area includes approximately 316 residential users, 53 commercial users and 12 institutional users.

The Marlboro Sewer Improvement Area has a taxable assessment of $101,816,185. and a current tax rate of $0.611 per $1000. of assessed value and a use rate of $ 4.33 per 1000 gallons. The MSIA has a $120,000. balance in serial bonds due to be retired in 2010, and a bond anticipation note of $ 398,750 (retirement date to be verified).

In 1991, the sludge de-watering process at the plant was modified to include a plate and frame press.

The wastewater treatment facility includes an entrance channel, comminutor, oxidation ditch with dual rotors (27.5 inch diameter), and secondary clarifiers. Sludge is returned to the oxidation ditch by screw pumps and de-watered with a plate and frame press. A small operations building with a laboratory is included on the site.

Currently, there is no disinfection process at the facility, but a disinfection requirement is being added to the SDPES permit by NYSDEC and will be effective in 2009.

B. RECENT OPERATION HISTORY

The wastewater treatment facility was designed for an average daily flow of 175,000 gallons per day, and has a permit (SPDES Permit # NY0109720) to discharge to the Lattintown Creek, a tributary of the Hudson River. The facility utilizes the Oxidation Ditch process. Operating data for the years 2003-2005 was evaluated to determine wastewater characteristics. This data is summarized as follows:

Table 1- Flow and Influent Characteristics

Year	Total Daily Flow (MGD)	BOD Influent (mg/l)	SS Influent (mg/l)
2003	0.109	202	147
2004	0.114	277	193
2005	0.125	213	133
Average	**0.116**	**231**	**158**

Table 2 - Organic Loading and Effluent
(lbs/day)

Year	BOD removal (%)	Influent BOD loading- actual	Influent BOD loading- design capacity	Effluent BOD loading- actual	Effluent BOD loading- allowed
2003	97.44%	183.6	302	4.7	43
2004	98.46%	262.0	302	4.1	43
2005	97.92%	221.4	302	4.6	43
Average		**222.3**		**4.5**	

Table 3 - Suspended Solids Loading and Effluent
(lbs/day)

Year	SS Removal (%)	Influent SS loading- actual	Influent SS loading- design capacity	Effluent SS loading- actual	Effluent SS loading- allowed
2003	93.6	133.6	355	8.5	43
2004	95.1	183.5	355	9.0	43
2005	94.0	191.0	355	11.5	43
Average		**169.4**		**9.7**	

C. ANALYSIS OF OPERATING DATA

In evaluating available plant hydraulic capacity, it is best to utilize a conservative approach. For example, any month in which the flow exceeds 175,000 gallons per day would constitute a violation of the SPDES permit. Therefore, the highest six months of each year are considered and used as a base flow for the calculation of available hydraulic capacity.

Table 4- Highest Six Months Flow Average

Year	Highest Six Months Flow (average-gpd)
2003	136,000
2004	128,500
2005	145,670
Average	**136,720**

The calculated remaining hydraulic capacity is derived as follows:

SPDES Permit and Design Flow: 175,000 gallons per day
Less Highest Flow Periods of 2003-2005: -136,720 gallons per day
Remaining Capacity (175,000 - 136,720) = 38,280 gallons per day

With respect to organic loading, and capacity, the average influent values over the past three years are utilized and factored by the highest flow periods (above) to derive a conservative mass loading of BOD5 and Suspended Solids.

Existing Suspended Solids Concentration (2003-2005): 158 mg/l
Existing BOD_5 Concentration (2003-2005): 231 mg/l

Mass Loading Suspended Solids: .137 MGD x 8.34 x 158 = 180.5 lbs/day
Mass Loading BOD_5: .137 MGD x 8.34 x 231 = 264 lbs/day

Remaining Capacity Suspended Solids = Design Capacity - Actual Loading
(conservative approach) = 355 lbs/day - 180.5 lbs/day
= 174.5 lbs/day

Remaining Capacity BOD_5 = Design Capacity - Actual Loading
(conservative approach) = 302 lbs/day - 264 lbs/day
= 38 lbs/day

With respect to current treatment removal efficiencies, a three year performance summary is as follows:

Year	BOD removal	SS Removal
2003	97.44%	93.62%
2004	98.46%	95.06%
2005	97.92%	94.00%
Average	**97.94%**	**94.23%**

II. FUTURE GROWTH AND FLOW PROJECTIONS

The present flow and organic loadings are contributed from properties in the Hamlet of Marlboro Sewer Improvement Area, including extensions on Jackson Avenue, Western Avenue and Prospect Street, which were installed in 1990-1992.

Future flows will be generated from two sources:

1. Vacant lands from within the SIA which become developed.
2. Lands outside of the SIA which request service.
3. Other lands outside of the SIA which may logically request service in the future.

The Town Board has received numerous requests for sewer service on lands adjacent to or near the Sewer Improvement Area (SIA).

In order to assess *potential* future flows and loadings at the facility, projections are being made in this report. It is important to emphasize that these are potential future flows and that sewer district extensions or municipal agreements for sewer service are made by the Town Board after evaluation of numerous factors, including: environmental impacts, financial impacts, and other community impacts.

Table 5 - Approved Projects in Marlboro (not yet built or occupied)

Project	Location	No. Units	Bedrooms	Flow (gpd)	BOD_5 (lbs/day)	SS (lbs/day)
NNA Development	**Dragotta Rd**	**4**	**16**	**2,160**	**4.14**	**4.14**
Pine View Corners	**Highland Ave**	**36**	**72**	**8,640**	**16.56**	**16.56**
Prime Development	**Orchard St**	**8**	**24**	**2,880**	**5.52**	**5.52**
Prospect St Development	**Prospect St**	**4**	**12**	**1,440**	**2.76**	**2.76**
TOTAL		**52**	**124**	**15,120**	**29**	**29**

1. Hydraulic loading based on 120 gpd/bedroom as per NYSDEC Hydraulic Loading rate guidelines
2. Biological loading based on 230 mg/l BOD and Suspended Solids

In addition to the above, the Town estimates that there is potential for approximately 53 homes and 2 businesses to be located on vacant lands within the Marlboro Sewer Improvement Area. This would equate to the following flows and loadings:

Table 6 - Projection of Flows from Vacant Lands within the Marlboro SIA

Vacant Land	Lots	Bedrooms	Flow	BOD5	SS
Residential	53	159	19,080	36.6	36.6
Business	2	n.a.	3,000	6	6
Total			**22,080**	**42.6**	**42.6**

Table 7- Pending Request and Projects Outside of the Marlboro SIA

Project	Location	No. Units	Bedrooms	Flow (gpd)	BOD_5 (lbs/day)	SS (lbs/day)
Bayside (1)	**9W/Purdy Ave**	**99**	**198 (2)**	**23,760 (2)**	**45.6**	**45.6**
Ginsberg	**Dock Rd**	**137**	**411**	**49,320**	**94.7**	**94.7**
NNA Development	**Grand St**	**44**	**92**	**15,840**	**30.4**	**30.4**
Stoutridge Winery (3)	**Prospect St**			**2,100**	**4**	**4**
TOTAL		**280**	**701**	**91,020**	**174.7**	**174.7**

(1) A small portion of the Bayside project/property is situated in the boundary of the Marlboro SIA
(2) Bayside request may rise to 297 bedrooms and 35,640 gpd.
(3) Stoutridge Winery request has been deferred. It is our understanding that an on-site system is being installed.

Table 8 - Future Flow Projections and Organic Loadings

Area	Existing Flow (gpd)	Future Flow 2026 (gpd)	Existing BOD loading (lbs/day)	Future BOD loading (lbs/day)
Marlboro Sewer Improvement Area (1)	**136,720**	**173,920**	**264**	**335.6**
Table 7 Extensions - Proposed (2)	**0**	**91,020**	**0**	**174.7**
Other Potential Extensions (3)	**0**			
Total		**264,940**	**264**	**510.3**

(1) Existing Six Month Highest Flow Average + Table 5 + Table 6
(2) Requests for Extension and Pending Projects
(3) Possible Future Extensions West (Marlboro High School) and North (9W Corridor) are not included at this time

III. WASTEWATER FLOWS AND CHARACTERISTICS

A. HYDRAULIC LOADINGS

1. DESIGN AVERAGE FLOW (DAF)

Projected Marlboro SIA (2026):

	Existing	**Proposed**
Marlboro SIA:	136,700	173,920
Pending Extensions:	0	91,020
Total	136,700	264,940

DAF = 265,000 G.P.D. (184 GPM)

2. DESIGN PEAK HOURLY FLOW (DPHF)

Using the DAF of 265,000 GPD, along with a 100 gallons per capita per day value for new collection systems (GLUMRB, Page 10-4), the resultant population equivalent is 2650 persons. Using Figure 1 (GLUMRB, Page 10-5), the desired ratio of design peak hourly flow to design average flow is 3.5. Accordingly, the Design Peak Hourly Flow (DPHF) is 927,500 GPD (265,000 GPD x 3.5).

DPHF = 927,500 G.P.D. (644 GPM)

B. ORGANIC LOADINGS

1. DESIGN ORGANIC LOADING

The design organic loading is provided in Table 8, as a total of existing and proposed loading.

Design Organic Loading = 510.3 #/day BOD_5

2. DESIGN AVERAGE BOD_5

Using the DAF and the Design Organic Loading values from above, the Design Average BOD_5 is calculated at 231 mg/l (510.3 #/day / 8.34 / .265 MGD)

Design Average BOD_5 = 231 mg/l

C. SOLIDS LOADINGS

1. DESIGN SOLIDS LOADING

The design solids loading is provided in Tables 5 through 7 , and is a total of existing and potential solids loading.

Design Solids Loading = 426.8 #/day Solids

2. DESIGN AVERAGE SUSPENDED SOLIDS

Using the DAF and the Design Solids Loading values from above, the Design Average Suspended Solids was calculated at 193 mg/l (426.8 #/day / 8.34 / .265 MGD).

Design Average Suspended Solids = 193 mg/l

IV. MAJOR PLANT PROCESS ASSESSMENTS

In this section, the theoretical treatment capacity of each major component will be determined. A brief discussion comparing the calculated capacity and the design values then follows.

Generally, the existing WWTP consists of: influent channel/bar screen(manual) & comminutor, 175,000 gallon oxidation ditch with dual rotor aeration, two(2) secondary clarifiers -17 ft diameter each with 12 ft SWD, , two (2) sludge recirculation pumps-screw type, cascade aeration device, and sludge dewatering facilities.

A. OXIDATION DITCH (EXTENDED AERATION PROCESS)

The WWTP is equipped with extended aeration facilities of the oxidation ditch type, whose function it is to reduce the organic content of the wastewater via microbiological activity to meet effluent BOD_5 limits.

Total volume under aeration is 175,000 gallons or 23,400 cubic feet. Side water depth of the ditch is 6 feet, and there are two large rotor aerators, each inches in diameter.

1. ORGANIC LOADING BASIS

   A. Existing Organic Loading

      From Section I.C, the existing organic loading of the facility is 264 lbs BOD/day.

   B. Proposed Organic Loading
      From Table 8, the projected total design year loading of the facility is 510.3 lbs BOD/day.

   C. Allowed Organic Loading

      Extended aeration basins are allowed to be loaded up to 15 #/day BOD_5 per 1000 cubic feet under aeration at average BOD_5 loading (GLUMRB, Page 90-7).

      Allowed Organic Loading =15#/day x 23,400 cu ft/1000 cu ft
      = 351 # BOD/day

D. Discussion

The allowed organic loading of the aeration basin is 351 #BOD/day. The proposed organic loading of the aeration basin 510.3 lbs BOD/day. **Additional aeration volume will be required once the loading increases from its present value of 264 #BOD/day to 351 #BOD/day.**

2. FOOD / MASS (F / M) RATIO

A. Existing F/M Ratio

At the existing loading of 264 # BOD/day and with the design Mixed Liquor Suspended Solids (MLSS) at 4,000 mg/l (3,000 - 5,000 mg/l as required by GLUMRB, Page 90-7), and further assuming the ratio of Mixed Liquor Volatile Suspended Solids (MLVSS) to MLSS is 0.8 (Metcalf & Eddy, Page 480), the MLVSS will approximate 3,200 mg/l (4,000 mg/l x 0.8).

The existing MLVSS, therefore, is about 3,656 #/day [(0.137 MGD) x (3,200 mg/l) x (8.34)].

The resultant F / M Ratio, therefore, is about **0.07 # BOD_5 per day per # MLVSS** [(264 #/day) / (3,656 #/day)].

B. Proposed F / M Ratio

From Section III.A.1. above, the proposed DAF is 265,000 GPD, and from Table 7, the proposed design organic loading is 510.3 #/day BOD_5.

Establishing the design Mixed Liquor Suspended Solids (MLSS) at 4,000 mg/l (3,000 - 5,000 mg/l as required by GLUMRB, Page 90-7), and further assuming the ratio of Mixed Liquor Volatile Suspended Solids (MLVSS) to MLSS is 0.8 (Metcalf & Eddy, Page 480), the MLVSS will approximate 3,200 mg/l (4,000 mg/l x 0.8).

The proposed MLVSS, therefore, is about 7,072 #/day [(.265 MGD) x (3,200 mg/l) x (8.34)].

The resultant proposed F / M Ratio, therefore, is about **0.07 # BOD_5 per day per # MLVSS** [(510.3 #/day) / (7072 #/day)].

C. Allowed F / M Ratio

For extended aeration, GLUMRB specifies the permissible F / M

Ratio at 0.05 - 0.10 # BOD_5 per day per # MLVSS (Page 90-7).

D. Discussion

Since the proposed F / M Ratio range compares favorably with the recommended F / M Ratio range, the proposed design MLSS of 4,000 mg/l is considered satisfactory for the proposed application.

B. FINAL CLARIFICATION

The WWTP is currently equipped with two-final settling tanks (clarifiers) whose function is to provide adequate quiescent storage capacity to promote separation of settleable solids from the liquid portion of the wastewater, and to provide thickening of the settled solids prior to digestion.

Each clarifier tank is 17' in diameter with a side-water depth (SWD) of 12'. The surface area of each tank is about 227 Square Feet (SF), and each clarifier has approximately 106 l.f. of weir length.

For final settling tanks, both the surface overflow rate and the solids loading rate are calculated to assure proper unit sizing.

1. SURFACE OVERFLOW RATE (SOR)

a. Existing SOR

The existing DPHF is .525 MGD (525,000 GPD).

Total final settling tank surface area is 454 SF (2 @ 227 SF).

The resultant proposed SOR at DPHF, therefore, is **1156 GPD/SF** (525,000 GPD / 454 SF).

b. Allowed SOR

For the extended aeration process, GLUMRB allows a final settling tank SOR at DPHF of up to 1,000 GPD/SF (Page 70-3).
Therefore, the final clarifiers are approximately 15% over GLUMRB standards at current loading levels. This is due to a change in design standards which has occurred.

c. Proposed SOR

To meet GLUMRB Standards for the proposed DPHF of 927,500 G.P.D., a SOR of 1000 G.P.D./SF is required.

Req'd Surface Area = 927,500 G.P.D./1000 G.P.D./SF=927.5 Sq. Ft.

Existing Surface Area = 454 Sq. Ft.

Add'l Surface Area Req'd = 927.5 Sq. Ft. - 454 Sq. Ft. =473.5 Sq. Ft.

Circular Clarifier, 25 diameter =490 Sq. Ft.

d. Discussion
It is required that additional surface area be installed to meet both present and future conditions. A new circular clarifier, 25 ft diameter with 12 ft SWD will meet both future and present requirements.

2. PEAK SOLIDS LOADING RATE (PSLR)

a. Proposed PSLR

GLUMRB specifies that the PSLR shall be computed based on the DMDF plus the design maximum return sludge rate, and the design MLSS under aeration.

The proposed DMDF is .265 MGD (265,000 GPD), and from Section III.B.2.a above, the proposed design MLSS under aeration is 4,000 mg/l.

Assuming a design maximum return sludge rate of 100% (.265 MGD), the resultant total flow is .530 MGD.

Peak Solids, therefore, are computed at 17,680 # / day [(.530 MGD) x (4,000 mg/l) x (8.34)].

Total final settling tank surface proposed is 944 Sq. Ft.

Therefore, the proposed PSLR, is about **18# / day / SF** [(17,680 #/day) / (994 SF)].

b. Allowed PSLR

GLUMRB allows a final settling tank PSLR of up to 35 #/day/SF (Page 70-3).

c. Discussion

The proposed PSLR falls within established PSLR guidelines.

3. WEIR LOADING RATE (WLR)

a. Proposed WLR

From Section III.A.3 above, the proposed DPHF is .9275 MGD (927,500 GPD).

Total final settling tank weir length proposed (150 lf) and existing (212 lf) is 362 linear feet.The resultant proposed WLR at DPHF, therefore, is **2562 GPD/FT** (927,500 GPD /362 FT).

b. Allowed WLR

For final settling tanks with a plant capacity of less than 1 MGD, the allowed WLR at DPHF is 20,000 GPD/FT.(GLUMRB Page 70-4).

c. Discussion
The proposed WLR falls within established WLR guidelines.

C. EFFLUENT DISINFECTION

The WWTP is currently not equipped with effluent disinfection facilities. While the current SPDES Permit does not require effluent disinfection, the Town has been notified by NYSDEC that there will be a disinfection requirement effective in 2009.

Design and installation of an effluent disinfection system will be required independent of a plant expansion. The cost of this will be borne by the Marlboro Sewer Improvement Area and any extensions thereof. Alternatives are chlorination and ultra-violet disinfection.

D. SLUDGE DIGESTION / STORAGE

Currently , substantial Sludge Digestion is accomplished within the oxidation ditch. A separate, aerated sludge holding tank is needed to facilitate sludge wasting and complete digestion. Sludge cannot be effectively stored in the clarifiers without negatively impacting suspended solids removal, especially during peak flow events.

1. VOLUME (POPULATION EQUIVALENT BASIS)

a. Proposed Population Equivalent

From Section III.A.3 above, the proposed Population Equivalent is 2650.

b. Allowed Population Equivalent

GLUMRB requires a digester volume of 3.0 cubic feet (CF) per

Population Equivalent (GLUMRB, Page 80-10). An additional 25% is recommended where supernatant separation is performed in the tank.

An aerated sludge holding tank/decant tank is proposed as follows:

Volume Req'd = 3.0 cu. ft. x 2650 P.E. x 1.25 = 9940
Volume = l x w x h

Tank Dimensions: 20 ft wide x 42 ft length x 12 ft SWD
(To be split into two basins)
Tank Volume: 10,080 cu. ft.

c. Discussion
An aerated sludge holding tank is required to facilitate complete digestion and proper sludge storage prior to dewatering.

2. AIR REQUIREMENTS

a. Required Air Supply

GLUMRB specifies that the aerobic sludge digestion process shall be provided with at least 30 cubic feet of air per minute per 1,000 cubic feet of tank volume (GLUMRB, Page 80-11).

Using the digester volume of 10,080 CF, the resultant air requirement for the aerobic sludge digestion process is 302 cfm (30 cfm air / 1,000 CF x 10,080 CF).

b. Discussion

From above, the aerobic digester requires 302 cfm of air. Two blowers, each capable of supplying the required 302 cfm will be provided.

E. SLUDGE DEWATERING

Currently, the plate and frame press is operated on 5-6 cycles per week. At the design flow of 265,000 gallons per day (2026), it is anticipated that the plate and frame press would operate 10-12 cycles per week. While GLUMRB recommends two units for mechanical sludge dewatering, it is recommended that storage and duplicate spare parts be used to meet this goal. Additionally, drying beds are available for emergency use/storage.

F. SUMMARY OF IMPROVEMENTS and COST

It is recommended that the following improvements be made at the Marlboro WWTF to accommodate an expansion to 265,000 gallons per day and to address other required improvements at the facility.

1. Installation of a 90,000 gallons per day EA Aerotor Plant to provide aeration and clarification of the additional sanitary flow anticipated over the next twenty years.

2. Modifications to the entrance channel to improve hydraulics and to accommodate the additional sanitary flow.

3. Installation of an aerated sludge holding tank to store and concentrate sludge prior to dewatering. This is both an operational enhancement and an expansion component. This improvement will also make it more efficient to deliver sludge from the Milton WWTF.

4. Installation of effluent disinfection, by chlorination or ultraviolet disinfection, to meet requirements recently imposed through the SPDES permit.

5. Site piping modifications to accommodate the expansion and to facilitate the sludge processing changes.

A preliminary opinion of probable cost is provided in Table 9 (below). An alternative to expand the facility by 100% (to a design flow of 355,000 gallons per day) is provided in Table 10.

Table 9 - Probable Cost of WWTF Improvements
Expansion to 265,000 GPD and Other Improvements

Item	Description	Total Cost
Add Combined Oxidation Ditch and Secondary Clarifier -Lakeside	90,000 GPD Treatment Unit 52 ft O.D. EA Aerator Process	$720,000
Add Aerated Sludge Holding Tank & Decant System	Utilize existing space in drying bed to meet GLUMRB requirements for 2 devices	$350,000
Entrance Channel Modifications & Additions		$140,000
Other Plant Improvements not related to Expansion		
Site Piping Modifications & Additions		$120,000
Splitter Box after Entrance Channel	2:1 Diversion of Influent	$40,000
Effluent Disinfection -allowance	Required by SPDES permit	$160,000
Electrical Construction		$220,000
Sub-Total		$1,750,000
Contingencies	10 % of above	$175,000
Total Construction		**$1,925,000**
Design Allowance	8% allowance	$154,000
Inspection Allowance	6.5 % allowance	$125,000
Legal & Administration Allowance	2% allowance	$38,500
Total Project Cost		**$2,242,500**
Portion Allocated to Expansion		*$1,695,730*
Portion Allocated to SIA		*$546,770*

Items Related to Existing SIA:
67% of Aerated Sludge Holding Tank & Decant ($234,500)
67% of Effluent Disinfection ($ 107,200)
25% of Electrical ($55,000)
25% of Site Piping Modifications ($30,000)
24.4 % of contingencies and all other costs

Table 10 - Probable Cost of WWTF Improvements
Expansion to 350,000 GPD and Other Improvements

Item	Description	Total Cost
Add Combined Oxidation Ditch and Secondary Clarifier -Lakeside	180,000 GPD Treatment Unit 52 ft O.D. EA Aerator Process	$1,000,000
Add Aerated Sludge Holding Tank & Decant System	Utilize existing space in drying bed to meet GLUMBR requirements for 2 devices	$470,000
Entrance Channel Modifications & Additions		$170,000
Other Plant Improvements not related to Expansion		
Site Piping Modifications & Additions		$160,000
Splitter Box after Entrance Channel	1:1 Diversion of Influent	$40,000
Effluent Disinfection -allowance	Required by SPDES permit	$220,000
Electrical Construction		$280,000
Sub-Total		$2,340,000
Contingencies	10 % of above	$234,000
Total Construction		**$2,574,000**
Design Allowance	8% allowance	$205,920
Inspection Allowance	6.5 % allowance	$165,000
Legal & Administration Allowance	2% allowance	$51,480
Total Project Cost		**$2,996,400**
Portion Allocated to Expansion		*$2,410,120*
Portion Allocated to SIA		*$586,280*

Items Related to Existing SIA:
50% of Aerated Sludge Holding Tank & Decant ($235,000)
50% of Effluent Disinfection ($ 110,000)
25% of Electrical ($70,000)
25% of Site Piping Modifications ($40,000)
20% of all other costs

V. SUMMARY AND RECOMMENDATIONS

1. The establishment and construction of the Marlboro Sewer Improvement Area occurred in 1980-82. This project included the installation of a wastewater collection system throughout the Hamlet of Marlboro and the construction of a wastewater treatment facility on Dock Road.

2. The Marlboro Sewer Improvement Area includes approximately 316 residential users, 53 commercial users and 12 institutional users. The Marlboro Sewer Improvement Area has a taxable assessment of $101,816,185. and a current tax rate of $0.611 per $1000 of assessed value and a use rate of $ 4.33 per 1000 gallons. The Hamlet of Marlboro SIA has a $120,000. balance in serial bonds due to be retired in 2010, and a bond anticipation note of $ 398,750 (retirement date to be verified).

3. A review of Marlboro Wastewater Treatment Facility (WWTF) loadings and performance for the years 2003-2005 indicate excellent treatment efficiencies, averaging 97.94% BOD removal and 94.23% Suspended Solids removal. The average daily flow at the WWTF is 116,000 gallons per day.

4. A conservation analysis of plant flows and loadings was performed to determine safe additional capacity. This yielded a safe additional flow capacity of 38,280 gallons per day, a safe BOD capacity of 38 lbs/day and a safe suspended solids capacity of 174.5 lbs/day.

5. A review of future growth and flow projections, both inside and outside of the Marlboro Sewer Improvement Area (SIA) was conducted. This included a review of: approved projects, vacant land with the SIA, and pending requests/projects outside of the SIA. The result of this review is the following:

- An estimated 15,120 gallons per day capacity requirement for approved projects

- An estimated 22,080 gallons per day capacity requirement for vacant lands in the SIA

- An estimated 91,020 gallons per day capacity requirement for pending requests/projects outside of the Hamlet of Marlboro SIA.

The total, projected flow capacity requirement, using conservative hydraulic loading factors, is 264,940 gallons per day (see Table 8). The current capacity is 175,000 gallons per day.

6. For additional users from outside the boundaries of the Marlboro Sewer Improvement Area to be approved for connection, a financial plan for the expansion of the WWTF must developed. A preliminary engineering assessment was performed on each plant component under the proposed future loading condition, and it is recommended that the SIA incorporate the same process (oxidation ditch) into an expansion. A modular EA Aerotor Plant would include additional aeration capacity and

clarification to accommodate an expansion of capacity.

7. A preliminary opinion of cost was developed (see Table 9) for expansion of the Marlboro WWTF from 175,000 gallons per day to 265,000 gallons per day. The total cost of the capital project is estimated to be $ 2,242,500., with $ 1,695,730. attributed to expansion of the capacity to 265,000 gallons per day.

8. For service to properties and projects outside of the SIA, it is recommended that a capital charge be instituted for entry into the Sewer Improvement Area, and that the subject project/property be extended into the Sewer Improvement Area for future assessment purposes. A preliminary charge is derived as follows:

Capacity Expansion Charge = Capacity Expansion Cost ÷Capacity Increase
(per gallon)
Capacity Expansion Charge = $ 1,695,730 ÷ 90,000 gallons
(per gallons)
Capacity Expansion Charge = $ 18.84

9. A larger expansion plan was reviewed since it is felt that a more extensive expansion of sewer service (i.e., northerly along the Route 9W corridor and Westerly) may be feasible in the future. A preliminary opinion of cost was developed (see Table 10) for expansion of the Marlboro WWTF from 175,000 gallons per day to 350,000 gallons per day. The total cost of the capital project is estimated to be $ 2,996,400., with $ 2,410,120. attributed to expansion of the capacity to 350,000 gallons per day, and the balance, $ 586,280., being SIA related improvements.
The capital assessment charge related to expansion in this larger expansion alternative is calculated as follows:

Capacity Expansion Charge = $ 2,410,120 ÷ 175,000 gallons
(per gallon)
Capacity Expansion Charge = $ 13.80

10. It is recommended that the Town establish a capital project to expand the wastewater facilities plant in the Hamlet of Marlboro from 175,000 gallons per day to 265,000 gallons per day, and that a capacity expansion charge of $ 18.84 per gallon of design flow be established for projects situated outside of the Hamlet of Marlboro Improvement Area.

11. It is also recommended that a 20% discount of design flow be utilized for projects which exclusively serve senior citizens. For such projects, a design flow of 100 gallons per day per bedroom can be utilized instead of 120 gallons per day per bedroom.

12. Should the Town Board feel that there is a likelihood of other sewer service extensions to the north and west, the larger expansion (to 350,000 gallons per day) should be adopted. This expansion has a lower unit cost (per gallon). Under this scenario, the establishment of a new District around all future service areas should be considered to reduce the financial risk to the Marlboro Sewer Improvement Area.

REFERENCES

1. Great Lakes-Upper Mississippi River Board of State Public Health and Environmental Managers (GLUMRB), Recommended Standards for Wastewater Facilities - 1990 Edition, Health Education Services, Albany, NY, 1990.

2. Metcalf & Eddy, Inc., Wastewater Engineering: Treatment, Disposal, Reuse, McGraw-Hill, Inc., New York, 1979.

3. Wastewater Facilities Plan, Town of Marlborough, April 1979 by Brinnier and Larios, P.C.

4. Design Standards for Wastewater Treatment Works, NYSDEC, 1988

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APPENDIX B

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