EXHIBIT P1

8

1012 Water Street
Meadville, Pennsylvania 16335
Telephone: A. C. 814/332-6942

MAR 0 4 1991

Subject: Official Sewage Plan Approval
Borough of Greenville, Mercer County

Ms. Marie H. Julian, Manager
Borough of Greenville
P. O. Box 604
Greenville, PA 16125

Dear Ms. Julian:

The Department of Environmental Resources hereby approves the report entitled, "Wastewater Treatment Facilities Design Report and Comprehensive Wastewater Plan," as amended, as an update to the Official Sewage Plan of the Borough of Greenville. The update was prepared by KLH Engineers and was adopted by Borough Council on February 12, 1991.

Under the Plan, the Authority will construct facilities which will eliminate illegal bypassing of raw sewage to the Shenango River and provide phosphorus treatment. Average daily design flow of the sewage treatment plant will be increased to 2.8 MGD. The implementation schedule which you have adopted for this project includes the following milestone dates:

- August 30, 1991--Submission of a complete Part II permit application.

- January 1, 1992--Advertise bids for construction.

- March 31, 1992--Award construction bids.

- May 31, 1993--Achieve NPDES permit compliance.

The Department will hold the Borough responsible for the complete and timely implementation of this Official Sewage Plan update.

Under Section 6 of Act 537, the Department is empowered to pay grants for expenses associated with the preparation of Official Sewage Plan updates. The grants are limited to 50% of the eligible costs incurred by the municipality. Payment is subject to adequate annual legislative appropriations for this purpose. Enclosed is an application for the planning grant.

If you have any questions on this matter, please do not hesitate to contact this office.

Sincerely,

David E. Milhous, P.E.
Regional Water Quality Manager
Bureau of Water Quality Management

DEM:WTC:sn:2/28/91

Enclosure

cc: Greenville Sanitary Authority
Hempfield Township Supervisors
Hempfield Township Municipal Authority
KLH Engineers, Inc.
Mercer County Regional Planning Commission

bc: Bob Hutchinson
Cyndi Martincic
Walt Sarsfield
Bill Crawford
RWQM
File

RESOLUTION NO. 1991-5

ADOPTING AN OFFICIAL PLAN REVISION FOR SEWAGE FACILITIES

RESOLUTION OF THE BOROUGH OF GREENVILLE (hereinafter "the municipality"), COUNTY OF MERCER, COMMONWEALTH OF PENNSYLVANIA.

WHEREAS, Section 5 of the Act of January 24, 1966, P.L. 1535, No. 537, known as the "Pennsylvania Sewage Facilities Act", as Amended, and the Rules and Regulations of the Pennsylvania Department of Environmental Resources (Department) adopted thereunder, Chapter 71 of Title 25 of the Pennsylvania Code, require the municipality to adopt an Official Sewage Facilities Plan providing for sewage services adequate to prevent contamination of waters and/or environmental health hazards with sewage wastes, and to revise said plan whenever it is necessary to conform to a comprehensive program of pollution control and water quality Management, and

WHEREAS, the municipality has reviewed the Sewage Facilities Planning Module dated December 1989, and has determined that the incorporation of said plan into its "Official Plan" is desirable for the municipality's program of pollution control and water quality management,

NOW, THEREFORE, BE IT RESOLVED that the Borough of Greenville hereby adopts the above referenced plan and submits it to the Department of Environmental Resources for approval as a revision to the "Official Plan" of the municipality. The municipality hereby assures the Department of the timely implementation of said plan as required by law.

I, Marie H. Julian, hereby certify that the foregoing is a true copy of the Borough Resolution adopted February 12, 1991.

GREENVILLE BOROUGH COUNCIL

By: Joseph L. Hulme Jr.
Council President

ATTEST:

Marie H. Julian
Manager/Secretary

RECEIVED
FEB 27 1991
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APPROVED:

Robert A. Gargasz
Mayor

Feb. 1991

Subject: Borough of Greenville, Mercer County
Plant Expansion

To: Bill Crawford 2/14/91
WQ Specialist Supervisor

From: Robert Hutchinson RH
Permits Engineer

Thru: Jon Lester, Chief
Planning Section

Thru: Pat Williams, Chief PGW
Permits Section

The Borough of Greenville has requested a plant expansion from its' current design flow of 2.5 MGD to a new flow of 2.8 MGD. This required a facility review to determine whether the plant could meet Sewerage Manual guidelines at the increased flow. I reviewed the sizing requirements of the primary clarifiers, trickling filters, flocculating clarifiers, and chlorination facilities. The plant generally meets all design criteria based on "average daily flow". Any criteria based on "peak hourly flow" was not checked since this flow will remain the same as the current 6.25 MGD figure. Due to the "partial treatment flow scheme" the flocculating clarifiers and the chlorination facilities also had to be designed to handle a total "stormwater" flow of 11.25 MGD. Their additional design considerations also meet Sewerage Manual requirements. I therefore recommend the Greenville STP be repermitted for 2.8 MGD.

STD-501, 9-86

Venus Fork

COMMONWEALTH OF PENNSYLVANIA
1012 Water Street
Meadville, Pennsylvania 16335
NETWORK: 673-6942

DATE: February 5, 1991

SUBJECT: Greenville Sanitary Authority - Act 537 Plan Update
Mercer County

TO: David E. Milhous, P.E.
Regional Water Quality Manager
Bureau of Water Quality Mgmt.

Thru: Jon E. Lester, Chief
Planning Section
Bureau of Water Quality Mgmt.

FROM: William T. Crawford
Water Quality Specialist Supervisor
Bureau of Water Quality Mgmt.

Patrick G. Williams
Chief, Permits Section
Bureau of Water Quality Mgmt.

Attached for your consideration is Greenville's Act 537 Plan Update. The Update was needed to address two (2) concerns: Phosphorous removal requirements; and elimination of wet weather bypassing to the Shenango River.

The Plan contains a program by which flows up to 6.25 MGD will receive full treatment. Flows in excess of this will receive partial treatment and be recombined with fully treated effluent prior to discharge. The average design flow of the facility will be increased from 2.5 MGD to 2.8 MGD.

At 2.8 MGD there should be adequate reserve capacity for growth (little is expected) and for extension of sewers into areas of need in adjacent townships. No sewer extensions to these municipalities are proposed under this Plan. When priorities permit, we will have to address some adjacent areas of need on a case-by-case basis.

The Plan goes into great detail in discussing alternative plant modifications, hydraulics, etc. Basically, the proposal involves:

1. Modification of the existing trickling filters.
2. Elimination of the secondary clarifiers.
3. Installation of flocculator clarifiers.
4. Installation of chlorine contact units.
5. Installation of a belt filter press for sludge handling.
6. Chemical and polymer feed systems for Phosphorus removal.
7. Facilities for screenng of high flows (over 6.25 MGD).

Wet weather flows will be "fine screened" and then be combined with the effluent stream from the trickling filters to the flocculator clarifiers and chlorine contact tanks.

Total construction costs are estimated at $3.55 M. together with engineering/legal and other administrative costs, the total project costs are estimated at $4.2 M. Operation and maintenance costs are estimated at $473,000 per year.

Two funding schemes are proposed. One utilizes Pennvest funding, and the other a bond issue. The Authority will contribute $750,000 from Capital Reserve funds. With a Pennvest loan at 3% for 20 years, cost per EDU is estimated at $17.78./mo. With a 25 year, 8.5% bond issue, the cost per EDU is $20.78./mo.

Consistency with various natural resource protection programs has been addressed. Although the wetland inventory maps show no wetlands in the project site, hydric soils exist (Red Hook, silt loam-flooded). The site is in bottom land adjacent to the Shenango River and is designated as flood prone. However, as the project involves no construction activities at sites other than the existing sewage treatment plant site, no problems are likely.

A letter from the Pennsylvania Historical and Museum Commission reports that no known archeological or historical resources will be effected by the project. A Pennsylvania Natural Diversity Inventory search performed in this office indicates no threatened or endangered plant or animal species will be affected.

According to the implementation schedule, a Part II application will be submitted by August 1, 1991, construction bids will be advertised by January 1, 1992, construction bids will be awarded by March 31, 1992, and construction will be completed by September 30, 1993. Compliance is to be achieved by May 31, 1993.

The Plan has been adopted by the Greenville Borough Council. Favorable comments have been received from the Mercer County Regional Planning Commission and from Hempfield Township. The proposal was advertised in a newspaper of general circulation on August 6, 1990, and no comments were received over the thirty day comment period.

The project is consistent with past planning including COWAMP. It is also consistent with approved Chapter 94 Compliance Plans. It appears that this Plan will adequately serve the sewage disposal needs of Greenville and the surrounding area now and in the future. It complies with Act 537 Planning Requirements. I therefore recommend approval. An approval letter for your signature is attached.

WTC/jb

Attachment

1012 Water Street
Meadville, Pennsylvania 16335
Telephone: A. C. 814/332-6942
January 28, 1991

Subject: Official Sewage Plan
Borough of Greenville
Mercer County

Ms. Marie H. Julian, Manager
Borough of Greenville
P.O. Box 604
Greenville, PA 16125

Dear Ms. Julian:

Based on the revision to your proposed Official Sewage Plan update contained in Mr. Soster's letter of December 11, 1990, the Borough and Sanitary Authority have proposed that the sewage treatment plant average daily flow be rated at 2.8 MGD.

Although the final approval of this cannot be granted until the NPDES permit and Part II Water Quality Management permit have been issued, the Department feels this flow is adequate for your existing and future sewage disposal needs.

Review of your Official Sewage Plan will be completed on this basis provided the Borough revises the Plan's implementation schedule and re-adopts the Plan.

A date for the achievement of NPDES permit compliance must be included in this schedule. Also, compliance must be achieved within three years of the issuance of the NPDES permit. Please revise the implementation schedule accordingly.

A new adoption resolution is needed because the implementation schedule and design flow have been changed significantly from those previously adopted by the Borough on December 29, 1989.

Please submit the updated implementation schedule and adoption resolution to this office as soon as possible. A blank adoption resolution is enclosed for your use.

Please contact me if you have any questions on this matter.

Sincerely,

William T. Crawford
Water Quality Specialist Supervisor
Bureau of Water Quality Management

WTC/bg

Enclosure

cc: Greenville Sanitary Authority
Mr. Terry Soster, KLH Engineers, Inc

bc: Cyndi Martincic
Bill Crawford
Bob Hutchinson

GREENVILLE
PENNSYLVANIA

December 21, 1989

Mr. William Crawford
Commonwealth of Pennsylvania
Department of Environmental Resources
1012 Water Street
Meadville, Pennsylvania 16335

Dear Mr. Crawford:

We are transmitting for your review, two (2) copies of the report entitled "Comprehensive Wastewater Facility Planning Report", (dated December, 1989). This report is submitted to address the Department's comments contained in their June 8, 1989 letter and KLH Engineer's letter dated July 5, 1989.

The report is to serve as the Borough of Greenville's Act 537 Comprehensive Sewage Facilities Planning Revision. The adopted resolution of the Borough is transmitted with this letter. The submitted plan is adequate to address immediate and near future wastewater needs including elimination of untreated bypasses, phosphorus removal, and reserve capacity for future development in outlying municipalities.

The Authority is in a position to progress with the project upon approval of the report. At the time the Department approves the report the Borough intends to file for Planning Grant assistance.

If there are any questions, please feel free to contact me.

Very truly yours,

BOROUGH OF GREENVILLE

Marie H. Julian

Marie H. Julian
Borough Manager

RECEIVED
JAN 04 1990
ENVIRONMENTAL RESOURCES
Meadville Regional Office

MHJ:lkk

Enclosures

cc: Greenville Sanitary Authority (letter only)
Clifford P. Gilmore (letter only)
KLH Engineers, Inc. (letter only)
Mercer County Regional Planning Commission (with report)

125 Main Street • P. O. Box 604 • Greenville, PA 16125
Phone: (412) 588-4190

RESOLUTION NO. 1989- 30

A RESOLUTION OF THE BOROUGH OF GREENVILLE, (hereinafter "the municipality"), COUNTY OF MERCER, COMMONWEALTH OF PENNSYLVANIA.

WHEREAS, Section 5 of the Act of January 24, 1966, P.L. 1535, No. 537, known as the "Pennsylvania Sewage Facilities Act", as Amended, and the Rules and Regulations of the Pennsylvania Department of Environmental Resources (Department) adopted thereunder, Chapter 71 of Title 25 of the Pennsylvania Code, require the municipality to adopt an Official Sewage Facilities Plan providing for sewage services adequate to prevent contamination of waters and/or environmental health hazards with sewage wastes, and to revise said plan whenever it is necessary to conform to a comprehensive program of pollution control and water quality Management, and

WHEREAS, the municipality has reviewed the Act 537 Plan, Comprehensive Sewage Facilities Planning Study dated December, 1989 and has determined that the incorporation of said plan into its "Official Plan" is desirable for the municipality's program of pollution control and water quality management,

NOW THEREFORE, BE IT RESOLVED that the Borough of Greenville hereby adopts the above-referenced plan and submits it to the Department of Environmental Resources for approval as a revision to the "Official Plan" of the municipality. The municipality hereby assures the Department of the timely implementation of said plan as required by law. The implementation schedule the Borough intends to follow is described within the Plan. The cost of this project is estimated at $4,237,000. The project will be financed by a combination of existing capital and long term financing. With the approval of the Plan by the Department, the Borough expects the Greenville Sanitary Authority to initiate the design of final drawings for constructing this project with the expectation of construction beginning April 15, 1992. All work is expected to be completed by December 31, 1993.

ADOPTED this 29 day of December, 1989.

GREENVILLE BOROUGH COUNCIL

By: Jean L. Hodge
Council President

ATTEST:

Marie H. Julian
Borough Manager/Secretary

APPROVED:

Robert A. Goya
Mayor

BOROUGH OF GREENVILLE AND GREENVILLE SANITARY AUTHORITY

MERCER COUNTY, PENNSYLVANIA

WASTEWATER TREATMENT FACILITY DESIGN REPORT AND COMPREHENSIVE WASTEWATER PLAN

DECEMBER 1989

KLH ENGINEERS, INC.
Pittsburgh, PA

TABLE OF CONTENTS

TABLES

PLATES

Exhibit I

ABBREVIATIONS

ADDW	Average Day Dry Weather
BFP	Belt Filter Press
BOD	Biochemical Oxygen Demand
cf	Cubic Feet
cy	Cubic Yard
DS	Dry Solids
DSR	Debt Service Requirement
EDU	Equivalent Dwelling Unit
-ft.	Feet
-gal.	Gallon
GPD	Gallons Per Day
GPM	Gallons Per Minute
-hrs	Hours
icfm	Inlet Cubic Feet Per Minute
lbs.	Pounds
MCP	Municipal Compliance Plan
MGD	Million Gallons ¦Per Day
MG/L	Miligrams Per Liter
MLSS	Mixed Liquor Suspended Solids
MOP	Manual of Practice
NPDES	National Pollution Discharge Elimination System
OER	Operating Expense Requirement
PA DER	Pennsylvania Department of Environmental Resources
PDWW	Peak Day Wet Weather
-psig	-Pounds Per Square Inch Gauge
RPM	Revolutions Per Minute
scfm	Standard Cubic Feet Per Minute
sq. ft.	Square Feet
SRT	Sludge Retention Time
SW	Stormwater
TF/SC	Trickling Filter/Solids Contact
TDH	Total Dynamic Head
WPCF	Water Pollution Control Federation
WWTP	Wastewater Treatment Plant

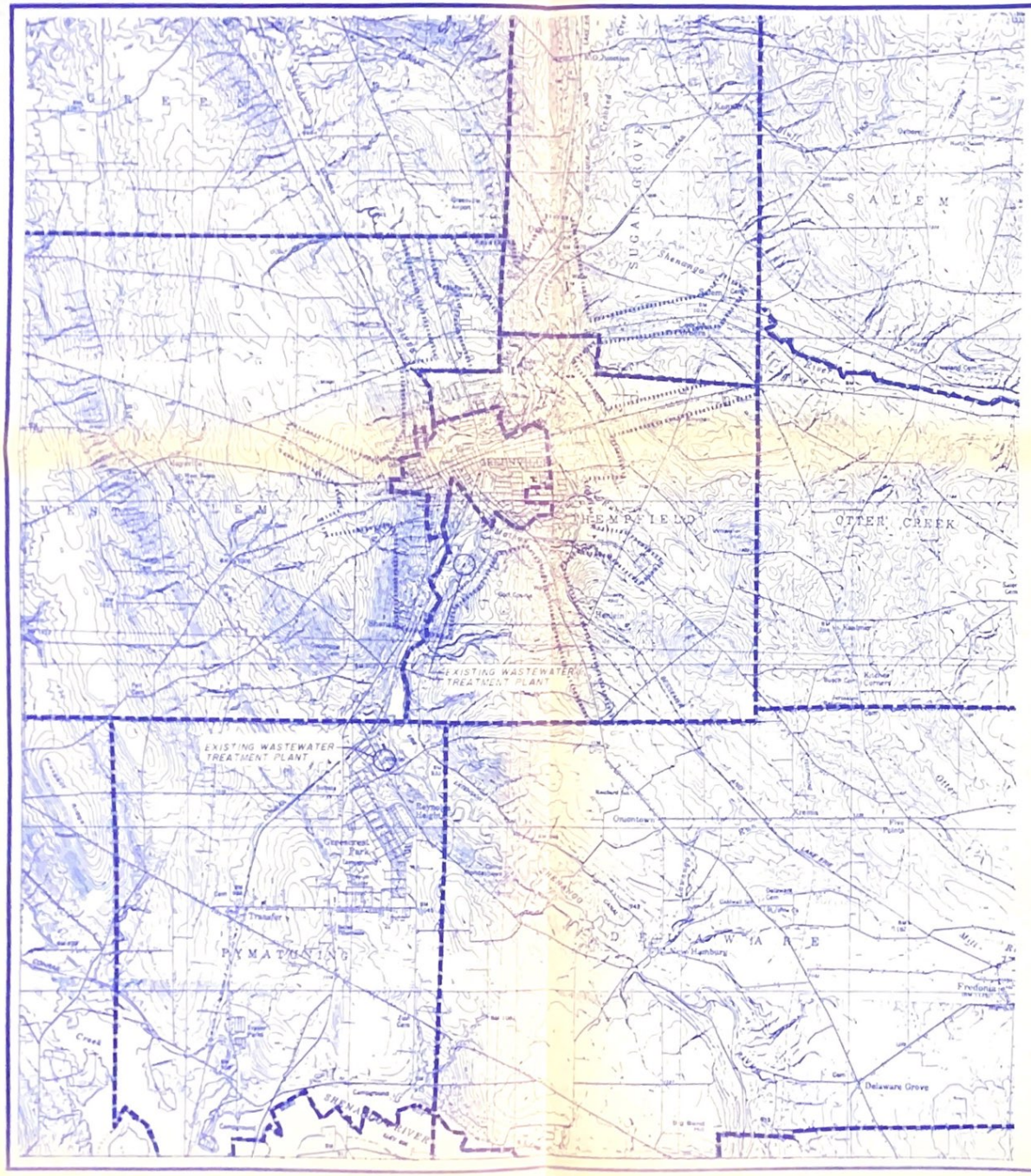
GREENVILLE DESIGN REPORT

Introduction

The Borough of Greenville, located in Mercer County, Pennsylvania, operates a secondary treatment plant under NPDES Permit PA 0027367 under a lease agreement with the Greenville Sanitary Authority. The existing WWTP consists of comminution, raw sewage pumping, primary clarification, trickling filters, and secondary clarification (in which chlorination also occurs). The effluent is discharged to the Shenango River. Plate I is a location map of the facilities. The Borough operates the treatment facility and employs four persons for this purpose. The Greenville Sanitary Authority is the legal owner of the WWTP and is the permittee.

On June 13, 1985, the Authority developed a MCP with the objective to cease bypassing the existing WWTP during high flow periods. As a component of the MCP, KLH Engineers, Inc. prepared a report entitled, "Report on Evaluation of Bypass Flows from April 1985 through December 1986" (dated March 1987). The report studied the frequency, duration, and quality of bypasses that occur at the WWTP. Bypasses occur either during stormwater events or power outages. The bypasses are recorded by a flowmeter and samples are manually composited. The report recommended to construct a stormwater pumping station and primary clarifiers and chlorine contact tanks to treat stormwater. This study re-evaluates the process requirements to effect stormwater treatment. The imposition of an effluent phosphorous limit is also evaluated.

The stormwater treatment process concept is based upon the fact that stormwater events are infrequent. When they occur, they must meet, as a minimum, NPDES instantaneous maximum or average weekly limits, depending on the duration of the stormwater event. If the dry weather flow process is capable of producing an effluent below the monthly average NPDES effluent limit, the inclusion of a partially treated stormwater event for a day or a week, with the effluent quality of the other weeks of the month, would produce an effluent with an average monthly limit in compliance with the NPDES permit. This concept is valid, provided that the 85% minimum removal requirement is not included in the NPDES permit conditions.



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LEGEND

INDICATES CORPORATE BOUNDARY LIMITS

INDICATES AREAS STUDIED TO NEED SEWAGE SERVICES BY THE YEAR 2010

SCALE 1:50,000

Date	Revisions

GREENVILLE SANITARY AUTHORITY
MERCER COUNTY, PENNSYLVANIA
WASTEWATER DISCHARGE POINT
LATITUDE: 41°-22'-59.5" LONGITUDE: 80°-23'-32.5"
PLATE I
LOCATION MAP

KLH Engineers, Inc
555 North Bell Avenue Pittsburgh, PA 15106

Scale AS SHOWN	Drawn By MAC/LBGS	Approved T.G.S.	Drawing No.
Date SEPT. 1985	Checked By G.R.	Sheet No.	123-43

Design Loadings

The Chapter 94 report for the Operating Year 1988 established that the present WWTP design loadings, are adequate for the foreseeable future. The present design limits of the WWTP are as follows:

Monthly Average Flow	- 2.5 MGD
Peak Day Flow	- 6.25 MGD
Monthly Organic Loading Average	-5,000 lbs. BOD/day

The present design anticipates that within the next several years, the water treatment plant in Greenville will discharge its backwash waters to the WWTP and St. Paul's Home will abandon an existing WWTP, and direct the flow to the Greenville WWTP.

The Chapter 94 report for the Operating Year 1987 contained a period of operation from April 5 through April 11 when, what is thought, the highest one week flow ever entering the WWTP. During this one-week period, the average daily flow into the WWTP was 3.5 MGD. This fact also supports the premise the 2.5 MGD design flow is adequate for the near future.

The concept of mixing a partially treated stormwater flow with the fully treated main process train complicates the NPDES permitting for the Greenville WWTP. The DER has been requested to issue effluent limitations for an average monthly flow of 3.88 MGD. This request is based on the premise that effluent discharges will be different from the main process influent design loadings. DER notified the Authority on June 8, 1989, of the effluent parameters. Table I is the effluent discharge limitations utilized in the design analysis.

The study on the analysis of stormwater provided information for WWTP design criteria. The analysis indicated peak stormwater flows to the WWTP were 9.0 MGD. The permitted peak flow for the WWTP is 6.25 MGD. Therefore, an additional 2.75 MGD must be accounted for in the treatment process. The analysis recommended a factor of 1.5 be applied to these flow rates to account for multi-day accumulations. The study concluded that the stormwater treatment facility should be designed for a bypass flow of 5.0 MGD.

In November, 1985, record rainfalls occurred and were reflected in flows reaching the WWTP. A four-week consecutive design analysis was performed for this month. The analysis considered that for a full week, 11.25 MGD would reach the WWTP. Of this, 6.25 MGD would be treated by the full-process train and 5.0 MGD would be partially treated and mixed with the fully treated wastewater. For the other three weeks of the month, the flows to the plant would be 2.5 MGD. The analysis assumed that for the week with 11.25 MGD, both the instantaneous and weekly NPDES

T A B L E I

NPDES EFFLUENT LIMITS

Based on a total design average flow of 3.88 MGD

Discharge Parameter	Mass Loadings (Lb/Day)		Concentrations		
	Average Monthly	Average Weekly	Average Monthly	Average Weekly	Instantaneous Maximum
$CBOD_5$	809	1,294	25	40	50
TSS	970	1,456	30	45	60
NH_3-N	291	420	9	13	18
Phosphorous (as Total P)	32	48	1	1.5	2
Fecal Coliforms					
(5/1 - 9/30)	***	***	200/100ml	***	***
(10/1 - 4/30)	***	***	18,500/100ml	***	***
Potential Total Residual Chlorine	***	***	***	***	.5

permit requirements must be met.

It was determined statistically what the WWTP effluent quality would need to be for the three remaining weeks of the month in order that, when averaged with the high flow week, would meet the monthly NPDES effluent requirements. The analysis indicated that the required effluent criteria for the three weeks must be as follows:

Parameter	Concentration
BOD	21 MG/L
Total Suspended Solids	25 MG/L
Ammonia Nitrogen	8 MG/L

The impact of the phosphorous limits on this process concept will be addressed later in this report.

In the month of November, 1985, 116.5 million gallons of water reached the WWTP. This is equivalent to an average daily flow of 3.88 MGD. This application was submitted to the Department in early September, 1989.

Many variations of the partial treatment concept were evaluated in detail. The evaluations included:

1. Construction of a stormwater pumping station versus utilization of the existing wet well with increased raw sewage pump capacity.

2. Utilization of fine screens with discharge into enlarged primary clarifiers and then filtration with tertiary sand filters.

3. Discharge of the fine screened wastewater directly onto tertiary sand filters.

4. Discharge of the fine screened wastewater to flocculating clarifiers.

5. Providing no stormwater treatment and having the raw stormwater mixed with highly treated dry weather flow.

Filtration analysis reviewed deep bed pulsing filters versus continuously backwashing shallow bed filters. These process concepts differed from that presented in the stormwater analysis that was submitted to DER. The previous concept was re-evaluated due to concern over the proposal to utilize only the primary clarifiers during stormwater flows. This concept could result in:

1. Operational problems of having to drain the primary clarifiers.

2. Excessive detention times resulting in reduced wastewater temperatures with decreased efficiencies in the trickling filters.

3. Detaining primary raw sewage for excessive lengths of time resulting in septicity and odor problems.

Other factors supporting abandonment of the previously proposed concept became obvious as the design analysis was completed. As will be addressed later in this report, it was found that the existing secondary clarifiers are not adequate even for the presently permitted peak day flow of 6.25 MGD. If the existing secondary clarifiers must be revised, it seemed best to construct totally new, more efficient clarification units. In consideration of the above factors and the newly added effluent phosphorous requirement, a complete design analysis was made of both the existing process train and the requirements for stormwater treatment.

To achieve the effluent limits contained in Table I, flocculator clarifiers should be constructed at the end of the treatment process. These clarifiers would be utilized during the treatment of ADDW flows and PDWW flows. Stormweather bypasses would be directed to these flocculator clarifiers after being fine screened. The effluent from the flocculator clarifiers would be chlorinated in new chlorine contact tanks and discharged to the river.

Flocculator clarifiers were selected over filtration for the following reasons:

1. The variable organic and hydraulic loadings can present problems to the sand filters.

2. Pulsing sand filters, which are believed to be required for this project to reduce plugging of the sand, have complex controls that must be operated and maintained.

3. Sand filters are more expensive to construct than flocculator clarifiers.

4. Sand filters will require the construction of a building to house both the filters and their controls.

5. The sand filter produces an effluent that is better than what is mandated to meet NPDES permit requirements.

6. Backwash flows from the sand filters must be equalized and treated.

7. There is potential for grease and oil problems to occur within the bed of the filter.

8. There is potential for the loss of sand.

The present design organic loading is 5,000 pounds per day of BOD. Utilizing the DER Design Manual for sewage facilities, a ratio between the suspended solids and BOD was established. On the basis of this ratio, the design suspended solids loading is 5,882 pounds per day. No influent analysis is available on ammonia nitrogen or phosphorous WWTP loadings. Typically, a balanced wastewater consists of 25 MG/L of ammonia nitrogen and 12 MG/L of phosphorous (as P). On the basis of the ADDW flow, ammonia nitrogen loadings will be 521 pounds per day. The phosphorous loading is 250 pounds per day based on ADDW flow.

The Chapter 94 Report for the Operating Year 1988 established a per capita hydraulic loading of 178 gallons per day. On the basis of the actual organic loading of 2,800 pounds per day, and the 9,645 persons utilizing the WWTP, the organic per capita loading is .29 pounds per day. Using the proposed hydraulic design of 2.5 MGD and organic design of 5,000 pounds per day of BOD (with 15% deducted to account for in plnt recycle flows) and dividing by the per capita loadings resulted in an equivalent hydraulic population of 12,640 persons and an equivalent organic population of 15,517 persons.

Plate I indicates the unsewered areas of the Borough. There are 12 to 15 residential homes within the Borough that are served by onlot systems. These areas have public water and there have been no complaints regarding malfunctioning onlot systems. Undeveloped land within the Borough also is limited and what land is available exists in the flood plain.

The three consecutive month maximum average flow to the WWTP in the operating year, 1989, is projected to be 2.29 MGD. The difference between the 2.5 MGD design flow and the three month maximum average is .21 MGD. The allocated flows for St. Paul's Home and the water treatment plant backwash is .035 MGD and .030 MGD, respectively. Those flows are included in the 2.29 projected 1989 flow. Thus, .21 MGD is available as discretionary capacity for future development. At 400 gallons per residential unit, there is hydraulic capacity available for 525 residential units.

Provisions will be made in both the WWTP design and site layout to allow construction of additional treatment units. The Greenville Sanitary Authority should review their existing connection fees and make any necesary adjustments in the fee to assure that capital funds are being generated to replace capacity that is being utilized by new development.

Wastewater Treatment Plant

Presently, loadings to the treatment plant are restricted by the automatically modulating influent sluice gate. This 24 inch square gate is controlled by the water level in the influent channel prior to the comminutors. At peak day flows of 6.5 MGD, plant personnel report the gate cycling open and closed causing the cycling of raw sewage pumps. Adjustments were made in the controls eliminating the problem but reducing to 4.5 MGD the maximum hydraulic load allowed into the WWTP.

The controls allow the gate to be opened from 0 to 24 inches. The gate opening speed can be varied by the water depth in the influent channel. The influent gate controls will be adjusted to allow for 6.25 MGD to enter the WWTP. Flows in excess of 6.25 MGD will result in the gate throttling, causing bypasses. The bypasses will be intercepted prior to reaching the river, and directed to a stormwater pumping station.

The flow entering the WWTP will be comminuted by two existing Worthington Model 20-C and 20-L comminutors. The comminutors are driven by 1 HP motors. The manufacturer's design criteria indicates average flows for each unit can vary between .3 to 4.6 MGD with maximum flows of 7.5 MGD. The 7.5 MGD can be achieved, provided that a baffle or bar screen is utilized above each unit. Therefore, a bar screen will be provided above each of the Worthington comminutors. The hydraulic considerations in passing this quantity of flow through the 20 inch screen and 3/8 inch slots of the comminutors will be addressed in the hydraulic profile.

The comminuted wastewater drops into a split wet well. Provisions exist to take a wet well out of service. Normal operating procedures are to have the sluice gate existing between the two wet wells open, so the wet well functions as one unit. The total effective volume of the wet well is 5,538 gallons. This equates to 132 gallons per inch of water depth. At the ADWW, the detention time is 3.2 minutes (excluding effect of influent flow).

Four centrifugal dry pit raw sewage pumps take suction from the wet well through two 16 inch suction pipes. Each pump has a 12 inch discharge into a 16 inch header to the two primary clarifiers. The four raw sewage pumps are all Fairbanks-Morse Figure 5400. Two are rated for 1,740 GPM at 24 feet TDH. One is rated for 1,740 GPM at 30 feet TDH. The fourth is rated 1045 GPM at 22 feet TDH. The pumps are driven by motors. They all operate at a maximum rotative speed of 1,150 RPM. The pumps are controlled by a variable speed pump control system. The control system is in good condition and is proposed to be re-utilized with the raw sewage pumps, without major modification.

The raw sewage pumps will be rebuilt. Rebuilding will consist of the following:

(1) Dismantle and impeller and casing inspection.

(2) Replace the following components:

a. Wearing Rings
b. Shaft Sleeves
c. Packing
d. Bearings
e. Impeller Balancing

(3) Reassemble, lubricate, and test pump

The combined capacity of three pumps operating together is 4,525 GPM (6.5 MGD). Three pumps are capable of meeting PDWW with the provision for one pump to serve as stand-by in the event of a pump failure. The pumps discharge through a 16 inch Venturi meter. The raw sewage flow is recorded, indicated, and totalized on a meter located in the entrance hallway to the WWTP.

The two existing primary clarifiers are 27 feet wide by 57 feet long, with an average side water depth of 10 feet. The ADWW produces a surface settling rate of 812 GPD per square foot. This is less than DER`s criteria of 1,000 GPD per square foot. At PDWW, the surface settling rate is 2,031 GPD, which exceeds DER's requirement of 1,500 GPD per square foot.

There are many WWTP facilities that are designed without primary clarifiers. These facilities are normally associated with activated sludge systems. Past operating data at the WWTP has indicated that at high flow rates, the trickling filter arms at the WWTP have been protected from clogging with solids. The existing primary clarifiers are proposed to be re-utilized without physical modifications. Provisions for the PDWW hydraulic flow must be accounted for as operating personnel report that at 6.25 MGD, the primary clarifiers flood above the effluent troughs.

Provisions will be made in the design analysis to reflect the increased loading to the trickling filters by reducing anticipated suspended solids and BOD removals in the primary clarifiers. The weir loading rate at PDWW is 21,701 GPD per foot. This is in excess of DER`s requirements, but no modifications are proposed on the basis of past operating data, and on accounting for less efficient removals. Design removals in the primary clarifiers have been selected as 35% for BOD and 40% for suspended solids.

Approximately 1,750 pounds per day of BOD will be removed in the primary clarifiers, leaving 3,250 pounds per day to be applied to the trickling filters. There will be 2,353 pounds suspended solids removed per day in the primary clarifiers with 3,529 pounds of suspended solids per day passing through for further treatment. Of the 5,882 pounds of suspended solids entering the plant, 882 pounds per day, or 15%, are estimated to be fixed solids. The remaining 85%, or 5,000 pounds per day, are volatile. This data is based upon review of WWTP operational records.

The effluent from the primary clarifier flows by gravity to the trickling filter recirculation wet well. There are two wet wells, with each wet well having a top and bottom. The top and bottom are connected by an opening in the concrete slab separating the wet wells. The mode of operation of the trickling filters--parallel or series--determines whether the primary effluent evenly splits the wet wells, or flows to one wet well. The trickling filters are presently operated in series and is proposed to permanently maintain this operational mode with physical modifications to the wet wells.

Flow will enter the bottom of wet well No. 1 and be pumped to trickling filter No. 1. Flow will return from trickling filter No. 1 to the top of wet well No. 1. Flow can pass through an opening in the floor of wet well No. 1 into the bottom of wet well to recycle flow to trickling filter No. 1. Otherwise, excess flow passes over a weir, and enters the bottom of trickling filter wet well No. 2. The flow is pumped to trickling filter No. 2. Flow returns from trickling filter No. 2 to the top of wet well No. 2. The flow can recycle to the bottom of wet well No. 2 for pumping to trickling filter No. 2. Otherwise, flow passes out of the top of wet well No. 2 to the secondary clarifiers.

There are two trickling filter feed pumps. They are Fairbanks-Morse Figure 5400. They are rated for 2,770 GPM at 20 feet TDH at maximum rotative speed. They are two-speed pumps operating at 695 RPM or 550 RPM. At 550 RPM the pumps are rated for 1,667 GPM at 17 feet TDH. The change of speeds is controlled automatically by a setting in the raw sewage meter. The maximum capacity of 2,770 GPM (4.0 MGD) is less than the PDWW of 6.25 MGD.

At flow rates in excess of 4.0 MGD, fully biologically treated effluent from trickling filter No. 2 is being mixed with primary effluent prior to secondary clarification. This degrades the trickling filter effluent. To correct this condition, pump speeds will be increased to approximately 870 RPM, and a new 17 inch pump impeller installed to produce a pump output of 4,340 GPM (6.25 MGD) at 25 feet TDH. The existing 20 HP motors will be replaced with 50 HP motors. The weir level at which flow can overflow and be mixed with primary effluent will be raised to prevent premature mixing of effluents.

Normal wetting rates for synthetic media are .7 GPM per square foot. Based on the present trickling filter areas and the future potential to install synthetic media, the pumping rate will need to be in the order of 7.9 MGD to the trickling filters. Therefore, it is proposed to operate the pumps at a constant speed at a rate of 6.25 MGD (eliminate the two speed motors) and to let the recirculation rate ratio vary in accordance with the influent to the wet well. At a future date the pumps operating 1,150 RPM can pump 6.25 MGD at 30 feet TDH (10 foot media depth) and not overload the 50 HP motor.

The two existing trickling filters contain rock media installed in 1962. They are each 100 feet in diameter and 5.42 feet in media depth. A tile underdrain system supports the rock media. At the ADDW of 2.5 MGD, the hydraulic loading rate is 159 GPD per square foot. This hydraulically classifies the trickling filters as an intermediate rate filter. The expected BOD removals for filters with the noted hydraulic and organic loadings are in the order of 65%-70%. The loading rates suggest little nitrification will occur in the trickling filters when fully loaded.

A review of the plant's effluent ammonia nitrogen limits from November, 1988, through January, 1989, indicates that the WWTP has been in compliance with NPDES limits. The period of time that the ammonia nitrogen limits are in effect--May 1 through October 31--indicates that the ammonia nitrogen concentrations are consistently below 3.00 MG/L. During the winter months, the trickling filter ammonia nitrogen removal efficiencies deteriorate considerably with the effluent limits being in the range of 5.0 to 9.0 MG/L.

It was previously indicated that for the proposed process concept for stormwater treatment, the ammonia nitrogen removals must be to an effluent level of 8 MG/L. On the assumption that influent levels are 25 MG/L, a 68% ammonia nitrogen removal efficiency is required across the trickling filters. The present loadings to the WWTP are in the order of 2,800 pounds of BOD per day. Utilizing curves contained in the EPA Technological Manual on "Nitrogen Control", the predicted ammonia nitrogen removal is 70%. This indicates that the WWTP is capable of nitrifying at the present WWTP loadings.

The EPA Technological Manual on "Nitrogen Control" states that BOD loadings must be in the order of 12 pounds of BOD per 1,000 cubic feet of media to effect nitrification. At the WWTP design BOD loadings, and considering BOD removals in the primary clarifiers, 3,250 pounds of BOD will be applied to the trickling filters. Utilizing the 12 pounds of BOD per 1,000 cubic feet criteria, 270,833 cubic feet of trickling filter media is required. The present trickling filters would need to be increased to 17.2 feet of media depth rock to meet this criteria.

Utilizing alternate EPA design criteria for synthetic media, under the assumption the existing rock media could be replaced with synthetic media to obtain more surface area, 57,380 cubic feet of 42 square feet per cubic foot synthetic media is required. There is 85,137 cubic feet of volume avilable in the trickling filters. Thus, the option of replacing existing rock media with synthetic media appears viable. It has been determined, through research, however, that at least 10 feet of synthetic media depth is required to assure nitrification. DER design standards require a minimum media depth of 10 feet. The present trickling filters would need to be raised 4.6 feet in synthetic media depth to meet this criteria.

The trickling filter arms seal at the base of the trickling filter. The seal on trickling filter No. 1 is leaking badly and must be replaced. The present trickling filter arms are 8 inches in diameter, and at a 4 MGD flow rate have a head loss of 7 feet. The head loss at 6.25 MGD is estimated to be 15 feet. This is excessive and new arms will be required to be installed on both trickling filters.

Several options exist regarding the size of the trickling filters. The first option is to construct the required facilities based on EPA technological manuals. The construction cost estimate to install new synthetic media 10 feet deep, increase the depth of the trickling filter sidewalls using an epoxy steel-coated tank, and installing new trickling filter arms is $750,000.

The second option is to lower the design organic loading of the WWTP from 5,000 pounds per day to a level which is capable of consistently producing the desired ammonia nitrogen effluent. This de-rating should only be determined through long term field testing of the trickling filters. The third option is to test the trickling filters to determine how they will operate at the WWTP design of 5,000 pounds of BOD per day. This can easily be accomplished by operating only one trickling filter and monitoring the effluent from the trickling filter and the WWTP.

The recommendation is to not alter the rating of the trickling filters. Alternate construction bids can be received for modifying the trickling filters to assess the economics. In the interim DER should be petitioned to allow removal of one trickling filter from operation. As more influent loading data is developed and the operational loadings change, the WWTP effluent quality can be monitored and analyzed. If appropriate revisions can be made in the trickling filter process. This conservative approach is recommended as the expenditure necessary to modify the trickling filters to theoretically assure compliances are excessive in relationship to the questionable benefit. In any event the trickling filter feed pumps will be sized at this time to account for this future modification.

The trickling filter effluent flows by gravity to two rectangular secondary clarifiers. These clarifiers have chain and flight sludge collection mechanisms. The surface settling rate at the PDDW of 6.25 MGD is 2,031 GPD per square foot. The PDWW detention time and weir loading respectively, are .9 hours and 21,701 GPD per foot. The surface settling rate exceeds DER's criteria of 1,200 GPD per square foot. A third secondary clarifier, 26 feet 6 inches wide by 80 feet long, would need to be constructed to satisfy DER's criteria. The secondary clarifiers do not contain scum removal facilities which are mandated by DER.

The following factors relate to the secondary clarifier's present operating condition and the proposed objectives of the project:

1. Existing secondary clarifiers are functionally inadequate for the design flows.

2. To implement a plan to treat stormwater and comply with NPDES criteria, increased treatment efficiencies are required to assure monthly compliance. Present facilities are not capable of producing the desired effluent in consideration of the stormwater concept.

3. The original proposal to construct additional primary clarifiers resulted in units that could decrease the temperature or cause septicity. They also provided no benefit for increased effluent suspended solids removal.

4. If an additional secondary clarifier would be required constructed, flow balancing would be required as the the result of differing clarifier sizing.

In consideration of the above, the secondary clarifiers should not be used for clarification, and two flocculator clarifiers should be constructed to replace them. The flocculator clarifiers should be sized to treat both PDWW flows and the bypassed stormwater flows. During ADDW, the flocculator clarifiers would produce an effluent of superior quality. The sizing of the flocculator clarifiers will be discussed under the report heading "Stormwater Treatment".

The existing secondary clarifier tankage would be re-utilized as alternate process units. One would serve as a wet well for the stormwater pumps and house the stormwater screening mechanisms. These proposed process units would only occupy a portion of one of the secondary clarifiers. It is therefore proposed that the remaining portion be a sludge thickener. The remaining secondary clarifier will be used as a post-aeration tank to aerate the trickling filter effluent prior to discharge into the flocculating clarifiers. During stormwater events, flows would be pumped to the screens, directed to the aeration facilities, and then to the flocculating clarifiers.

The proposed main treatment process is known as the Trickling Filter Solids Contact (TF/SC) Process. The trickling filter effluent is aerated and mixed with sludge removed from the flocculator clarifiers. A portion of the sludge can be wasted to the sludge thickener. In the aerated solids contact channel, a mixed liquor is developed which through solids contact has its flocculating qualities enhanced. The flocculated solids, in conjunction with the flocculator clarifiers, will provide superior solids removal. The flocculator clarifiers have a flocculation center well, that is mildly stirred, and rapid sludge removal systems. The sludge removal systems will include pumps to lift the sludge to return it to the aeration solids contact channel or to the sludge thickener.

There is a small amount of soluble BOD that is removed in the aerated solids contact channel. This removal will be reflected in superior effluent quality. The consulting engineering firm of Brown & Caldwell, who are based on the West Coast, performed a study of the TF/SC process. Basic design criteria was established for the aeration channel, but in general consisted of the following:

1. MLSS of 500 to 1500 MG/L.

2. Non-vigorous mixing in order to not break up settleable floc particles.

3. Flocculator clarifier sidewall depths of 16-20 feet.

4. Flocculator clarifier surface settling rates of 1,500 gallons per square foot per day at PDWW flow.

5. Use of a flocculation chamber.

6. Rapid sludge removal.

7. Solids contact time of 30 minutes (excluding sludge recirculation).

The TF/SC process is expected to produce a final effluent quality with a BOD of 15 MG/L and a corresponding suspended solids concentration.

Only one of the existing secondary clarifiers will be used for the aeration facility. Redundancy in this process facilities is not critical, as the system is reliable, and, in the event that it were de-watered for maintenance, the process can be operated by directing the trickling filter effluent directly into the flocculator clarifiers.

The aeration system will be a coarse-bubble stainless steel piping system covering the bottom of the tank. The process air blowers providing air for channel aeration will be centrifugal blowers. These will allow the air to be turned down over a range of flows. When the stormwater pumps are activated, the aeration system will be designed such that the air can be turned off automatically at the option of the operator. During these high flow-through periods, the solids can be saved and not wasted from the tank. A provision to cycle the air off and on as a percentage of a sixty-minute time period will allow maximum utilization of the air and provide anoxic conditions to enhance settling. The existing flume air blowers for the primary and secondary clarifiers will be eliminated.

The scum ejector on the primary clarifiers will be eliminated, as presently it does not operate properly. Both the air compressor for the scum ejector and the flume air blowers are located on the main floor of the trickling filter recirculation pump building.

The elimination of this equipment will provide space for locating the channel aeration centrifugal blowers. Two centrifugal blowers will be provided-- one for operation and the other for standby. The centrifugal process air blowers will be skid mounted, complete with all accessories, such as intakes, shut-off valving, check valves, etc. Air flow will be metered and recorded, and totalized.

The channel aeration requirements are based on mixing rather than the process requirements. Assuming that 5 MG/L of soluble BOD will be removed in the aerated solids contact channel and that the MLSS will be 1,500 MG/L, there will be 162 pounds of oxygen required per day. At a 20% oxygen transfer efficiency, 63 SCFM of air will be needed for the process requirements. This is much lower than the mixing air requirement of 308 SCFM.

The existing WWTP has no chlorine contact tanks. Chlorination is effected in the secondary clarifiers. This will not be acceptable to DER. DER will allow the use of chlorine as a disinfect and will impose no residual limits. EPA is expected in the near future to mandate the Commonwealth to impose a .5 MG/L chlorine residual limit.

There will be constructed two chlorine contact tanks with a total capacity of 117,195 gallons. At the SW flow of 11.25 MGD, there will be 15 minutes of contact time. At the ADDW flow of 2.5 MGD, the contact time will be 67.5 minutes. This exceeds DER's requirements of 15 minutes at the peak hour flow rate and 30 minutes at the average flow rate.

There will be a wide variation in the flow and wastewater quality entering the chlorine contact tanks. This will cause operational problems with the chlorination dosage. A two loop compound will monitor both flow and residual chlorine in the effluent and make adjustments to the chlorine feed to maintain a fixed residual. For example, a SW flow of 11.25 MGD having 15 MG/L of chlorine demand requires 1407 pounds of chlorine. A fully treated wastewater having a chlorine demand of 6 MG/L at a ADDW of 2.5 MGD requires 125 pounds of chlorine.

A sharp crested rectangular weir constructed on the chlorine tank outfall will measure and record flow for NPDES permit conditions and control the chlorine dosage. A pump will take effluent samples and monitor chlorine residual. Both of these signals--flow and residual--will be used to adjust the chlorine dosage. Chlorine will be dosed at the flocculator clarifier effluent chamber to provide turbulence for effective mixing. The source of effluent water for the chlorinators will be an effluent water pump. A standby source of water will be the existing well water system. The system will be arranged so that upon power failure, a solenoid valve will open and allow chlorination utilizing the well water system.

The existing Operations Building will house the chlorination equipment. The chlorination room will be designed to house three one-ton chlorine tanks. Each will contain a 500 pound per day chlorine regulator. Water supply for chlorination will be sampled with a composite sampler for use in the NPDES permit analysis requirement. There will be a composite sampler at the wet well to secure a sample for influent wastewater analysis.

Provisions will be made to alarm loss of chlorine, chlorine leak, and to provide automatic switchover between two of the one-ton containers. The chlorine residual and tank loss of weight will be recorded.

Stormwater Treatment

The influent gate to the wet well will regulate flow to the main treatment process. All flow over 6.25 MGD will be bypassed to the stormwater pumping station that will be constructed within the existing secondary clarifier. The existing WWTP influent chamber contains a bypass weir and backflow gate. The bypass will be lowered and the backflow gate will be removed so as to not impede the flow of stormwater to the wet well.

A new diversion chamber will be constructed over the 30 inch stormwater bypass pipe. Bypassed flow will not be allowed to discharge to the river, but will be directed to the wet well. Only in event of extreme emergency, when there are system malfunctions, will the water be allowed to bypass over the weir in the diversion chamber to the river. This bypass will be alarmed and recorded.

There will be three submersible variable speed pumps that will discharge to a rotating fine screen. There will be no check valves or gate valves in the discharge of the stormwater pumps. All stormwater will pass through a rotating fine screen. It is anticipated that 10% of the BOD and 15% of the suspended solids will be removed from the stormwater flow. An alternate process concept was reviewed of passing all flow, including ADDW and PDWW flows through the screen. The screen size and cost was prohibitive in relationship to the benefit.

An effluent water system will use water from the chlorine contact tanks to wash the screen. All screen solids will be discharged to a hopper with a provision for a drain to thicken the solids. The hopper will be designed to be moved utilizing the Authority's existing Bobcat front-end loader. The area will be covered and heated to prevent freezing of the solids. Provisions for washing and maintaining the area will be provided. All solids will be trucked from the WWTP to a permitted landfill.

The water level in the stormwater wet well cannot exceed elevation 930.50. This is the elevation of the top of the 30 inch influent pipe at the wet well. This prevents surcharging of the influent sewer and potential flooding in the sewer system. The stormwater wet well will have 9,028 gallons of effective capacity. At the SW flow of 5.0 MGD (11.25 MGD less 6.25 MGD PDWW)), the detention time will be 2.6 minutes.

The variable speed submersible pumps will start automatically upon the wet well reaching a pre-selected level and pump the water to the screen. Flow from the screen will pass into the aeration channel and be mixed with flow that was treated on the trickling filters. The combined waste stream will flow to the flocculator clarifiers.

The surface loading rate on the flocculator clarifiers at the SW flow of 11.25 MGD will be 1,200 GPD per square foot. At the ADDW flow of 2.5 MGD, the surface loading rates will be 267 GPD per square foot. The detention time at ADDW and SW flow rates, respectively, is 10.7 hours and 2.4 hours. The cooling of the water and septicity as the result of long detention times will not be a problem as the water will be discharged to the river and the sludge will be removed continuously. Scum removal will not be provided on the flocculator clarifier, but rather in the chlorine contact tanks.

Phosphorous Treatment

The DER has notified the Authority that a phosphorous effluent limit is being added to the Authority's NPDES Permit. PA DER has advised the effluent phosphorous requirement is being applied to all WWTPs located above the Shenango Reservoir. Phosphorous limits will be mandated as the NPDES Permits become due for these WWTP facilities. There is no relationship to the phosphorous requirement being the result of the increased flow discharge resulting from stormwater.

The phosphorous limit is 1 MG/L (as P) on the basis of an average month, and 2 MG/L as an instantaneous maximum. The limit was imposed as a result of a trophic state index study on the Shenango Reservoir. The concept of mixing partially treated stormwater with fully treated wastewater stream was previously discussed in this report. The instantaneous 2 MG/L could present problems with the concept if the stormwater contains excessive quantities of phosphorous. The Authority should appeal to the PA DER to remove the instantaneous requirement and to relax the average weekly to 2.0 MG/L. Otherwise, excessively large treatment facilities dedicated for phosphorous removal will be required to be constructed.

The design phosphorous removal considerations within this report are based upon the review of other WWTP operational records and theoretical calculations. To accurately determine the most efficient phosphorous removal, chemical dosage and associated sludge production pilot studies are required. The existing Authority facilities are inadequate to conduct such pilot studies as there is inadequate surface settling rates and chemical storage facilities. The treatment facilities that are being proposed have sufficient flexibility for the use of a variety of chemical additions for phosphorous removal. Once the WWTP is constructed, the Authority should devote efforts to maximizing the efficiency of the phosphorous removal facilities.

No long term operational data is available on influent phosphorous concentrations for dry weather or stormwater flow conditions. Grab samples taken of the effluent by PA DER were analyzed for phosphorous (Total P) and the following values reported to the Authority:

Date	Total P
07/25/88	5.06 MG/L
11/07/88	2.09 MG/L
03/22/89	2.97 MG/L
06/26/89	2.97 MG/L

The Authority secured grab samples at the following locations, had them analyzed for the following parameters, and reported the following results:

Sample Location	Analysis	Results
Influent	Phosphorous	2.32 MG/L (P)
TF Effluent	Phosphorous	2.37 MG/L (P)
Effluent	Phosphorous	4.96 MG/L (P)
Influent	Alkalinity	144 MG/L (CaCO3)
TF Effluent	Alkalinity	83 MG/L (CaCO3)
Effluent	Alkalinity	83 MG/L (CaCO3)

The Authority should continue to collect information on phosphorous concentrations in the influent stormwater bypasses and on the trickling filter effluent. Alkalinity measurements should be taken to assess the buffering capability of the wastewater so that the addition of chemicals will not depress pH below NPDES effluent requirements.

There are three types of phosphorous that exist in wastewater:

1.	Organic	This phosphorous exists as organic matter. It is dissolved into the wastewater.
2.	Inorganic	This phosphorous is known as orthophosphate (PO4). It is readily available for biological use or removal by metal salts such as ferric chloride or alum.
3.	Complex Inorganic	This phosphorous is known as polyphosphates. They occur in detergents.

In the WWTP biological processes, phosphorous is mostly present in the dissolved form. When chemical precipitation using metal salts (alum, ferric chloride, etc.) is practiced to remove phosphorous, WWTP effluents will contain some undissolved forms of phosphorous that escape the settling process. Phosphorous is essential for the WWTP biological process. For every 100 MG/L of BOD, there is required 1 MG/L of phosphorous, otherwise, the biological population that treats the wastewater will die.

The existing WWTP has the ability to reduce BOD, which is the measure of the oxygen demand of the wastewater; suspended solids, nitrogen (which is a nutrient that if not removed demands oxygen from the receiving stream), and to disinfect the wastewater. The facilities are not designed for phosphorous removal.

Phosphorous is best removed chemically. There are biological processes that can remove phosphorous without chemical addition, but are not feasible for the Authority's project goals. Phosphorous, when discharged to the river, causes excessive algae and other biological growth. The growth and death cycle of this biological matter robs oxygen from the water, producing stagnant conditions, or killing aquatic life that required the oxygen. Hence, DER's requirement for the removal of phosphorous.

Phosphorous can be removed by the addition of the following chemicals, either in combination or singly:

- Lime
- Alum
- Sodium Aluminate
- Ferric Chloride

Each chemical has its advantages and disadvantages in cost, handling, effects on the chemical makeup on the wastewater, and efficiency to remove phosphorous.

In removing the phosphorous, the impact of the chemical on sludge quantities, effect on the wastewater pH (which is a measure of the wastewater's alkalinity or acidity), and the fact that precipitated phosphorous is a light particle which does not settle well, must be evaluated. If the phosphorous floc cannot be settled, it is discharged from plant, and not only will the phosphorous effluent concentrations increase, but so will the suspended solids, causing another violation of the NPDES Permit.

Operating records indicate the trickling filters remove nitrogen from the wastewater. Nitrogen is biologically removed from the wastewater after BOD has been substantially removed. The bacteria look for another food source once BOD (a carbon source) is removed. The bacteria that remove nitrogen function best when the pH of the wastewater is between 7.0 and 8.5, which is a slightly alkaline wastewater. Certain chemicals when added to the wastewater to remove phosphorous, will lower the pH of the wastewater. Lowering the pH prior to the trickling filter will retard or cease nitrification.

One milligram (mg) of aluminum and ferric/ferrous iron reduces alkalinity 4.2 and 1.3 milligrams, respectively. The greater the reduction in alkalinity, the more pH will drop. Aluminate is used with low alkalinity wastewaters, or where nitrification is required, to help maintain pH. Aluminate will increase the pH of the wastewater.

The trickling filters can alter the form of phosphorous from those that are not precipitable with chemicals to a form that can be precipitated. If chemicals are added in influent wastewater, only that phosphorous that is precipitable will be removed. The benefit of the trickling filter altering a form of phosphorous from the complex detergent form (complex inorganic) to the inorganic form (orthophosphates).

Phosphorous Removal with Lime

Lime is a difficult chemical to handle. It requires large and complex storage facilities. The lime tends to cake and will form calcium carbonate deposits throughout the WWTP. It is best suited for low alkalinity waters of 105 MG/L calcium carbonate or less.

The lime forms a poor settleable phosphorous floc. The addition of lime and its relationship to phosphorous removal is a function of the pH and is not related to the quantity of phosphorous in the wastewater.

Other chemicals discussed herein are dosed in relationship to the quantity of phosphorous in the wastewater. Lime is dosed to raise the pH to the point where phosphorous will change from the dissolved to undissolved form.

With lime, pH's of 9.5 to 10 result in excellent phosphorous removal. This pH cannot be discharged to the river as it exceeds the NPDES limit of 6.0 - 9.0. Use of lime should be avoided as an acid as will be required to be added to the wastewater prior to discharge to the stream to lower the pH.

Phosphorous Removal with Alum

The optimum pH for phosphorous removal with alum is 5.5 - 6.5. Alum addition results in slight depression of pH. Due to the nitrification requirement in the trickling filter, alum cannot be added prior to the trickling filters.

The weight ratio of alum to phosphorous required to meet the NPDES Permit is 9.6 to 1. Jar tests are normally required to determine dosages in order to access the side reactions that occur.

Phosphorous Removal with Sodium Aluminate

Sodium aluminate results in a slight rise in pH. If dosed prior to the trickling filter, it would not effect, and could possibly enhance, nitrification. It is an inferior phosphorous removal chemical when compared to alum. Its weight ratio of sodium aluminate to phosphorous is 3.6 to 1.

Phosphorous Removal with Ferric Chloride

The optimum pH for phosphorous removal with ferric chloride is 4.5 to 7.0. The weight ratio of iron to phosphorous is 1.8 to 1. Ferric chloride reacts with the alkalinity in the water and will depress pH. If the phosphorous floc is not settled out, the solids will be carried over into the effluent and a reddish color will appear in the stream.

Much work has been done by others on pilot and full scale operations relative to the appropriate dosage points and the use of chemicals in trickling filter processes for phosphorous removal. Dosage points for iron or aluminum salts have been to primary or secondary clarifiers. In the EPA Manual, "Phosphorous Removal", the following addition points of chemicals is given:

- Mineral before primary clarifier
- Lime before primary clarifier
- Mineral in trickling filter effluent
- Lime in trickler filter effluent

Provisions will be made in a full scale chemical feed system for flexibility in the dosage points. The main chemical dosage point will be prior to the flocculator clarifiers. The sludge from the clarifiers can be recycled to the WWTP influent to possibly reduce chemical dosages.

Chemicals can be added to both the primary and secondary clarifier to obtain the benefits of both addition points. Chemicals introduced in the primary clarifier, in addition to removing ortho-phosphate, will reduce BOD applied to the trickling filters. Phosphorous may exist in a form other than the ortho form and it will not react with the chemicals. Addition of chemicals in the secondary clarifier aids in removing phosphorous converted in the trickling filters. It also presents a serious problem with suspended solids not settling. The EPA Manual recommends a secondary clarifier settling rate not exceeding 500 GPD per square foot. At the design of 2.5 MGD, the flocculator clarifiers have a settling rate of 267 GPD per square foot.

In EPA's manual entitled, "Upgrading Trickling Filters", there is considerable data on the use of chemicals to remove phosphorous in trickling filter plants. Fourteeen trickling filter plants in Michigan were studied. Of the fourteen, eleven used ferric chloride in combination with the polymer. One used aluminum chloride in combination with polymer, and only one used lime. The treatment in all the plants was to reduce phosphorous from an influent concentration of 6 to 8 MG/L to an effluent concentration of 1 to 2 MG/L. Dosage of ferric chloride varied from 25 to 40 MG/L and polymer from .1 to .3 MG/L. Most chemicals were added in the primary clarifier and were well mixed. A typical chemical system consisted of a 5,000 gallon chemical storage tank, two metering pumps, and a feed line.

In the selection of any chemical for phosphorous removal, sludge production must be considered. Table II is from the EPA Manual, "Chemical Aids Manual for Wastewater Treatment". It lists sludge production utilizing various chemicals for phosphorous removal. Alum produces the least mass of sludge. Phosphorous sludges can have more odors. Lime sludges are much easier to dewater than alum or iron sludges.

Chemicals should not be added which will make difficult the ultimate disposal of the sludge. The addition of any of the chemicals previously listed will not cause a sludge disposal problem. Aluminum and iron can also be added to digesters and will not cause upsets. The release of soluble phosphorous (redissolving phosphorous which has been settled) during digestion, is reported as being minimal. Therefore, there should not be any problems with phosphorous laden sludges that are settled out in the flocculator clarifier releasing the phosphorous if they are held in the anaerobic digesters.

DER's Sewerage Manual, Section 103, defines guidelines for phosphorous removal by chemical addition. It recommends the addition of lime, aluminum, and iron salts for phosphorous removal, with possible addition of polymer to aid in settling. The facility should be designed to feed alternate chemicals at alternate locations. A 30-second flash mix should be considered and flocculators should be speed adjustable. Velocities in flumes and piping should not exceed 1.5 fps in order that floc formation is not destroyed.

Chemicals will be able to be dosed to the primary clarifiers at several points within the aeration channel and in the flocculation zone of the flocculator clarifier. The addition of chemicals at the primary clarifiers will result in the greatest sludge yield. It can help reduce BOD and suspended solids loading to the trickling filter, and, therefore, improve nitrification. The primary clarifiers are not designed to efficiently remove phosphorous in all the hydraulic design range. In addition, phosphorous does not exist in the ortho form at this treatment stage, which is the most easily removed. The ortho form does exist after passage of wastewater through the trickling filters. Biodegradable detergents can also interfere with the precipitation of the phosphorous in the primary clarifiers. Provisions will be made to recirculate the underflow from the flocculator clarifiers to the primary clarifiers in order to enhance clarification.

TABLE II

Additional Sludges to be Handled with Chemical Treatment Systems:

Primary Treatment for Removal of Phosphorus

Sludge Production Parameter	Conventional Primary	Lime Addition to Primary Influent	Lime Addition to Primary Influent	Alum Addition to Primary Influent*	Fe^{+3} Addition to Primary Influent
Level of chemical addition (mg/l)	0	350-500	800-1600	143-250	25.80
Percent sludge solids					
Mean	5.25	11.1	4.4	1.2	2.25
Range	5.0-5.5	3.0-19.5	2.1-5.5	0.4-2.0	1.0-4.5
lb/mil gal					
Mean	788	5,630	9,567	1,323	2775
Range	600-950	2500-8000	4700-15,000	1200-1545	1400-4500
gal/mil gal					
Mean	4,465	8,924	28,254	23,000	21,922
Range	3,600-5,000	4663-18,000	16,787-38,000	10,000-36,000	9000-38,000

* MW of Alum: $Al_2(SO_4)_3 \cdot 14H_2O = 594$

The use of liquid alum at several treatment plants resulted in phosphorous limits consistently in the order of 1 MG/L. This limit had been demonstrated as being obtainable with efficient flocculator clarifiers. Phosphorous levels below 1 MG/L require the use of sand filters. Elizabethtown, Pennsylvania utilizes standard rate trickling filters with alum and polymer addition at the secondary clarifier. Chemical dosages are based on a metal ion ratio of 2.5:1 (AL:P). The influent total phosphorous of 5.1 MG/L is reduced to 1.7 MG/L. This WWTP closely resembles that being proposed for the Authority. It is recommended that during the design phase, the facility be visited to secure design information on equipment selection and layout.

Due to the lack of operational data on the phosphorous concentrations at the Authority facilities, it is assumed that the trickling filter effluent will contain 12 MG/L of phosphorous (as P). At this concentration, the following mass of phosphorous will be contained in the wastewater at the noted flows:

Flow	Phosphorous Loading
2.5 MGD	250 lbs. per day - P
6.25 MGD	625 lbs. per day - P
11.25 MGD	1,125 lbs. per day - P

The PDWW flow of 6.25 MGD will be used as the design basis for phosphorous removal. This will provide reasonable assurance that the weekly average NPDES requirement for phosphorous can be met. Two chemicals were analyzed for use--sodium aluminate and liquid alum. Liquid alum is a commonly used chemical for phosphorous removal. It can depress pH as it consumes alkalinity in the wastewater. Sodium Aluminate also can be utilized for phosphorous removal and raises pH. The Authority will have the options of using either chemical based on the buffering capacity of the wastewater, its effectiveness on phosphorous removal, chemical cost and sludge production.

Based on a molar ratio of two parts of aluminum to one part phosphorous, 1,432 gallons of sodium aluminate will be required to dose the peak day flow at the design phosphorous concentration. At ADDW flow rates, 573 gallons of sodium aluminate will be required. EPA determined that the dilution of phosphorous by rainwater does not affect the pounds of aluminum required for phosphorous removal. Stormwater may be nutrient-rich due to field runoff and phosphorous levels may not be diluted. This will increase chemical use.

At the noted dosages, a chemical feed pump with the capacity of 0 to .5 GPM is required at average daily usage. A one-month supply of sodium aluminate would be 17,190 gallons. It is recommended that two heavy duty chemical feed pumps be furnished with one 5,000 gallon storage tank. A 500 gallon mix tank with two transfer pumps will be provided.

Regulating the chemical feed should be as simple as possible, as well as providing the operator with flexibility to maximize the efficiency of the chemical addition. The system will be capable of manual adjustment, automatic pacing based on the flow rate transmitted from the chlorine contact meter, and by a programmable logic controller programmed on the basis of developed phosphorous loading data.

Polymer addition to the flocculator clarifiers and within the aeration channel 30 seconds downstream of any chemical addition will be possible. This polymer system will be separate from that required for the BFP. EPA states that .2 to .5 MG/L of polymer will be required as a settling aid. On the basis of a 1 MG/L design dosage at 6.25 MGD 52 pounds of polymer will be required per day. At ADDW flows, 20.8 pounds will be required. Dry polymer will be stored on site in bags and be mixed in a two tank polymer system. This will allow one tank for feeding and one tank for batching and aging.

Polymer solution should not be stored for more than one to three days and should be fed diluted with water. A polymer dilution facility will be provided on the discharge of the polymer feed pumps. Two feed pumps will be provided with two 500 gallon storage tanks. At ADDW flow 332 gallons of .75% polymer solution will be used, establishing the requirement for a 500 gallon storage tank. To dilute 52 pounds of polymer to a .75% solution, 831 gallons of water will be required during PDWW flow. Space will be provided for the storage of 6 months supply of 100 pound polymer bags. At the maximum dosage rate of 52 pounds per day of polymer, there will be 360 bags that must be stored. Provisions will be made to dilute the polymer with water to a .05% solution strength on the discharge from the chemical pumps. The polymer pumps will be adjustable from a rate of 0 to .6 GPM.

Polymer costs are presently in the order of $2.25 per pound. At ADDW flows the annual polymer budget will be $17,082. Several chemical suppliers were contacted for information on sodium aluminate deliveries. Two of those contacted did not deliver the chemical, although stated it was available from other suppliers.

For the quantity required, liquid alum is the most economical use of chemical versus dry alum. Deliveries of liquid alum are made in 3,600 to 4,000 gallon trucks. The cost for liquid alum is $160.00 per ton on a wet basis. Alum weights 10.9 lbs. per gallon. Therefore, a 3,600 gallon delivery would cost approximately $3,200.00. There would be required 2,245 GPD of liquid alum for the flow of 6.25 MGD. At ADDW flow, 898 GPD of liquid alum is required. At average day flows the annual liquid alum budget will be $35,000.

Chemical feed pumps will be 0 to 1.6 GPM to feed liquid alum. Liquid alum freezes at much lower temperatures than sodium aluminate (sodium aluminate should be maintained at 70oF). Liquid alum is easier to use, requires no mixing, and can be stored indefinitely, while sodium aluminate is difficult to use, must be mixed, and is only good for two to three months. Tank sizing for storage is recommended to be for a two week supply with provisions for a 4,000 gallon delivery to be added to the tank. The combination of the 5,000 gallon storage and 500 gallon mix will fulfill this recommendation.

A moderately high alkalinity is required in the wastewater to avoid pH suppression; otherwise, lime or caustic may be necessary to increase the pH. Alum is available in the hydrated aluminate sulfate form. Although alum works best at a pH of 5 to 6.5, it is not advisable to lower the pH to these levels as the addition of alum may further deplete the pH. FRP tanks should be utilized for storage of the alum. These tanks will also allow storage of sodium aluminate and ferric chloride. The alum solution should not be diluted with water on the feed pump discharge as hydrolysis problems can occur. Chemical piping should be FRP with diaphragm pinch valves.

Should the DER or Authority feel it necessary, a minimum two month trial pilot operation could be conducted after completion of the flocculator clarifier construction. The trial operation should be full scale and gather the following information:

1. Optimum points of dosage.
2. Optimum chemical dosage.
3. Optimum effluent quality versus dosage and chemical.
4. Estimate the sludge production.
5. Estimate the impact on the sludge process train.

Prior to final design and/or the two month trial operation, jar tests can be conducted on composite and grab samples. Grab samples should be taken at key points during the day to attempt to determine peak and low phosphorous loadings. Dosage ranges can be determined for the chemicals. Data points and effluent quality should be plotted and a probability curve developed for phosphorous removal.

Sludge production will increase dramatically within the wastewater treatment process as a result of phosphorous removal. Alum sludges normally concentrate to 1.4% in the flocculator clarifiers. Aerobic digestion is used in the majority of WWTPs using aluminum salts. Dewatering was reported being by conventional means consisting of sand beds, vacuum filters, etc (the information was obtained prior to the popularity of the BFP). Sludge is normally thickened to 4.6 to 6.5% in gravity thickener. The volatile content averages 59%.

The Authority WWTP utilizes anaerobic digesters. A literature review indicates the impact of anaerobic digesters with the addition of phosphorous sludge is as follows:

1. Phosphorous is not released in the process to re-enter the wastewater treatment plant.

2. There are no toxic effects.

3. There will be a decreased gas production.

4. An increase in energy mixing, pumping, and heating and mixing the digesters.

5. There will be increased difficulty in heating and and mixing the digesters.

6. Problems with solids liquid separations within the anaerobic digester can be expected to occur.

7. Belt filter press solids cakes will be less than otherwise anticipated.

Consideration should be given to providing better mixing in the anaerobic digesters. Recommended energy input is 10HP per digester.

Solids Treatment

The average stormwater quality has been 107 MG/L of suspended solids and 116 MG/L of BOD. Based on the frequency of the stormwater bypasses, and the volume of water, it is estimated that there will be approximately 9,100 pounds of suspended solids generated annually from stormwater treatment. This is insignificant when reviewed against the solids productions in the normal treatment process, and, hence, will be neglected in the solids production calculations.

The same is true of solids generation in the aerated solids contact channel. Due to the insignificant amount of BOD being removed, there will be little solid production. Solids production will be four pounds per day, and thus, it will also be neglected in the calculations.

Daily there will be 2,353 pounds of solids of the 5,882 pounds entering the WWTP that will be removed in the primary clarifiers. Of the 2,353 pounds of solids removed in the primary clarifier, 882 pounds will be fixed and 1,471 will be volatile. At 5% solids, the 2,353 pounds of primary solids will generate 5,600 gallons per day of wet sludge. This sludge can either be pumped to the primary digester or to a proposed sludge thickener. The existing duplex positive displacement pumps have a capacity of 122.5 GPM and will be utilized for this purpose. This will require pumping 46 minutes per day.

The trickling filters will be loaded with 3,250 pounds per day of BOD. The WPCF MOP 8 indicates .5 pounds of solids are produced on fixed film reactors for every pound of the BOD removed. With consideration for the amount of BOD to be removed in the trickling filters, 1,300 pounds of solids will be produced on the trickling filter each day. Of this amount, 1,040 pounds will be volatile and 260 pounds fixed.

Based on an influent concentration of 12 MG/L and an effluent of 1 MG/L-P and using an aluminum to phosphorous molar ratio of 2 to 1, 1,449 lbs. of chemical sludge will be produced per day. Due to the uncertainty of the use of stoichiometric calculations for sludge estimates, this quantity should be increased 35% as a factor of safety. Therefore, 2,000 lbs. per day of solids will be generated in the chemical sludge phase at the Authority WWTP.

Solids will also increase as a result of more efficient suspended solids removal. Previous sludge production calculations accounted for this increased efficiency of the flocculator clarifiers suspended solids removal. There is also dissolved solids removed by the addition of alum. There will be 921 lbs. per day of dissolved solids removed in addition to the chemical sludge. The total sludge production as a result of phosphorous removal is 2,921 lbs. per day.

The flocculator clarifiers will be loaded with 3,529 pounds of volatile suspended solids that were not removed in the primary clarifier, 1,300 pounds of solids that were produced in the trickling filter, and 2,921 pounds of chemical solids--a total of 7,750 pounds of solids per day. Deducting the allowable discharge of solids to the river, there will be 6,937 pounds of volatile solids removed in the flocculator clarifiers.

The 6,937 pounds of secondary sludge will be at a concentration of .6% solids. This will require removal of 139,000 GPD of wet sludge. This sludge will be removed continuously from the flocculator clarifiers by pumping to the sludge thickener. Two variable speed centrifugal vortex submersible sludge pumps rated for 97 GPM at 5 feet TDH will be used for this purpose. The variable speed will allow the withdrawal of sludge to be regulated. Provisions will be provided to pump secondary sludge to the primary digester using the positive displacement pumps.

The new sludge thickener will be constructed within the tankage of the existing secondary clarifier. It will be limited in size to 27 feet square. The dilute nature of the secondary sludge requires that a thickener be constructed to remove the excess water to reduce the sludge volume. The sludge thickener will also provide another storage device for solids. At the projected hydraulic daily loadings of sludge, the surface loading rate on the thickener will be 212 GPD per square foot. There will be provided 95 GPM of effluent water which will allow the thickener to be loaded at 400 GPD per square foot.

The solids loading will be 12.7 pounds per square feet. With provisions for the escape of solids back to the wet well from the sludge thickener overflow, 8,608 pounds of solids will need to be removed daily from the thickener and be disposed of in the primary anaerobic digester. At 6% solids, 17,000 GPD will need to be pumped. The positive displacement pumps will need to operate 93 minutes per day for this purpose.

There are two existing anaerobic digesters, a primary floating roof, and a secondary gas holder. Of the 8,608 pounds of solids pumped to the primary digester each day, 1,291 will be fixed and 7,317 will be volatile. The solids loading will be .113 pounds of volatile solids per day per cubic foot of digester storage. This is within the design criteria for high rate digesters of .4 pounds of volatile suspended solids per day per cubic foot.

The solids retention time will be 27.9 days. This exceeds the recommended range of 10-20 days for high rate digesters. The organic population equivalent is 4.15 cubic feet per capita, which is within the range of 4-5 cubic feet per capita for primary and trickling filter sludges. The hydraulic retention time will be 28 days.

The WPCF MOP 8 indicates that the solids reductions in the digester can be conservatively estimated at 50%. Therefore, 3,659 pounds of solids will be destroyed, leaving 2,949 pounds per day of solids to be disposed of by dewatering. With a digester underflow of 6% solids, 10,000 GPD of sludge must be disposed.

There are presently 12 open sludge drying beds, and 5 covered sludge drying beds. Utilizing the organic population and DER's requirements of 3 square feet per capita, (a 50% increase has been added to account for the chemical sludge), there is a need for 46,551 square feet of sludge drying bed area, wherein only 26,780 square feet are available. There will be 3,650,000 gallons per year of sludge that must be disposed. At a depth of 15 inches of sludge, 180,868 gallons will fill the sludge drying beds. Therefore, the beds must be filled, dryed and emptied in a 20 day cycle. Based on climatic conditions in the Greenville area, and the possible addition of a water treatment plant sludge, this cycle time is not adequate. The Authority must consider alternate sludge dewatering methods.

A 1.5 meter BFP is recommended for sludge dewatering. The BFP should be constructed in existing operations. The BFP must be located close to the digesters and laboratory.

At 80 GPM, the BFP will take 127 six hour shifts per year to dewater the total sludge volume. There are approximately 250 shifts in a year, thus, the BFP would be operated 51% of the time. The BFP can be utilized in conjunction with the sludge drying beds. The beds can be used for sludge dewatering during

the time period of May through October. The covered sludge drying bed roof will need to have glass panels replaced with clear plastic panels. Sludge dewatered on the BFP can be stored on the sludge drying beds to achieve even higher solids content. Higher solids content means less water in the sludge and hence lower disposal costs.

Plate II is the proposed flow diagram. Table III is the proposed design criteria which relates to the process flow diagram. Table III summarizes the previous process discussions in this report. Plate III is a Site Layout indicating the new tankage, access to the tankage, and methods by which access will be gained to remove sludge solids, maintenance of equipment, and chemical deliveries.

Miscellaneous Design Considerations

DER requires WWTPs an alternate source of electrical power to allow continuity of operations during power failures. Approved methods of alternate power sources include:

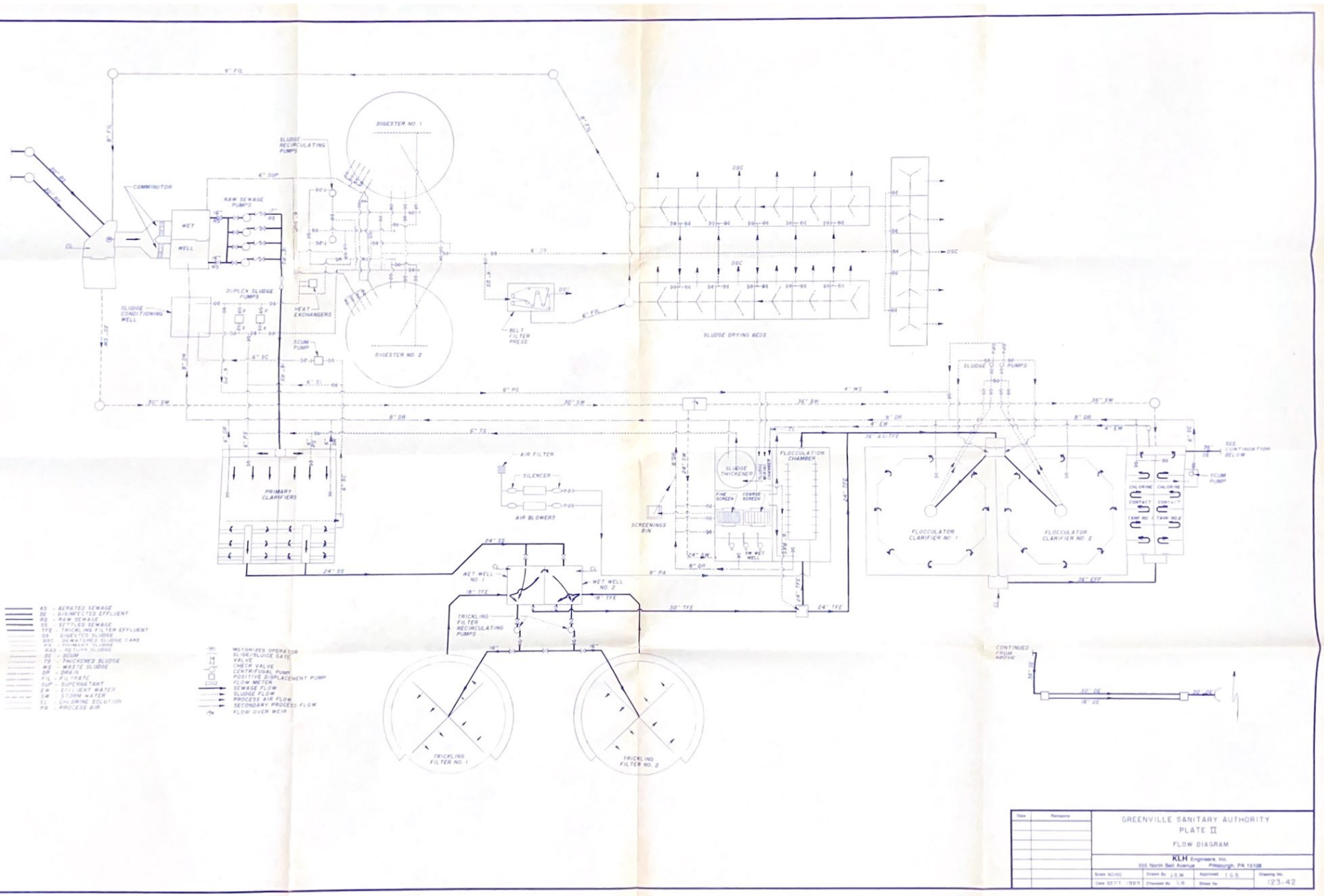
1. Connection to two separate independent public utility sources. (Single feeds from substations of different areas are acceptable.)

2. Portable or in-place combustion engines to generate electricity.

3. Portable pumping equipment.

The design of the treatment facilities provides for a diesel operated generator to power the stormwater submersible pumps, the fine screen, the potable water system, and emergency lighting for use during power failure. During a power failure, the influent gate will close and not allow flow to enter the WWTP wet well. Disinfection will be provided by the opening of a normally closed solenoid valve on the potable water system. The intent is to locate the generator as near the existing motor control center as possible.

The proposed process concept provides considerations for interim construction to maintain treatment. The flocculator clarifiers, chlorine contact tanks, and a new operation building, will be constructed without any disruption of the existing facilities. The plant outfall will need to be relocated and the WWTP effluent will need to be pumped during this construction. At the appropriate time, flow will be diverted from the existing secondary clarifiers into the flocculator clarifiers.



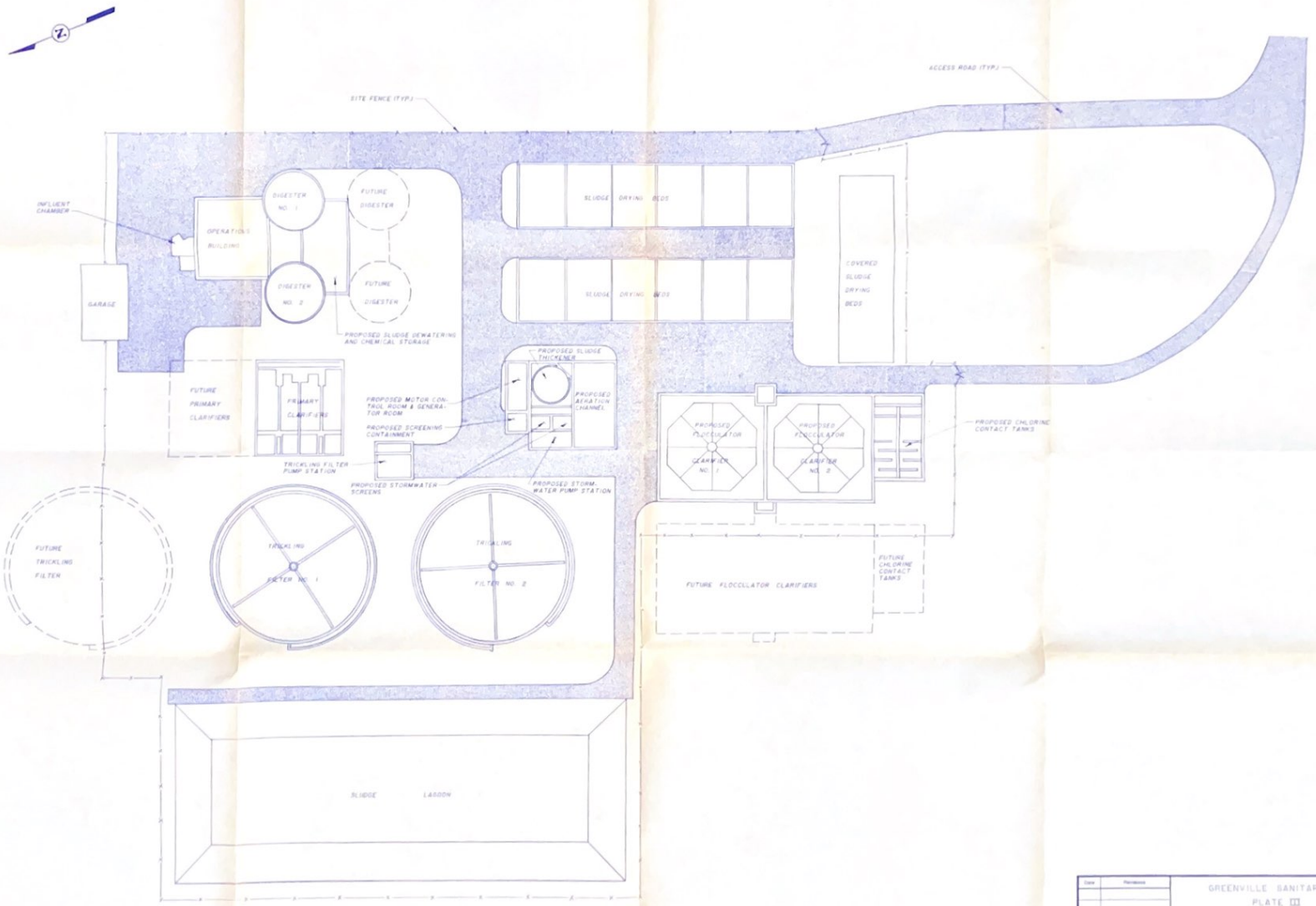
GREENVILLE SANITARY AUTHORITY

PLATE II

FLOW DIAGRAM

KLH Engineers, Inc.
555 North Bell Avenue Pittsburgh, PA 15108

Scale NONE	Drawn By J.S.W.	Approved J.S.S.	Drawing No.
Date SEPT. 1993	Checked By S.R.	Sheet No.	123-42



Date	Revisions

GREENVILLE SANITARY AUTHORITY

PLATE III

PROPOSED SITE PLAN

KLH Engineers, Inc.
535 North Bell Avenue Pittsburgh, PA 15106

Scale 1" = 50'	Drawn By M.A.S.	Approved T.A.B.	Drawing No.
Date SEPT. 1969	Checked By A.R.	Sheet No.	123-41

T A B L E I I I
Summary of Design Criteria

Design Loadings

Tributary Population	
Hydraulic Basis	12,640
Organic Basis	15,517

Hydraulic Loading

Average Day Dry Weather (ADDW) Flow (MGD)	2.50
Peak Day Wet Weather (PDWW) Flow (MGD)	6.25
Stormwater (SW) Flow (MGD)	11.25

Organic Loading

BOD (lb/day)	5,000
SS (lb/day)	5,882
NH3 - N (lb/day)	521
PO4 - P (lb/day)	250
Cold Weather Wastewater Temperature (oF)	50

Preliminary Treatment

PDWW Flow	
Type	Comminutor
Number	2
Capacity, Each (MGD)	3.125
SW Flow	
Type	.06" Rotating Screen
Number	1
Capacity (MGD)	5.0
BOD removal (%)	10
SS removal (%)	15

Wastewater Metering

Raw Wastewater	
Type	Venturi Meter
Size	15"
Capacity	6.25 MGD
Stormwater	
Type	Rectangular Sharp Crested Weir
Capacity	11.25 MGD at 9" Headloss

Influent Gate

Number	1
Type	Automatically throttling to limit influent flow to main process train to 6.25 MGD

Wet Well (Raw Wastewater)

Number	2
Type	Split with interconnecting sluice gate
Effective Volume	
Each	
cubic feet	370
gallons	2,760
Total	
cubic feet	740
gallons	5,538
Detention @ ADDW Flow (minutes)	3.2

Wet Well (SW)

Number	1
Type	Open Pit
Effective Volume	
cubic feet	1207
gallons	9028
Detention @ SW minus PDWW (minutes)	2.6

Raw Sewage Pumps

Type	Variable Speed Centrifugal		
Number	2	1	1
Operating Point @ 1150 RPM	1740 GPM @ 24'TDH	1740 GPM @ 30'TDH	1045 GPM @ 22'TDH
Horsepower	20	20	20

Stormwater Pumps

Type	Submersible Variable Speed
Number	2
Operating Points @ 1170 RPM	1736 GPM @ 25' TDH
Horsepower	35

Primary Clarifiers

Number	2
Size	27'-0"W x 51'-0"L x 10'-0"SWD
Surface Area (square feet)	
Each	1539
Total	3078
Volume	
Total	
cubic feet	30,780
gallons	230,234
Each	
cubic feet	15,390
gallons	115,117
Weir Length (feet)	
Each	144
Total	288
Surface Setting (GPD/square feet)	
ADDW	812 910
PDWW	2031 < 1500 ✓
Detention Time (hours)	
ADDW	2.2 1.97
PDWW	.9
Weir Loading (GPD/ft)	
ADDW	8680 9722
PDWW	21,701

Trickling Filter

Number of Trickling Filters	2
Type	Stone Media
Size	100' diameter x 5.4[illegible] SWD
Operating Mode	Series
Surface Area (square feet)	
Each	7854
Total	~~42,569~~ 15,708

Volume (cubic feet)	42569 $V=\pi hr^2$
Each	~~15,708~~
Total	85,137
Recirculation	Uncontrolled Recycle
NH3 Input (lb/day)	521
NH3 to be Oxidized (lb/day)	313
First Stage	
BOD Input (lb/day)	3250
BOD Loading (lb/day/1000 cu. ft.)	~~210~~ 76
Hydraulic Loading @ ADDW (GPD/sq. ft.)	~~159~~ 356 318
Second Stage	
BOD Input (lb/day)	1105
BOD Loading (lb/day/1000 cu. ft.)	~~70~~ 26
Hydraulic Loading @ ADDW (GPD/sq. ft.) w/o recirculation	~~159~~ 356 318
Trickling Filter Feed Pumps	
Type	Constant Speed Centrifugal
Number	2
Operating Point @ 870 RPM	4340 GPM @ 25' TDH
Horsepower @ 870 RPM	50

Short Term Aeration

Number of Tanks	1
Size (ft.)	27W x 57L x 10 SWD
Volume (gallons)	115,117
Detention time (excludes return solids) (min.)	
@ ADDW	66
@ PDWW	27
@ SW	15
Forward Velocity (FPS)	
@ ADDW	.014
@ PDWW	.036
@ SW	.064
Process Air Blowers	2
Number	2
Capacity	308 scfm @ 4 psig
Horsepower	10
Diffuser Type	Coarse Bubble

Flocculator Clarifiers

@ 2,8 MGD ADDW

Number of Tanks	2
Type	Flocculator/Clarifier
Size	70' x 70' x 16'
Total area (sq. ft.) 1 tank	4688
Total volume (gal.) 2 tanks	1,122,000
Total Weir Length (minimum) (ft.) ?	750
Settling Rate (gal/sq. ft./day)	
@ ADDW	267 298.6
@ PDWW	667
@ SW	1200
Weir Rate (gal./~~sq~~. ft./day)	
@ ADDW	3333 3733
@ PDWW	8333
@ SW	15,000
Detention Time (hours)	
@ ADDW	10.7
@ PDWW	4.3
@ SW	2.4

Chlorination Facilities

Number of Contact Tanks	2
Size	15W x 52L x 10 SWD
Total Volume (gal.)	117,195
Detention Time (minutes)	
@ ADDW	68 60
@ PDWW	27
@ SW	15
Number of Chlorinators	3
Type of System	Compound Loop Control (Flow & Residual)
Size of Chlorinators (lb/day)	500
Maximum dosage rate (MG/L) @ SW	16
Dosage Points	1. Raw Sewage 2. TF Wet Wells #1 & #2 3. Chlorine Contact Tank

Sludge Production

Total SW Screenings (maximum lb/day)	1365
Total Primary Sludge	2353
Total Excess BiologicalSludge (lb/day)	1300
Total Secondary Sludge (excluding excess biological) (lb/day)	2716
Total Chemical Sludge (lb/day)	2921
Total Sludge (lb/day)	7750

Sludge Pumping

Primary Sludge	
Solids Concentration (%)	5
Volume (GPD)	5600
Number	2
Type	Positive Displacement
Capacity (GPM)	123
Daily Operating Time (minutes)	46
Secondary Sludge	
Solids Concentration (%)	.6
Volume (GPD)	139,000
Number	2
Type	Submersible Centrifugal Variable Speed
Capacity	97 GPM @ 5' TDH
Operating Time	Continuous

Sludge Thickener

Number	1
Size	27'W x 17'L x 10' SWD
Surface (square feet)	729
Hydraulic Loading (excluding effluent water((GPD/sq. ft.)	212
Solids to Loading (#/sq. ft.)	12.7
Effluent Water Loading (GPM)	95
Solids to Digester	
Quantity (lb/day)	8608
Solids Concentration (%)	6
Volume (GPD)	17,000
Operating Time (minutes using PD Pump)	139
Sludge Storage (days @ 6% @ solid) 8.7 feet SWD)	3

Digestion Facilities

Type	Anaerobic
Number	2
Size	40' diameter x 24'-6"
Total Volume	
Gallons	483,520
Cubic feet	64,508
Loading	
Lb Volatile Solids/day	.113
Solids Retention Time (days)	27.6
Hydraulic Retention Time (days)	28.0
Cubic feet per capita	4.2
Solids Destruction (%)	50
Solids to be ultimately disposed (#DS/day)	4949
Solids to be ultimately disposed (gallons/day @ 6% solids)	10,000

Sludge Dewatering

Primary Method	1.5 Meter Belt Filter Press
Time of Operation	Year Around
Machine Capacity (GPM @ 3% Solids)	80
Operation Time (hr/month)	63.3
Alternate Method	Sludge Drying Beds
Open Beds	
Number	12
Total Area (square feet)	15,624
Sludge Volume (gallons @ 15" deep)	146,088
Cover Beds	
Number	5
Total Area (square feet)	9,928
Sludge Volume (gallons @ 15" deep)	34,790

Chemical Feed System (Phosphorous Removal)

Primary Chemical	Alum
Secondary Chemical	Sodium Aluminate/ Ferric Chloride
Al:P	2:1
Liquid Alum Usage (4.37% A)	
GPD @ PDWW	2245
GPD @ ADDW	898

Chemical Storage Tanks	
Number	1
Volume (gallons)	5,000
Days of Storage	
@ PDWW	6.7
@ ADDW	16.7
Chemical Feed Pumps	
Number	2
Capacity (GPM)	.16
Day Tank	
Number	2
Volume (gallons)	500
Coagulant Aid	
Type	Dry Polymer
Usage @ (MG/L)	
@ PDWW (#/D)	52
@ ADDW (#/D)	20.8
Usage @ 0.75% solution	
@ PDWW (GPD)	831
@ ADDW (GPD)	332
Storage Tanks	
Number	2
Volume Each (gallons)	500
Polymer Feed Pumps	
Number	2
Capacity (GPM)	0 - .60

The chlorination facilities will also be placed into operation. The existing secondary clarifiers will be removed from operation to have the required modifications made at this time. During this period of construction, only one trickling filter feed pump will be modified at one time. After the pumps are modified, the wet wells must be removed from operation and structural changes made. NPDES limits will not meet the monthly NPDES Permit requirements during this phase, and interim limit will be required for primary treatment.

A new concrete block Operations Building will be constructed near the chlorine contact tanks. The building will house the chlorination facilities. The chlorination solution will then be directly discharged into the chlorine contact tank. Samples of the effluent will need to travel only a short distance to be analyzed for the residual chlorine and for the proper adjustments to be made for phosphorous removal and polymer addition. The flocculator clarifiers will be located adjacent to the building, and chemical addition points will be minimal. Deliveries of chlorine, polymer, and phosphorous removal chemicals will be made through the existing gate located at the west end of the treatment plant.

Potable water at the WWTP is provided by two wells. The well water has not been a problem in quality or quantity. The incoming power is furnished by Penn Power whose offices are located in Clark, Pennsylvania. A sludge lagoon is utilized for cleaning the digesters and has no other process function. It, therefore, cannot be considered in the process scheme.

The sprockets and chains on the primary and secondary clarifiers are in poor condition. Since the secondary clarifiers will be abandoned, only the primary clarifiers need to have the sprockets and chains replaced. An evaluation of plastic versus steel chains was made. The recommendation is to use cast steel, since it is stronger and more wear-resistant than plastic, in the primary clarifier. One of the raw sewage pumps must have a new impeller installed. The new impeller is in inventory and will be given to the contractor for installation.

During the original plant construction, no piling was required at the WWTP. The original contract documents contain all core borings and core boring information. These will be re-utilized in the redesign. There is a considerable amount of concrete in poor condition. It consists of surface repair of depths of one to two inches. Provisions will be made in the construction contract to provide a cash allowance to repair concrete.

Three additional valves will be installed in existing sludge lines in order to facilitate recirculatin of sludge in the digester while utilizing the sludge pumps. Other valves will be used to recirculate Anaerobic Digester No. 2. The three existing methane gas meters on the anaerobic digesters are inoperative and will be replaced with new heat-sensing gas flow detectors and new recording gas flow meters. A surface cleanout on the scum discharging line on both the primary clarifiers and the newly proposed scum lines on the chlorine tanks will be constructed to facilitate line cleanout.

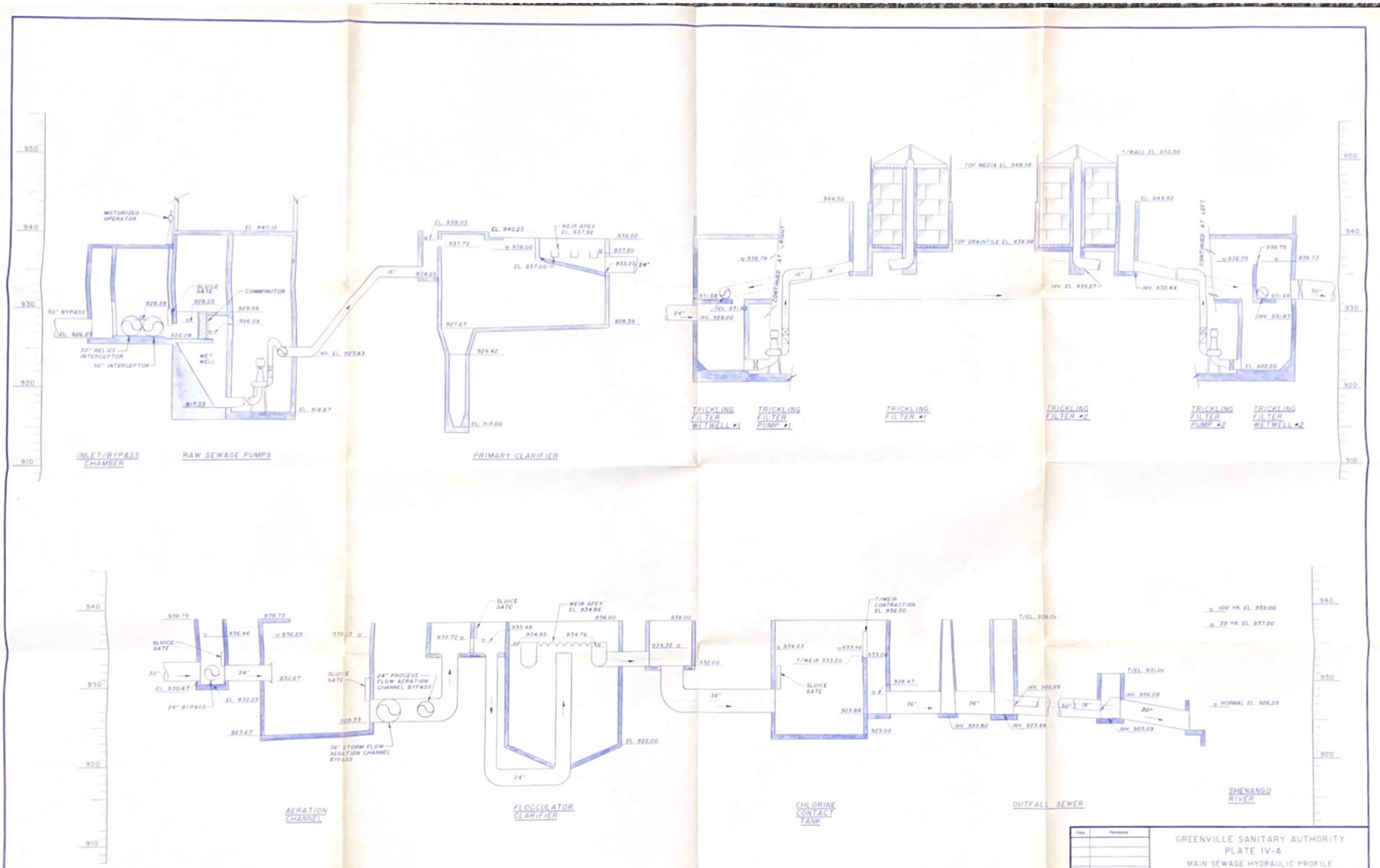
Hydraulics

The Pittsburgh District of the Corps of Engineers provided information regarding flood elevations. The WWTP lies on the East bank of the Shenango River at river mile 80.7, as measured from the mouth of the Beaver River. The Shenango and Mahoning Rivers meet to form the Beaver River near the City of New Castle, Pennsylvania. The 100 year flood elevation at the WWTP was computed by the Pittsburgh District to be 939.0 NGVD. The 25 year flood level has not been determined for this location, but the 10 and 50 year elevations were estimated to be approximately 936.0 and 938.0 feet, respectively.

DER requires the treatment works structures be protected from physical damage from the 100 year flood. The treatment works also are to remain fully operational and accessible during a 25 year flood. Plate IV (3 sheets) is a hydraulic profile of the proposed treatment process. The hydraulic profile indicates the 25 and 100 year flood levels. It shows all the relevant key design features regarding pipe size, slopes, weir settings, top of wall, and bottom of tanks.

The existing treatment facility is built at an elevation that limits the flexibility in the hydraulic design. The Army Corps of Engineers have established the 100 year flood as elevation 939.0 and a 25 year flood is estimated as 937.0. It is obvious from the elevation of the existing facilities that at the 25 year flood, minor flooding of process units would occur. The design is based on a 25 year flood frequency of 937.0 to maintain a process operation. The facility is protected from 100 year floods by floor elevations being set no lower than elevation 939.0.

The existing effluent head wall will be maintained and no new head walls will be constructed. The WWTP will surcharge at 6.25 MGD. It is necessary to parallel an 18" pipe with the existing 30" outfall to the point of the head wall to eliminate surcharging. The location of the proposed flocculator clarifiers and chlorine contact tanks will require the relocation of existing 30" outfall. It will need to be performed as one of the initial construction tasks.



Date	Revisions

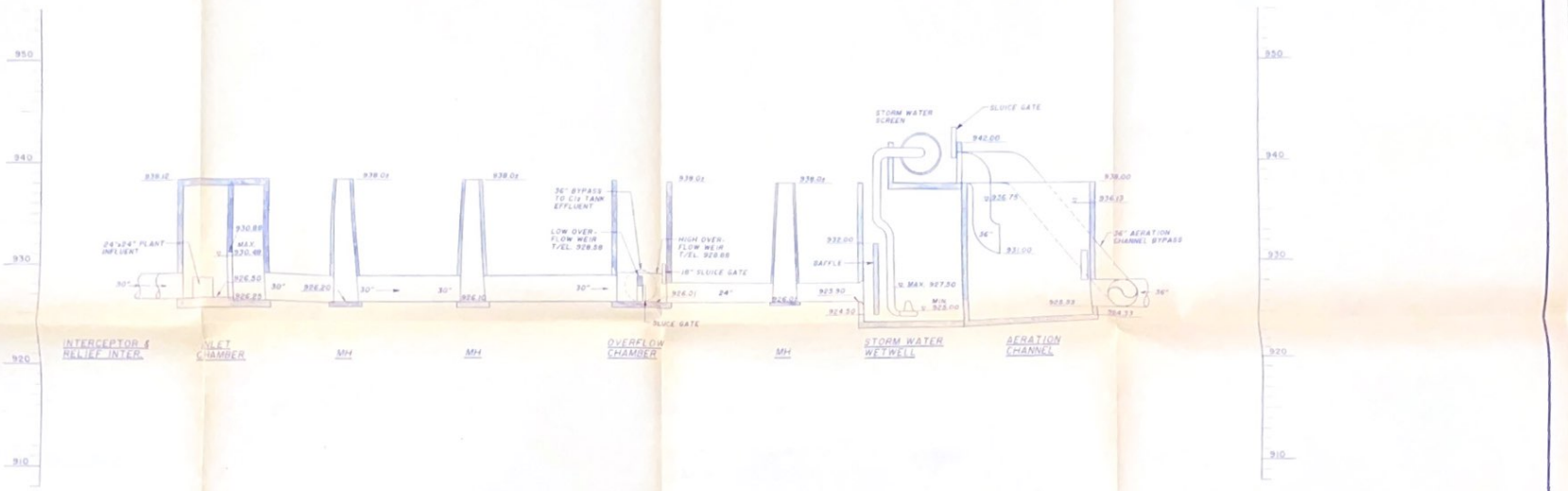
GREENVILLE SANITARY AUTHORITY

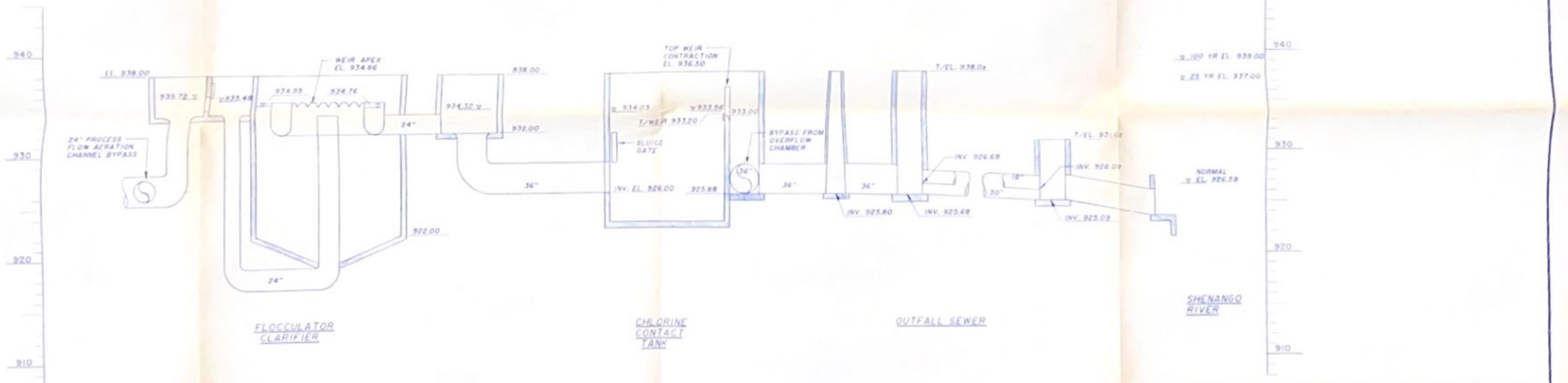
PLATE IV-A

MAIN SEWAGE HYDRAULIC PROFILE

KLH Engineers, Inc.
555 North Bell Avenue Pittsburgh, PA 15108

Scale AS SHOWN	Drawn By ECT	Approved TGS	Drawing No.
Date SEPT. 1989	Checked By GR	Sheet No.	123-38



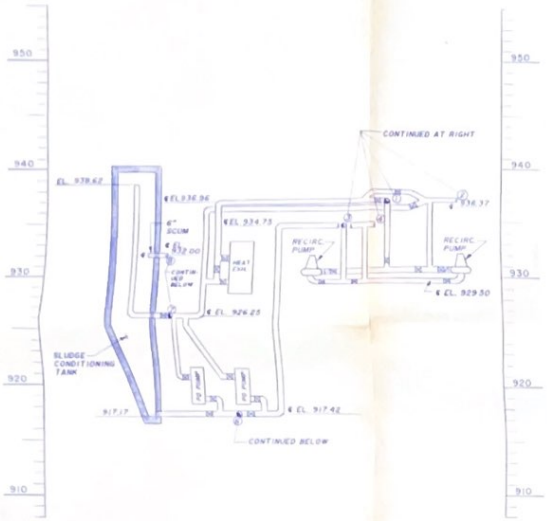


Date	Revisions

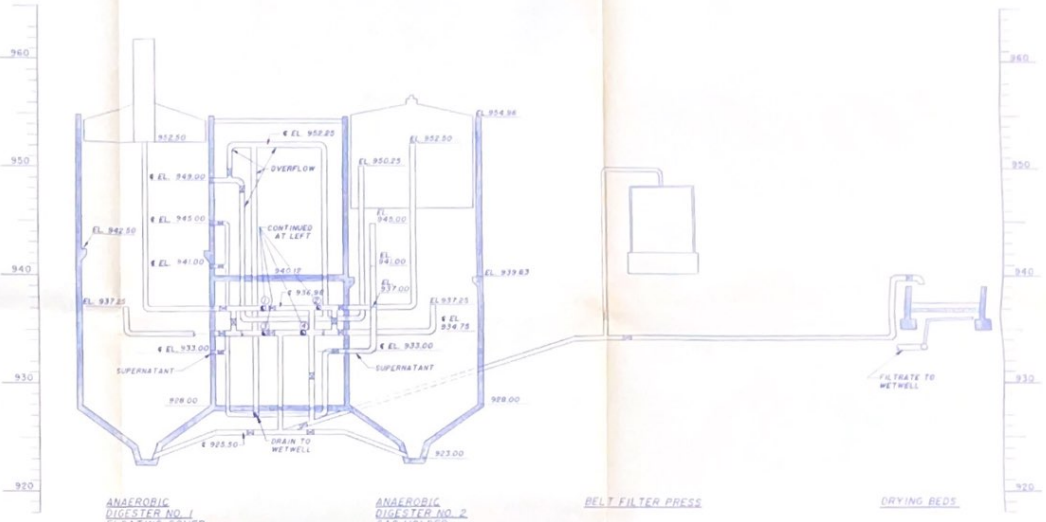
GREENVILLE SANITARY AUTHORITY
PLATE IV-B
STORM FLOW HYDRAULIC PROFILE

KLH Engineers, Inc.
535 North Bell Avenue Pittsburgh, PA 15106

Scale: AS SHOWN	Drawn By: ECT	Approved: TGB	Drawing No: 123-39
Date: SEPT. 1989	Checked By: GB	Sheet No:	



OPERATIONS BUILDING

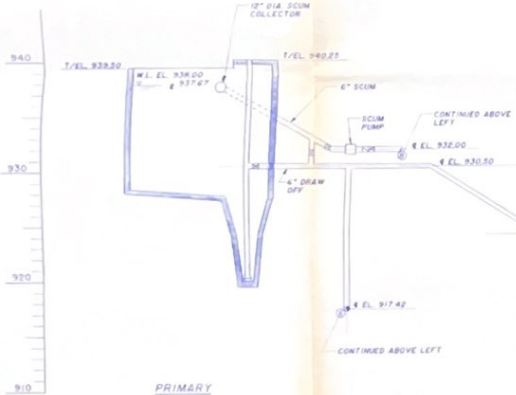


ANAEROBIC DIGESTER NO. 1 FLOATING COVER

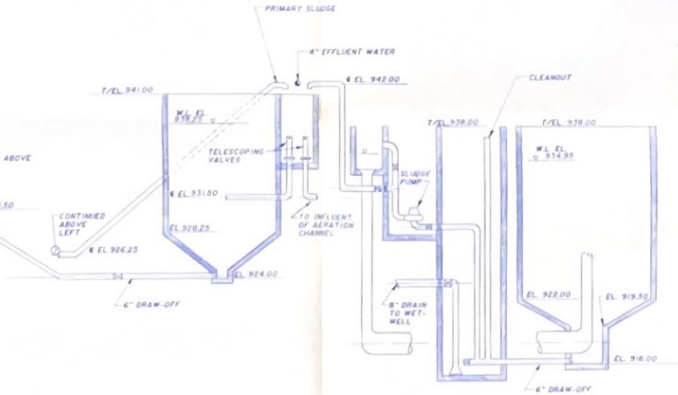
ANAEROBIC DIGESTER NO. 2 GAS HOLDER

BELT FILTER PRESS

DRYING BEDS

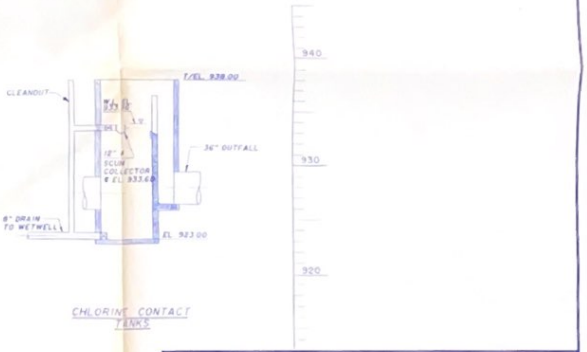


PRIMARY CLARIFIER



SLUDGE THICKENER

FLOCCULATOR CLARIFIERS



CHLORINE CONTACT TANKS

Date	Revisions

GREENVILLE SANITARY AUTHORITY
PLATE IV-C
SLUDGE FLOW HYDRAULIC PROFILE

KLH Engineers, Inc.
555 North East Avenue Pittsburgh, PA 15136

Scale: 1/8" = 1'-0"	Drawn By: ECT	Approved: TJS	Drawing No.
Date: SEPT. 1985	Checked By: GR	Sheet No.	123-40

The chlorine contact effluent weir is set at 933.0, which is lower than the 937.0 design elevation. This is necessary in order to not surcharge the existing secondary clarifiers and trickling filter tiles which have respective elevations of 934.0 (flow line) and 937.04 (top of tile). At flood elevation 937.0 the WWTP will continue to function with the existing trickling filter underdrains flooded as they presently have been for the last 30 years.

The chlorine contact tank weir will be utilized as a flow measurement device and totalize, indicate, and record the total flow exiting from the WWTP. The raw sewage pump venturi meter will record the water treated in the main process flow stream. The difference between the chlorine contact reading and the venturi reading will be the stormwater flow.

It is necessary to utilize 36" pipe to minimize head loss in order to not flood the trickling filter under drains. This size piping is required whenever flows of 11.25 MGD must be transported. The inlet box to the flocculator clarifiers has an induced head loss by use of a submerged orifice in order to attempt to balance the flow of solids to each flocculator clarifier. This is accomplished with the use of 18" square sluice gate.

It is necessary to replace the existing 18" pipe from the trickling filter recirculation wet well to the proposed aeration channel with a 30" pipe. This is required to eliminate existing flooding conditions in the primary clarifiers. Within the trickling filter recirculation wet wells, hydraulic modifications must be made to minimize head loss and to avoid the mixing of treated with untreated wastewater streams. To accomplish this, the following will be completed:

1. The weir in Wet Well No. 2 is raised to elevation 936.75.

2. The weir in Wet Well No. 1 will be removed.

3. 30" outlet piping and valves will be installed to the aeration tanks.

4. In Wet Well No. 1, the existing overflow weir will be removed and the opening cut to allow free passage from the top chamber of Wet Well No. 1 to the flume leading to the bottom of Wet Well No. 2.

5. The influent pipe from the primary clarifiers will be increased from 18" to 24~.

6. The trickling filter recirculation pumps will be modified to constantly pump 6.25.

The above modifications will necessitate the shutting down of the trickling filter recirculation wet well and providing primary treatment during certain phases of construction.

In the Comminutor Room, a bar screen will be furnished above the existing comminutors in the event that they should overflow, and coarse screening will be provided. Otherwise, the existing comminutors will pass 6.25 MGD. An evaluation was made of the hydraulic level in the influent chamber for the following conditions:

1. Average dry weather flow to the treatment plant.

2. Stormwater bypass with 5 MGD to stormwater treatment and 6.25 MGD to wastewater treatment plant.

3. Complete power failure (including non operating emergency generator) with a complete bypassing of 11.25 MGD to the river.

The water levels in the influent chamber prior to the raw sewage wet well will not create problems in the sewer system. During a power failure, emergency generators will operate the stormwater facilities and provide coarse screening, sedimentation, and chlorination for approximately 5.0 MGD of wastewater.

A flow splitting box will be constructed near the secondary clarifiers. The existing flap gate will be removed in the existing influent chamber and the weir opening cut flush to the floor. All flow to 6.25 MGD will enter the WWTP for full treatment. Flows above will pass over a weir into the stormwater treatment units activating the pumps and screening mechanisms. Up to 11.25 MGD will result in full or partial treatment of the wastewater flows. Full flows in excess of 11.25 MGD will pass over the weir and be mixed in the effluent of the plant.

PROJECT COST ESTIMATES

The cost estimates in this report were prepared on the basis of September, 1989 costs. The number of Equivalent Dwelling Units (EDU's) being served is based upon discussions with the Borough Administrative personnel. Financing is based on the Authority applying for PennVest funding. Funding terms are 20 years with interest rates dependent on the local economy. The interest rate is fixed for the last fifteen years. In this analysis, the interest rate on the PennVest financing has been estimated to

average 4% over 20 years. Acceptance of PennVest funding precludes the Authority from receiving additional Act 339 Operating Subsidies. Thus, the present $28,646.00 operating subsidy will remain at that level.

There will be no assessments or sewer tap-in fees collected for the project. The Authority presently has, in the Capital Improvements Sewer Fund, $433,190.00, all of which is assumed to be contributed as capital to the project financing.

The cost components of a project are as follows:

Construction

The costs to be paid to the contractors who will build the required facilities. In addition to the estimated costs, a contingency of 5% is added to the construction cost to account for omissions and unexpected construction costs. Table IV is the detailed estimated construction costs.

Engineering

The costs to be paid to professional engineers to design the facilities, observe construction, and provide other required services such as to assist in operations and financing. Engineering services include:

Grant Assistance - To file grant applications.

Topographic Survey - Topographic surveys will be required of the WWTP.

Design - Preparation of documents (drawings and specifications) on which bids for construction will be received. DER, L & I, and other regulatory agencies will need to review and approve the documents. The design fee includes the completion of these applications for filing by the Authority. The design fee also includes the cost of this design report.

General Project Services - Engineering assistance during construction consisting of:

a. Approving contract payments
b. Answering questions
c. Approving construction submittals
d. Periodic site visits
e. Attending meetings
f. Preparing routine change orders

TABLE IV
CONSTRUCTION COSTS

Item	Cost
Division 1 - General Requirement	$ 60,000
Division 2 - Site Work	300,000
Division 3 - Concrete	975,000
Division 4 - Masonry	65,000
Division 5 - Metals	90,000
Division 7 - Waterproofing	20,000
Division 8 - Door and Windows	22,000
Division 9 - Coatings	25,000
Division 11 - Wastewater Equipment	
Bar Screen	1,500
Primary Clarifier Renovations	55,000
TF Recirculation Pump Modifications and Drives	40,000
TF Arms	143,100
Channel Aeration Equipment	23,400
Channel Aeration Blowers	27,500
Flocculator Clarifiers	260,000
Chlorination Equipment	59,890
Primary Clarifier Scum Pump	12,000
Flocculator Clarifier Sludge Pumps and Drive	7,500
Scum Removal Mechanisms	7,000
Sludge Thickener	58,500
Belt Filter Press (includes pump, polymer, conveyor, spray water)	227,500
Sludge Thickener Effluent Water Pump	4,000
Chlorination Effluent Water Pump	4,000
Composite Sampler	7,500
Instrumentation	33,750
Phosphorous Chemical Feed System	55,000
Polymer Feed System	25,000
Stormwater Submersible Pumps and Drive	95,000
Stormwater Screen	110,500
Emergency Generator	45,000
Division 15 - Mechanical	317,000
Division 16 - Electrical	370,000
Construction Total	$3,550,640

The construction cost to replace the trickling filter media with a 10 foot depth of synethetic media is estimated to cost $750,000.

Printing of Bid Documents - Printing plans and specifications to issue to interested contractors and suppliers.

Resident Observation - A full time individual on site to observe if the contractor is proceeding per the construction documents.

O & M Manual - A document prepared on how the facilities are to be operated and maintained.

Construction Drawings - Revising the bid documents to reflect changes made during construction.

Start-Up - Assistance in starting the WWTP process, testing the equipment, and training the operator.

Financing / Administrative / Legal

The costs to be paid attorneys and financial consultants for professional services relating to financing the project. Financial, administrative, and legal services include:

Concrete Lab Tests - Paid by the Authority to monitor concrete construction.

Authority Expense - Costs to advertise bids, postage, etc.

Bond Counsel - Specialized attorney to assist in the PennVest funding.

Local Counsel - Authority Solicitor to assist in PennVest funding review of bid documents and bids, services during construction, etc.

Contingency

A sum of money set aside for unexpected administrative expenses.

Estimated Total Project Cost

The total of the above costs are termed the "Estimated Total Project Cost". In this report, they are based on estimates and are reported in September, 1989 dollars. Table V is the estimate of the WWTP project costs.

TABLE V

ESTIMATED TOTAL PROJECT COSTS

Construction Costs	
Construction WWTP Contract	$3,550,640
Contingency	177,360
Total Construction	$3,728,000
Engineering	
Grant Assistance	$ 1,500
Topographic Survey	1,500
Design	228,000
General Project Services	57,000
Printing Bid Documents	7,500
Resident Observation	101,000
Construction Drawings	7,500
Start-Up Assistance	10,000
O & M Manual	15,000
Total Engineering	$ 429,000
Authority / Financial / Legal Expense	
Concrete Lab Tests	$ 15,000
Authority Expense	5,000
Bond Counsel	30,000
Local Counsel	30,000
Total Authority / Financial / Legal Expense	$ 80,000
Estimated Total Project Cost	$4,237,000

Operating Cost Estimates

Table VI is an estimate of the required operational and maintenance costs for the newly upgraded WWTP. The budget has incorporated the following provisions:

- Addition of one person to assist in the operation and maintenance.
- Substantial increases in power and chemical costs from previous budgets.
- Zero budgeting basis, thus leaving no monies to be transferred to the Sewer System Capital Improvement Fund. Additional monies have been allocated to "Capital Expense" for year to year capital projects.

User Cost Estimates

This study assumes the method to finance the project is with fund obtained through the Commonwealth PennVest Program. It will be necessary for the Authority to utilize available funds on a short term basis for initial project costs until PennVest fund are received. The Authority should file with PennVest for a design allowance to fund the project design phase. The Authority's project will eliminate an environmental rpoblem (PO4) and enhance the economic climate (Trinity Industries) and, hence, the PennVest application has an excellent opportunity to be funded.

The only means to repay the borrowed money and the operational and maintenance costs is by collecting service charges from the customers of the system. The average user concept will be utilized in the development of estimated user fees. To properly establish the number of users, a meeting was held with Borough personnel. This established that there are a total of 3,343 users (EDU's) in the service area. This includes 120 additional EDU's for St. Paul's Home and the water treatment plant.

T A B L E V I
Estimated Annual Operation and Maintenance Costs

Item	Cost
Personnel Services	-
Administration	$ 15,200
Superintendence	27,650
Treatment Plant Operators	85,000
Sewer Maintenance Labor	9,000
Summer, Sewer Jet and Labor	
Authority Board Fees	1,200
Employer's Share of Benefits	-
Vision	450
Hospitalization, Disability, Major Medical and Dental	20,000
Life Insurance	600
Pension Retirement Pay	0
FICA (Social Security)	10,500
Unemployment Compensation	900
Other Salaries and Wages	-
Longevity Pay	1,900
Overtime, Holidays	600
Sat. & Sun. Pay Differential	1,700
Sick Pay	760
Supplies	750
Chemicals	70,000
Heating Oil	5,000
Vehicle Fuel	900
Miscellaneous	1,500
Sludge Hauling/Disposal	30,000
Maintenance Materials	1,000
Tools & Miscellaneous Equipment	1,000
Audit	1,500
Engineering	3,600
Legal	2,000
Billing/Collecting	21,600
Sewage Enforcement Officer Fee	0
Delinquent Collection Fee	0
Telephone	2,100
Advertising	400
Insurance (Liability, Flood, Auto, Workmen's Compensation)	40,000
Utilities (Power)	45,000
Plant Maintenance	13,000
Maintenance - Operator's House	2,000
Building Rent Allocation	2,000
Rental Requirement	0
Capital Fund Transfer	-
Truck Maintenance	400
Sewer Jet Maintenance	2,400
Construction	1,800
Capital Expense	50,000
TOTAL EXPENDITURES	$473,410

Factors which must be addressed in the user fee analysis and which are used in the Project Cost Analysis are as follows:

Term of Bond Issue	Over how many years will the money borrowed have to be repaid?
Interest Rate	What is the cost of the borrowed money?
Debt Service Coverage	What is the amount of money the holders of the bonds will require to be collected in excess of debt repayment and placed into an account to cover any future defaults?
Number of EDU's	How many customers will help pay for the annual costs?
Delinquency Rate	How many of the customers will not pay their sewer service bill?
Total Project Cost	How much will the project cost?
Capital Contributions	Will the Authority assist by paying for a portion of the total project costs at the beginning of the project?
Annual Administration and Operation	Utility, labor, billing, insurance, salary, etc. necessary to operate and maintain the WWTP. This cost is in addition to the annual payment for the bond issue. Table V is the estimated annual operation and maintenance cost for the proposed WWTP.
Eligible Act 339 Costs	The Commonwealth of Pennsylvania provides a sum of money equivalent to 2% of the costs associated with that portion of the construction costs associated with treating sewage that are constructed using conventional financing means.

Table VII is the analysis of what each user must pay monthly for wastewater collection and treatment service. The user cost to support the project is estimated to be $17.78 per month. The Authority should consider implementing a 15% across the board rate increase in each of the next three years to finance the project.

Table VII
GREENVILLE SANITARY AUTHORITY
PROJECT COST ANALYSIS

PROJECT FINANCING

Total Project Cost	$4,237,000.00
Less:	
Sewer tap-in Fees	0
Front Foot Assessments	0
Capital Contributions	750,000.00
Other Contributions	0
Required Bond Issue	$3,487,000.00
Annual Debt Service Payment	$ 233,148.37
Annual Debt Service Coverage	0
Required Annual Debt Service Payment	$ 233,148.37

ANNUAL FINANCING

Administration & Operation/Maintenance	$ 473,000.00
Annual Debt Service Payment	$ 233,148.37
Total Annual Revenue Requirement	$ 706,148.37
Less:	
PA State Act 339 Subsidy	$ 28,000.00
Plus:	
Delinquency/Uncollectable	35,307.42
Adjusted Annual Revenue Requirement	$ 713,455.79

COST PER EQUIVALENT DWELLING UNIT ($/MONTH) $ 17.78

FACTORS UTILIZED IN THE ANALYSIS

Term of Bond Issue (Years / # Payments) 20.00	40.00
Interest Rate of Bond Issue (% / Decimal) 3.00	.030
Debt Service Cover (%)	0
Number of EDU's	3,343.00
Delinquency Rate (%)	5.00
Total Project Cost ($)	4,237,000.00
Front Foot Assessment ($ Per Foot)	0
Capital Contributions ($)	750,000.00
Sewer Tap-in Fee ($ Per EDU)	0
Other Contributions ($)	0
Annual Administration & O/M ($)	473,000.00
Eligible Act 339 Costs ($)	1,400,000.00

PROJECT SCHEDULE

Table VIII is the proposed project schedule. The tasks are arranged in the recommended order they should be undertaken. Several of the tasks have already been completed. The following applications to support the project's approval by DER must be made by the Authority:

1. NPDES Part I Application
2. NPDES Part II Application
3. Planning Modules for Land Development
4. Stream Encroachment Permit
5. Borough/Township Building Permit
6. Wet Land Determination

This design study and planning revision has been completed for DER's review. If the concept of the project is agreeable with the Borough, the Authority, and DER, preparation of detailed plans and specifications will proceed as quickly as possible. Formal procedures for execution of the required applications, the required public notification, and submission to the proper agencies of the required number of applications with the proper fees, will be made at that same time.

FUTURE GROWTH

Chapter 71 of the DER Rules and Regulations requires each community to revise its Act 537 Plan for Comprehensive Wastewater Planning whenever it appears that the existing plan is inadequate to meet the needs of the community's wastewater planning. Other than recent studies conducted by the Authority relating to specific NPDES violations and the annual wasteload management report, the last comprehensive planning effort appears to be the 1969 Mercer County Sewer and Water Plan.

The Greenville Sanitary Authority, has, in the past several years, faced environmental problems consisting of bypasses of stormwater induced infiltration and inflow, and the imposition of phosphorous effluent limits as a result of a study by the DER on eutrophication in the Shenango Reservoir. These two factors, coupled with growth in the outlying communities of Hempfield, Sugar Grove, Greene, and West Salem Townships, requires that the Act 537 Plan be updated.

T A B L E V I I I

GREENVILLE WWTP PROJECT SCHEDULE

TASK	COMPLETION DATE
File NPDES Part I WQM Permit	09/29/89
Review Wastewater Treatment Plant Design Report/Act 537 Plan Revision	10/26/89
Submit Wastewater Treatment Plant Deign Report/Act 537 Plan Revision to DER with Borough Resolutions	12/26/89
DER approves Plan Revision	01/26/90
File PennVest Design Allowance Loan Application	01/20/90
File Planning Modules for Land Development	01/31/90
File Planning Grant Application	02/16/90
File Stream Encroachment Permit	02/23/90
Lease Agreement Article VIII Engineer's Certification	02/28/90
Authorize Preparation of Bid Documents	03/22/90
DER Wet Land Determination	03/30/90
Initiate Grant Program Search (i.e. EDA, CDBG, etc.)	04/01/90
File Bid Documents with DER, Labor & Industry and other Regulatory Agencies	12/31/90
File Building Permit Part II	12/31/90
DER Issues Part II WQM Construction Permit	03/31/91
File PennVest Construction Loan Application	04/30/91
File Grant Applications	04/30/91

Schedule Cont'd

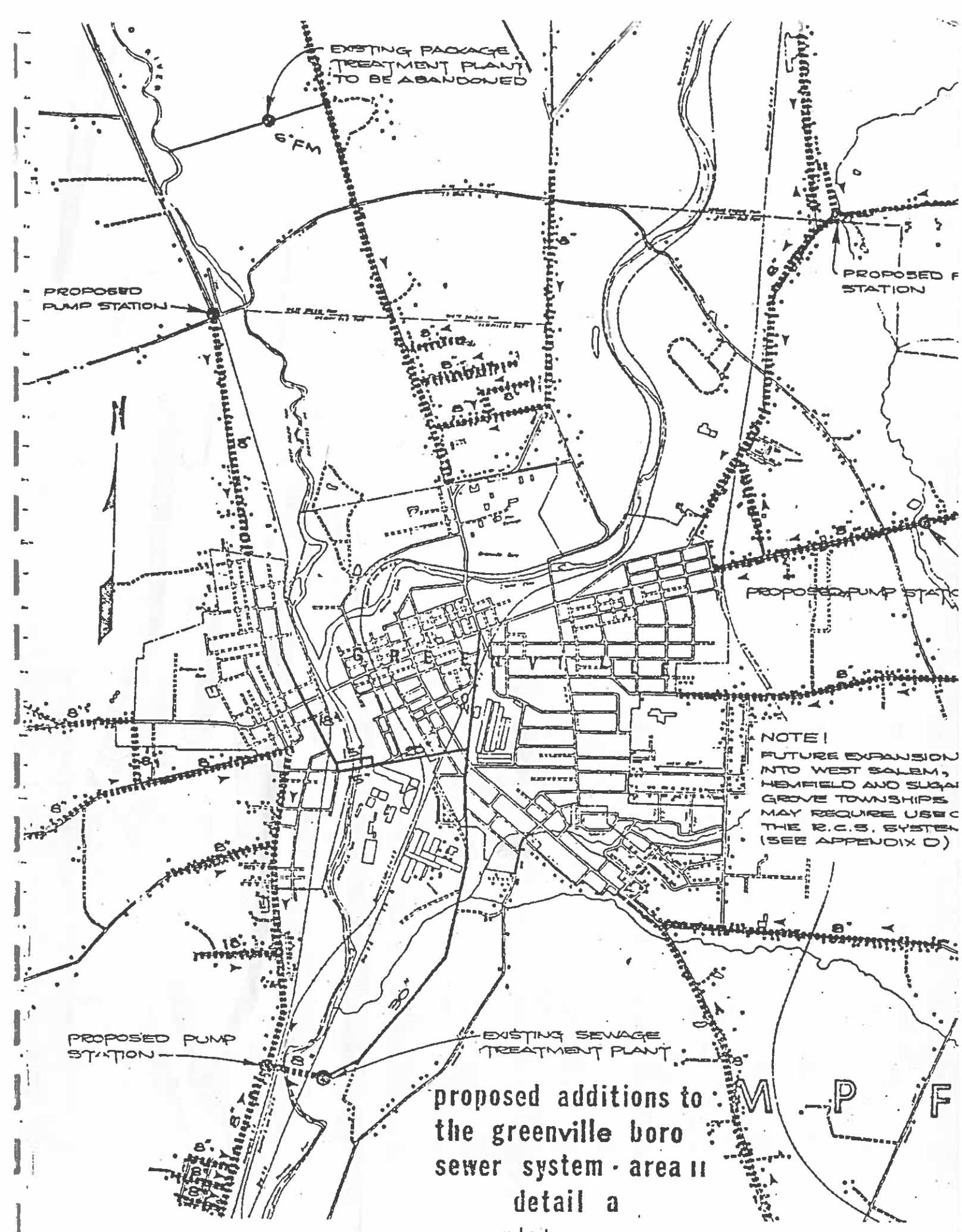
Receive PennVest Loan Approval or Arrange for Public Financing of Project	08/01/91
Advertise for Construction Bids	11/01/91
Receive Construction Bids	01/15/92
Award Construction Bids	04/15/92
Complete Construction and Commence WWTP Operation	12/31/93

Plate I delineates the corporate limits of the Borough of Greenville. It also indicates outlying municipalities. Plate V taken from the Mercer County Plan indicates where wastewater facilities may be required in the next ten to fifteen year period. The Greenville Sanitary Authority has prepared several reports on wastewater planning. These reports included the following:

- Report on evaluation of bypass flows from April 1985, through December 1986 (March, 1987)
- Chapter 94 report for operating year 1988

The entire Borough has been developed and is sewered with sanitary collector sewers. There are several homes not provided with sewer service. These areas operate with onlot wastewater disposal systems. The Borough has received no complaints, nor has the local Sewage Enforcement Officer issued any violations with regards to these systems.

Plate VI is a zoning map of the Borough of Greenville. As the Borough is fully developed, little or no population increases will occur. Any increased wastewater flows will result through increases in commercial and industrial activity within the Borough.



proposed additions to the greenville boro sewer system - area II

detail a

plate v

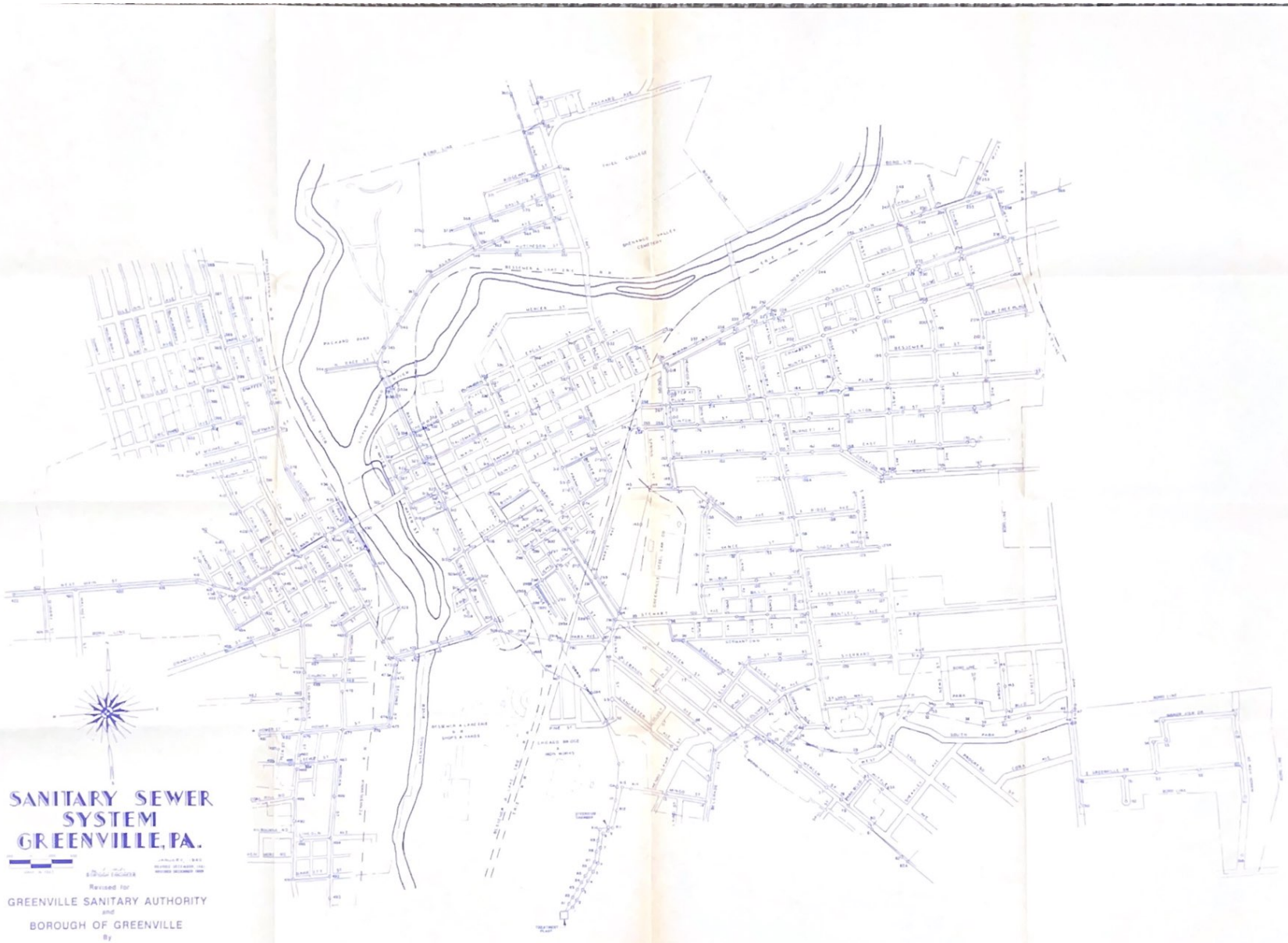
Plate VII is a map of the Borough of Greenville Sewer System. Extensive work has been accomplished in the past relative to flooding problems that have occurred in the York Street area. In 1988 a relief interceptor sewer was constructed to the wastewater treatment plant. The relief interceptor sewer has been in service for a year. Since its construction, no flooding occurred in previous problem areas, even though significant rainfall events have occurred.

The Hempfield Township Sanitary Authority has submitted to the Department, evaluations regarding the capacity of the main interceptor sewer from Canal Street to the wastewater treatment plant. This information is on file with the Department. Otherwise, there are no known hydraulic restrictions within the Borough of Greenville or any reports of overflow of basement flooding.

The Mercer County plan indicated that the areas contiguous to the Borough (i.e Hempfield, Greene, Sugar Grove and West Salem Townships) will have a long term upward growth. The administrative procedures to extend the Greenville collection system will be the major problem-not treatment capacity. The new stringent water quality regulations for the Shenango River will mandate that centralized treatment be effected.

As the Greenville Sanitary Authority provides wastewater treatment service to the area the recommendation is that the existing plant be expanded to incorporate the these developing areas and that no new treatment plants be constructed. The Greenville Sanitary Authority's immediate plans to construct facilities to treat for nutrients and to treat stormwater serve to reinforce the proposal of centralized treatment. Plate V indicated the potential expansion of wastewater service to outside areas.

The Mercer County Plan stated the construction of collector sewers into adjacent areas would be costly and therefore difficult to implement. The use of small package plants did not appear viable as the Corp of Engineers had stated that they would object to their construction above the Shenango Reservoir. This is an additional factor that lends support to the proposed plan that the Greenville Sanitary Authority serve as the centralized treatment facility for the area.



SANITARY SEWER SYSTEM GREENVILLE, PA.

Revised for

GREENVILLE SANITARY AUTHORITY

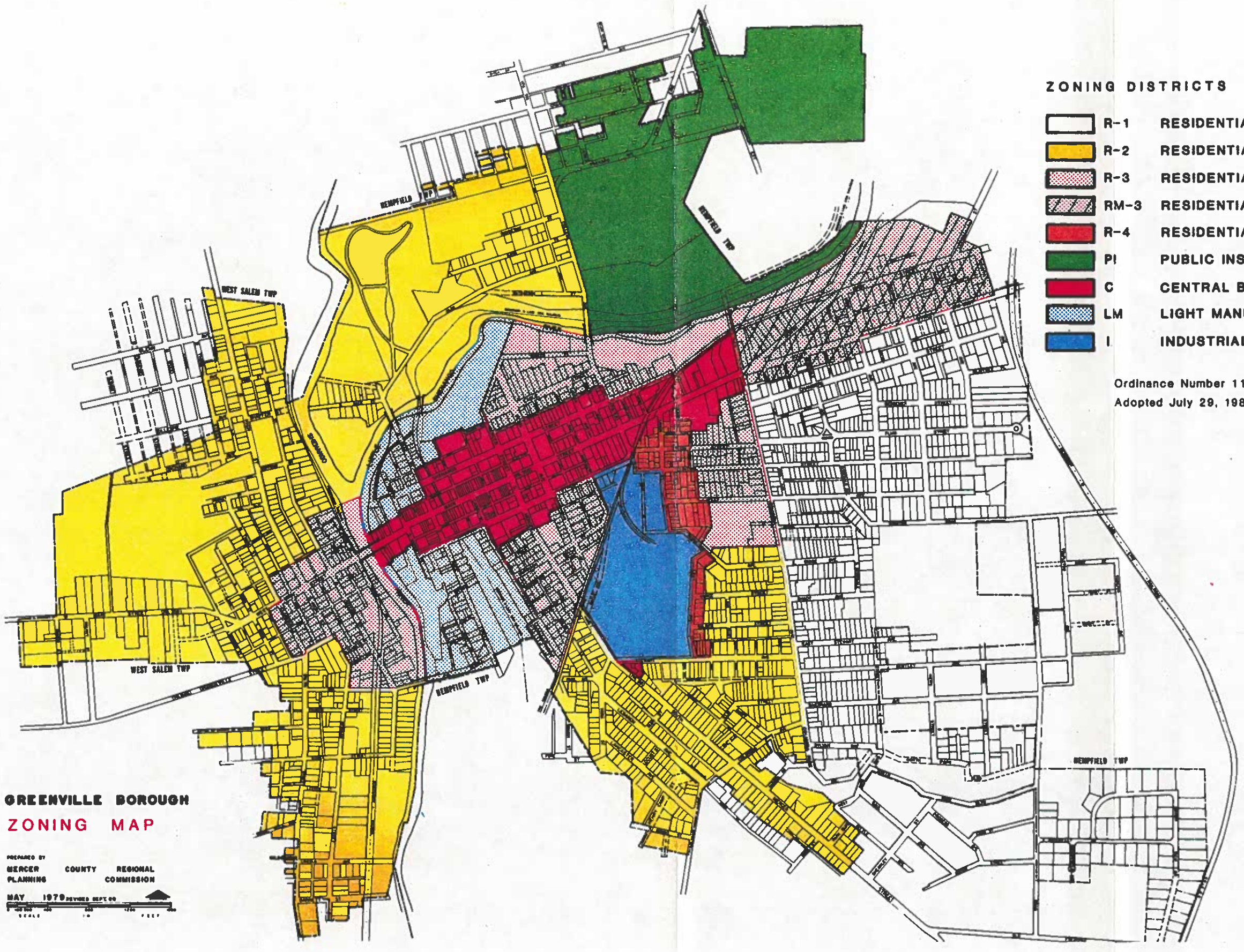
and

BOROUGH OF GREENVILLE

By

KLH ENGINEERS, INC.
Pittsburgh, PA

PLATE VII



ZONING DISTRICTS

	R-1	RESIDENTIAL
	R-2	RESIDENTIAL
	R-3	RESIDENTIAL
	RM-3	RESIDENTIAL/MEDICAL
	R-4	RESIDENTIAL
	PI	PUBLIC INSTITUTIONAL
	C	CENTRAL BUSINESS
	LM	LIGHT MANUFACTURING
	I	INDUSTRIAL

Ordinance Number 1154
Adopted July 29, 1985

PLATE VI

The Greenville Municipal Water Authority is constructing a new water treatment plant. The Water Authority is expected to extend services into these same developing areas as the need arises for water service. It is therefore logical that wastewater services be planned to be consistent with the expansion of the Water Authority service district.

The Mercer County Plan investigated the consolidation of the Reynolds wastewater system with the Greenville Sanitary Authority. The use of a single facility was not feasible due to the limited development that exists along the corridor that connects the two treatment facilities. This conclusion is still valid.

Table IX is the DER's Municipal Population Projections for the surrounding municipalities.

TABLE IX

Population Projections

	Population			
Municipality	1980	1990	2000	2010
Greenville	7,730	7,704	7,715	7,763
Hempfield	4,078	4,227	4,316	4,397
West Salem	3,862	4,003	4,090	4,169
Greene	1,292	1,343	1,372	1,399
Sugar Grove	1,153	1,196	1,222	1,246
Totals	18,115	18,473	18,715	18,974

Onlot systems are used for wastewater disposal in the Townships. The population forecasts were utilized to estimate the quantity of septage generated in the surrounding communities. Table X is the calculation of the septage quantity. The administrative procedure for collecting and disposing of septage is with the municipal and their sewage enforcement officer. However the Greenville Sanitary Authority should take the initiative to encourage the treatment of septage at their facility. The proposed facility construction will be capable of handling and treating these wastes. Revenues for treatment can be held in a special fund to both offset costs and generate capital for future expansion of the system.

TABLE X

Septage Generation

Municipality	Estimated Residents with Septage Tanks	Annual Volume of Septage Gallons	Annual BOD Load of Septage Pounds
Greenville	5	5,000	13
Hempfield	660	660,000	1716
West Salem	1290	1,290,000	3354
Greene	430	430,000	1118
Sugar Grove	380	380,000	988
Totals	2765	2,765,000	7189

The quantities in Table X are based upon each septic tank being 5,000 gallons in capacity and being emptied every five years. The annual volume is equivalent to 7,600 gallons per day of additional hydraulic loadings. The daily BOD Loading is 20 pounds per day.

Greenville is, with the exception of several homes, totally sewered. Hempfield Township presently has approximately 840 customers sewered and discharging to the Greenville wastewater treatment plant. In the remaining communities for that area immediately contiguous to the Borough of Greenville sewage service is provided. Of the population totals it is estimated-disregarding economics-that 30% could be provided sewage service. Table XI is the anticipated incremental pollutional loadings from the contiguous areas capable of being provided wastewater services.

TABLE XI

Future Pollutional Average Daily Loadings to the Greenville Wastewater Treatment Plant.

Municipality	Year 1990 Flow	1990 BOD	2000 Flow	2000 BOD	2010 Flow	2010 BOD
Hempfield	.080	136	.003	5	.003	5
West Salem	.150	255	.003	5	.003	5
Greene	.050	85	.003	5	.003	5
Sugar Grove	.050	85	.003	5	.003	5
Totals	.330	561	.012	20	.012	20

Table XII is an estimate of the treatment plant utilization in the year 2010 based upon the loadings projected in Table XI.

TABLE XII

Greenville Wastewater Treatment Plant Ultimate Utilization

	Flow	BOD
Existing Utilization (based on highest 3 consecutive month average)	2.290	3600
Proposed Design Capacity	2.500	5000
Septage Generation	.076	20
Customer Growth	.366	601
Surplus/(Deficit) Capacity	(.232)	(1400)

The next expansion is estimated to occur in the year 2010 barring unforseen industrial growth/decline, etc. The expansion is estimated to be an additional .5 MGD and will cost approximately $3,500,000 (1989 dollars). The present remaining capacity is ~~capacity is~~ .71 MGD. With each equivalent customer contributing 400 gallons per day of wastewater the remaining and expanded capacity will serve 1775 customers. If $1970 were charged every new customer for the initial wastewater service connection the next expansion could be funded with available capital. Allowances for future connections at the time of the future expansion would need to be addressed in long term financing.

Plate III contained within the Wastewater Treatment Plant Design Report indicates where future process units can be constructed at the Greenville Sanitary Authority facility. Space is available to allow the treatment plant capacity to be increased from 2.5 MGD to approximately 5 MGD.

The Greenville Sanitary Authority owns the collector sewer system and wastewater treatment plant. The system is operated by the Borough of Greenville under a lease-back~~k~~ arrangement with the Authority. The wastewater treatment plant was previously described in detail. The Borough maintains an on-going collection system operation and maintenance program consisting of manhole inspection and sewer cleaning. The Borough employs four personnel to operate and maintain the treatment facilities. Borough personnel also are utilized in the operation and maintenance of the collection system. This report recommends a fifth person be hired at the upgraded wastewater treatment facilities to assist in operation and maintenance.

No industrial wastewater discharges are presently made to the Authority collector sewer system. The Authority has pending, two applications for industrial wastewater discharges. These include the discharge of backwash water from a proposed water treatment plant upgrading and expansion for the Greenville Water Authority, and for discharge of noncontact cooling waters from Trinity Industries. The application are under review with KLH Engineers, Inc. No constituents in these wastewaters will harm the wastewater treatment facilities, and a permitting system is being developed for acceptance of these wastes.

Exhibit I is a copy of the rules and regulations that presently govern sewer collection and treatment service within the Borough. These rules and regulations should be updated to adequately control the wastewater system.

The wastewater treatment plant upgrading previously described in this report, should be accomplished per the proposed schedule. The important aspects of wastewater planning should be devoted to the administrational and economic aspects. The recommendations to implement future wastewater planning are presented below for consideration by the Borough and its adjacent municipal neighbors.

1. The Greenville Sanitary Authority should meet with West Salem, Greene, and Sugar Grove municipal officials to develop sewage service agreements. The Greenville Sanitary Authority should consider that it would construct, own, and operate all collection and treatment facilities in the service area.

2. The Greenville Sanitary Authority should meet with Hempfield Township municipal officials to discuss arrangements for the potential to transfer ownership of Hempfield Township's existing collection system to the Greenville Sanitary Authority.

3. Prior to the execution of any service agreements each of the municipalities will need to adapt new Comprehensive Wastewater Planning as mandated by DER.

4. The Greenville Sanitary Authority should implement a replacement capacity fee to be charged to any new customers. The purpose of the fee is to generate capital to finance the next expansion of the wastewater treatment plant. The exact procedure and amount will require further administrative, technical, and legal analysis.

5. The Greenville Sanitary Authority should review all Ordinances governing sewage service and if necessary revise, update, or adopt new Ordinances. The review would be comprehensive and include stormwater control, building standards, industrial permitting requirements, connection/replacement capacity fees, rate analysis (including septage treatment), etc.

End of Report

Exhibit I

Rules and Regulations

PART 11

Public Services and Improvements

CHAPTER 1

Sanitary Sewers

ARTICLE A

Sewer Connections and Uses

ARTICLE B

Sewer Rentals

ARTICLE A

Sewer Connections and Uses

Section 11-1001 Definition.

The word "person" as used in this article shall mean any natural person, association, partnership, firm or corporation. The singular shall include the plural and the masculine shall include the feminine and the neuter. (Ord. No. 754, 10/6/58, Sec. 1)

Section 11-1002 Extent.

Every property in the borough, adjoining or abutting upon any street or alley in which a public sewer is now or shall hereafter be located, shall be connected with such sewer in such manner and within such time as the borough may order, for the purpose of the discharge of all fecal matter, human excrement, kitchen and laundry waste and other sewage from such premises. All such sewage, shall, after connection, be conducted into such sewer. Every such property shall be connected separately and independently with the sewer through the house connection branch directly opposite the building or nearest in a down stream direction. Grouping of buildings upon one house sewer shall not be permitted, except under special circumstances and for good sanitary reasons, with special permission granted by council upon recommendation of the engineer. (Ord. No. 754, 10/6/58, Sec. 2)

Section 11-1003 Failure to connect.

If the owner of any property, after 45 days' notice from the borough to make connections of such property with a borough sewer, shall fail to make such connection, the borough may make such connection and may collect the cost thereof from such owner by a municipal claim or in an action of assumpsit as is provided by law. (Ord. No. 754, 10/6/58, Sec. 3)

Section 11-1004 Procedure.

No person shall make or cause to be made any connection of his property with any of the borough sewers until he has fulfilled all of the following conditions:

(1) He shall submit plans to the secretary showing the locations and grades of all storm and sanitary sewers and showing how all sewage and surface waters are to be disposed of.

(2) He shall have obtained a permit from the engineer for such connection and shall have paid a fee of $10 for said permit.

(3) He shall notify council of his desire and intention to make such connection.

(4) He shall pay a sewer connection fee of $25, which shall be payable to the secretary for the use of the borough.

(5) He shall have applied and obtained a permit to excavate in the street, if such excavation is necessary, in accordance with any borough ordinances regulating the same.

(6) He shall have given the secretary at least 24 hours' notice of the time when such connection shall be made, in order that the engineer or his authorized agent can be present to approve and supervise the work of the connection. (Ord. No. 754, 10/6/58, Sec. 4)

Section 11-1005 Inspection and test of subdevelopment sewer systems.

Where subdevelopment is proposed of lots which require a system of drainage facilities, the foregoing method of procedure shall be followed as outlined under section 11-1004, with the additional conditions with regard to inspection and testing of the sewer system.

(1) All subdevelopment drainage systems shall be inspected continuously during construction and all inspection costs shall be borne by the developer.

(2) Upon installation of a part or all of the system, but prior to backfilling the portions installed, the system shall be subjected to a hydraulic exfiltration or infiltration test conducted by the engineer. The system or portion so tested shall be within the limits of leakage set up by the engineer; where the leakage exceeds those limits, the developer shall make necessary repairs so as to meet the requirements under subsequent tests. The cost of these tests shall be paid for by the developer on the basis of the actual time spent by the engineer and his assistants on the tests. The engineer shall furnish a certified copy of each test so conducted to the developer. (Ord. No. 754, 10/6/58, Sec. 5)

Section 11-1006 Supervision of connection.

All work of making connections to any of the borough sewers shall be done under the personal supervision of the engineer or his authorized agent and shall conform to the following requirements: All sewer connections shall be made at the place where the wye in the borough sewer is provided, but if no wye is provided in the borough sewer, then the property owner making such connection shall, at his expense, put in the wye in making such connection. All joints shall be sealed and made watertight, and shall be made smooth and clean inside, with all sewers in straight alignment and of proper grade, so as to provide free flow of sewage matter without any obstructions and to be made in accordance with the borough's specification for its sanitary sewers. All work pertaining to the connection with the borough's sewers shall be financially and otherwise, the responsibility of the owner of the property with which connection is made,

subject to the right of supervision hereby reserved by the borough. (Ord. No. 754, 10/6/58, Sec. 6)

Section 11-1007 Exclusions of certain wastes.

No person shall connect or cause to be connected with any of the public sewers in the borough, directly or indirectly, any stream exhaust, boiler blow off, sediment trap, or any pipe carrying or constructed to carry hot water or acid, germicide, grease, brewery mash, gasoline, naphtha, benzine, oil or any other substance detrimental to the sewers or to the operation of the sewage system or the sewage disposal works of the borough. (Ord. No. 754, 10/6/58, Sec. 7)

Section 11-1008 Privy vault exclusion.

No privy vault, cesspool or similar receptacle for human excrement shall at any time, now or hereafter, be connected with any of the borough sewers. (Ord. No. 754, 10/6//58, Sec. 8)

Section 11-1009 Remedial actions.

No privy vault, cesspool or similar receptacle for human excrement shall hereafter be maintained upon any premises from which connection with any of the borough sewers shall have been made. Every such privy vault, cesspool or other receptacle shall, within 30 days after final enactment of this article in the case of premises now connected with a sewer, and within the 30 days after connection with a sewer in the case of premises hereafter so connected, be abandoned, cleansed and filled under the direction and supervision of the health office of the borough. Any such privy vault, cesspool or other receptacle not abandoned, cleansed and filled as required by this section shall constitute a nuisance and such nuisance may be abated on order of the board of health as provided for by law, at the expense of the owner of such property. (Ord. No. 754, 10/6/58, Sec. 9)

Editorial Note: The "final enactment" referred to is that of Ordinance No. 754, not of this Code.

Section 11-1010 Velocity of flow.

No sewers shall be laid on a grade such that the mean velocity of flow when full or half full is less than two (2) foot per second when using Kutter's or Manning's formula with a roughness efficient of N-013. (Ord. No. 754, 10/6/58, Sec. 10)

Section 11-1011 Sewer capacities.

In the design of the system the capacity of the sewers, both collecting and transporting, which in the future will be installed by property owners or owners of subdivisions should conform to and adhere to the following:

The sewer capacity of any sanitary sewer from a single dwelling shall not be less than six (6) inches and to a multiple dwelling shall not be less than eight (8) inches in diameter. Where it is deemed advisable by the engineer, larger sewers at adequate grades shall be supplied as may be required by the engineer in his sound discretion. (Ord. No. 754, 10/6/58, Sec. 11)

Section 11-1012 Sanitary wastes.

The sewerage system proposed is that for the conveyance, transportation and final treatment, of sanitary sewage and other allied wastes such as industrial wastes which can be adequately treated by the system and which will not tend to destroy or damage the system. By sanitary wastes are meant the sanitary sewage discharge from any property exclusive of ground water seepage, surface or roof and foundation drainage. (Ord. No. 754, 10/6/58, Sec. 12)

Section 11-1013 Industrial and allied wastes.

Industrial wastes will only be accepted into the sanitary sewerage system after adequate analysis and certified conditions as to strength, quantity, etc., have been presented to the borough and the borough has examined the submission and determined that it will not harm or be detrimental to either the system used in conveyance or the treatment plant operations. It may be that certain industrial wastes before acceptance may require pre-treatment, in which event the applicant shall adequately control and pre-treat the wastes before delivery to the system. (Ord. No. 754, 10/6/58, Sec. 13)

Section 11-1014 Oils and greases.

Mineral oils and greases will not be accepted for transportation and treatment, and all appli-

cants shall eliminate such wastes from the sanitary sewerage before discharge into the borough's system providing proper equipment for such separation. This equipment, in the form of grease traps or oil separators, shall be adequately operated and maintained by the applicant so as to prevent such discharge. (Ord. No. 754, 10/6/58, Sec. 14)

Section 11-1015 Inflammable and explosive fluids.

No inflammable or explosive fluids, such as gasoline, naphtha or similar volatile wastes, shall be discharged into the sewage system whereby explosions, or damage to the sewage system may occur or cause danger to the maintenance force of the borough in performing their ordinary duties. Such fluids shall be adequately and thoroughly removed or separated from the sanitary wastes before discharge. (Ord. No. 754, 10/6/58, Sec. 15)

Section 11-1016 Acids and alkalies.

Strong acids or alkalies which would damage the sewerage system will not be accepted except after proper dilution or neutralization. Before any such acids or alkalies are discharged to the system, the borough shall be notified and will prescribed the requirements necessary to obtain permission to discharge such wastes to the sewers. (Ord. No. 754, 10/6/58, Sec. 16)

Section 11-1017 Ground water and seepage drains.

No basement seepage, ground water drainage, or any other uncontaminated source of water shall be discharged to the sanitary sewerage system and all applicants desiring connection to the sewerage system shall certify that no ground water or seepage drains are connected to their system. After connection to the borough's sewer is made the applicant shall maintain his house system in such a manner that no such seepage or drainage enters his sanitary sewerage system. A penalty will be charged for any violation of this rule in the amount of triple the annual bill for the length of time the situation has existed after connection to the borough's system. (Ord. No. 754, 10/6/58, Sec. 17)

Section 11-1018 Downspout and roof drainage.

No downspouts, roof drainage or surface or areaway drainage shall be connected into the sanitary sewerage system, and before attachment of the sanitary sewers to the borough's system, the property owner or applicant for servicing shall remove such connections and adequately and tightly plug his system to prevent the entrance of any downspout, roof, surface or areaway drainage. (Ord. No. 754, 10/6/58, Sec. 18)

Section 11-1019 Vents.

Each user of the system, before connections are made thereto, shall provide in his main sewerage system just outside the building wall, a trap with vents, both ahead and after, to permit cleaning and to provide proper ventilation for the system. These vents shall not be less than 4 inches in diameter. (Ord. No. 754, 10/6/58, Sec. 19)

Section 11-1020 Cross-connections.

No cross-connections shall be made between the sanitary sewerage system and the potable water system whereby vacuums or back siphonage could permit sanitary wastes to enter the potable water system. No cross-connections shall be made between the sanitary sewerage system and storm drains or storm sewers. (Ord. No. 754, 10/6/58, Sec. 20)

Section 11-1021 Permission to inspect.

Any contributor shall permit the borough's representative to inspect or test his sanitary house system at any reasonable or proper time upon adequate notice from the borough's representative. (Ord. No 754, 10/6/58, Sec. 21)

Section 11-1022 Penalty for violation.

Any person who shall violate or fail to conform to any of the provisions of this article shall, upon conviction thereof, be sentenced to pay a fine of not more than $50 plus costs of prosecution, and in default of payment of such fine and costs, to imprisonment for not more than 30 days. Provided: each day's continuance of violation, after notice thereof by council,

shall constitute a separate offense. (Ord. No. 754, 10/6/58, Sec. 22)

Sections 11-1023 through 11-1040 reserved.

ARTICLE B

Sewer Rentals

Section 11-1041 Sewer rentals established.

There is hereby established and imposed a sewer rental or charge for the use of the sanitary sewers, sewer system and sewerage treatment works owned or operated by the Borough of Greenville, to be payable by the owners of all properties served thereby. In order to apportion the cost of such sanitary sewer service equitably among the properties served by said sanitary sewers, sewer system and sewerage treatment works, the rental or charges for such services for every property served by the sanitary sewers, sewer system and sewerage treatment charged to be 85 percent of the face amount charged to such properties for water consumed by such properties (with exception herein noted) during the period for which the sewer rental or charge is being billed. For customers supplied with water by the Municipal Authority of the Borough of Greenville, the sewer rental or charge shall be computed according to the water meter readings of the Municipal Authority of the Borough of Greenville for water furnished to said properties. (Ord. No. 736, 1/25/58, Sec. 1, as amended by Ord. No. 774, 3/23/60; by Ord. No. 864, 1/5/65, Sec. 1; by Ord. No. 955, 9/8/70, Sec. 1; by Ord. No. 1015, 10/8/74, Sec. 1; and by Ord. No. 1025, 12/9/75, Sec. 1; and by Ord. No. 1062, 1/24/78, Sec. 1)

Section 11-1042 Rendering of bills; when due and payable; discounts; discontinuance of service for failure to pay.

(a) Bills for sewer rentals and charges hereby imposed shall be rendered concurrently with the bills for water services rendered by the Municipal Authority of the Borough of Greenville and shall be due and payable concurrently with said bills for water services.

(b) All bills for sewer rentals and charges shall be due when rendered and shall be subject to a discount of five (5) percent if paid within 12 days from date of bill.

(c) Sewer service to any property may be discontinued, after five (5) days' notice, for failure of the property owner or user to pay the bill for such services within 30 days after the due date thereof. (Ord. No. 736, 1/25/58, Sec. 2)

Section 11-1043 Sewer rentals for property having water source other than from municipal authority.

Users of the sanitary sewers, sewer system and the sewerage treatment works having a source of water other than the water supply of The Municipal Authority of the Borough of Greenville shall pay sewer rental or charge by one of the following methods:

(1) Restaurants, cafes, hotels, clubs, rooming houses, public garages, filling stations, laundries, ice cream and/or soda dispensers, dairies, dental offices and all users of the sanitary sewer system having water-cooled refrigeration and/or air conditioning systems shall install water meters on their source of water, which meters shall be subject to approval by the borough and shall pay a sewer rental or charge on the basis of the meter readings at the same rate as is provided under section 11-1041 hereof.

(2) Industrial plants and establishments shall make application to council for approval to pay a sewer rental or charge by one of the following methods, viz.:

a. The user shall install a water meter on his source of water, which meter shall be subject to approval by the borough, and shall pay a sewer rental or charge on the basis of the meter readings at the same rate as is provided under section 11-1041 hereof; or

b. The user shall pay a quarterly rental of $3.13 per employee using the sewer facilities of such industrial user, as determined on the last day of the preceding quarter.

c. Domestic users shall make application to the council for approval to pay a sewer rental or charge by one of the following methods, viz.:

1. The user shall install a water meter on his source of water, which meter shall be subject to approval by the borough, and shall pay a sewer rental or charge on the basis of the meter readings at the same rate as is provided under section 11-1041 hereof, or

2. The user shall pay quarterly sewer rental of $18.87. (Ord. No. 736, 1/25/58, Sec. 3, as amended by Ord. No. 864, 1/5/65, Secs. 2 and 3; by Ord. No. 955, 9/8/70, Secs. 2 and 3; by Ord. No. 1015, 10/8/74, Secs. 2 and 3; and by Ord. No. 1025, 12/9/75, Secs. 2 and 3; and by Ord. No. 1062, 1/24/78, Secs. 2 and 3)

Editorial Note: Section 2 of each of the amending ordinances cited above amended Section (b-2) of this section, while Section 3 amended Section (c-2). Each amendment contained an effective date, the most recent being Section 4 of Ord. No. 1025, which provided that the changes of rates set forth in that ordinance were to become effective as of January 1, 1976.

Section 11-1044 Certain substances not to be discharged into sewer; surcharge for discharge of certain wastes.

(a) The above schedule of rates shall cover the charges based on volume only for a normal domestic sanitary sewage having a pH range between 6 and 9.5, a suspended solids quantity of less than 250 p. p. m., a chlorine demand not to exceed 50 p. p. m., a 5-day 20 degrees C. B. O. D. of 250 p. p. m., and comparatively free from grit or mineral solids, such as sand, ashes, etc., which would not be moved or conveyed along the sewers by the velocity of the sewage flow, in addition the following concentrations of chemical substances shall not be exceeded in the sewage originating from any customer:

Phenol Compounds		1 p. p. m.
Cyanides	(CN)	1 p. p. m.
Cyanates	(CNO)	10 p. p. m.
Iron	(Fe)	5 p. p. m.
Trivalent Chromium	(Cr)	0.3 p. p. m.
Hexavalent Chromium	(Cr)	0.5 p. p. m.
Nickel	(Ni)	3 p. p. m.
Copper	(Cu)	2 p. p. m.
Zinc	(Zn)	2 p. p. m.

The waste of any customer containing excessive quantities of these chemicals may be refused entry into the said sewer system, until such waste has been pretreated to bring it within the allowable limits set forth above.

(b) It is prohibited to discharge into the sanitary sewer system any:

(1) Liquid or vapor having a temperature higher than 150 degrees F.

(2) Waste containing more than 100 p. p. m. by weight of fat, oil or grease.

(3) Gasoline, benzene, naphtha, fuel, oil, or other inflammable or explosive liquid, solid, or gas.

(4) Any garbage not shredded to such degree that all particles will be carried freely under normal sewer flow conditions and with no particle greater than one-half (1/2) inch in dimension.

(5) Any noxious or malodorous gas or substance capable of creating a public nuisance.

(c) The following surchage rate, in addition to the applicable rate set forth above, shall be charged any customer whose wastes exceed the limits set forth in subparagraph (a) of this section:

$0.000288 for each p. p. m. of suspended solids in excess of 250 p. p. m. per 1000 gallons of sewage.

$0.000292 for each p. p. m. of 5-day 20 degrees C. B. O. D. above 250 p. p. m. per 1000 gallons of sewage.

$0.001008 for each p. m. m. of chlorine demand greater than 50 p. p. m. of grit or mineral solids in excess of 14 p. m. m. per 1000 gallons of sewage.

$0.000015 for each p. p. m. of grit or mineral solids in excess of 14 p. p. m. per 1000 gallons of sewage.

The surcharge or additional strength sewage shall be determined by analysis based on accepted standards for sewage analysis.
(Ord. No. 736, 1/25/58, Sec. 4)

Section 11-1045 Special rates where discharge on water usage basis inequitable.

In cases where any user of the sanitary sewer system paying sewer rentals or charges on the basis of metered water uses discharges less than 75 percent of his total water usage into the system, upon application by the user to council, a sewer rental or charge shall be determined by either:

(1) Placing a water meter, which shall be subject to the approval of the borough, at the expense of the user, on the water supply line or lines not discharging into the sanitary sewer system, and the readings therefrom will then be deducted from the total water meter readings and the remainder will be used in computing the sewer rental or charge according to the rates set forth in section 11-1041 above, or

(2) Placing a meter or measuring device, which shall be subject to the approval of the borough, on the sewer connection at the expense of the user, and the sewer rental or charge shall be computed on the basis of gallons discharged into the sanitary sewer system according to the rates set forth in section 11-1041 above.
(Ord. No. 736, 1/25/58, Sec. 5)

Section 11-1046 Property owner's responsibility; recovery of unpaid sewer rentals.

(a) Any person, whether as principal, agent or employee, violating or assisting in the violation of any of the provisions of this article or of any regulation made by council under the provisions hereof, shall, upon conviction thereof, pay a fine of not less than five ($5.00) dollars, or more than $25, and in default of the payment of such fine and costs of prosecution, shall be imprisoned for not more than 10 days. After notice, each day's neglect to comply with the provisions of this article, or any such regulation shall be deemed a separate offense and be subject in all respects to the same penalty as the first offense, and separate proceedings may be instituted and separate penalties imposed for each day's offense after the first conviction. .

(b) The owner or owners of property are responsible for all the above sewer rentals or charges for sewer services rendered to any tenant or occupant of that property. Any sewer rental or charge not paid on or before 12 days after the date on which the same is billed, shall be a lien upon the property charged with the payment thereof. Such sewer rental or charge, if not paid after 30 days' notice, may be collected as provided by law by an action of assumpsit, or by distress of personal property on the premises, or by lien filed in the nature of a municipal lien. (Ord. No. 736, 1/25/58, Sec. 6, as amended by Ord. No. 805, 5/1/62)

ARTICLE B

Greenville Sanitary Authority

Section 2-4011 Intention and desire to organize authority.

It is the desire of the Borough Council of the Borough of Greenville in the County of Mercer and Commonwealth of Pennsylvania, and said Borough Council hereby signifies its intention to organize an Authority under the Municipality Authorities Act of May 2nd, One Thousand Nine Hundred Forty-Five P.L. 382. (Ord. No. 716, 5/14/56, Sec. 1)

Section 2-4012 Articles of incorporation.

In pursuance of said desire and intention, and in conformity with the terms and provision of said Municipality Authorities Act, the proposed Articles of Incorporation are hereby set forth in full, as follows:

ARTICLES OF INCORPORATION
OF GREENVILLE SANITARY AUTHORITY

To the Secretary of the Commonwealth of Pennsylvania:
Harrisburg, Pennsylvania.

In compliance with the requirement of the Municipality Authorities Act of 1945, approved the second day of May 1945, P.L. 382, as amended and pursuant to an ordinance adopted by the Municipal Authorities of the Borough of Greenville, Mercer County, Pennsylvania, that Greenville Sanitary Authority be established under the provisions of the aforementioned law, the Borough of Greenville, Mercer County, Pennsylvania, desiring that Greenville Sanitary Authority be established and that a Certificate of Incorporation be issued to said Authority, does hereby certify:

(a) The name of the Authority shall be: Greenville Sanitary Authority.

(b) The Authority is formed under the Act of May 2nd, 1945, P.L. 382, as amended.

(c) An Authority under the name of "The Municipal Authority of the Borough of Greenville" was organized under the Provisions of the Act of June 28th 1935, P. L. 463, and the project undertaken by said Authority and now under its supervision was and is the acquiring, holding, constructing, improving, maintaining, operating, owning and leasing, either in the capacity of lessor or lessee, water works, water supply works and water distribution systems in any or all of the following territories, namely, the Borough of Greenville, County of Mercer, and in territory contiguous and adjacent thereto, including Hempfield and West Salem Townships.

(d) The name of the incorporating municipality is the Borough of Greenville, Mercer County, Pennsylvania.

The names and addresses of the Burgess and members of the Council of the Borough of Greenville, Mercer County, Pennsylvania, are as follows: . . .

(e) The names and addresses and terms of office of the first members of the Board of said Authority are as follows: . . .

(f) The purpose for which said Greenville Sanitary Authority is incorporated is the acquiring, holding, constructing, improving, maintaining and operating, owning, leasing, either in the capacity of lessor or lessee, sewers, sewer systems, or parts thereof, and sewage treatment works, including works for treating and disposing of industrial waste. (Ord. No. 716, 5/14/56, Sec. 2)

Editorial Note: Following (d) as enacted were the names and addresses of the persons serving as Burgess and members of Council at the time of enactment of Ord. No. 716; following (e) were the names, addresses and terms of office of the first members of the governing body of the Authority. By Res. 1974-15 (6/21/74) council approved the proposal of the Authority to increase the term of its existence to the year 2024, or 50 years after approval of the proposed articles of amendment by the Secretary of the Commonwealth.

Section 2-4013 Members of authority board to receive director's fee or salary.

The members of the Greenville Sanitary Authority shall receive a director's fee or salary effective January 1, 1971. This director's fee or salary shall be $25 for each regular or special scheduled meeting attended during each year with a maximum of four such meetings per year. Payment of this director's fee or salary will be made in December of each year for that year from the General Fund of the Greenville Sanitary Authority. (Res. No. 1971-4, 5/11/71)

Sections 2-4014 through 2-4020 reserved.

ORDINANCE NO. 1108

AN ORDINANCE OF THE BOROUGH OF GREENVILLE, MERCER COUNTY, PENNSYLVANIA, AMENDING CODE OF ORDINANCES OF SAID BOROUGH AND PROVIDING FOR JOINT RESPONSIBILITY FOR PAYMENT OF FEES FOR SEWER RENTAL AND REFUSE COLLECTION.

ARTICLE I: Part 11, Article B, Section 11-1041, of Code of Ordinances of the Borough of Greenville, shall be amended to read as follows:

There is hereby established and imposed a sewer rental or charge for the use of the sanitary sewers, sewer system and sewerage treatment works owned or operated by the Borough of Greenville, to be payable by the owners of all properties served thereby or by the users of sewer service jointly and severally. In order to apportion the cost of such sanitary sewer service equitably among the properties served by said sanitary sewers, sewer system and sewerage treatment works, the rental or charges for such services for every property served by the sanitary sewers, sewer system and sewerage treatment charged to be 82 percent of the face amount charged to such properties for water consumed by such properties (with exception herein noted) during the period for which the sewer rental or charge is being billed. For customers supplied with water by the Municipal Authority of the Borough of Greenville, the sewer rental or charge shall be computed according to the water meter readings of the Municipal Authority of the Borough of Greenville for water furnished to said properties.

ARTICLE II: Part 11, Article B, Section 11-1046 (b), shall be amended to read as follows:

Both the owner or owners of the property and the user of the sewer service are responsible for all the above sewer rentals or charges for sewer services rendered to any tenant or occupant of that property. Any sewer rental or charge not paid on or before 12 days after the date on which the same is billed, shall be a lien upon the property charged with the payment thereof. Such sewer rental or charge, if not paid after 30 days' notice may be collected as provided by law by an action of assumpsit, or by distress of personal property on the premises, or by lien filed in the nature of a municipal lien.

ARTICLE III: Part 5, Section 5-4009 (b), of the Code of Ordinances, shall be amended to read as follows:

> Both the owner of the property and the tenant or occupant thereon are responsible for the above fees or charges for services rendered to any tenant or occupant of that property. Any charge not paid on or before 30 days after the date on which the same is billed shall be a lien upon the property responsible for payment. The charge, if not paid after 90 days' notice, may be collected as provided by law by an action of assumpsit, or by distress and sale of personal property on the premises, or by lien filed in the nature of a municipal lien.

ARTICLE IV: All other single references to "owner" or "user" shall be changed to read owner and/or user in Sections 11-1043 and 11-1045.

ARTICLE V: This ordinance shall be incorporated into the Code of Ordinances of the Borough of Greenville at the appropriate places therein, and all other provisions of said Code of Ordinances not inconsistent herewith shall remain in full force and effect.

ORDAINED AND ENACTED this 16 day of February, 1981.

BOROUGH OF GREENVILLE

By _____
Council President

ATTEST: -

_____
Manager/Secretary

APPROVED: -

_____
Mayor

ORDINANCE NO. 1122

AN ORDINANCE OF THE BOROUGH OF GREENVILLE, MERCER COUNTY PENNSYLVANIA, AMENDING SECTION 11-1041 AND SECTION 11-1043 OF THE CODE OF ORDINANCES OF THE BOROUGH OF GREENVILLE, PENNSYLVANIA, PROVIDING FOR CHANGE IN THE SEWER RENTAL RATES ESTABLISHED IN SAID CODE OF ORDINANCES.

ARTICLE ONE: Section 11-1041 shall be amended to provide that the rental or charge for sewer services for every property served by sanitary sewers, sewer system and sewage treatment charged shall be reduced from 80 % of the face amount charged to such properties for water consumed by such properties to 76 % of the face amount charged to such properties for water consumed by or for such properties.

ARTICLE TWO: Section 11-1043 (2) b. shall be amended to read as follows: b. The user and/or owner shall pay a quarterly rental of $3.69, per employee using the sewer facilities of such industrial user, as determined on the last day of the preceding quarter.

ARTICLE THREE: Section 11-1043 (2) c. 2. shall be amended to read as follows: The user and/or owner shall pay quarter sewer rental of $22.24.

ARTICLE FOUR: This Ordinance shall become effective July 1, 1982.

ARTICLE FIVE: All other provisions of Section 11-1041 and 11-1043 and all other provisions of said Code of Ordinances not inconsistent herewith shall remain in full force and effect.

ADOPTED this 11th day of May, 1982.

GREENVILLE BOROUGH COUNCIL

By: _____
Council President

ATTEST: -

_____
Manager/Secretary

APPROVED: -

_____
Mayor

ORDINANCE NO. 1109

AN ORDINANCE OF THE BOROUGH OF GREENVILLE, MERCER COUNTY, PENNSYLVANIA, AMENDING SECTION 11-1041 AND SECTION 11-1043 OF THE CODE OF ORDINANCES OF THE BOROUGH OF GREENVILLE, PENNSYLVANIA, PROVIDING FOR CHANGE IN THE SEWER RENTAL RATES ESTABLISHED IN SAID CODE OF ORDINANCES.

ARTICLE ONE: Section 11-1041 shall be amended to provide that the rental or charge for sewer services for every property served by sanitary sewers, sewer system and sewage treatment charged shall be reduced from 82% of the face amount charged to such properties for water consumed by such properties to 80% of the face amount charged to such properties for water consumed by or for such properties.

ARTICLE TWO: Section 11-1043 (2) b. shall be amended to read as follows: b. The user and/or owner shall pay a quarterly rental of $3.53, per employee using the sewer facilities of such industrial user, as determined on the last day of the preceding quarter.

ARTICLE THREE: Section 11-1043 (2) c. 2. shall be amended to read as follows: The user and/or owner shall pay quarter sewer rental of $21.28.

ARTICLE FOUR: This Ordinance shall become effective April 1, 1981.

ARTICLE FIVE: All other provisions of Section 11-1041 and 11-1043 and all other provisions of said Code of Ordinances not inconsistent herewith shall remain in full force and effect.

ADOPTED this 10th day of March, 1981.

GREENVILLE BOROUGH COUNCIL

By: _____
Council President

ATTEST: -

_____
Manager/Secretary

APPROVED: -

_____
Mayor

I, Marie H. Julian, Borough Manager and Secretary of the Borough Council of the Borough of Greenville, do hereby certify the foregoing is a true and correct copy of the Ordinance duly passed and adopted at a Regular Meeting of the Borough Council of said Borough held March 10, 1981, and that same has been approved and recorded in the Borough Ordinance Book and has been advertised and posted as required by law.

Date: March 10, 1981 By: _____

ORDINANCE NO. 238

AN ORDINANCE OF THE BOROUGH OF GREENVILLE, ESTABLISHING, FIXING AND IMPOSING SANITARY SEWER RENTALS OR CHARGES TO BE COLLECTED FROM THE OWNERS OF ALL PROPERTIES SERVED BY ANY OF THE SANITARY SEWERS, SEWER SYSTEM AND SEWAGE TREATMENT WORKS OWNED OR OPERATED BY THE BOROUGH OF GREENVILLE, PROVIDING FOR THE COLLECTION OF SAID RENTALS OR CHARGES, AND PRESCRIBING PENALTIES FOR NON-PAYMENT THEREOF.

BE IT ORDAINED AND ENACTED and it is hereby ordained and enacted by the Council of the Borough of Greenville, Mercer County, Pennsylvania, by authority of the same as follows:

SECTION I. There is hereby established and imposed a sewer rental or charge for the use of the sanitary sewers, sewer system and sewage treatment works owned or operated by the Borough, to be payable by the owners of all properties served thereby. In order to apportion the cost of such sanitary sewer service equitably among the properties served by said sanitary sewers, sewer system and sewage treatment works, the rental or charge for such services, for every property served by said sanitary sewers, sewer system and sewage treatment charged to be 115% of the face amount charged to such properties for water consumed by such properties (with exception herein noted) during the period for which the said sewer rental or charge is being billed. For customers supplied with water by The Municipal Authority of the Borough of Greenville, the sewer rental or charge shall be computed according to the water meter readings of The Municipal Authority of the Borough of Greenville for water furnished to said properties.

SECTION II. (a) Bills for sewer rentals and charges hereby imposed shall be rendered concurrently with the bills for water services rendered by the Municipal Authority of the Borough of Greenville and shall be due and payable concurrently with said bills for water services.

(b) All bills for sewer rentals and charges shall be due when rendered and shall be subject to a discount of five (5) per cent if paid within twelve (12) days from date of bill.

(c) Sewer service to any property may be discontinued, after five (5) days notice, for failure of the property owner or user to pay the bill for such services within thirty (30) days after the due date thereof.

SECTION III. Users of said sanitary sewers, sewer system and sewage treatment works having a source of water other than the water supply of The Municipal Authority of the Borough of Greenville shall pay sewer rental or charge by one of the following methods:

(a) Restaurants, cafes, hotels, clubs, rooming houses, public garages, filling stations, laundries, ice cream and/or soda dispensers, dairies, dental offices and all users of the sanitary sewer system having water cooled refrigeration and/or air conditioning systems shall install water meters on their source of water, which meters shall be subject to approval by the Borough, and shall pay a sewer rental or charge on the basis of the meter readings at the same rate as is provided under Section I hereof.

(b) Industrial plants and establishments shall make application to the Council for approval to pay a sewer rental or charge by one of the following methods, viz.:

(1) The user shall install a water meter on his source of water, which meter shall be subject to approval by the Borough, and shall pay a sewer rental or charge on the basis of the meter readings at the same rate as is provided under Section I hereof; or

(2) The user shall pay a quarterly rental of $1.50 per person using the sewer facilities of such industrial user, as determined on the last day of the preceding quarter.

(c) Hospitals shall make application to the Council for approval to pay a sewer rental or charge by one of the following methods, viz.:

(1) The user shall install a water meter on his source of water, which meter shall be subject to approval by the Borough, and shall pay a sewer rental or charge on the basis of the meter readings at the same rate as is provided under Section I hereof, or

(2) The user shall pay quarterly sewer rental of $11.50.

SECTION IV. (a) The above schedule of rentals shall cover the charges based on volume only for a normal domestic sanitary sewage having a pH range between 5 and 9.5, a suspended solids quantity of less than 250 p. p. m., a chlorine demand not to exceed 50 p. p. m., a 5-day 20° C. B. O. D. of 250 p. p. m., and comparatively free from grit or mineral solids, such as sand, ashes, etc., which would not be moved or conveyed along the sewers by the velocity of the sewage flow. In addition the following concentrations of chemical substances shall not be exceeded by the sewage originating from any customer:

Phenol Compounds		1 p. p. m.
Cyanides	(CN)	1 p. p. m.
Cyanates	(CNO)	10 p. p. m.
Iron	(Fe)	5 p. p. m.
Trivalent Chromium	(Cr)	0.3 p. p. m.
Hexavalent Chromium	(Cr)	0.5 p. p. m.
Nickel	(Ni)	3 p. p. m.
Copper	(Cu)	2 p. p. m.
Zinc	(Zn)	2 p. p. m.

The waste of any customer containing excessive quantities of these chemicals may be refused entry into the said sewer system, until such waste has been pretreated to bring it within the allowable limits set forth above.

(b) It is prohibited to discharge into the sanitary sewer system any:

(1) Liquid or vapor having a temperature higher than 150° F.

(2) Waste containing more than 100 p. p. m. by weight of fat, oil or grease.

(3) Gasoline, benzene, naphtha, fuel, oil, or other inflammable or explosive liquid, solid, or gas.

(4) Any garbage not shredded to such degree that all particles will be carried freely under normal sewer flow conditions and with no particle greater than one-half (½) inch in dimension.

(5) Any noxious or malodorous gas or substance capable of creating a public nuisance.

(c) The following Surcharge Rate, in addition to the applicable rate set forth above, shall be charged any customer whose wastes exceed the limits set forth in subparagraph (a) of this Section IV:

$0.000288 for each p. p. m. of suspended solids in excess of 250 p. m. m. per 1000 gallons of sewage.

$0.000292 for each p. p. m. of 5-day 20° C. B. O. D. above 250 p. p. m. per 1000 gallons of sewage.

$0.001008 for each p. m. m. of chlorine demand greater than 50 p. p. m. of grit or mineral solids in excess of 14 p. m. m. per 1000 gallons of sewage.

$0.000015 for each p. p. m. of grit or mineral solids in excess of 14 p. p. m. per 1000 gallons of sewage.

The surcharge or additional strength sewage shall be determined by analysis based on accepted standards for sewage analysis.

SECTION V. In cases where any user of the sanitary sewer system paying sewer rentals or charges on the basis of metered water uses discharges less than 75% of his total water usage into the system, upon application by the user to the Council, a sewer rental or charge shall be determined by either:

(a) Placing a water meter, which shall be subject to the approval of the Borough, at the expense of the user on the water supply line or lines not discharging into the sanitary sewer system, and the readings therefrom will then be reducted from the total water meter readings and the remainder will be used in computing the sewere rental or charge according to the rates set forth in Section I above, or

(b) Placing a meter or measuring device, which shall be subject to the approval of the Borough, on the sewer connection at the expense of the user, and the sewer rental or charge shall be computed on the basis of gallons discharged into the sanitary sewer system according to the rates set forth in Section I above.

SECTION VI. The owner or owners of property are responsible for all the above sewer rentals or charges for sewer services rendered to any tenant or occupant of that property. Any sewer rental or charge not paid on or before twelve (12) days after the date on which the same is billed shall be a lien upon the property charged with the payment thereof. Such sewer rental or charge, of not paid after thirty (30) days' notice, may be collected as provided by law by an action of assupsit, or by distriss of personal property on the premisis, or by lien filed in the nature of a municipal lien.

SECTION VII. The rates set forth above shall become effective on February 1, 1958.

SECTION VIII. All ordinances or parts of ordinances not in accordance with this ordinances are repealed effective February 1, 1958.

ORDAINED AND ENACTED this 24th day of January, 1958.

Donald C. McClimans
President of Council

(SEAL)
Attest:
John S. Beachler,
Borough Secretary

EXAMINED AND APPROVED this 25th day of January, 1958.

Lamont E. Reznor,
Burgess

ORDINANCE NO. 1122

AN ORDINANCE OF THE BOROUGH OF GREENVILLE, MERCER COUNTY PENNSYLVANIA, AMENDING SECTION 11-1041 AND SECTION 11-1043 OF THE CODE OF ORDINANCES OF THE BOROUGH OF GREENVILLE, PENNSYLVANIA, PROVIDING FOR CHANGE IN THE SEWER RENTAL RATES ESTABLISHED IN SAID CODE OF ORDINANCES.

ARTICLE ONE: Section 11-1041 shall be amended to provide that the rental or charge for sewer services for every property served by sanitary sewers, sewer system and sewage treatment charged shall be reduced from 80 % of the face amount charged to such properties for water consumed by such properties to 76 % of the face amount charged to such properties for water consumed by or for such properties.

ARTICLE TWO: Section 11-1043 (2) b. shall be amended to read as follows: b. The user and/or owner shall pay a quarterly rental of $3.69, per employee using the sewer facilities of such industrial user, as determined on the last day of the preceding quarter.

ARTICLE THREE: Section 11-1043 (2) c. 2. shall be amended to read as follows: The user and/or owner shall pay quarter sewer rental of $22.24.

ARTICLE FOUR: This Ordinance shall become effective July 1, 1982.

ARTICLE FIVE: All other provisions of Section 11-1041 and 11-1043 and all other provisions of said Code of Ordinances not inconsistent herewith shall remain in full force and effect.

ADOPTED this 11th day of May, 1982.

GREENVILLE BOROUGH COUNCIL

By: _____
Council President

ATTEST: -

_____
Manager/Secretary

APPROVED: -

_____
Mayor

ORDINANCE NO. 1188

AN ORDINANCE OF THE BOROUGH OF GREENVILLE, MERCER COUNTY, PENNSYLVANIA, AMENDING SECTION 11-1041 AND SECTION 11-1043 OF THE CODE OF ORDINANCES OF THE BOROUGH OF GREENVILLE, PENNSYLVANIA, PROVIDING FOR CHANGE IN THE SEWER RENTAL RATES ESTABLISHED IN SAID CODE OF ORDINANCES.

ARTICLE ONE: Section 11-1041 shall be amended to provide that the rental or charge for sewer services for every property served by sanitary sewers, sewer system and sewage treatment charged shall be reduced from 76 percent of the face amount charged to such properties for water consumed by such properties to 75 percent of the face amount charged to such properties for water consumed by or for such properties.

ARTICLE TWO: Section 11-1043 (2) b. shall be amended to read as follows: b. The user and/or owner shall pay a quarterly rental of $3.86 per employee using the sewer facilities of such industrial user, as determined on the last day of the preceding quarter.

ARTICLE THREE: Section 11-1043 (2) c. 2. shall be amended to read as follows: The user and/or owner shall pay quarter sewer rental of $23.26.

ARTICLE FOUR: This Ordinance shall become effective April 1, 1988.

ARTICLE FIVE: All other provisions of Section 11-1041 and 11-1043 and all other provisions of said Code of Ordinances not inconsistent herewith shall remain in full force and effect.

ADOPTED this 8th day of March, 1988.

GREENVILLE BOROUGH COUNCIL

By: _____
Council President

ATTEST:

_____
Manager/Secretary

APPROVED:

_____
Mayor

ORDINANCE NO. 1209

AN ORDINANCE OF THE BOROUGH OF GREENVILLE, MERCER COUNTY, PENNSYLVANIA, AMENDING SECTION 11-1041 AND SECTION 11-1043 OF THE CODE OF ORDINANCES OF THE BOROUGH OF GREENVILLE, PENNSYLVANIA, PROVIDING FOR CHANGE IN THE SEWER RENTAL RATES ESTABLISHED IN SAID CODE OF ORDINANCES.

ARTICLE ONE: Section 11-1041 shall be amended to provide that the rental or charge for sewer services for every property served by sanitary sewers, sewer system and sewage treatment charged shall be reduced from 76% of the face amount charged to such properties for water consumed by such properties to 75% of the face amount charged to such properties for water consumed by or for such properties.

ARTICLE TWO: Section 11-1043 (2) b. shall be amended to read as follows: b. The user and/or owner shall pay a quarterly rental of $4.17 per employee using the sewer facilities of such industrial user, as determined on the last day of the preceding quarter.

ARTICLE THREE: Section 11-1043 (2) c. 2. shall be amended to read as follows: The user and/or owner shall pay quarterly sewer rental of $25.12.

ARTICLE FOUR: This Ordinance shall become effective April 1, 1989.

ARTICLE FIVE: All other provisions of Section 11-1041 and 11-1043 and all other provisions of said Code of Ordinances not inconsistent herewith shall remain in full force and effect.

APPROVED this 14th day of March, 1989.

GREENVILLE BOROUGH COUNCIL

By: _____
Council President

Attest: -

_____
Borough Manager/Secretary

Approved: -

_____
Mayor

ORDINANCE NO. 1081

AN ORDINANCE OF THE BOROUGH OF GREENVILLE, MERCER COUNTY, PENNSYLVANIA AMENDING SECTION 11-1004 OF THE CODE OF ORDINANCES OF THE BOROUGH OF GREENVILLE AND PROVIDING FOR A SEWER CONNECTION FEE FOR MULTIPLE UNIT DWELLINGS.

Article 1: Section 11-1004 (4) of the Code of Ordinances of the Borough of Greenville shall be amended to read as follows:

> Section 11-1004 (4) He shall pay a sewer connection fee of Twenty-five and no/100ths Dollars ($25.00) which shall be payalbe to the Secretary for the use of the Borough. In the event connection is desired for a multiple unit dwelling, then he shall pay a sewer connection fee of 80% of the total charge which is made for an individual house connected to the system per unit within that multiple unit dwelling which shall amount to the sum of Twenty and no/100ths Dollars ($20.00) per unit at the current rate.

Article 2: All other provisions of the Code of Ordinances of the Borough of Greenville not inconsistent herewith shall remain in full force and effect.

ADOPTED this 11th day of September, 1979.

GREENVILLE BOROUGH COUNCIL

Attest:-

By Walter Caswell
Walter Caswell, President

Secretary

Approved:-

Robert C. Smith
Mayor

ORDINANCE NO. #1090

AN ORDINANCE amending Sections 11-1041, 11-1043 (b), and 11-1043 (c) 2 of the Code of Ordinances of the Borough of Greenville, Pennsylvania, which is known as the Ordinance setting sanitary sewer rentals and which is an ordinance entitled: "AN ORDINANCE OF THE BOROUGH OF GREENVILLE ESTABLISHING, FIXING AND IMPOSING SANITARY SEWER RENTALS OR CHARGES TO BE COLLECTED FROM THE OWNERS OF ALL PROPERTIES SERVED BY ANY OF THE SANITARY SEWERS, SEWER SYSTEM AND SEWAGE TREATMENT WORKS OWNED OR OPERATED BY THE BOROUGH OF GREENVILLE, PROVIDING FOR THE COLLECTION OF SAID RENTALS OR CHARGES AND PRESCRIBING PENALTIES FOR NON-PAYMENT THEREOF," said ordinance changing rental charges for water consumed on properties:

NOW THEREFORE, be it hereby ordained and enacted as follows:

SECTION 1: Section 11-1041 of the Code of Ordinances of the Borough of Greenville, Pennsylvania, is hereby amended to read as follows:

"There is hereby established and imposed a sewer rental or charge for the use of the sanitary sewers, sewer system and sewage treatment works owned or operated by the Borough of Greenville, to be payable by the owners of all properties served thereby. In order to apportion the cost of such sanitary sewer service equitably among the properties served by said sanitary sewers, sewer system and sewage treatment works, the rental or charges for such services for every property served by said sanitary sewers, sewer system and sewage treatment charged to be 82 percent of the face amount charged to such properties for water consumed by such properties (with exception herein noted) during the period for which the said sewer rental or charge is being billed. For customers supplied with water by the Municipal Authority of the Borough of Greenville, the sewer rental or charge shall be computed according to the water meter readings of the Municipal Authority of the Borough of Greenville for water furnished to said properties."

SECTION 2: Section 11-1043 (b) of the Code of Ordinances of the Borough of Greenville, Pennsylvania, shall be hereby amended to read as follows:

"The user shall pay a quarterly rental of $3.29 per employee using the sewer facilities of such industrial user, as determined on the last day of the preceding quarter."

SECTION 3: Section 11-1043 (c) 2 of the Code of Ordinances of the Borough of Greenville shall be hereby amended to read as follows:

"The user shall pay quarterly sewer rental of $19.83."

SECTION 4: The change of rates set forth in the above amended sections, shall take effect as of April 1, 1980.

SECTION 5: That any ordinance, or parts of ordinance conflicting with this ordinance be and the same is hereby repealed as the same effects this ordinance.

ORDAINED AND ENACTED this 11 day of March, 1980.

BOROUGH OF GREENVILLE

By: _____
Vice President

ATTEST:

_____
Borough Manager/Secretary

Examined and approved by me this 11 day of March, 1980.

Robert C. Smith
Mayor

I, Marie H. Julian, Borough Manager and Secretary of the Borough Council of the Borough of Greenville, do hereby certify the foregoing is a true and correct copy of the Ordinance duly passed and adopted at a Regular Meeting of the Borough Council of said Borough held March 11, 1980, and that same has been approved and recorded in the Borough Ordinance Book and has been advertised and posted as required by law.

Date: March 11, 1980

By: _____
Marie H. Julian, Manager/Secretary

KLH Engineers, Inc.

555 North Bell Avenue, Pittsburgh, PA 15106

(412) 279-0817
FAX (412) 279-1826

December 11, 1990
Ref. 123

Department of Environmental Resources
Bureau of Water Quality Management
1012 Water Street
Meadville, Pa 16335

Attention: Mr. William Crawford

Gentlemen:

Borough of Greenville/Greenville Sanitary Authority

In response to the Department's letter dated December 4, 1990 we have reanalyzed the hydraulic loadings at the subject wastewater treatment plant(WWTP). Our analysis and selection of the design hydraulic loadings takes into consideration the following criteria.

- oWWTP design flow should not exceed the maximum three consecutive month average that will occur in the next twenty years (year 2015).

- oThe final clarifiers, and the disinfection system must be designed for the peak flow rate that will be experienced.

The organic design loadings presented in the Act 537 Plan are adequate and will remain unchanged.

Organic and nitrogenous removals are associated with the unit processes through and including the biotower. The suspended solids, phosphorus, fecal coliforms, organic, and nitrogenous removals impact the final clarifier and disinfection unit process design. Of particular importance is the requirement of the instantaneous phosphorus limit of 2 mg/l.

The peak hourly flow rate will remain at 11 MGD. This value was derived by monitoring. The results were presented in the report entitled, "Report on Evaluation of Bypass Flows from April 1985 through December 1986" (dated March 1987). The peak day flow of 6.25 MGD is the present WWTP rating and review of past daily rates indicates it is rarely exceeded (see 6/20/90 KLH letter to Department). It is proposed that the peak day hydraulic rate remain at 6.25 MGD.

The average daily flow (based on 30 day average) will be determined by analysis of the past five years monthly flow reports. Pursuant to our meeting of November 20, 1990, I understand that the average daily design flow for the WWTP must be consistent with reflected on the Part I NPDES Discharge Permit Application. The Department currently has the Authority's application for a 3.88 MGD monthly flow on file pending resolution of the WWTP flow design.

Table I is attached with this letter. The data was obtained from Chapter 94 Reports and Operational Summaries of the WWTP. I am enclosing the relevant pages of the documents from which Table I was prepared as backup information.

The average maximum three consecutive month total flow (including bypasses) that has occurred to date is 2.80 MGD.

As growth occurs in the surrounding areas new sewer system construction will result in collector sewer construction which is less susceptible to infiltration and inflow. Table XII on Page 69 of the Act 537 Plan(copy attached) addressed future loadings on the Authority WWTP from new growth and sewer system construction in outlying communities. The 2.80 MGD average monthly design hydraulic loading appears adequate for future growth accommodations. This statement is supported by the following factors.

- oMany of the unit processes are designed on the basis of peak day and peak hour flows which should not increase as dramatic as the average day flow.
- oOrganic design loading of 5,000 #/day will be adequate to accommodate the stated future growth.
- oThe unit processes proposed are more efficient in solids removal than existing unit processes.
- oFuture loadings should be paid for by the new users through a proposed replacement capacity charge.

It is proposed therefore that the average month hydraulic flow be 2.80 MGD. If the Department concurs with this value an amended Part I Permit Application will be resubmitted.

A revised Flow Diagram is attached. Note we propose to plan for but not install the fine screen on the bypass flow. Process piping will be arranged to allow excess flows to be directed to either the influent of the short term aeration tank, the flocculator clarifier, or the chlorine contact tanks. Authority personnel can monitor operations and select the mode that meets NPDES Permit requirements at the least operating costs.

Based on the above loadings the intent would be to construct the modifications to the trickling filter. The need for an aerobic digester(s) will also be evaluated in more detail. All this information would be documented in the Part II Construction Permit Application. Table II is attached which revises the Project Schedule contained in the Act 537 Plan on Pages 61 and 62.

I will await your response to this letter.

Very truly yours,

KLH ENGINEERS, INC.

Terry G. Soster

Terry G. Soster

cc: Greenville Sanitary Authority
Borough of Greenville
Clifford Gilmore

TABLE I

GREENVILLE SANITARY AUTHORITY
SIX YEAR FLOW SUMMARY

OPERATING YEAR	MAXIMUM MONTH MGD	MAXIMUM THREE CONSECUTIVE MONTH AVERAGE MGD	MAXIMUM DAILY BYPASS BASED ON THREE MONTH AVERAGE MGD	MAXIMUM THREE CONSECUTIVE MONTH TOTAL FLOW FLOW AVERAGE MGD
1990 (THROUGH SEPTEMBER)	3.227	2.430	.085	2.515
1989	2.960	2.640	.160	2.800
1988	2.450	1.950	NO BYPASSES REPORTED IN CHAPTER 94	
1987	2.292	1.604	.003	2.295
1986	2.556	2.050	0	2.050
1985	3.583	2.299	.100	2.390

TABLE II

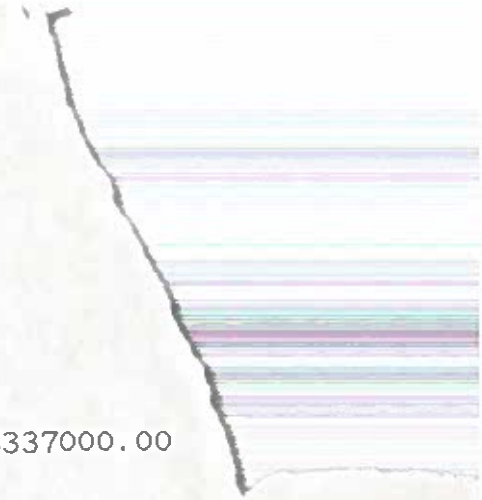
GREENVILLE WWTP PROJECT SCHEDULE

TASK	COMPLETION DATE
File NPDES Part I WQM Permit	2/1/91
Review Wastewater Treatment Plant Design Report/Act 537 Plan Revision	Done
Submit Wastewater Treatment Plant Design Report/Act 537 Plan Revision to DER with Borough Resolutions	Done
DER approves Plan Revision	1/15/91
File PennVest Design Allowance Loan Application	2/1/91
File Planning Modules for Land Development	2/15/91
File Planning Grant Application	3/1/91
File Stream Encroachment Permit	3/15/91
Lease Agreement Article VIII Engineer's Certification	4/1/91
Authorize Preparation of Bid Documents	1/15/91
DER Wet Land Determination	done
initiate Grant Program Search (i.e. EDA, CDBG, etc.)	4/1/91
File Bid Documents with DER, Labor & Industry and other Regulatory Agencies	10/30/91
File Building Permit	10/30/91
DER Issues Part II WQM Construction Permit	2/1/92
File PennVest Construction Loan Application	3/1/92
File Grant Applications	3/1/92

filename:greenville

GREENVILLE SANITARY AUTHORITY

PROJECT COST ANALYSIS



PROJECT FINANCING

Total Project Cost	4337000.00
Less:	
Sewer Tap In Fees	0.00
Front Foot Assessments	0.00
Capital Contributions	750000.00
Other Contributions	0.00
Required Bond Issue	3587000.00
Annual Debt Service Payment	348375.79
Annual Debt Service Coverage	69675.16
Required Annual Debt Service Payment	418050.95

ANNUAL FINANCING

Administration & Operation/Maintenance	473000.00
Annual Debt Service Payment	418050.95
Total Annual Revenue Requirement	891050.95
Less:	
PA State Act 339 Subsidy	102000.00
Plus:	
Delinquincy/Uncollectable	44552.55
Adjusted Annual Revenue Requirement	833603.50

T PER EQUIVALENT DWELLING UNIT($/MONTH) 20.78

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Greenville ~~CC-765~~

mcrpc mercer county regional planning commission
94 e. shenango st., sharpsville center plaza, sharpsville, pa. 16150 962-5787

January 30, 1990

Mr. William T. Crawford,
Water Quality Specialist Supervisor
Bureau of Water Quality Management
DEPARTMENT OF ENVIRONMENTAL RESOURCES
1012 Water Street
Meadville, PA 16335

Dear Bill:

I have reviewed the Comprehensive Wastewater Facility Planning Report dated December 1989 for the Borough of Greenville updating the 537 Comprehensive Sewage Facilities Plan.

Please be advised that we recommend approval of the proposed plan. I think it is very thoroughly done and will serve the needs of the Borough and surrounding area very adequately.

If you have any further questions, please give me a call.

Sincerely yours,

Leslie E. Spaulding,
Executive Director

LES/ew
cc: Marie H. Julian, Greenville Borough Manager ✓