APPENDIX P

Sewer Report

LJA | Leonard Jackson Associates Consulting Engineers

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# ENGINEER'S REPORT, CONCEPTUAL SANITARY SEWER PLAN AND PRELIMINARY PUMP STATION DESIGN

**Prepared for**

## PATRICK FARM

**TOWN OF RAMAPO**
ROCKLAND COUNTY, NEW YORK

Revised December 1, 2008
Revised November 10, 2008
July 18, 2008
LJA #02033

# Table of Contents

GRAPHIC SCALE

500 0 250 500 1000 2000

( IN FEET )

1 inch = 500 ft.

MAGNETIC

SITE

ROUTE 202 PUMP STATION TO BE REPLACED

APPROX. LOCATION OF EXISTING FIRE HYDRANT

ROUTE 202 PUMP STATION

APPROX. LOCATION OF EXISTING FIRE HYDRANT

NEW SANITARY FORCE MAIN

NEW SANITARY FORCE MAIN

REPLACE EXISTING GRAVITY SEWER MAIN FROM PATRICK FARM SITE TO WILDER ROAD PUMP STATION

WILDER RD. PUMP STATION

POMONA HTS PUMP STATION

NOTE:
ALL ON-SITE PATRICK FARM SEWERS TO CONNECT TO THE NEW RT. 202 PUMP STATION VIA GRAVITY

ROUTE 202

ROUTE 306

ROUTE 306

COTTAGE LN.

FALL HOLLOW ROAD

BOAR CT.

STAG CT.

BABCOCK LN.

HIDDEN VALLEY DR.

SCENIC DRIVE

PROSPERITY DRIVE

WILDER RD.

SHERWOOD RIDGE ROAD

SFM

SFM

SFM

SFM

SFM

SFM

| REV. | DESCRIPTION | DATE |
|---|---|---|
| | | |

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PATRICK FARM
TOWN OF RAMAPO
ROCKLAND COUNTY, NEW YORK

VICINITY MAP

| | |
|---|---|
| Job number: | 02033 |
| Drawn by: | c.f.l. |
| Date: | 5/13/08 |
| Scale: | 1"=500' |
| Drawing Number: | VM |

## INTRODUCTION AND METHODOLOGY

This report has been prepared for review by all involved agencies in conjunction with the subject application for construction of a public sewer main and preparation of a Draft Environmental Impact Statement.

The Patrick Farm site is a 200±-acre parcel located in the Town of Ramapo at the intersection of Route 202 and Route 306. The project consists of 497 units (sixty-three (63) proposed buildings containing six units each, four (4) buildings containing five units each, three (3) buildings containing 4 units each, and 87 single family homes). Table 1 illustrates the breakdown of unit types and phasing for the project.

**TABLE 1 - UNIT DISTRIBUTION BY PHASE**

| PHASE | BLDG. TYPE | NUMBER OF BUILDINGS | TOTAL UNITS |
|---|---|---|---|
| 1 | 6 UNITS<br>6 UNITS<br>6 UNITS | 16<br>12<br>4 | 96<br>72<br>24 |
| PHASE 1 TOTAL | | | 192 |
| 2 | 6 UNITS<br>5 UNITS<br>4 UNITS | 20<br>4<br>3 | 120<br>20<br>12 |
| PHASE 2 TOTAL | | | 152 |
| 3 | 6 UNITS | 11 | 66 |
| 4 | SINGLE FAMILY | | 21 |
| 5 | SINGLE FAMILY | | 17 |
| 6 | SINGLE FAMILY | | 14 |
| 7 | SINGLE FAMILY | | 13 |
| 9 | SINGLE FAMILY | | 17 |
| GRAND TOTAL TO PUMP STATION | | | 492 |
| 8 | SINGLE FAMILY<br>THESE HOMES DO NOT CONTRIBUTE TO THE PUMP STATION. THESE LOTS FRONT ON SCENIC DR. AND CAN MAKE DIRECT LATERAL CONNECTION TO THE EXISTING GRAVITY MAIN IN SCENIC DR. | | 5 |

The project will be served by both public and private roads and public water supply (United Water New York). The property is included within the Rockland County Sewer District No. 1 (RCSD1). The project site is identified on the preceding Vicinity Map.

Sanitary sewer service for the project shall be constructed in phases, roughly corresponding to the phasing of dwelling construction. With the exception of the 5 single family homes fronting on Scenic Drive, all sanitary discharges will flow via gravity main to a proposed sanitary sewer pump station, which shall replace the existing RCSD1 Route 202 pump station. The pump station shall be located adjacent to the existing pump station.

An on-site sanitary force main will be constructed to convey sewage from the proposed pump station to the existing gravity sanitary sewer main located in the westerly corner of the Patrick Farm site. From this point, a new parallel sewer main will be constructed to the Wilder Road pump station because the existing main has insufficient capacity to convey proposed conditions peak discharges without surcharging the existing sewer main.

Peak discharge, equivalent pipe length and head loss calculations and pump and system curves follow. These calculations are based upon the sanitary sewer phasing and layout plan which is included herein.

All wastewater generated by the subject development will be discharged to a system of new 8- and 12-inch diameter sanitary sewer mains located within the project site. The sanitary sewer system to be constructed on-site will become public sewer main, owned, maintained and operated by the Town of Ramapo. The system will discharge to the proposed pump station, which will be owned, operated and maintained by RCSD1.

**DESIGN FLOWS**

The subject Patrick Farm site will generate the only wastewater flows that will contribute to the proposed on-site sewer main. The proposed pump station will receive all sewage generated from the proposed development in addition to those discharges currently contributing to the existing Route 202 pump station:

1. Proposed additional average daily flow to new pump station:

   492 residences @ 400 gpd/residence = 196,800 gpd

2. Peak Hourly Flow from Entire Site:

   Utilizing a peaking factor of 4.0:
   Peak Flow = 4.0 x 196,800 gpd = 787,200 gpd
   = 547 gpm

   Average daily flow delivered by the 2 pumps in the existing Route 202 pump station (based upon data provided by RCSD1) during the period from 12/4/06 to 3/8/08 is 143,000 gpd.

**MINIMUM AND MAXIMUM PEAK FLOWS CONTRIBUTING TO THE NEW PUMP STATION**

The minimum peak sewage discharge to the proposed pump station would follow the completion of Phase 1, consisting of 192 units, and include discharges delivered by the existing Route 202 pump station (143,000 gpd):

192 units x 400 gpd/unit = 76,800 gpd (avg. daily flow from Patrick Farm site) + 143,000 gpd
= 219,800 gpd

Peak Flow = 219,800 gpd x 4 = 879,200 gpd = 611 gpm

The maximum peak sewage discharge to the pump station follows Phase 7 consisting of a total of 492 additional units:

492 units x 400 gpd/unit = 196,800 gpd (avg. daily flow from Patrick Farm site) + 143,000 gpd
= 339,800 gpd

Peak Flow = 339,800 gpd x 4 = 1,359,200 gpd = 944 gpm

**DOWNSTREAM SEWER ANALYSES**

A hydraulic analysis of the existing gravity sanitary sewer main from Scenic Drive to the Wilder Road pump station has been performed to determine its adequacy to receive additional sewage from the proposed pump station. The analysis illustrates that existing 8" and 10" sewer mains between the site and the Wilder Road Pump Station has insufficient capacity to convey proposed discharges without surcharging the sewer main. The analysis conservatively assumes coincidental peak discharges from the Pomona Heights pump station and the Patrick Farm site. To rectify the inadequacy of this main, we propose to either replace or install a parallel main for the entirety of the main from Scenic Drive to the Wilder Road pump station with a 16" diameter PVC sanitary sewer main having a minimum slope of 0.004 ft/ft.

In order to analyze the effect of the addition of Patrick Farm sewage discharges into the receiving RCSD1 system, the increased peak discharge delivered by the Wilder Road pump station was algebraically added to the peaks observed by RCSD on 10/28/06. The existing capacity of the Wilder Road pump station is 833 gpm. Proposed replacement pumps are estimated to operate at 1600 gpm, resulting in an increase in peak discharge of 767 gpm. Refer to Table 2 for a summary of anticipated peak discharges within the downstream system.

**DESIGN STANDARDS**

All proposed facilities are designed to meet the latest edition of the "Ten-State Standards" and all applicable regulations and standards promulgated by the Town of Ramapo, RCSD1, the New York State Department of Health and the Rockland County Department of Health. The proposed collection system shall include 8-inch and 12-inch diameter PVC mains and precast concrete manholes, as detailed on the site plans. The minimum slope utilized in 8-inch diameter sewer mains is 0.004 ft/ft and in 12-inch mains is 0.0022 ft/ft. Following completion of construction, all sewer main and manholes will be tested prior to being placed in service as required by the Town of Ramapo and RCSD1.

**PUMP NARRATIVE**

Equivalent pipe length and head loss calculations are based upon the conceptual sanitary sewer phasing and layout plan. The Hazen-Williams formula was utilized to calculate the head losses due to friction through the proposed 12" diameter PVC force mains.

The wet well invert was assumed to be elevation 483, the same as that of the existing pump station. The invert of the force main at its terminus at the proposed gravity main was assumed to be 4 feet below existing grade. Total dynamic head at the "pump on" and "pump off" elevations is considered within the relationships illustrated on pages 9 and 10.

As directed by RCSD1, Gorman Rupp pumps were selected for these applications. Each pump station shall contain 3 pumps which will be configured for alternating operation, while allowing for the future possibility of operating multiple pumps in parallel. The system curves for such operation are included on the pump curves for comparison purposes. Proposed pumps for shall be 8" diameter Gorman Rupp non-clog submersible pumps.

System curves are illustrated for a scenario in which 2 pumps could operate in parallel rather than alternating.

Conceptual pump station configuration:

- Gorman-Rupp pump model JS8AA-E94-1; 8" diameter discharge; 1750 rpm. 10.25" impeller following the completion of Phase 1. Following full-build out of Patrick Farm site use a 14.96" impeller.
- Operating point (following Phase 1): 1000 gpm at 132 ft. TDH;
- Operating point (following full build-out): 1565 gpm at 143 ft. TDH;
- If 2 pumps are operating in parallel (full build-out), the 2 pumps deliver 2300 gpm total at 172 ft. TDH.

To determine the size of the wet well, the total pump run time to convey the average daily sewage volume was calculated and divided by 24, which provides

for a pump cycle time of 1 hour. Total pump run time to discharge the average was calculated to be 217 minutes (at full build-out of the Patrick Farm site), resulting in a pump run time of 9 minutes during each cycle.

The pump station schematic illustrates the conceptual configuration of each proposed pump station. The 9 minute run time, assuming no inflow, was retained for determining the wet well dimensions. Calculations are included herein.

Based upon the pump run time calculations, the proposed wet well shall have a cross-sectional area of 188 square feet and an operating range of 10 feet. A wet well in the shape of a 14 foot b y 14 foot box is proposed, thereby resulting in a revised operating range of 9.6 feet.

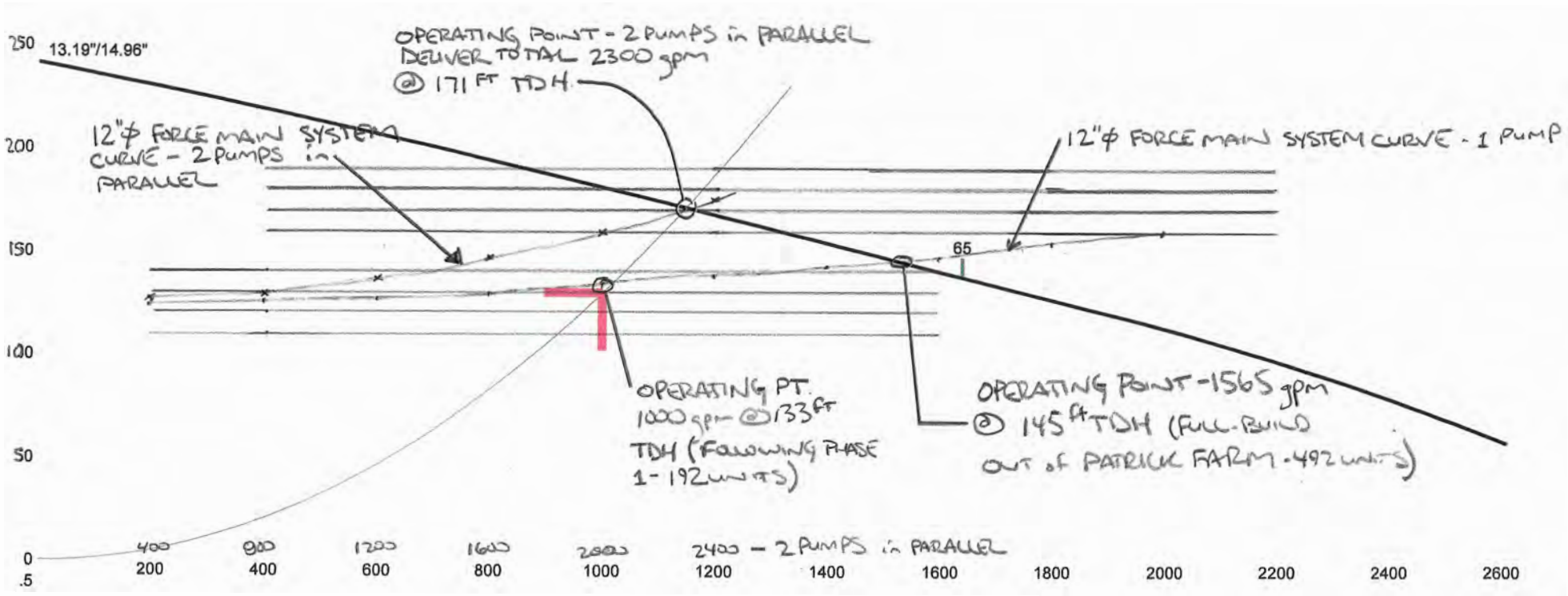
In addition to receiving sewage from the replacement Route 202 pump station, the existing gravity sanitary main which passes through the westerly portion of the Patrick Farm site receives sewage from the Pomona Heights Pump Station. The subject main contributes to the Wilder Road Pump Station approximately 2500 feet to the west. Based on peak flow data provided by RCSD1, if the Patrick Farm site were to be fully developed as currently proposed, the Wilder Road pump station would be unable to sufficiently convey peak discharges to the Grandview Avenue pump station.

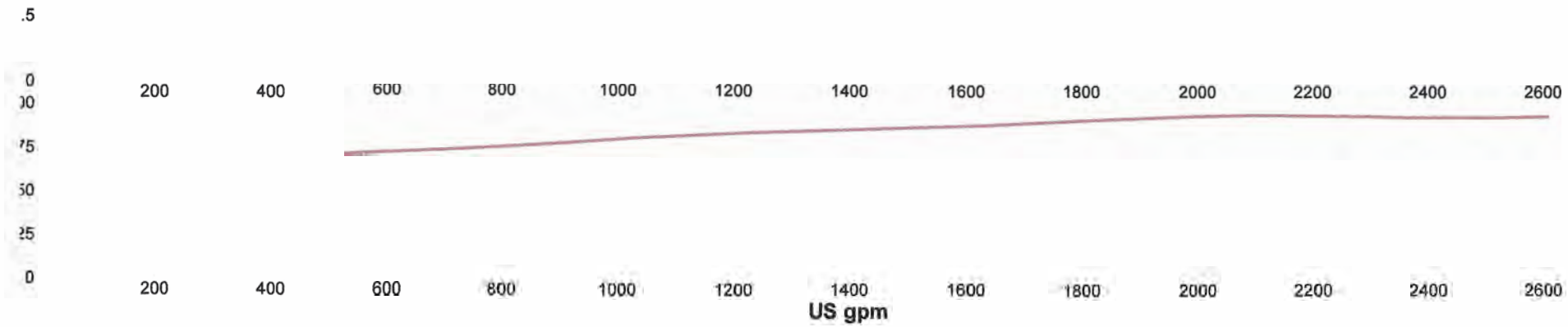
Peak operating capacity of the Wilder Road pump station is 1.2 MGD (833 gpm). The Pomona Heights pump station delivers 430 gpm. The operating point of the replacement Route 202 pump station is 1000 gpm. Additional contribution to the Wilder Road pump station via gravity main is estimated at 100 gpm. If the peaks are conservatively combined by algebraically summing the peaks, a peak discharge of 1530 gpm results. This peak is much greater than the operating capacity of the Wilder Road pump station. Therefore, we shall propose to replace the pumps within the Wilder Road pump station in conjunction with other sanitary sewer system upgrades required in association with the development of the Patrick Farm site. It is anticipated that the replacement pumps operate at approximately 1600 gpm. Refer to Table 3.

## EQUIVALENT LENGTH CALCULATIONS WITHIN NEW PUMP STATION AND ASSOCIATED FORCE MAIN

| FITTING | EQUIVALENT LENGTH PER | NUMBER OF FITTINGS | EQUIVALENT LENGTH |
|---|---|---|---|
| 6"x12" ECCENTRIC EXPANSION | 19 | 1 | 19 |
| 90 ELBOW | 35 | 2 | 70 |
| 45° ELBOW | 17 | 1 | 17 |
| CHECK VALVE | 100 | 1 | 100 |
| GATE VALVE | 9 | 1 | 9 |
| FLOW THROUGH TEE | 18 | 2 | 36 |
| FLOW THROUGH WYE | 9 | 1 | 9 |
| 22.5° ELBOW | 8 | 4 | 32 |
| 45° ELBOW | 17 | 5 | 85 |
| 90° ELBOW | 35 | 6 | 210 |
| AIR RELEASE VALVES AT H.P. = FLOW THROUGH TEE | 18 | 5 | 90 |
| CLEANOUT CHAMBER AT L.P. = FLOW THROUGH WYE | 9 | 4 | 36 |
| EXIT INTO GRAVITY MANHOLE | 31 | 1 | 31 |
| | | SUBTOTAL | 744 |
| | | LINEAR FEET OF FORCE MAIN | 4460 |
| | | **TOTAL** | **5204** |

| DISCHARGE VS. TOTAL DYNAMIC HEAD (12" FORCE MAIN) | | | |
|---|---|---|---|
| DISCHARGE (gpm) | DYNAMIC HEAD (ft) | STATIC HEAD (ft) | TOTAL HEAD LOSS (ft) |
| 200 | 0.5 | 117.0 | 117.5 |
| | 0.5 | 127.0 | 127.5 |
| 250 | 0.8 | 117.0 | 117.8 |
| | 0.8 | 127.0 | 127.8 |
| 300 | 1.1 | 117.0 | 118.1 |
| | 1.1 | 127.0 | 128.1 |
| 350 | 1.5 | 117.0 | 118.5 |
| | 1.5 | 127.0 | 128.5 |
| 400 | 1.9 | 117.0 | 118.9 |
| | 1.9 | 127.0 | 128.9 |
| 450 | 2.4 | 117.0 | 119.4 |
| | 2.4 | 127.0 | 129.4 |
| 500 | 2.9 | 117.0 | 119.9 |
| | 2.9 | 127.0 | 129.9 |
| 550 | 3.5 | 117.0 | 120.5 |
| | 3.5 | 127.0 | 130.5 |
| 600 | 4.1 | 117.0 | 121.1 |
| | 4.1 | 127.0 | 131.1 |
| 650 | 4.7 | 117.0 | 121.7 |
| | 4.7 | 127.0 | 131.7 |
| 700 | 5.4 | 117.0 | 122.4 |
| | 5.4 | 127.0 | 132.4 |
| 750 | 6.2 | 117.0 | 123.2 |
| | 6.2 | 127.0 | 133.2 |
| 800 | 6.9 | 117.0 | 123.9 |
| | 6.9 | 127.0 | 133.9 |
| 850 | 7.8 | 117.0 | 124.8 |
| | 7.8 | 127.0 | 134.8 |
| 900 | 8.6 | 117.0 | 125.6 |
| | 8.6 | 127.0 | 135.6 |
| 950 | 9.5 | 117.0 | 126.5 |
| | 9.5 | 127.0 | 136.5 |
| 1000 | 10.5 | 117.0 | 127.5 |
| | 10.5 | 127.0 | 137.5 |
| 1100 | 12.5 | 117.0 | 129.5 |
| | 12.5 | 127.0 | 139.5 |
| 1200 | 14.7 | 117.0 | 131.7 |
| | 14.7 | 127.0 | 141.7 |
| 1300 | 17.1 | 117.0 | 134.1 |
| | 17.1 | 127.0 | 144.1 |
| 1400 | 19.6 | 117.0 | 136.6 |
| | 19.6 | 127.0 | 146.6 |
| 1500 | 22.2 | 117.0 | 139.2 |
| | 22.2 | 127.0 | 149.2 |
| 1600 | 25.1 | 117.0 | 142.1 |
| | 25.1 | 127.0 | 152.1 |
| 1700 | 28.1 | 117.0 | 145.1 |
| | 28.1 | 127.0 | 155.1 |
| 1800 | 31.2 | 117.0 | 148.2 |
| | 31.2 | 127.0 | 158.2 |
| 1900 | 34.5 | 117.0 | 151.5 |
| | 34.5 | 127.0 | 161.5 |
| 2000 | 37.9 | 117.0 | 154.9 |
| | 37.9 | 127.0 | 164.9 |
| 2100 | 41.5 | 117.0 | 158.5 |
| | 41.5 | 127.0 | 168.5 |
| 2200 | 45.2 | 117.0 | 162.2 |
| | 45.2 | 127.0 | 172.2 |
| 2300 | 49.1 | 117.0 | 166.1 |
| | 49.1 | 127.0 | 176.1 |
| 2400 | 53.1 | 117.0 | 170.1 |
| | 53.1 | 127.0 | 180.1 |
| 2500 | 57.3 | 117.0 | 174.3 |
| | 57.3 | 127.0 | 184.3 |




any: LJA
: Chris
2008

Gorman-Rupp Eng. Sys. Catalog
Catalog: Gorman-Rupp Engineered Systems Pumps.60, Vers 4.03
J-SERIES - 1800
Design Point: 1000 US gpm, 130 ft

Size: JS8AA-E94-1
Speed: 1750 rpm
Line: 13.19"/14.96"
Curve: JS8AA-E94-1

GORMAN-RUPP PUMPS

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JOB PATRICK FARM
SHEET NO. ____ OF ____
CALCULATED BY ____ DATE 11/10/08
CHECKED BY ____ DATE ____
SCALE ____

## SIZE WET WELL

- OPERATING POINT of PUMP = 1565 gpm

- AVERAGE DAILY VOLUME RECEIVED BY PUMP STATION
  = 339,800 gallons

- TO CONVEY THIS VOLUME PUMP RUN TIME
  = 339,800 gallons / 1565 gpm = 217 MINUTES = 3.6hrs

- IF PUMP is TO CYCLE 24 TIMES/DAY (1x PER HOUR)
  217 MINUTES / 24 CYCLES = 9 MIN/CYCLE

  PUMP ON TIME = 9 MIN
  PUMP OFF TIME = 51 MIN

- VOLUME PUMPED :- 1 CYCLE = 1565 gpm x 9 MIN
  = 14,085 gal = 1883 $ft^3$

- ASSUME OPERATING RANGE = 10 FT (394 → 384)
  CROSS-SECTIONAL AREA of WET WELL = 198 $ft^2$

  USE a 14'x14' BOX A = 196 $ft^2$
  ∴ OPERATING RANGE BECOMES
  1883 $ft^3$ / 196 $ft^2$ = 9.6 ft

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JOB PATRICK FARM
SHEET NO. _____ OF _____
CALCULATED BY CA DATE 11/10/08
CHECKED BY _____ DATE _____
SCALE _____

CHECK WET WELL FOR SEWAGE FLOWS FOLLOWING PHASE I
(MINIMUM CONTRIBUTION TO NEW PUMP STATION)

- AVG DAILY FLOW = 219,900 gpd
- OPERATING POINT W/ SMALLER IMPELLER = 1000 gpm
- TO CONVEY THE VOLUME of AVG. DAILY FLOW, PUMP RUN TIME = 219,900 gal / 1000 gpm = 220 MINUTES = 3.7 hrs
- IF PUMP IS TO CYCLE 24 TIMES PER DAY (1x PER HOUR)
  220 MIN / 24 CYCLES = 9 MIN/CYCLES

  PUMP ON TIME = 9 MIN
  PUMP OFF TIME = 51 MIN

- VOLUME PUMPED in 1 CYCLE = 9 MIN x 1000 gpm
  = 9000 gallons = 1203 $ft^3$
- CROSS-SECTIONAL AREA of WET WELL = 196 $ft^2$

  ∴ OPERATING RANGE = 1203 $ft^3$ / 196 $ft^2$ = 6.1 ft ok

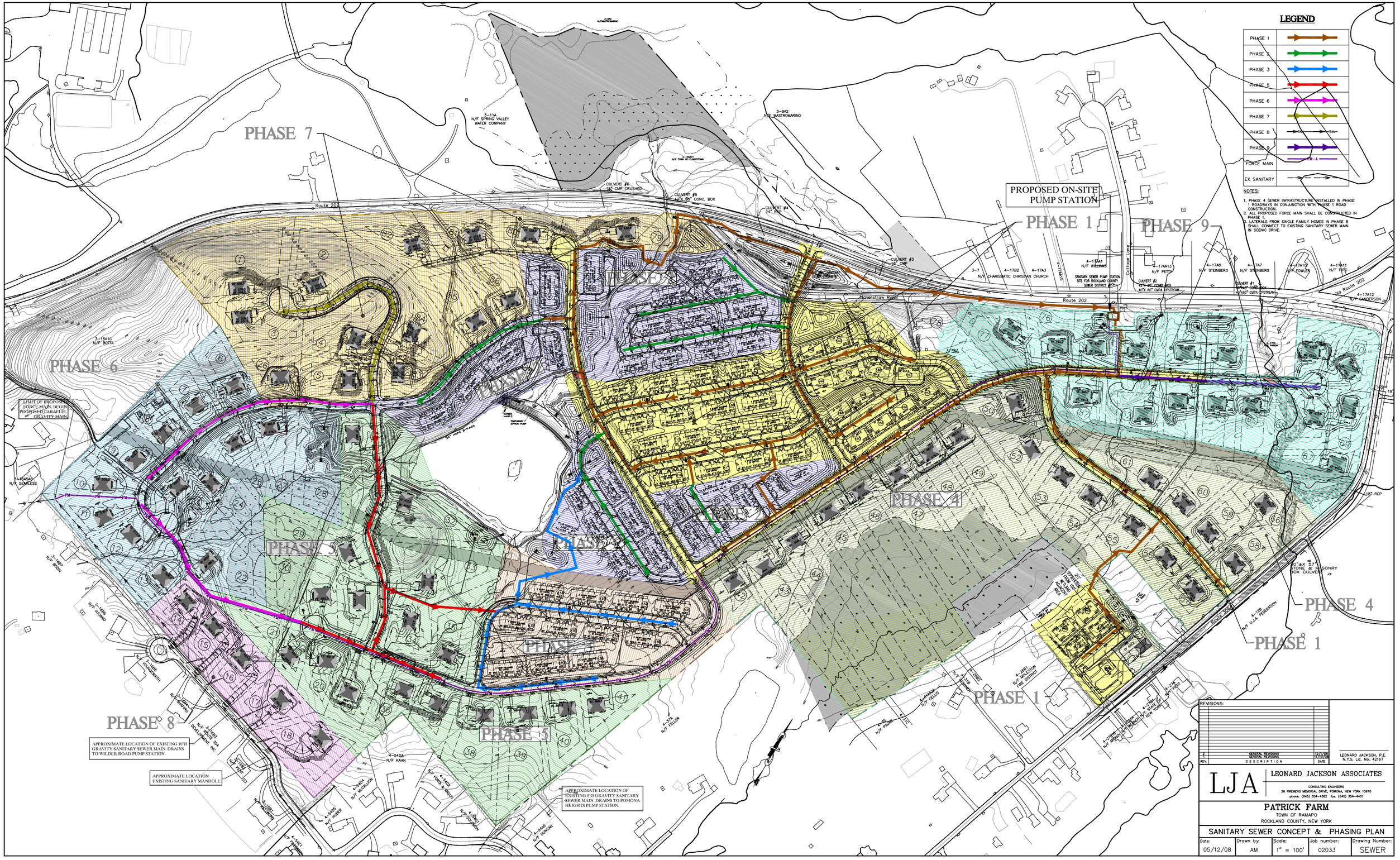
| TABLE 2 - DOWNSTREAM PUMP STATION SUMMARY | | | | |
|---|---|---|---|---|
| | ① | ② | ③ | ④=②+③ |
| PUMP STATION | EXISTING PUMP STATION CAPACITY (gpm) | OBSERVED WET WEATHER PEAK FLOW* (gpm) | ADDITIONAL PEAK DELIVERED BY NEW WILDER ROAD P.S. (gpm) | ANTICIPATED WET WEATHER FLOW (gpm) |
| GRANDVIEW AVE | 3005 | 2117 | 767 | 2884 |
| MAHWAH | 5621 | 3165 | 767 | 3932 |
| UNION HILL | 5496 | 4650 | 767 | 5417 |
| TALLMAN | 5760 | 3255 | 767 | 4022 |

| | |
|---|---|
| Operating point of existing Wilder Road pump station | 833 gpm |
| Estimated operating point of proposed Wilder Road replacement pump station | 1600 gpm |
| Additional peak discharge delivered by Wilder Road pump station (conservatively added to existing peaks algebraically) | 767 gpm |

* Wet weather peak observed on 10/28/06 provided by RCSD1.

| TABLE 3 - WILDER ROAD PUMP STATION SUMMARY | | | | |
|---|---|---|---|---|
| EXISTING CAPACITY (gpm) | OPERATING POINT OF REPLACEMENT RT. 202 PUMP STATION (gpm) | OPERATING POINT OF POMONA HEIGHTS PUMP STATION (gpm) | ESTIMATED PEAK FLOW CONTRIBUTION VIA GRAVITY MAIN (gpm) | ALGEBRAIC SUM OF COINCIDENTAL PEAKS (gpm) |
| 833 | 1000 | 430 | 100 | 1530 |

Estimated operating point of replacement Wilder Road pump station is **1600 gpm**.




REVISIONS:

| REV. | DESCRIPTION | DATE |
|---|---|---|
| 2 | GENERAL REVISIONS | 12/12/08 |
| 1 | GENERAL REVISIONS | 07/16/08 |

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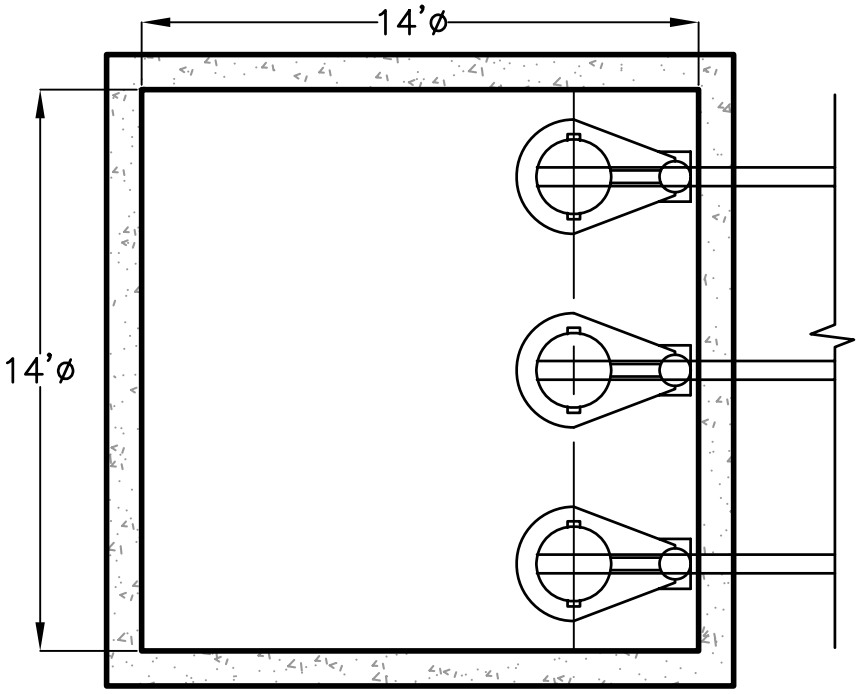
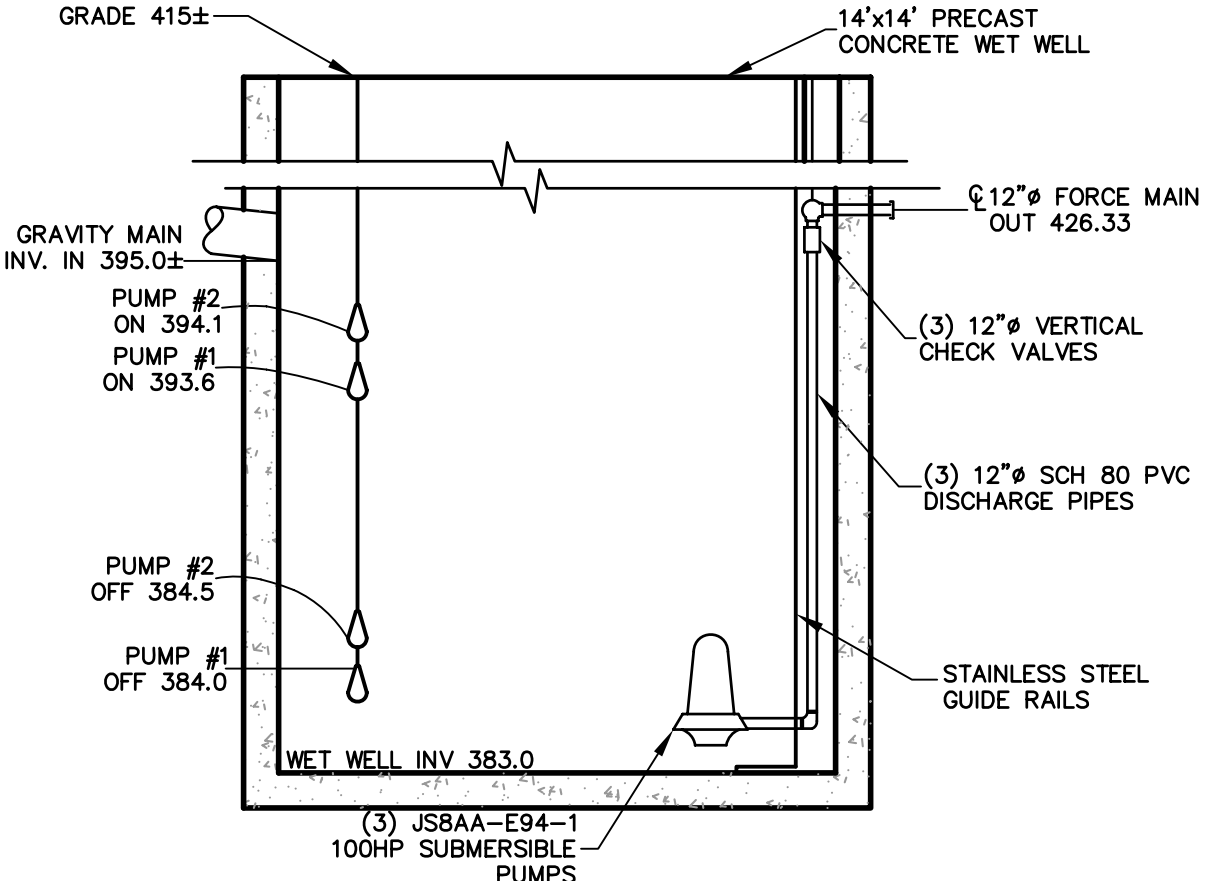
# PATRICK FARM
TOWN OF RAMAPO
ROCKLAND COUNTY, NEW YORK

## SANITARY SEWER CONCEPT & PHASING PLAN

| Date: | Drawn by: | Scale: | Job number: | Drawing Number: |
|---|---|---|---|---|
| 05/12/08 | AM | 1" = 100' | 02033 | SEWER |

## PLAN




## SECTION

NOTE:

TRIPLEX PUMP SYSTEM BY GORMAN RUPP PUMPS, MANSFIELD, OHIO.
MODEL: JS8AA-E94-1. 100HP SUBMERSIBLE PUMP TO DELIVER 1565 GPM @ 143 FT. TDH. 14.96" IMPELLER.

# PUMP STATION SCHEMATIC

N.T.S.

| REV. | DESCRIPTION | DATE |
|---|---|---|
| | | |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TOWN OF RAMAPO
ROCKLAND COUNTY, NEW YORK

PUMP SCHEMATIC

| | |
|---|---|
| Job number: | 02033 |
| Drawn by: | c.f.l. |
| Date: | 5/13/08 |
| Scale: | N.T.S. |
| Drawing Number: | C |

FORCE MAIN FROM RT. 202 PUMP STATION

EXISTING WILDER ROAD PUMP STATION

FORCE MAIN FROM RT. 202 PUMP STATION

EXISTING ROUTE 202 PUMP STATION

APPROXIMATE LOCATION OF EXISTING 10"Ø GRAVITY SANITARY SEWER MAIN DRAINS TO WILDER ROAD PUMP STATION

APPROXIMATE LOCATION EXISTING 48" MH MANHOLE

APPROXIMATE LOCATION OF EXISTING 8"Ø GRAVITY SANITARY SEWER MAIN DRAINS TO POMONA HEIGHTS PUMP STATION

GRAVITY MAIN DRAINING TO RT. 202 PUMP STATION

FORCE MAIN FROM POMONA HTS. PUMP STATION

EXISTING POMONA HEIGHTS PUMP STATION

REVISIONS:

| REV. | DESCRIPTION | DATE |
|---|---|---|
| 1 | GENERAL REVISIONS | 11/15/08 |

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# PATRICK FARM

TOWN OF RAMAPO
ROCKLAND COUNTY, NEW YORK

## EXISTING SANITARY SEWER MAP – RCSD #1

| Date: | Drawn by: | Scale: | Job number: | Drawing Number: |
|---|---|---|---|---|
| 7/14/08 | AM | 1" = 150' | 02033 | EX SEWER |