Dockton Water Association
520 Zone Booster Pump Station
Operations and Maintenance Summary

The Purpose of the Booster Station is to provide adequate pressures and fire flows to all areas located within the 520 pressure zone. This area, previously served by the 418.5 zone, had low pressures and insufficient fire flows throughout the higher elevations of the zone. Generally, lots starting at elevations of approximately 325 feet to 380 feet are in the 520 pressure zone. Antidotal evidence shows that customers at the higher points of the 520 zone experienced pressured just above 20 psi or approximately a 33 psi pressure drop from the current booster pump station suction pressure.

The station was designed by RH2 in 1996 and manufactured by EFI inc. as a complete packaged booster pump station. The station was installed in 1997. The station is designed for near continuous pump operation utilizing bypass recirculation piping and a control valve to relieve excess pressure and maintain constant pressure in the 520 zone. RH2 estimated the 520 zone demanded a continuous 5 gpm minimum to an 80 gpm maximum with a typical demand of 10-25 gpm. Fire flows requirements were estimated at 1080 gpm.

The station consists of four staged booster pumps that elevate the 418.5 zone pressure of 53 psi to greater than 90 psi in the 520 zone. Pumps one and two are rated as 17 gpm @ 85 NPSH. These pumps alternate from lead to lag and under the current use patterns and provide the majority of the work. The lead pump starts when the pressure falls below 93 psi and runs almost continuous, but is timed out after 10 minutes of sustained pressures greater than 95 psi. When the lead pump fails to sustain upper zone pressure greater than 89 psi the lag pump starts and operates until 2 minutes of sustained pressures greater than 95 psi have been attained. These small pumps are rated for no more than 30 starts per hour. When the lead pump shuts down it becomes the lag pump and the other pump is alternated to the lead. Also, under the current wiring, when the lead pump shuts down the high discharge pressure alarm is activated.

When the lead and lag pumps fail to sustain pressure greater that 85 psi pump # 3, rated at 85 gpm @ 85 NPSH, starts and runs until 1 minute of sustained pressure over 95 psi. Under current use patterns pump #3 rarely is called upon. A 24 hour timer is utilized to exercise pump #3. When the timer is activated pumps #1 and #2 are timed out allowing pump # 3 to become the lead pump and the fire pump as the lag pump. Note that pump #3 maintains its set points (on @ 85 off >95psi for 1 minute) even though it is the lead pump. This is different than the alternation of pumps #1 and #2. For these pumps the lead pump always has the lead set points and the lag pump the lag set points. The pumps alternate from lead set points to lag set points.

When pumps #1, #2, and #3 cannot maintain zone pressure greater than 79 psi pump #4, rated as 1060 gpm @ 100 NPSH, starts and provides fire flow. Pump #4 shuts down after 4 minutes at sustained pressures >95 psi.

Jeff Mathias 11-4-05

The pressure control valve consists of a 3 inch ClaVal brand pressure relief valve. It is set to open and maintain a consistent pressure of 103 psi. Excess pressure is relieved through this valve back to the suction side of the pumps utilizing the bypass recirculation piping.

A continuous flow of 5 gpm from high pressure back to low pressure is maintained to help reduce pump cycling and pressure fluctuations during minimal use periods. A Griswold flow controller with no adjustment regulates flow.

Setpoint adjustments are interrelated and need to be considered in context of the whole. A change of one setpoint may cause pressure fluctuations that produce a never-ending cycle of on/off that lead to share holder complaints. Especially critical is the relief valve opening and closing speed. If adjusted to close to fast the valve will produce pressure fluctuations. Likewise if adjusted to close too slowly then pumps will cycle too often and pressure will drop dramatically when the pumps deenergize.

Ancillary Equipment

Neptune Tricon Smartrol – The Smarttrol shows one of three different variables on its display: Total, Grand Total, or Rate. Total is the volume of flow through the meter in gallons. Grand Total is similar to Total but continues to count when Total is reset. Rate is the volume flowing through the meter in gallons per minute. All values are scaled independently and can be programmed various units.

Pressing the "C" button toggles between Total and Rate. When Rate is displayed an R appears in the left most digit of the screen. The rate should be noted at each station inspection.

G&L
A GOULDS PUMPS COMPANY

Pump Submittal

SSV
Model: 1SV

		Catalog No.	
Customer:			
Engineer:			
Submitter:	**Date:**		
Approval:	**Date:**		
Order No.:	**Date:**		

KING COUNTY, WASHINGTON
JOB REFERENCE NO. 85471

CONDITIONS: PUMP #1 & #2

17 G.P.M. @ 85' T.D.H.
3/4 H.P., 3500 R.P.M.

Base Model: 1SV General Pump Description

Construction: 304 or 316 stainless steel

Capacities: 5–22 gallons per minute (1.1–5 m³/hr)

Heads: 40–720 feet TDH (12–219 meters)

Staging: 2–16

Maximum working pressure: 230 PSI (16 bar) for the NPT version and 360 PSI (25 bar) for the ANSI flange version

Temperatures: Standard liquid temperature from -13°F (-25°C) to 250°F (120°C)

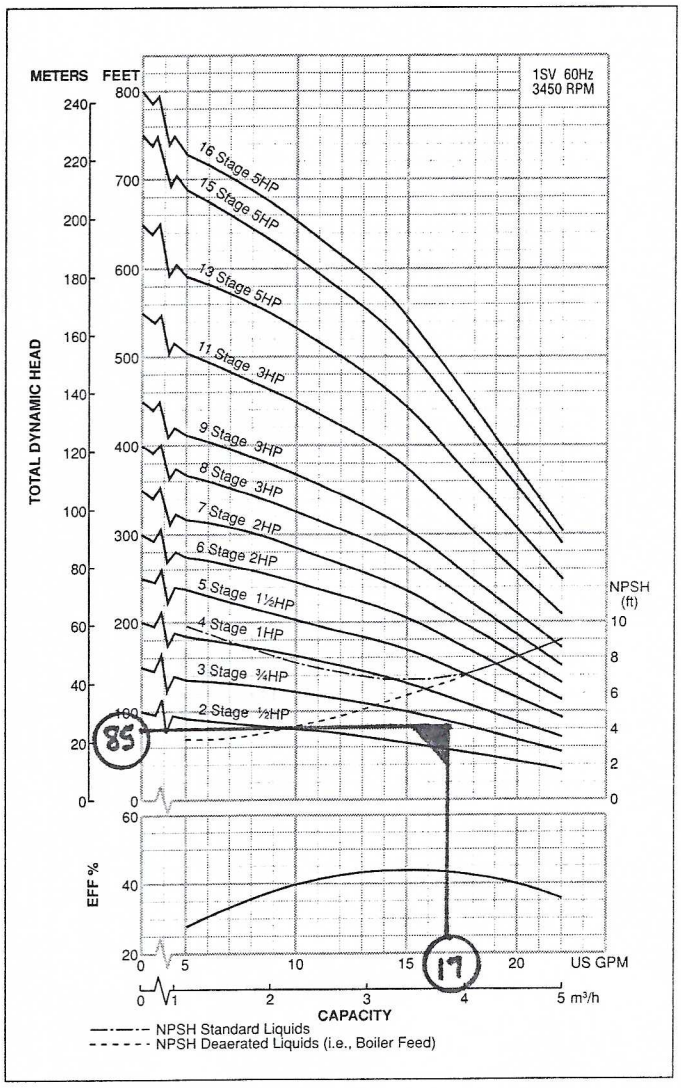
Design options:

	Material				
Type	**304**	**316**	**Stages**	**Connections**	**Location**
1SVA	x		2–11	NPT	In-line
1SVB	x		2–16	ANSI flange	In-line
1SVC	x		5–16	ANSI flange	Top/bottom
1SVD		x	2–16	ANSI flange	In-line

Piping Connections: Suction and discharge openings are 1" NPT. ANSI flanges are class 300, 1¼" flanges.

Component Materials	304 Version	316 Version
Pump base	Aluminum casting	Same
Pump body	304 stainless steel	316L SS
Casing O-rings	EPR	Same
Tie-rods and nuts	Zinc-coated steel	Same
Pump shaft	304 stainless steel	316L SS
Pump casing	304 stainless steel	316L SS
Top seal housing	304 stainless steel	316L SS
Inner bowls	304 stainless steel	316L SS
Diffusers	304 stainless steel	316L SS
Impellers	316L stainless steel	Same
Impeller O-rings	EPR	Same
Shaft spacers	316L stainless steel	Same
Shaft bushing	Ceramic	Same
Shaft sleeve	Tungsten carbide	Same
Seal spring and retainer clip	316L stainless steel	Same
Mechanical seal	Standard with tungsten carbide/carbon faces, 316L stainless steel sleeve and EPR elastomers	Same
Priming and drain plugs	316L stainless steel	Same
NEMA motor adapter	Cast iron	Same
Coupling guards	304 stainless steel	Same
Motor shaft coupling	Cast aluminum	Same

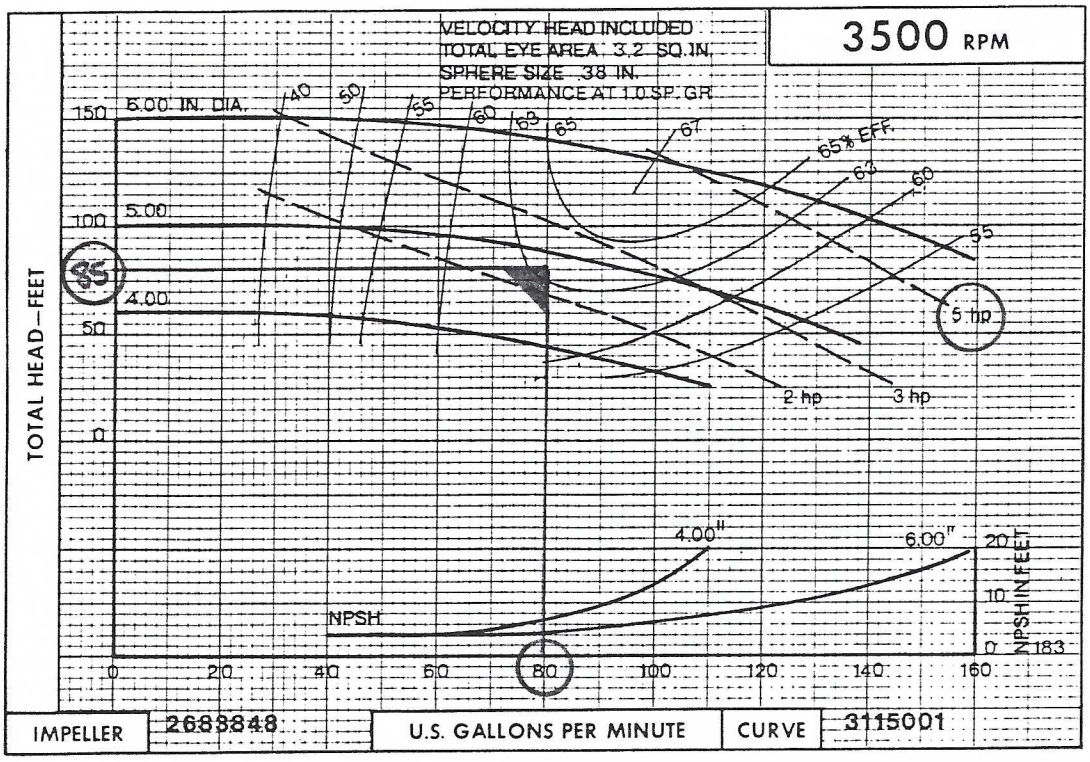
Performance Curves



Motors

NEMA standard TC frame vertical motors with open drip proof, or totally enclosed fan cooled enclosures. 60 Hz, 3500 RPM, single phase (115/230 V) and three phase (208–230/460 V). 1SV horsepowers from ½ to 5. For other motor options, contact the factory. Above motors are 1.25 S.F. for ½, ¾ and 1 HP, 1.15 S.F. for 1½ – 5 HP.

SECTION 2340	END SUCTION PUMPS Series C or F Type 610A	PEERLESS PUMP INDIANAPOLIS



SECTION 23

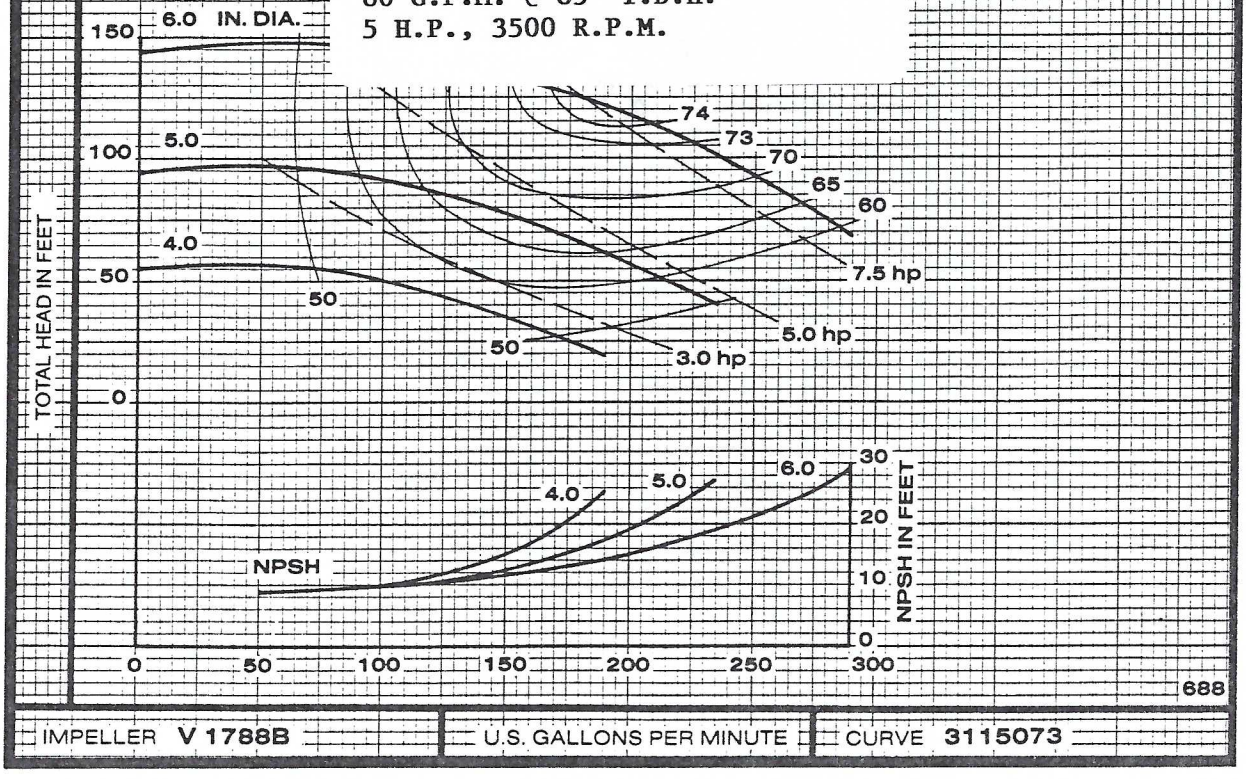
KING COUNTY, WASHINGTON
JOB REFERENCE NO. 85471

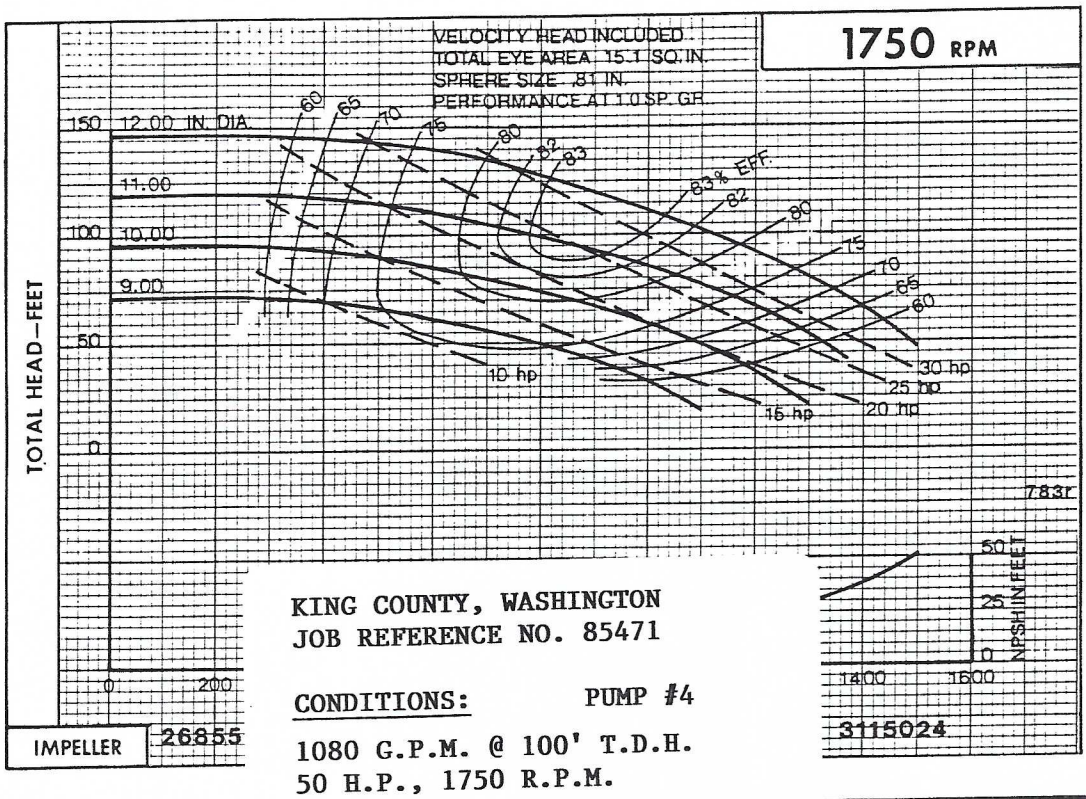
CONDITIONS: PUMP #3

80 G.P.M. @ 85' T.D.H.
5 H.P., 3500 R.P.M.

Peerless Pump
A Sterling Company

3500 RPM





KING COUNTY, WASHINGTON
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CONDITIONS: PUMP #4

1080 G.P.M. @ 100' T.D.H.
50 H.P., 1750 R.P.M.