



**RHMG ENGINEERS, INC.**

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## DESIGN MEMO

To: Steve Cross  
Dan McMillan

From: Bill Rickert

Date: April 9, 2018

Re: ~~Canterbury Parc~~ Lift Station  
Concept Design Review

Renamed "Philip Estate Subdivision"

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### Overall Proposed Lift Station Design

The proposed lift station will be located in Outlot A on the west side of Canterbury Drive as shown on the attached Exhibit A. Per the request of Lake County Public Works Department (LCPWD), the station will be sized to accommodate the wastewater flow from both the Canterbury Parc Subdivision and the future potential development of the 40 acre parcel immediately east of Canterbury Parc. The lift station will be a duplex submersible station discharging through a 4-inch diameter forcemain.

As shown on Exhibit A, the forcemain route will run north from the lift station within the Canterbury Drive parkway to just south of Cuba Road, then west through Outlot B, and north across Cuba Road through an easement, and ultimately discharging into an existing manhole at the east end of Turnberry Lane in the Glenstone Subdivision. The proposed route essentially parallels the route of the proposed watermain connection to Glenstone; and it is a logical, efficient route.

### LCPWD Design Requirements

It is the intention that the lift station be owned and operated by LCPWD. As such, the following design requirements will apply:

- a. **Generator** – For small stations such as this, a permanent standby generator is not required. However a plug to accommodate one of LCPWD's portable generators must be provided. In addition, a concrete or asphalt pad of adequate size for the generator must be included as part of the station's site work.
- b. **Control Panel & SCADA** - The control panel and SCADA (supervisory control and data acquisition) system interface must be designed and fabricated in accordance with specifications furnished by LCPWD.
- c. **Access Drive** - The station must have a concrete or asphalt paved access drive adequately sized to accommodate LCPWD maintenance vehicles.

Mr. Steve Cross  
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Page 2

- d. **Fencing** - The station site must be enclosed within a fence. The fence can be chain link, wood panel or other suitable type. A 10-foot double door access gate is required.
- e. **Lighting** - A street light shall be provided in close proximity to the station to facilitate night-time emergency repair work.

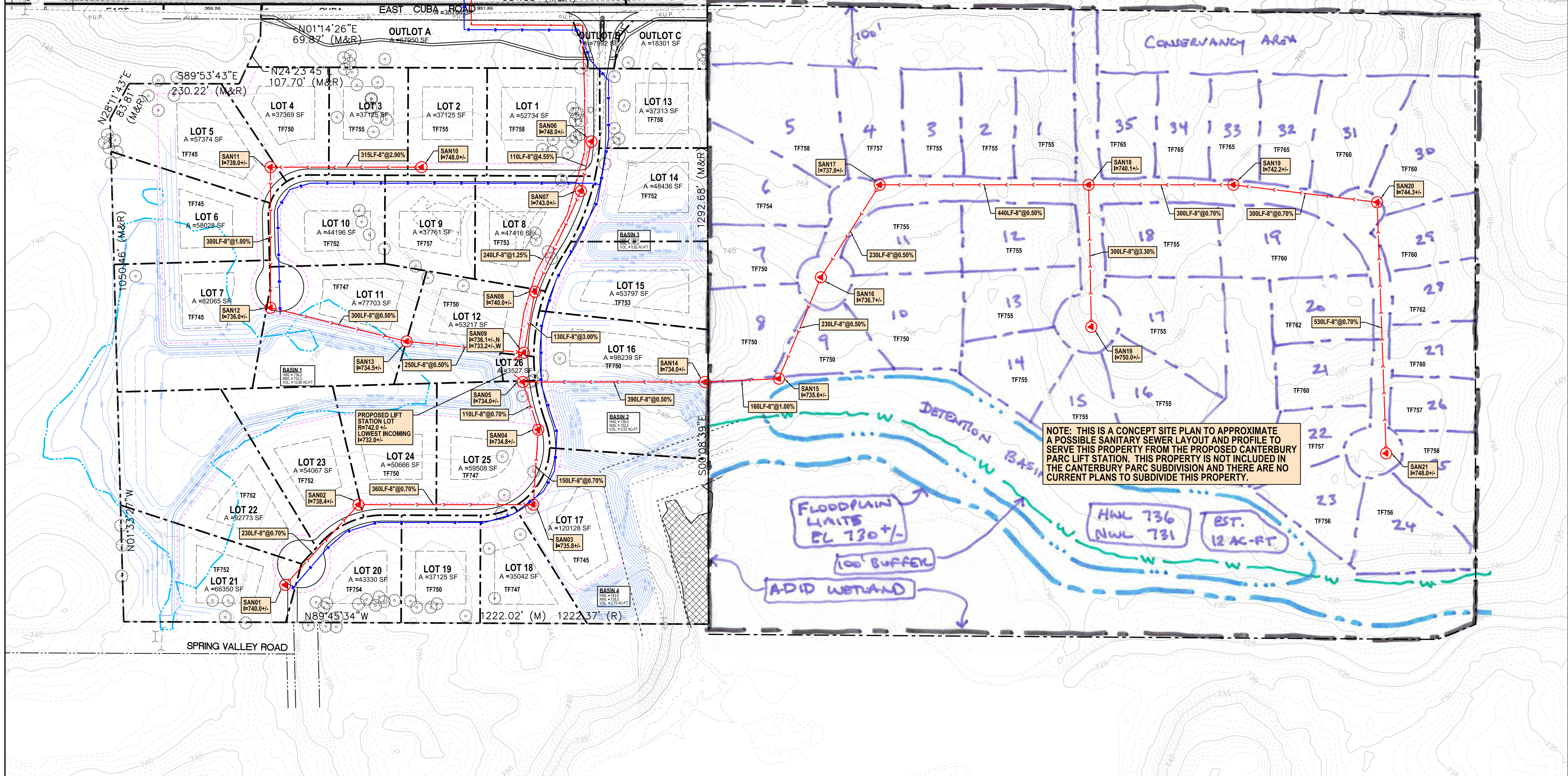
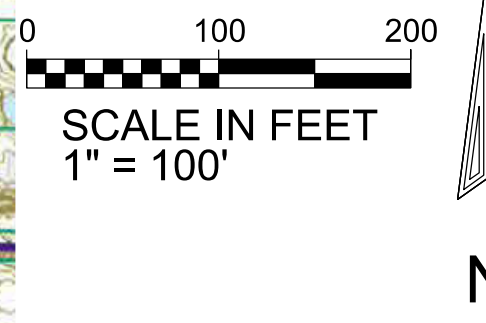
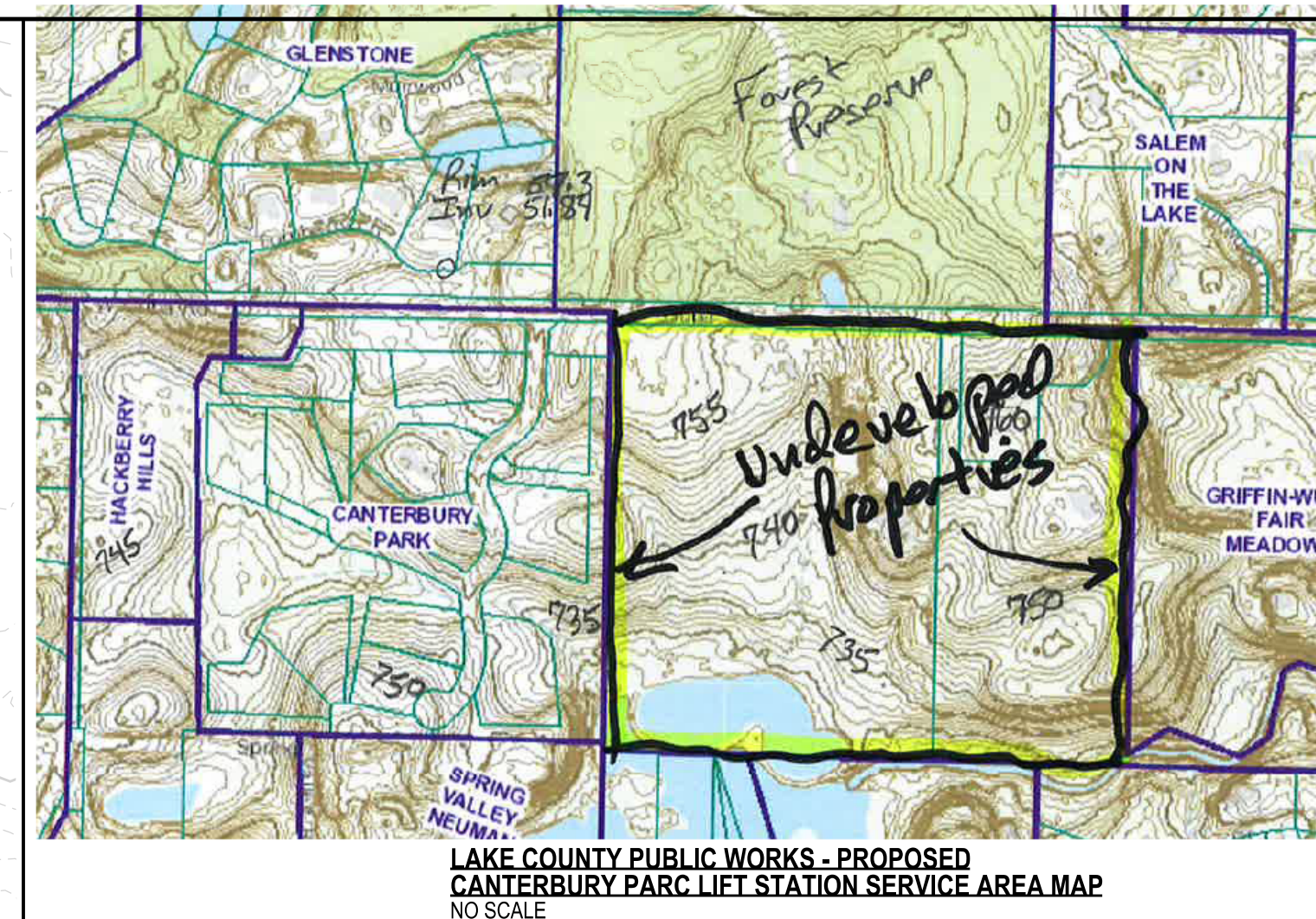
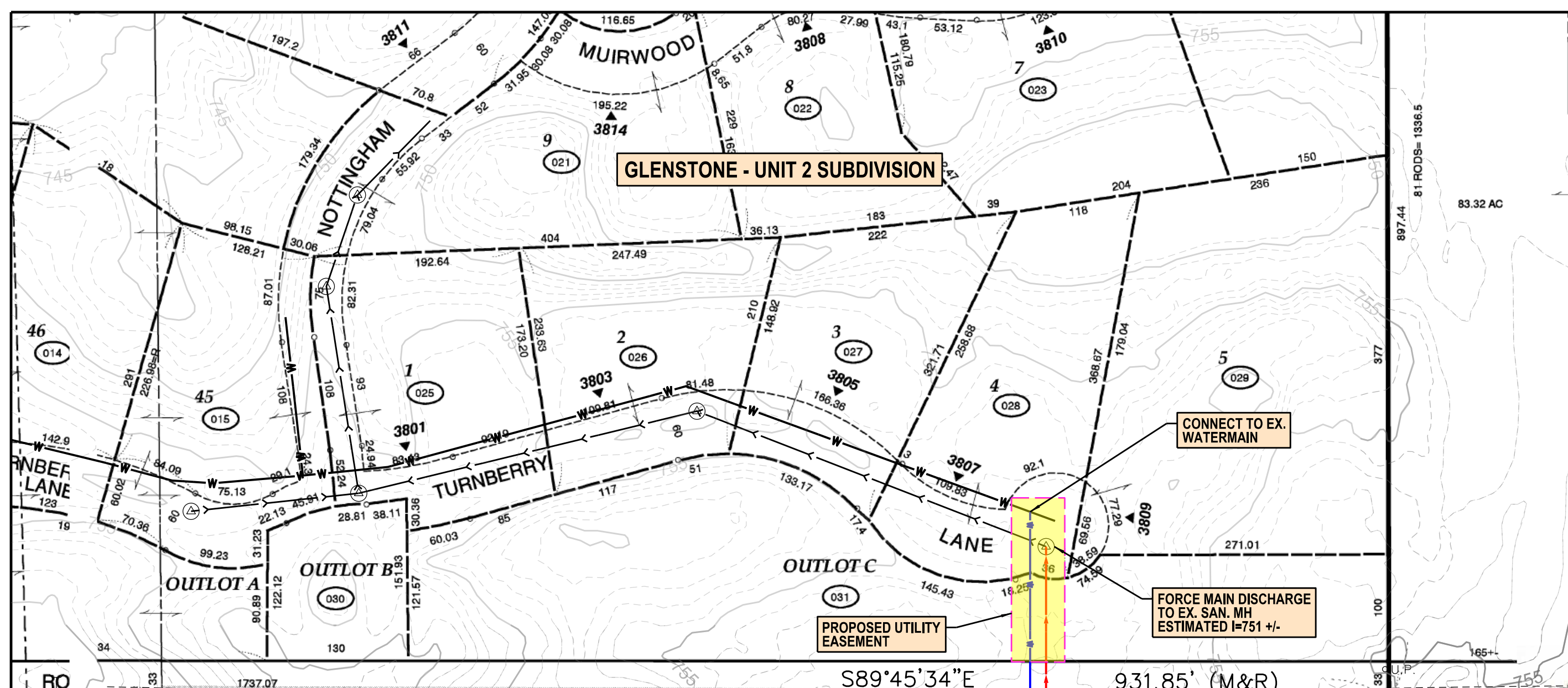
### **Flow Projections and Lift Station Capacity**

Projected wastewater flows are presented in Table 1. The projected peak flow for Canterbury Parc only is 26 GPM, while the projected peak flow for Canterbury Parc plus the adjacent parcel to the east is 66 GPM. However, as also shown in Table 1, the minimum allowable forcemain diameter per IEPA standards is 4-inch. And the minimum allowable forcemain velocity is 2 feet/second. The required flow for 2 feet / second velocity is 80 GPM. However, the recommended lift station capacity is 100 GPM, which provides a slightly higher velocity of 2.55 feet/second. This will result in less possibility of solids deposition within the forcemain. However, it should be noted that regardless of whether the station is sized for Canterbury Park only or for Canterbury Parc plus the adjacent parcel to the east, the station capacity will be the same because it is dictated by the minimum forcemain and minimum velocity requirements.

### **Hydraulic Calculations**

Hydraulic calculations were performed for the proposed lift station and forcemain (see Exhibit B). The required pump duty point is 100 GPM at 42 feet of total dynamic head (TDH). Two possible pump selections are included in Appendix B. One is Hydromatic Model S4NRC / S4NVX with a 5 HP motor and the other is a Grundfos SLV 30 A40.55 Ex 4.61 R.C. with a 5.5 HP motor. Both of these pumps utilize special impellers which are less susceptible to clogging due to rags, wipes and other debris which has become a major problem at residential area lift stations in recent years. The required pump station wet well would be 6 feet in diameter and 18 feet deep.





PROJECT:  
**CANTERBURY PARC SUBDIVISION**  
 CUBA ROAD, LONG GROVE, IL

PREPARED FOR:  
**CANTERBURY PARC, LLC**  
 8150 W. 159th Street  
 Orland Park, IL 60462

NO.	DATE	DESCRIPTION
1	4/15/18	Date Issued

CONCEPT  
 LIFT STATION  
 SERVICE AREA  
 PLAN



**TABLE 1**  
**FLOW PROJECTIONS & LIFT STATION CAPACITY**  
**CANTERBURY PARC LIFT STATION**

**1. Canterbury Parc Only**

$$\begin{aligned} \text{Ave. daily water consumption} &= 25 \text{ homes} \times 3.5 \text{ P.E./home} \times 100 \text{ GPCD} \\ &= 8,750 \text{ GPD} \\ &= 6 \text{ GPM} \end{aligned}$$

$$\begin{aligned} \text{Peak flow} &= 6 \text{ GPM} \times (18 + \sqrt{0.0875}) / (4 + \sqrt{0.0875}) \\ &= 26 \text{ GPM} \end{aligned}$$

**2. Canterbury Parc Plus Adjacent Parcel to East**

$$\begin{aligned} \text{Ave. daily water consumption} &= 65 \text{ homes} \times 3.5 \text{ P.E./home} \times 100 \text{ GPCD} \\ &= 22,750 \text{ GPD} \\ &= 16 \text{ GPM} \end{aligned}$$

$$\begin{aligned} \text{Peak flow} &= 16 \text{ GPM} \times (18 + \sqrt{0.228}) / (4 + \sqrt{0.228}) \\ &= 66 \text{ GPM} \end{aligned}$$

**3. Lift Station Capacity**

Minimum forcemain diameter per IEPA = 4-inch

Required flow for 2ft./second minimum velocity in 4-inch = 80 GPM

Recommended capacity = 100 GPM, which results in 2.55 ft./second velocity

Canterbury Parc Lift Station  
 Hydraulic Calculations  
 Project No. 21844000  
 Date: 4/3/18  
 Calc by: WRR  
 2 Pump Station - Design Operation 1 Pump Discharging to Existing Sewer in Glenstone

**EXHIBIT B**

**Dynamic Losses - Pump Discharge Piping**

**Lift station**

Diameter (in)	4	Dynamic Losses							
Length (ft)	40	Q (gpm)	0	100	200	275	300	350	400
C-factor	120	Hf	0.00	0.35	1.26	2.28	2.68	3.56	4.56
Pipe Material	DIP	Hm	0.00	0.43	1.73	3.27	3.90	5.30	6.93
		H (ft)	0.00	0.78	3.00	5.55	6.57	8.86	11.49
		V (fps)	0.00	2.55	5.11	7.02	7.66	8.94	10.21

Hf = 6.997E-05 x gpm<sup>1.85</sup>

Fittings	#	K	Total K
Entrance	1	0.78	0.78
90 Elbow	2	0.42	0.84
Check Valve	1	1.40	1.40
Plug Valve	1	0.42	0.42
T-branch	1	0.84	0.84

Total K = 4.28

Hm = 4.33016E-05 x gpm<sup>2</sup>

**Forcemain**

Diameter (in)	4	Dynamic Losses							
Length (ft)	1300	Q (gpm)	0	20	40	80	100	120	140
C-factor	120	Hf	0.00	0.58	2.09	7.54	11.40	15.97	21.24
Pipe Material	PVC	Hm	0.00	0.01	0.04	0.16	0.25	0.36	0.48
		H (ft)	0.00	0.59	2.13	7.70	11.64	16.33	21.72
		V (fps)	0.00	0.51	1.02	2.04	2.55	3.06	3.57

Hf = 2.274E-03 x gpm<sup>1.85</sup>

Fittings	#	K	Total K
Exit	1	1.00	1.00
T-run	1	0.60	0.60
90 Bend	2	0.42	0.84

Total K = 2.44

Hm = 2.46859E-05 x gpm<sup>2</sup>

**Static Head - Minimum**

Forcemain Discharge Elevation or High Point in FM = **753.00**  
 Lift Station High Water Elev = **732.00**  
 Static Head (ft) = **21.00**

**TOTAL**

	Q (gpm)	0	20	40	80	100	120	140
Total Dynamic Losses (ft)	0.00	1.37	5.13	13.25	18.22	25.19	33.21	
Static Head (ft)	21.00	21.00	21.00	21.00	21.00	21.00	21.00	21.00
TDH (ft)	21.00	22.37	26.13	34.25	39.22	46.19	54.21	

**Static Head - Maximum**

Forcemain Discharge Elevation or High Point in FM = **753.00**  
 Lift Station Low Water Elev = **729.00**  
 Static Head (ft) = **24.00**

**TOTAL**

	Q (gpm)	0	20	40	80	100	120	140
Total Dynamic Losses (ft)	0.00	1.37	5.13	13.25	18.22	25.19	33.21	
Static Head (ft)	24.00	24.00	24.00	24.00	24.00	24.00	24.00	24.00
TDH (ft)	24.00	25.37	29.13	37.25	42.22	49.19	57.21	



**Company name:** Gasvoda & Associates  
**Created by:** John T. Greaney  
**Phone:** 708-774-1456  
**Email:** jgreaney@gasvoda.com  
**Date:** 4/5/2018

**Project:** LCDPW . RHMG  
**Reference number:**

**Client:**  
**Client number:**  
**Contact:** Bill Rickert, P.E.

Description	Value
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**General information:**  
 Product name: SLV.30.A40.55.EX.4.61R.C  
 Product No.: 99030280  
 EAN: 5712605418580

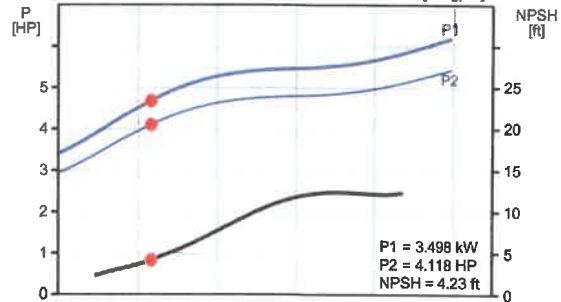
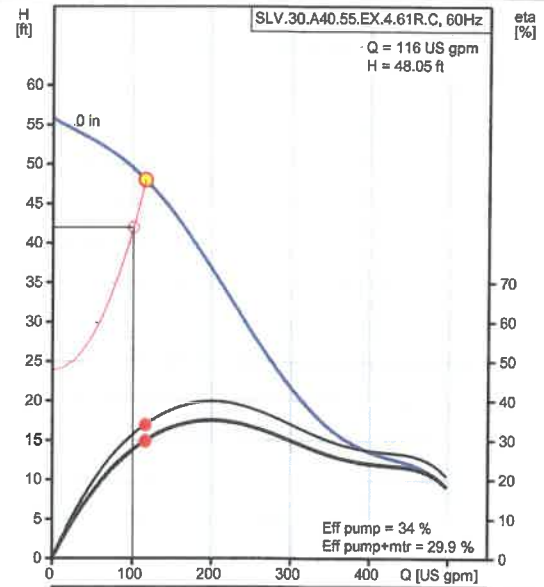
**Technical:**  
 Actual calculated flow: 116 US gpm  
 Max flow: 493 US gpm  
 Resulting head of the pump: 48.05 ft  
 Head max: 54.14 ft  
 Type of impeller: Super Vortex  
 Maximum particle size: 3 1/8 in  
 Primary shaft seal: SIC/SIC  
 Secondary shaft seal: CARBON/CERAMICS  
 Approvals on nameplate: CSA, FM  
 Curve tolerance: ANSI/HI11.6:2012 3B2  
 Cooling jacket: without cooling jacket

**Materials:**  
 Pump housing: EN-GJL-250  
 Impeller: EN-GJL-250  
 Motor: EN-GJL-250

**Installation:**  
 Maximum ambient temperature: 104 °F  
 Flange standard: ANSI  
 Pump inlet: 80  
 Pump outlet: 100  
 Pressure stage: PN 10  
 Maximum installation depth: 65.62 ft  
 Inst dry/wet: SUBMERGED  
 Installation: Vertical  
 Frame range: C

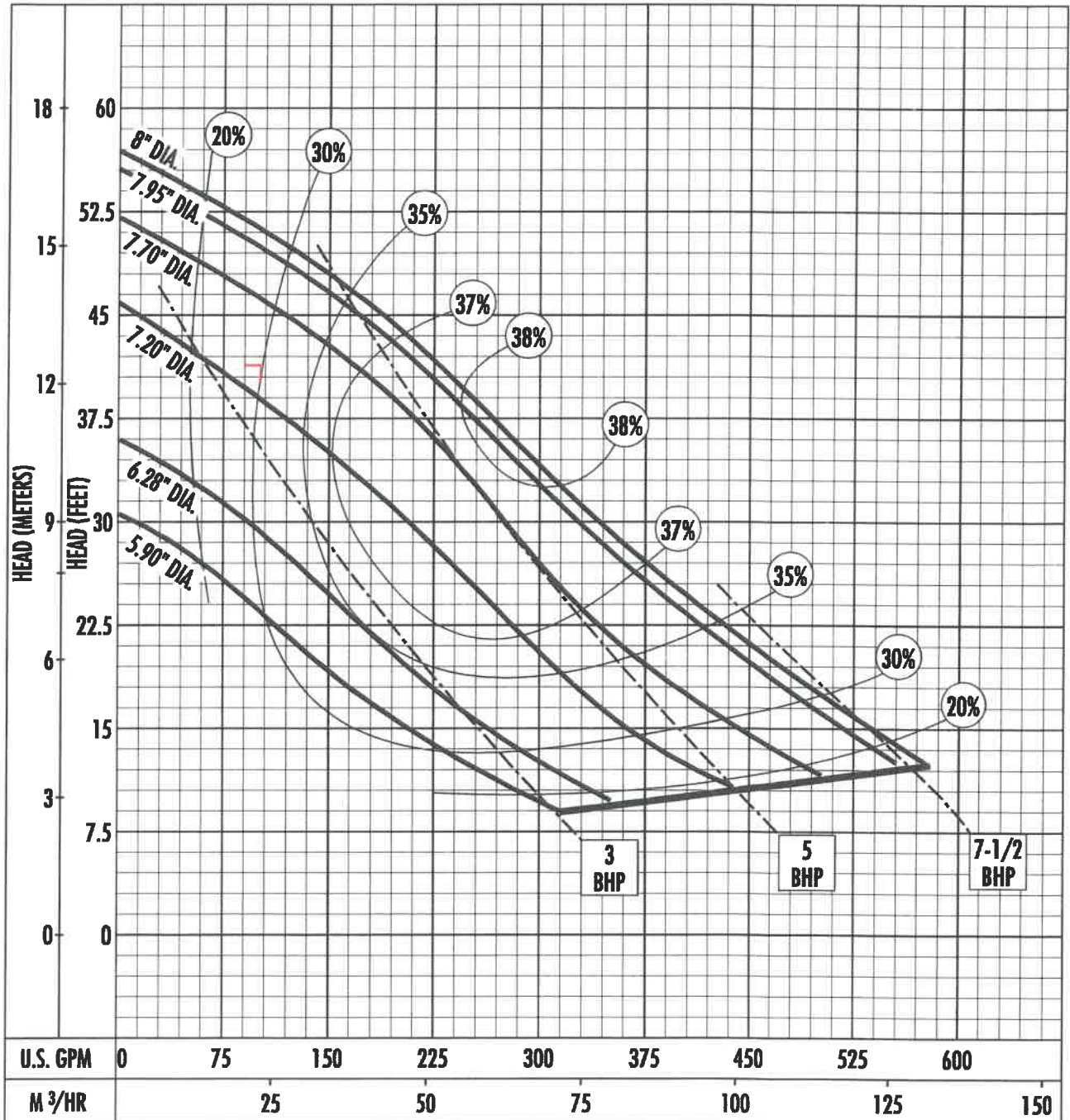
**Liquid:**  
 Pumped liquid: any viscous fluid  
 Maximum liquid temperature: 104 °F  
 Density: 62.29 lb/ft<sup>3</sup>

**Electrical data:**  
 Power input - P1: 4.8 kW  
 Rated power - P2: 5.5 HP  
 Main frequency: 60 Hz  
 Rated voltage: 3 x 230/460 V  
 Voltage tolerance: +10/-10 %  
 Max starts per. hour: 20  
 Rated current: 16.2/9.05 A  
 Starting current: 120 A  
 Cos phi - power factor: 0.78  
 Cos phi - p.f. at 3/4 load: 0.7  
 Cos phi - p.f. at 1/2 load: 0.59  
 Rated speed: 1760 rpm  
 Motor efficiency at full load: 87.8 %  
 Motor efficiency at 3/4 load: 87.8 %  
 Motor efficiency at 1/2 load: 86.2 %



# Performance Curve – S4NRC/S4NVX

RPM: **1750** DISCHARGE: **4"** SOLIDS: **3"**



The curves reflect maximum performance characteristics without exceeding full load (Nameplate) horsepower. All pumps have a service factor of 1.2. Operation is recommended in the bounded area with operational point within the curve limit. Performance curves are based on actual tests with clear water at 70° F. and 1280 feet site elevation.

Conditions of Service: