CITY OF BELLINGHAM

WHATCOM COUNTY **WASHINGTON**

WASTEWATER CONVEYANCE PLAN

VOLUME II

JULY 2016

Gray & Osborne, Inc.

CONSULTING ENGINEERS

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APPENDIX A

MODEL FLOW INPUTS

City of Bellingham
Sanitary Sewer Flow Model Input for UGA Areas

Subbasin	Total Area (ac)	Residential Acres	Commercial/ Industrial Acres	I/I flow (gpm)(1)	Flow from Exist. Resid. (gpm)	No. of Future Houses	Additional Future Residential Flow (gpm)(2)	No. of Future Jobs	Future Commercial Flow (gpm)(3)	Additional Previous Model Flows (gpm)	Flow Input for Model (gpm)	Input Node ID
AIRPORT												
AP-A	62.01			34.5						7.9	49.5	26606
AP-B	34.49			19.2						0.7	22.0	26309
AP-C	25.72			14.3						2	18.3	24001
AP-D	46.3			25.7						25.7	63.7	26306
AP-E	122.67			68.2							96.8	U0072-S08
AP-F	224.69			124.8						14.4	185.3	U0047-S11
BAKERVIEW	346.5			152.2		860.0	109.9	0.0	0.0			
BV-A	20.5	17.2	0.0	9.5		53.9	6.9				16.4	BV14
BV-B	24.2	24.2	0.0	13.4		76.0	9.7				23.2	BV35
BV-C	24.8	21.2	0.0	11.8		66.5	8.5				20.3	BV22
BV-D	13.9	13.9	0.0	7.7		43.7	5.6				13.3	BV43
BV-E	4.8	4.8	0.0	2.7		15.0	1.9				4.6	BV26
BV-F	6.1	5.9	0.0	3.3		18.6	2.4				5.7	BV56
BV-G	15.6	15.6	0.0	8.7		49.0	6.3				14.9	BV49
BV-H	3.0	3.0	0.0	1.6		9.3	1.2				2.8	BV38
BV-I	19.8	18.8	0.0	10.4		59.0	7.5				18.0	BV3
BV-J	12.2	12.2	0.0	6.8		38.2	4.9				11.6	BV10
BV-K	17.6	13.8	0.0	7.7		43.3	5.5				13.2	BV16
BV-L	16.5	15.2	0.0	8.4		47.6	6.1				14.5	O3
BV-M	5.0	4.9	0.1	2.7		15.3	2.0				4.7	BV66
BV-N	4.3	4.3	0.0	2.4		13.6	1.7				4.1	BV21
BV-O	17.5	13.5	0.0	7.5		42.5	5.4				12.9	BV9
BV-P	10.5	7.6	0.0	4.2		23.8	3.0				7.3	W0088-S05
BV-Q	18.4	16.8	0.0	9.3		52.7	6.7				16.1	W0088-S03
BV-R	16.1	14.9	0.0	8.3		46.7	6.0				14.2	BV63
BV-S	9.6	8.8	0.0	4.9		27.7	3.5				8.4	BV58
BV-T	3.4	3.4	0.0	1.9		10.6	1.4				3.2	BV25
BV-U	6.2	5.1	0.0	2.8		16.0	2.0				4.9	BV27
BV-V	10.4	9.1	0.0	5.0		28.4	3.6				8.7	BV55
BV-W	4.6	4.0	0.0	2.2		12.4	1.6				3.8	BV46
BV-X	4.0	3.8	0.0	2.1		12.0	1.5				3.6	BV30
BV-Y	7.4	7.4	0.0	4.1		23.1	3.0				7.1	BV13
BV-Z	4.8	4.8	0.0	2.7		15.0	1.9			0.2	4.8	83181-11
Total Residential Acres	273.9											
Total Commercial/Ind. Acres	0.1											
BARKLEY	254.6			49.8		1000.0	127.8	1100.0	62.6			
B-A	21.7	4.3	1.4	3.2		109.4	14.0	31.3	1.8		19.0	B1
B-B	14.9	6.4	5.1	6.3		160.2	20.5	111.4	6.3		33.2	B2
B-C	12.7	10.5	1.1	6.5		265.1	33.9	25.1	1.4		41.8	B6
B-D	12.0	0.0	10.1	5.6		0.0	0.0	222.5	12.7	2.3	20.6	S0253-S01
B-E	9.2	0.1	7.8	4.4		1.8	0.2	171.7	9.8		14.4	B10
B-F	9.3	0.0	3.9	2.2		0.0	0.0	86.5	4.9		7.1	B11
B-G	12.5	8.8	3.1	6.6		222.5	28.4	67.6	3.8		38.9	83214-13

1. I/I based upon 800 gpad
2. Residential flow based upon 2.4 people/house x 77 gpcd
3. Commercial flow based upon 82 gpcd

City of Bellingham
Sanitary Sewer Flow Model Input for UGA Areas

Subbasin	Total Area (ac)	Residential Acres	Commercial/ Industrial Acres	I/I flow (gpm)[1]	Flow from Exist. Resid. (gpm)	No. of Future Houses	Additional Future Residential Flow (gpm)[2]	No. of Future Jobs	Future Commercial Flow (gpm)[3]	Additional Previous Model Flows (gpm)	Flow Input for Model (gpm)	Input Node ID
B-H	13.0	0.0	12.4	6.9		0.7	0.1	272.7	15.5		22.5	B14
B-I	6.8	3.5	1.2	2.6		87.0	11.1	25.4	1.4		15.1	B19
B-J	6.5	4.4	1.5	3.3		111.3	14.2	32.5	1.8		19.4	B8
B-K	11.2	1.2	0.4	0.9		29.9	3.8	8.7	0.5		5.2	B4
B-L	7.7	0.5	2.0	1.4		12.0	1.5	44.6	2.5		5.5	B12
Total Residential Acres	39.7											
Total Commercial/Ind. Acres	49.9											
NORTH BELLINGHAM (NORTH)	150.0			83.3		949.0	121.3	180.0	10.3			
CAN-A	60.0	60.0	0.0	33.3		949.0	121.3	0.0	0.0		154.6	CAN4
CAN-B	90.0		90.0	50.0		0.0	0.0	180.0	10.3		60.3	CAN7
Total Residential Acres	60.0											
Total Commercial/Ind. Acres	90.0											
NORTH BELLINGHAM (MIDDLE)	104.0			57.8		330.0	42.2	0.0	0.0			
CAM-A	89.0	89.0	0.0	49.4		282.4	36.1				85.5	CAM4
CAM-B	15.0	15.0	0.0	8.3		47.6	6.1				14.4	CAM3
Total Residential Acres	104.0											
Total Commercial/Ind. Acres	0.0											
NORTH BELLINGHAM (SOUTH)	160.0			88.9		543.0	69.4	377.0	21.5			
CAS-A	28.0	28.0	0.0	15.6		100.7	12.9	0.0	0.0		28.4	CAS4
CAS-B	88.0	88.0	0.0	48.9		316.5	40.4	0.0	0.0		89.3	CAS8
CAS-C	44.0	35.0	9.0	24.4		125.9	16.1	377.0	21.5		62.0	CAS11
Total Residential Acres	151.0											
Total Commercial/Ind. Acres	9.0											
CHUCKANUT VILLAGE	90.7			15.8		3.0	0.4	0.0	0.0			
CV-A	3.2	1.4	0.0	0.8	0.1	1.5	0.2				1.1	CV3
CV-B	8.3	5.1	0.0	2.8	0.3	0.0	0.0				3.1	CV5
CV-C	6.0	3.6	0.0	2.0	1.3	0.0	0.0				3.3	CV7
CV-D	8.6	6.1	0.0	3.4	0.9	1.0	0.1				4.4	CV14
CV-E	3.8	3.6	0.0	2.0	0.8	1.0	0.1				2.9	CV9
CV-F	5.0	4.7	0.0	2.6	1.3	0.0	0.0				3.9	CV11
CV-G	3.3	3.1	0.0	1.7	1.4	0.0	0.0				3.1	CV4
CV-H	1.2	0.8	0.0	0.5	0.3	0.0	0.0				0.7	CV12
Total Residential Acres	28.4											
Total Commercial/Ind. Acres	0.0											
CONSOLIDATION TO PADDEN	610.6			154.3		350.0	44.7	0.0	0.0			
CP-A	1.6	1.6	0.0	0.9		2.0	0.3				1.1	CP103
CP-AA	7.2	4.4	0.0	2.5		5.6	0.7				3.2	CP21
CP-B	17.0	12.8	0.0	7.1		16.2	2.1				9.2	CP3
CP-BB	13.3	6.6	0.0	3.7		8.3	1.1				4.7	CP22
CP-C	4.6	4.6	0.0	2.6		5.8	0.7			0.4	3.7	73082-06
CP-CC	8.8	8.8	0.0	4.9		11.2	1.4				6.3	CP14
CP-D	1.5	1.5	0.0	0.8		1.9	0.2				1.1	CP104
CP-DD	6.5	6.1	0.0	3.4		7.7	1.0				4.4	CP16
CP-E	6.1	6.1	0.0	3.4		7.7	1.0				4.4	CP69

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Subbasin	Total Area (ac)	Residential Acres	Commercial/ Industrial Acres	I/I flow (gpm)(1)	Flow from Exist. Resid. (gpm)	No. of Future Houses	Additional Future Residential Flow (gpm)(2)	No. of Future Jobs	Future Commercial Flow (gpm)(3)	Additional Previous Model Flows (gpm)	Flow Input for Model (gpm)	Input Node ID
CP-EE	21.6	19.5	0.0	10.8		24.6	3.1				14.0	CP43
CP-F	3.8	3.8	0.0	2.1		4.8	0.6				2.7	CP110
CP-FF	17.8	12.3	0.0	6.9		15.6	2.0				8.8	CP46
CP-G	2.7	2.6	0.0	1.5		3.3	0.4				1.9	CP99
CP-GG	11.7	6.6	1.0	4.2		8.3	1.1				5.3	CP101
CP-H	5.2	5.1	0.0	2.8		6.5	0.8				3.7	CP88
CP-HH	2.8	2.8	0.0	1.5		3.5	0.4				2.0	CP60
CP-I	2.0	2.0	0.0	1.1		2.5	0.3				1.4	CP86
CP-II	10.8	10.7	0.0	6.0		13.6	1.7				7.7	CP55
CP-J	3.6	3.6	0.0	2.0		4.5	0.6				2.6	CP83
CP-JJ	7.0	7.0	0.0	3.9		8.9	1.1				5.0	CP49
CP-K	10.5	10.4	0.0	5.8		13.2	1.7			6	13.5	X0077-S15
CP-KK	5.0	5.0	0.0	2.8		6.4	0.8				3.6	CP48
CP-L	3.0	2.9	0.0	1.6		3.7	0.5				2.1	CP78
CP-LL	4.3	4.3	0.0	2.4		5.5	0.7			2.9	6.0	83323-40
CP-M	2.2	2.2	0.0	1.2		2.8	0.4				1.6	CP69
CP-MM	2.2	2.2	0.0	1.2		2.8	0.4			2.2	3.8	X0077-S01
CP-N	28.5	27.8	0.0	15.4		35.1	4.5				19.9	CP77
CP-O	10.5	10.5	0.0	5.9		13.3	1.7				7.6	CP73
CP-P	17.5	17.5	0.0	9.7		22.1	2.8				12.5	CP13
CP-Q	7.6	6.9	0.0	3.8		8.7	1.1				5.0	X0077-S05
CP-R	4.7	4.7	0.0	2.6		6.0	0.8				3.4	CP33
CP-S	2.5	2.5	0.0	1.4		3.2	0.4			3.7	5.5	X0077-S07
CP-T	8.6	8.6	0.0	4.8		10.8	1.4				6.1	CP31
CP-U	4.2	4.2	0.0	2.3		5.3	0.7				3.0	CP29
CP-V	6.2	6.2	0.0	3.4		7.8	1.0				4.4	CP27
CP-W	4.4	3.9	0.0	2.2		4.9	0.6				2.8	CP25
CP-X	2.8	1.9	0.0	1.1		2.4	0.3				1.4	CP24
CP-Y	12.3	12.3	0.0	6.8		15.5	2.0				8.8	CP7
CP-Z	14.2	14.1	0.0	7.8		17.8	2.3				10.1	CP20
Total Residential Acres	276.7											
Total Commercial/Ind. Acres	1.0											
DEWEY	163.5			42.0		390.0	49.8	300.0	17.1			
D-A	9.3	8.7	0.0	4.9		50.8	6.5	0.0	0.0		11.3	D7
D-B	22.5	19.7	0.0	11.0		114.8	14.7	0.0	0.0		25.6	D6
D-C	7.6	1.4	1.2	1.5		8.2	1.1	43.3	2.5		5.0	D5
D-D	17.6	9.6	0.0	5.3		55.6	7.1	0.0	0.0		12.4	D1
D-E	25.8	5.1	7.4	6.9		29.9	3.8	256.7	14.6		25.4	X0067-S07
D-F	13.4	13.1	0.0	7.3		76.4	9.8	0.0	0.0		17.1	83161-04
D-G	19.3	9.3	0.0	5.2		54.3	6.9	0.0	0.0		12.1	D14
Total Residential Acres	67.1											
Total Commercial/Ind. Acres	8.6											
EDGEMOOR	38.6			5.9		30.0	3.8	0.0	0.0			
E-A	5.2	5.2	0.0	2.9		14.7	1.9				4.8	E10

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Subbasin	Total Area (ac)	Residential Acres	Commercial/ Industrial Acres	I/I flow (gpm)[1]	Flow from Exist. Resid. (gpm)	No. of Future Houses	Additional Future Residential Flow (gpm)[2]	No. of Future Jobs	Future Commercial Flow (gpm)[3]	Additional Previous Model Flows (gpm)	Flow Input for Model (gpm)	Input Node ID
E-B	1.2	1.2	0.0	0.7		3.4	0.4				1.1	E17
E-C	4.2	4.2	0.0	2.3		11.9	1.5				3.8	E2
Total Residential Acres	10.6											
Total Commercial/Ind. Acres	0.0											
HANNEGAN	207.5			100.1		0.0	0.0	500.0	28.5			
H-A	31.7	0.0	24.1	13.4	0.1			66.9	3.8		17.3	H7
H-B	65.7	0.0	57.9	32.2	0.1			160.6	9.1		41.4	H14
H-C	21.1	0.0	20.7	11.5	0.0			57.3	3.3		14.7	H15
H-D	30.3	0.0	30.1	16.7	0.1			83.4	4.8		21.6	H10
H-E	19.7	0.0	19.0	10.6	0.1			52.7	3.0		13.7	H6
H-F	19.2	0.0	18.6	10.3	0.4			51.7	2.9		13.7	H11
H-G	9.9	0.0	9.8	5.5				27.3	1.6		7.0	H3
Total Residential Acres	0.0											
Total Commercial/Ind. Acres	180.1											
KELLOGG	119.0			39.3		660.0	84.4	0.0	0.0			
K-A	20.5	12.0	0.0	6.7		111.7	14.3				20.9	K3
K-B	6.8	6.8	0.0	3.8		63.7	8.1				11.9	K5
K-C	37.7	33.6	0.0	18.7		313.3	40.1				58.7	NK22
K-D	4.2	4.2	0.0	2.3		39.0	5.0				7.3	K24
K-E	6.2	3.2	0.0	1.8		29.8	3.8				5.6	K7
K-F	7.8	7.8	0.0	4.3		72.7	9.3			4.2	17.8	X0063-S14
K-G	3.2	3.2	0.0	1.8		29.7	3.8				5.6	K23
Total Residential Acres	70.8											
Total Commercial/Ind. Acres	0.0											
KLINE / KELLY	166.3			83.3	16.8	0.0	0.0	565.0	32.2			
KK-A	16.7	0.0	15.1	8.4	3.3		0.0	56.9	3.2		15.0	KK25
KK-B	18.8	0.0	18.7	10.4	1.6		0.0	70.4	4.0		16.0	KK6
KK-C	26.4	0.0	24.4	13.6	0.6		0.0	91.9	5.2		19.4	KK22
KK-D	31.4	0.0	30.0	16.7	4.7		0.0	113.1	6.4		27.8	KK26
KK-E	73.0	0.0	61.8	34.3	6.6		0.0	232.6	13.2		54.1	KK21
Total Residential Acres	0.0											
Total Commercial/Ind. Acres	150.0											
LARRABEE	107.3			43.9		72.0	9.2	0.0	0.0			
L-A	13.5	12.3	0.0	6.8		11.2	1.4				8.3	L8
L-B	6.0	6.0	0.0	3.3		5.5	0.7				4.0	L1
L-C	15.4	14.6	0.0	8.1		13.3	1.7				9.8	L7
L-D	3.0	3.0	0.0	1.6		2.7	0.3				2.0	L2
L-E	11.9	9.9	0.0	5.5		9.0	1.2				6.7	L9
L-F	22.2	19.1	0.0	10.6		17.4	2.2				12.8	L14
L-G	11.2	11.2	0.0	6.2		10.2	1.3				7.5	L10
L-H	3.1	2.8	0.0	1.6		2.6	0.3				1.9	L4
Total Residential Acres	78.9											
Total Commercial/Ind. Acres	0.0											

1. I/I based upon 800 gpad
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3. Commercial flow based upon 82 gpcd

City of Bellingham
Sanitary Sewer Flow Model Input for UGA Areas

Subbasin	Total Area (ac)	Residential Acres	Commercial/ Industrial Acres	I/I flow (gpm)[1]	Flow from Exist. Resid. (gpm)	No. of Future Houses	Additional Future Residential Flow (gpm)[2]	No. of Future Jobs	Future Commercial Flow (gpm)[3]	Additional Previous Model Flows (gpm)	Flow Input for Model (gpm)	Input Node ID
LARSON RD	77.0			42.8	3.1	119.0	15.2	0.0	0.0			
LARS-A	20.0	20.0	0.0	11.1	0.8	30.9	4.0				15.8	LAR16
LARS-B	57.0	57.0	0.0	31.7	2.3	88.1	11.3				45.2	LAR15
Total Residential Acres	77.0											
Total Commercial/Ind. Acres	0.0											
NORTH KING MTN	238.9			114.1		850.0	108.6	0.0	0.0			
NK-A	49.0	49.0	0.0	27.2		202.9	25.9				53.2	NK10
NK-B	18.5	18.4	0.0	10.2		76.4	9.8				20.0	NK12
NK-C	20.6	20.6	0.0	11.5		85.4	10.9				22.4	NK20
NK-D	23.7	23.7	0.0	13.1		97.9	12.5				25.7	NK6
NK-E	14.0	8.0	0.0	4.4		33.1	4.2				8.7	NK26
NK-F	7.6	7.6	0.0	4.2		31.4	4.0				8.2	NK36
NK-G	10.7	10.4	0.0	5.8		43.0	5.5				11.3	NK13
NK-H	12.7	12.7	0.0	7.0		52.5	6.7				13.7	NK7
NK-I	10.2	10.0	0.0	5.6		41.6	5.3				10.9	NK15
NK-J	17.5	17.1	0.0	9.5		70.8	9.0				18.5	NK17
NK-K	18.0	17.1	0.0	9.5		70.6	9.0				18.5	NK23
NK-L	10.7	10.7	0.0	6.0		44.4	5.7				11.6	NK21
NK-M	8.3	8.3	0.0	4.6	15.2						19.8	NK28
Total Residential Acres	205.3											
Total Commercial/Ind. Acres	0.0											
ORCHARD	263.1			57.8		780.0	99.7	0.0	0.0			
O-A	26.2	25.9	0.0	14.4		194.1	24.8				39.2	O15
O-B	25.4	19.1	0.0	10.6		143.0	18.3				28.9	O9
O-C	4.3	4.3	0.0	2.4		32.3	4.1				6.5	O11
O-D	18.6	18.5	0.0	10.3		138.5	17.7				28.0	O4
O-E	22.4	20.9	0.1	11.7		156.9	20.1				31.7	O7
O-F	9.2	8.9	0.0	5.0		67.0	8.6				13.5	U0043-S09
O-G	6.4	6.4	0.0	3.6		48.2	6.2				9.7	U0043-S05
Total Residential Acres	104.1											
Total Commercial/Ind. Acres	0.1											
PAC HWY / NORTHWEST	578.3			133.1		440.0	56.2	626.0	35.6			
PH-A	18.2	0.0	14.5	8.0				37.8	2.2		10.2	PH10
PH-B	8.1	0.0	2.6	1.4				6.7	0.4		1.8	PH7
PH-C	69.5	0.0	45.4	25.2				118.7	6.8		32.0	PH2
PH-D	59.7	0.0	42.7	23.7				111.4	6.3		30.0	PH3
PH-E	44.4	0.0	35.2	19.6				92.0	5.2		24.8	PH19
PH-F	20.4	0.0	13.7	7.6				35.8	2.0		9.7	PH6
PH-G	28.0	0.0	27.3	15.1				71.2	4.1		19.2	PH5
PH-H	44.9	0.0	24.3	13.5				63.5	3.6		17.1	PH11
PH-I	33.3	0.0	15.0	8.3				39.1	2.2		10.5	PH12
PH-J	17.5	0.0	15.4	8.5				40.1	2.3		10.8	PH18
PH-K	5.6	0.0	3.7	2.1				9.7	0.6		2.6	PH8
PH-L	39.8	0.0	39.8	22.1				44.0	2.5		24.6	PH14

1. I/I based upon 800 gpad
2. Residential flow based upon 2.4 people/house x 77 gpcd
3. Commercial flow based upon 82 gpcd

City of Bellingham
Sanitary Sewer Flow Model Input for UGA Areas

Subbasin	Total Area (ac)	Residential Acres	Commercial/ Industrial Acres	I/I flow (gpm)(1)	Flow from Exist. Resid. (gpm)	No. of Future Houses	Additional Future Residential Flow (gpm)(2)	No. of Future Jobs	Future Commercial Flow (gpm)(3)	Additional Previous Model Flows (gpm)	Flow Input for Model (gpm)	Input Node ID
Costco	11.2	0.0	11.2	6.2				22.0	1.3		7.5	PH15
Mixed Use (East of Costco)	38.0	38.0	0.0	21.1		440.0	56.2	0.0	0.0		77.4	PH17
Total Residential Acres	0.0											
Total Commercial/Ind. Acres	239.6											
PADDEN	157.9			27.8		250.0	32.0	0.0	0.0			
P-A	55.0	50.1	0.0	27.8		250.0	32.0				59.8	P1
Total Residential Acres	50.1											
Total Commercial/Ind. Acres	0.0											
QUEEN MTN	38.7			17.2		90.0	11.5	0.0	0.0			
QM-A	7.6	7.6	0.0	4.2		21.9	2.8				7.0	QM17
QM-B	14.7	13.1	0.0	7.3		38.0	4.9				12.1	QM6
QM-C	16.3	10.4	0.0	5.8		30.0	3.8				9.6	QM7
Total Residential Acres	31.0											
Total Commercial/Ind. Acres	0.0											
SOUTH	341.4			60.1		125.0	16.0	0.0	0.0			
S-A	9.2	8.6	0.0	4.8		9.9	1.3				6.0	S11
S-B	10.5	10.2	0.0	5.7		11.8	1.5				7.2	S7
S-C	17.2	17.0	0.0	9.4		19.6	2.5				12.0	S5
S-D	8.5	8.5	0.0	4.7		9.8	1.3				6.0	S3
S-E	7.2	7.0	0.0	3.9		8.0	1.0				4.9	S2
S-F	7.7	7.7	0.0	4.3		8.9	1.1				5.4	S26
S-G	7.9	7.7	0.0	4.3		8.9	1.1				5.4	S13
S-H	1.8	1.8	0.0	1.0		2.1	0.3			7.1	8.4	73074-10
S-I	10.6	9.8	0.0	5.5		11.4	1.5				6.9	S25
S-J	11.8	9.6	0.0	5.3		11.1	1.4				6.7	S15
S-K	38.2	15.8	0.0	8.8		18.2	2.3				11.1	S17
S-L	6.4	4.5	0.0	2.5		5.2	0.7				3.2	S24
Total Residential Acres	108.2											
Total Commercial/Ind. Acres	0.0											
SOUTH YEW ST	520.6			110.5		450.0	57.5	0.0	0.0			
SY-A	34.3	34.2		19.0		77.4	9.9				28.9	SY11
SY-B	4.6	4.6		2.6		10.5	1.3				3.9	SY13
SY-C	9.1	9.1		5.1		20.7	2.6				7.7	73093-10
SY-D	67.5	67.5		37.5		152.8	19.5				57.0	SY15
SY-E	10.2	9.7		5.4		21.9	2.8				8.2	SY2
SY-F	10.9	10.9		6.1		24.7	3.2				9.2	X0039-S04
SY-G	11.0	11.0		6.1		24.9	3.2				9.3	SY14
SY-H	2.7	2.7		1.5		6.1	0.8				2.3	SY17
SY-I	33.3	31.9		17.7		72.1	9.2				26.9	SY22
SY-J	17.6	17.2		9.6		38.9	5.0				14.5	SY24
Total Residential Acres	198.9											
Total Commercial/Ind. Acres	0.0											

1. I/I based upon 800 gpad
2. Residential flow based upon 2.4 people/house x 77 gpcd
3. Commercial flow based upon 82 gpcd

APPENDIX B

MODEL RESULTS (TABULAR FORMAT)

CIty of Bellingham

Sanitary Sewer Model Results Representing the Future Scenario (Year 2026/Buildout within the UGA)

Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
105_106	8	329	0.0093	105	106	92.74	89.67	30	526	0.06	*1.81*	6.9
106_107	8	172	0.0167	106	107	89.57	86.70	30	704	0.04	2.23	4.0
107_1303	8	552	0.0199	107	1303	86.60	75.64	74	766	0.10	3.10	3.2
108_U0093-Y01	36	225	0.0020	108	U0093-Y01	92.45	92.00	31	13,415	0.00	*0.01*	6.4
112_1213	8	108	0.0079	112	1213	153.80	152.94	16	484	0.03	*1.43*	3.4
201_202	8	179	0.0043	201	202	316.04	315.27	0	356	0.00	0.00	2.5
202_203	8	154	0.0037	202	203	315.17	314.60	0	331	0.00	0.00	22.2
203_206	8	94	0.0011	203	206	314.50	314.40	0	177	0.00	0.00	4.3
206_207	8	122	0.0016	206	207	314.30	314.10	0	220	0.00	0.00	3.7
207_208	8	37	0.0109	207	208	314.00	313.60	0	568	0.00	0.00	6.0
208_209	8	89	0.0011	208	209	313.50	313.40	0	183	0.00	0.00	2.0
209_210	8	119	0.0017	209	210	313.30	313.10	0	223	0.00	0.00	3.3
210_238	10	114	0.0011	210	238	313.00	312.88	119	320	0.37	*1.21*	3.1
217_82362-04	8	40	0.4101	217	82362-04	267.53	251.17	119	3,483	0.03	10.33	4.3
228_229	10	499	0.0104	228	229	247.62	242.43	151	1,006	0.15	2.96	4.7
229_1101	12	476	0.0371	229	1101	242.33	224.66	184	3,090	0.06	4.81	6.6
237_31210	10	243	0.0013	237	31210	310.65	310.34	-	352	0.00	0.00	5.8
238_239	10	41	0.3211	238	239	312.78	299.61	119	5,587	0.02	9.20	4.6
239_217	10	78	0.4094	239	217	299.51	267.63	119	6,308	0.02	10.02	6.0
415_801	8	476	0.0495	415	801	238.62	215.05	122	1,210	0.10	4.95	11.2
512_513	8	124	0.0333	512	513	220.51	216.38	7	992	0.01	*1.81*	6.0
513_813	8	198	0.0100	513	813	216.28	214.30	17	544	0.03	*1.56*	6.1
515_14504	8	457	0.0108	515	14504	204.12	199.21	128	564	0.23	2.91	8.2
516_515	8	485	0.0029	516	515	205.62	204.22	65	292	0.22	*1.50*	6.7
520_604	20	439	0.0099	520	604	198.40	194.05	88	6,234	0.01	2.27	11.0
521_520	12	172	0.0463	521	520	206.45	198.50	19	3,449	0.01	2.63	8.5
523_521	8	162	0.0415	523	521	213.29	206.55	10	1,108	0.01	2.20	3.8
604_712	20	96	0.0160	604	712	193.95	192.41	229	7,922	0.03	3.58	8.4
606_520	8	172	0.0016	606	520	198.78	198.50	55	219	0.25	*1.16*	3.5
607_606	8	181	0.0022	607	606	199.27	198.88	54	252	0.21	*1.28*	6.2
706_1908	20	636	0.0168	706	1908	179.95	169.29	877	8,105	0.11	3.61	9.7
708_709	8	439	0.0264	708	709	194.00	182.42	81	883	0.09	2.60	4.7
709_710	8	203	0.0070	709	710	182.32	180.90	205	455	0.45	2.83	5.2
710_706	8	8	0.0835	710	706	180.80	180.10	327	1,572	0.21	7.22	9.0
711_706	20	417	0.0249	711	706	190.45	180.05	425	9,882	0.04	4.37	6.8
712_711	20	311	0.0057	712	711	192.31	190.55	285	4,713	0.06	2.65	9.9
801_802	8	350	0.0426	801	802	214.95	200.05	166	1,122	0.15	4.64	7.4
802_811	8	490	0.0183	802	811	199.95	191.01	329	735	0.45	4.56	7.2
804_U0071-S02	8	258	0.0014	804	U0071-S02	168.49	168.14	204	202	1.01	*1.47*	8.6
805_1811	12	351	0.0241	805	1811	173.84	165.38	17	2,488	0.01	2.02	8.5
809_1809	15	223	0.0424	809	1809	171.19	161.75	751	5,987	0.13	4.82	7.7

Bold cells = pipe at capacity / manholes surcharged within 2' of rim.

If a mh is surcharged and the pipe is not at capacity, this is a result of the model recognizing a downstream problem.

Italic = Velocity < 2 fps

CIty of Bellingham

Sanitary Sewer Model Results Representing the Future Scenario (Year 2026/Buildout within the UGA)

Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
810_809	15	214	0.0504	810	809	182.07	171.29	685	6,524	0.11	7.68	4.8
811_810	15	293	0.0298	811	810	190.91	182.17	588	5,022	0.12	6.11	6.5
812_811	12	327	0.0400	812	811	204.09	191.01	137	3,208	0.04	3.21	6.2
813_812	12	393	0.0255	813	812	214.20	204.19	26	2,559	0.01	2.33	8.7
904_905	8	143	0.0089	904	905	183.15	181.88	53	512	0.10	2.11	5.9
904_83314-25	8	119	0.0367	904	83314-25	183.15	178.79	107	1,042	0.10	4.29	5.9
905_T83314-01	8	221	0.0778	905	T83314-01	181.78	164.56	92	1,517	0.06	5.34	5.6
914_U0071-S03	8	234	0.0283	914	U0071-S03	191.92	185.30	202	915	0.22	4.69	6.5
915_916	8	25	0.2620	915	916	245.36	238.87	65	2,783	0.02	7.38	4.7
916_802	8	486	0.0797	916	802	238.77	200.05	80	1,535	0.05	4.05	7.9
924_925	8	13	0.0720	924	925	167.21	166.25	241	1,459	0.17	6.66	6.8
925_1801	8	440	0.0262	925	1801	166.15	154.63	314	880	0.36	2.00	7.1
928_72111-02	60	44	0.0011	928	72111-02	30.10	30.05	52,788	39,473	1.34	5.97	2.2
8994	48	207	0.0007	958	2821	9.19	9.05	7,539	16,806	0.45	*1.31*	5.7
8996	72	50	0.0028	958	944	9.19	9.05	28,532	100,855	0.28	6.80	5.7
1003_1004	8	147	0.0740	1003	1004	216.43	205.54	130	1,479	0.09	5.81	4.5
1004_1006	8	208	0.1449	1004	1006	205.44	175.28	140	2,070	0.07	7.53	5.7
1005_1006	8	41	0.0739	1005	1006	178.31	175.28	7	1,478	0.00	2.42	4.5
1006_83314-22	8	153	0.1471	1006	83314-22	175.18	152.75	150	2,085	0.07	5.93	5.3
1007_83314-03	10	194	0.0959	1007	83314-03	132.95	114.38	504	3,053	0.16	9.22	3.3
1101_83314-40	8	30	0.0474	1101	83314-40	224.56	223.15	214	1,185	0.18	5.73	4.5
1105_1107	8	171	0.0599	1105	1107	72.02	61.79	25	1,331	0.02	2.49	10.5
802_914	8	349	0.0227	1106	914	199.95	192.02	1	820	0.00	*0.79*	2.8
1106_1107	10	30	0.2618	1106	1107	69.75	61.79	86	5,045	0.02	5.59	2.8
1107_1108	10	281	0.0075	1107	1108	61.69	59.58	141	853	0.17	2.58	10.6
1108_1501	12	370	0.0042	1108	1501	59.48	57.92	177	1,044	0.17	2.21	12.4
1116_83314-20	8	219	0.0847	1116	83314-20	195.63	177.05	264	1,583	0.17	7.49	2.0
1119_83314-22	8	47	0.0248	1119	83314-22	153.92	152.75	280	856	0.33	4.89	7.8
1123_1116	8	260	0.0549	1123	1116	210.00	195.73	248	1,274	0.19	6.30	3.0
1203_1219	8	451	0.0728	1203	1219	128.63	95.80	58	1,467	0.04	4.54	4.3
1211_1106	8	429	0.0447	1211	1106	89.06	69.85	86	1,150	0.07	4.31	7.2
1213_1218	8	404	0.0507	1213	1218	152.84	132.37	27	1,224	0.02	3.18	5.2
1218_1203	8	113	0.0312	1218	1203	132.27	128.73	47	960	0.05	3.18	4.9
1219_1211	8	32	0.2018	1219	1211	95.70	89.16	71	2,443	0.03	6.92	6.7
1301_1306	12	510	0.0219	1301	1306	74.20	63.05	96	2,371	0.04	3.29	2.6
1303_1301	12	60	0.0205	1303	1301	75.54	74.30	96	2,297	0.04	3.22	5.4
1306_1308	12	113	0.3197	1306	1308	62.95	26.74	112	9,065	0.01	8.79	7.0
1308_1309	8	74	0.1707	1308	1309	26.64	13.95	112	2,247	0.05	7.46	5.4
1309_PINELS	6	122	0.0395	1309	PINELS	13.85	9.05	112	502	0.22	*1.27*	3.4
1311_PINELS	10	37	0.0041	1311	PINELS	9.20	9.05	42	629	0.07	*0.17*	3.3
1312_1311	10	217	0.0005	1312	1311	9.40	9.30	0	211	0.00	0.00	2.9

Bold cells = pipe at capacity / manholes surcharged within 2' of rim.

If a mh is surcharged and the pipe is not at capacity, this is a result of the model recognizing a downstream problem.

Italic = Velocity < 2 fps

CIty of Bellingham

Sanitary Sewer Model Results Representing the Future Scenario (Year 2026/Buildout within the UGA)

Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
1314_82361-08	12	446	0.0009	1314	82361-08	7.95	7.57	154	468	0.33	*1.19*	9.2
1315_1312	10	269	0.0004	1315	1312	9.60	9.50	0	190	0.00	0.00	5.5
1501_83314-13	12	81	0.0024	1501	83314-13	57.82	57.63	269	781	0.34	2.01	14.1
1503_1516	12	39	0.0114	1503	1516	41.00	40.55	1,468	1,714	0.86	5.46	11.1
1505_T83303-11	18	29	0.2002	1505	T83303-11	11.82	6.00	633	21,150	0.03	*0.80*	10.7
1506_1505	10	136	0.0163	1506	1505	14.13	11.92	182	1,257	0.14	3.65	7.3
1507_1514	12	170	0.0552	1507	1514	55.35	45.94	1,398	3,766	0.37	8.95	21.7
1509_1510	18	139	0.0184	1509	1510	32.72	30.17	381	6,407	0.06	4.43	18.8
1510_1511	18	61	0.0745	1510	1511	30.07	25.55	402	12,902	0.03	7.36	9.5
1511_1505	16	58	0.2326	1511	1505	25.45	11.92	452	16,653	0.03	11.53	11.9
1513_1507	10	28	0.1780	1513	1507	60.35	55.45	1,033	4,160	0.25	11.19	13.7
1514_1503	12	157	0.0303	1514	1503	45.84	41.10	1,468	2,791	0.53	6.18	16.5
1516_1517	10	59	0.2725	1516	1517	40.45	24.33	1,591	5,147	0.31	18.53	11.6
1517_83303-01	18	243	0.0796	1517	83303-01	24.23	4.91	1,591	13,341	0.12	2.01	8.0
1601_1621	10	194	0.1014	1601	1621	100.33	80.67	950	3,140	0.30	11.24	7.6
1603_1509	8	477	0.0436	1603	1509	53.65	32.82	235	1,136	0.21	5.72	12.3
1610_1601	8	512	0.0123	1610	1601	106.75	100.43	349	604	0.58	3.99	6.8
1614_1715	8	520	0.0328	1614	1715	162.95	145.92	221	985	0.22	5.07	4.4
1617_1610	8	465	0.0021	1617	1610	107.84	106.85	159	251	0.63	*1.70*	5.8
1618_1617	8	135	0.0208	1618	1617	110.76	107.94	27	785	0.03	*1.38*	6.9
1619_1713	8	289	0.0194	1619	1713	107.57	101.98	62	757	0.08	2.81	9.9
1621_1513	10	158	0.1277	1621	1513	80.57	60.45	1,003	3,523	0.28	12.40	10.4
1712_2401	8	271	0.0570	1712	2401	100.74	85.31	740	1,298	0.57	8.56	10.6
1713_1712	8	151	0.0069	1713	1712	101.88	100.84	115	452	0.25	*1.97*	12.3
1715_1721	8	475	0.0399	1715	1721	145.82	126.85	352	1,086	0.32	5.14	6.3
1716_T83311-02	8	647	0.0276	1716	T83311-02	155.87	137.98	272	904	0.30	4.67	8.2
1720_1721	10	217	0.0216	1720	1721	131.53	126.85	787	1,448	0.54	6.04	5.6
1721_1723	10	221	0.0130	1721	1723	126.75	123.89	452	1,123	0.40	4.34	7.6
1721_T83302-57	8	167	0.0525	1721	T83302-57	126.75	118.01	733	1,245	0.59	4.68	7.6
1722_T83302-57	8	18	0.1006	1722	T83302-57	119.88	118.11	0	1,725	0.00	0.00	8.1
1723_1712	8	349	0.0658	1723	1712	123.79	100.84	537	1,395	0.39	7.26	9.6
1801_T83311-01	8	39	0.0001	1801	T83311-01	154.53	154.52	350	62	5.67	2.23	6.2
1803_T83302-56	8	45	0.0528	1803	T83302-56	102.07	99.68	849	1,250	0.68	7.40	9.9
1804_83302-41	18	58	0.0464	1804	83302-41	91.39	88.69	1,081	10,183	0.11	8.35	9.3
1805_83302-40	8	170	0.0640	1805	83302-40	112.24	101.33	79	1,376	0.06	4.60	8.9
1806_1805	8	60	0.0924	1806	1805	117.86	112.34	55	1,653	0.03	4.87	8.5
1807_1804	18	432	0.0807	1807	1804	126.32	91.49	1,033	13,429	0.08	10.02	8.5
1808_1807	8	455	0.0735	1808	1807	159.86	126.42	921	1,474	0.63	9.93	7.0
1809_1808	8	111	0.0152	1809	1808	161.65	159.96	840	670	1.25	5.36	9.0
1810_T83311-01	10	132	0.0503	1810	T83311-01	161.15	154.52	7	2,211	0.00	2.07	8.1
1811_1809	10	122	0.0280	1811	1809	165.28	161.86	45	1,649	0.03	*1.69*	9.0

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
1905_2201	8	382	0.0563	1905	2201	135.17	113.65	400	1,290	0.31	7.26	5.3
1906_1905	8	384	0.0291	1906	1905	146.45	135.27	272	928	0.29	5.15	5.8
1907_1906	8	531	0.0348	1907	1906	165.05	146.55	122	1,015	0.12	4.23	5.2
1908_1909	8	125	0.0185	1908	1909	169.19	166.87	1,005	740	1.36	6.42	0.0
1909_1911	8	36	0.0051	1909	1911	166.77	166.59	1,025	387	2.65	6.55	3.2
1910_1911	8	21	0.0119	1910	1911	167.07	166.82	0	593	0.00	0.00	1.3
1911_1912	12	319	0.0028	1911	1912	166.49	165.61	1,198	845	1.42	3.40	5.3
1912_1913	8	161	0.0099	1912	1913	165.51	163.90	1,238	542	2.28	7.90	0.0
1913_1914	8	482	0.0269	1913	1914	163.80	150.84	1,389	891	1.56	8.86	0.0
1914_1915	8	436	0.0312	1914	1915	150.74	137.13	1,539	960	1.60	9.82	0.0
1915_2207	8	394	0.0330	1915	2207	137.03	124.02	1,674	988	1.69	10.68	0.0
2009_83293-14	8	133	0.1215	2009	83293-14	120.36	104.15	546	1,895	0.29	8.16	6.9
2010_2009	8	297	0.0333	2010	2009	130.36	120.46	469	993	0.47	6.24	8.2
2011_2010	8	287	0.0267	2011	2010	138.12	130.46	364	888	0.41	5.39	6.7
2012_2011	10	443	0.0209	2012	2011	147.47	138.22	236	1,426	0.17	4.31	7.5
2014_2015	18	328	0.0326	2014	2015	150.79	140.11	2,945	8,536	0.35	9.75	11.1
2015_2016	18	301	0.0364	2015	2016	140.01	129.06	3,034	9,021	0.34	10.24	13.0
2016_2018	18	299	0.0465	2016	2018	128.96	115.05	3,071	10,190	0.30	11.22	7.3
2018_2020	18	293	0.0532	2018	2020	114.95	99.35	3,105	10,905	0.28	10.81	6.1
2020_2122	18	398	0.0322	2020	2122	99.25	86.45	3,139	8,477	0.37	9.69	8.9
2112_2120	10	151	0.0186	2112	2120	77.86	75.05	699	1,344	0.52	2.86	8.8
2120_2121	18	457	0.0208	2120	2121	74.95	65.46	3,844	6,813	0.56	8.66	8.4
2121_3501	18	154	0.0215	2121	3501	65.36	62.05	4,033	6,925	0.58	8.05	8.1
2122_2120	18	450	0.0251	2122	2120	86.35	75.05	3,153	7,488	0.42	8.23	5.4
2201_2218	8	346	0.0453	2201	2218	113.55	97.86	517	1,158	0.45	6.97	4.2
2202_83302-15	8	395	0.0557	2202	83302-15	86.28	64.30	707	1,284	0.55	7.81	8.1
2204_3306	8	407	0.0477	2204	3306	61.32	41.94	2,028	1,187	1.71	12.94	0.0
2205_2204	8	49	0.1021	2205	2204	66.44	61.42	1,994	1,738	1.15	12.72	0.0
2207_2208	12	274	0.0099	2207	2208	123.92	121.21	1,785	1,595	1.12	5.06	0.0
2208_2209	8	316	0.0533	2208	2209	121.11	104.27	1,865	1,255	1.49	11.90	0.0
2209_2210	8	441	0.0630	2209	2210	104.17	76.36	1,932	1,365	1.42	12.33	0.0
2210_2205	8	158	0.0617	2210	2205	76.26	66.54	1,994	1,351	1.48	12.72	0.0
2217_83302-10	8	307	0.0568	2217	83302-10	111.54	94.11	90	1,296	0.07	4.75	5.8
2218_2202	8	305	0.0373	2218	2202	97.76	86.38	608	1,050	0.58	6.95	8.6
2304_T83302-02	53	421	0.0024	2304	T83302-01	38.51	37.51	28,340	41,023	0.69	6.42	26.2
2305_T83302-51	42.35	220	0.0010	2305	T83302-51	39.28	39.06	27,762	14,648	1.90	6.27	18.3
2306_2305	24	17	0.3454	2306	2305	45.10	39.38	2,450	59,835	0.04	*1.74*	14.6
2308_2306	24	150	0.0173	2308	2306	47.80	45.20	2,450	13,400	0.18	7.23	19.1
2309_2308	24	256	0.0210	2309	2308	53.26	47.90	2,449	14,743	0.17	7.74	14.4
2310_2309	20	46	0.0568	2310	2309	56.00	53.36	2,380	14,924	0.16	10.39	13.4
2311_83302-31	20	388	0.0335	2311	83302-31	77.27	64.27	2,310	11,466	0.20	9.16	6.2

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
2315_2324	8	298	0.0258	2315	2324	62.45	54.75	102	874	0.12	3.73	7.4
2317_T83302-55	8	26	0.4588	2317	T83302-55	51.45	39.73	212	3,683	0.06	*1.35*	11.4
2319_T83302-55	42.35	77	0.0013	2319	T83302-55	39.83	39.73	25,108	16,705	1.50	5.66	17.1
2324_2317	8	125	0.0247	2324	2317	54.65	51.55	212	854	0.25	4.52	8.2
2401_2403	8	34	0.1523	2401	2403	85.21	80.02	799	2,122	0.38	9.73	7.7
2403_83303-11	8	118	0.0466	2403	83303-11	79.92	74.40	889	1,174	0.76	8.24	11.4
2407_2522	53	382	0.0119	2407	2522	31.95	27.41	30,204	91,880	0.33	4.35	38.7
2410_2421	15	206	0.0280	2410	2421	57.95	52.18	132	4,861	0.03	3.83	14.4
2412_2424	8	368	0.0255	2412	2424	74.51	65.13	235	868	0.27	4.71	8.3
2421_T83302-02	15	21	0.6958	2421	2422	52.08	37.45	132	24,250	0.01	*0.24*	15.0
2422_T83302-01	15	34	0.0869	2422	T83302-01	40.01	37.05	1,671	8,571	0.20	3.03	26.1
2424_T83302-51	8	629	0.0413	2424	T83302-51	65.03	39.06	412	1,105	0.37	2.63	10.6
2502_1603	8	43	0.1184	2502	1603	58.87	53.75	180	1,871	0.10	7.55	11.7
2507_2618	53	606	0.0035	2507	2618	27.12	25.00	30,694	49,793	0.62	6.55	40.3
2510_2626	10	376	0.0290	2510	2626	56.89	45.99	1,455	1,680	0.87	7.37	13.6
2513_2510	10	355	0.0099	2513	2510	60.49	56.99	1,276	980	1.30	5.21	9.8
2517_2513	10	371	0.0236	2517	2513	69.35	60.59	1,067	1,514	0.70	4.61	14.8
2522_2507	53	318	0.0003	2522	2507	27.31	27.22	30,432	13,929	2.18	4.38	40.2
2601_2602	48	266	0.0011	2601	2602	8.09	7.80	22,014	21,364	1.03	3.90	6.0
2602_2604	48	53	0.0009	2602	2604	7.75	7.70	22,014	19,903	1.11	3.90	6.3
2603_83303-05	36	49	0.0132	2603	83303-05	7.86	7.21	19,243	34,492	0.56	5.86	6.2
2604_83303-05	48	30	0.0128	2604	83303-05	7.60	7.21	22,014	73,276	0.30	3.90	6.4
2605_2606	60	324	0.0006	2605	2606	6.95	6.77	40,433	27,637	1.46	4.59	6.8
2606_T83303-11	60	822	0.0008	2606	T83303-11	6.67	6.00	40,782	33,465	1.22	4.62	5.9
2608_1506	8	128	0.0063	2608	1506	15.04	14.23	182	432	0.42	2.64	28.7
2615_2910	48	277	0.0140	2615	2910	16.07	12.18	13,874	76,611	0.18	2.39	19.9
2616_2615	48	94	0.0779	2616	2615	23.49	16.17	13,828	180,424	0.08	2.39	21.3
2619_2618	24	68	0.0278	2617	2619	24.50	22.60	18,249	16,962	1.08	13.71	18.7
2617_2616	48	11	0.2716	2617	2616	26.54	23.59	13,828	336,895	0.04	19.01	18.7
2618_2617	53	11	0.0246	2618	2617	24.90	24.64	30,789	131,936	0.23	8.14	19.2
2617_2603	36	253	0.0575	2619	2603	22.50	7.96	19,258	71,988	0.27	5.86	15.1
2622_2608	8	95	0.1636	2622	2608	30.66	15.14	182	2,200	0.08	6.35	11.3
2626_T83303-01	10	221	0.0352	2626	T83303-01	45.89	38.10	1,561	1,849	0.84	7.71	15.3
2702_2801	10	163	0.0053	2702	2801	4.45	3.59	1,182	716	1.65	4.83	0.0
2801_2802	10	266	0.0025	2801	2802	3.49	2.83	1,330	490	2.71	5.43	0.9
2802_2813	10	144	0.0015	2802	2813	2.73	2.51	1,330	383	3.47	5.43	14.6
2804_2812	36	373	0.0002	2804	2812	11.25	11.19	13,270	3,808	3.49	4.16	2.6
2805_2804	36	318	0.0003	2805	2804	11.40	11.30	13,271	5,320	2.49	4.17	2.9
2806_2805	28	67	0.0006	2806	2805	11.54	11.50	13,272	3,746	3.54	6.90	2.2
2807_2808	18	251	0.0431	2807	2808	24.91	14.12	1,293	9,809	0.13	4.38	12.2
2808_2810	18	263	0.0088	2808	2810	14.02	11.70	2,074	4,445	0.47	4.54	10.9

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2810_2831	48	258	0.0037	2810	2831	11.60	10.64	2,160	39,304	0.05	*1.98*	6.2
2812_2814	30	66	0.0149	2812	2814	11.09	10.11	13,270	22,544	0.59	5.99	3.4
2813_82252-04	10	44	0.0068	2813	82252-04	2.41	2.11	1,330	814	1.63	5.43	10.8
2814_2819	30	124	0.0019	2814	2819	10.01	9.77	14,516	8,119	1.79	6.57	2.5
2817_CSTLS	12	159	0.0212	2817	CSTLS	4.37	0.99	-	2,333	0.00	0.00	8.9
2818_2817	12	108	0.0115	2818	2817	5.71	4.47	-	1,721	0.00	0.00	6.5
2819_2820	30	52	0.0159	2819	2820	9.67	8.84	14,516	23,272	0.62	6.57	4.8
2820_2601	48	549	0.0010	2820	2601	8.74	8.19	21,850	20,468	1.07	3.87	5.3
2821_2820	48	168	0.0007	2821	2820	8.95	8.84	7,539	16,525	0.46	*1.31*	5.2
2822_2823	48	211	0.0015	2822	2823	10.32	10.00	14,132	25,109	0.56	2.43	5.7
2823_2825	36	25	0.0225	2823	2825	9.90	9.34	14,132	44,998	0.31	4.32	5.9
8992	48	18	0.0022	2825	958	9.24	9.20	36,071	30,390	1.19	6.28	5.5
2826_2825	36	27	0.0204	2826	2825	9.90	9.34	21,958	42,842	0.51	6.85	5.7
2828_2826	48	15	0.0149	2828	2826	10.22	10.00	2,260	78,927	0.03	*0.40*	5.7
2829_2826	36	27	0.0185	2829	2826	10.49	10.00	19,733	40,815	0.48	10.04	5.5
2831_2828	48	221	0.0010	2831	2828	10.54	10.32	2,238	20,493	0.11	*1.83*	5.4
2905_2907	24	98	0.2692	2905	2907	46.90	20.42	16,932	52,824	0.32	17.04	2.7
2907_2908	30	24	0.0520	2907	2908	20.32	19.05	17,031	42,080	0.40	18.03	9.8
2908_83304-04	48	73	0.0300	2908	83304-04	18.95	16.77	19,668	111,981	0.18	14.53	4.4
2910_2822	48	441	0.0038	2910	2822	12.08	10.42	14,007	39,681	0.35	2.41	12.3
2911_2908	42	194	0.0342	2911	2908	25.67	19.05	2,701	83,704	0.03	*0.63*	11.6
2912_2911	42	107	0.1023	2912	2911	36.67	25.77	2,701	144,815	0.02	12.85	6.1
2913_2912	8	77	0.0013	2913	2912	36.87	36.77	1,436	196	7.31	9.17	6.9
2921_2922	18	50	0.0152	2921	2922	47.90	47.15	1,064	5,827	0.18	5.59	14.2
2922_T83304-02	18	183	0.0197	2922	T83304-02	47.05	43.43	1,265	6,637	0.19	6.44	15.2
2923_2921	18	34	0.0120	2923	2921	48.40	48.00	1,064	5,170	0.21	5.13	7.1
3004_2923	15	327	0.0030	3004	2923	49.50	48.50	949	1,605	0.59	3.03	12.3
3010_3011	8	201	0.0044	3010	3011	58.12	57.24	482	359	1.34	3.07	3.2
3011_3013	8	42	0.0461	3011	3013	57.14	55.19	577	1,168	0.49	7.43	2.7
3012_3004	12	335	0.0131	3012	3004	54.00	49.60	766	1,839	0.42	3.24	6.9
3013_3012	12	12	0.0840	3013	3012	55.09	54.10	749	4,646	0.16	6.92	6.3
3108_2422	15	258	0.0378	3108	2422	48.85	39.11	1,495	5,649	0.26	2.71	13.1
3109_3108	15	235	0.0045	3109	3108	50.01	48.95	1,392	1,952	0.71	3.85	8.8
3110_3109	15	157	0.0059	3110	3109	51.03	50.11	1,392	2,227	0.62	4.27	8.2
3111_3110	15	115	0.0025	3111	3110	51.42	51.13	1,275	1,461	0.87	2.99	12.2
3114_3111	12	139	0.0054	3114	3111	52.27	51.52	1,098	1,175	0.93	3.47	4.4
3116_3114	8	198	0.0085	3116	3114	54.05	52.37	1,097	502	2.19	7.00	1.2
3118_3116	15	285	0.0042	3118	3116	55.35	54.15	1,097	1,886	0.58	2.76	3.2
3202_3118	12	270	0.0025	3202	3118	56.12	55.45	891	799	1.11	2.53	2.4
3206_3202	12	271	0.0031	3206	3202	57.07	56.22	890	897	0.99	2.75	3.8
3207_3208	8	130	0.0304	3207	3208	61.57	57.61	148	949	0.16	*0.95*	0.0

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3208_3206	12	127	0.0027	3208	3206	57.51	57.17	826	826	1.00	2.57	0.8
3208_3209	8	118	0.0222	3208	3209	59.50	56.88	567	810	0.70	3.62	0.8
3209_3210	8	480	0.0037	3209	3210	56.78	55.01	643	330	1.95	4.10	0.0
3210_83302-14	8	177	0.0184	3210	83302-14	54.91	51.65	771	739	1.04	4.92	0.0
3211_83302-21	20	289	0.0154	3211	83302-21	47.10	42.65	3,067	7,768	0.39	5.39	12.6
3212_3211	18	505	0.0161	3212	3211	55.35	47.20	2,093	6,002	0.35	6.51	6.7
3213_3212	10	271	0.0037	3213	3212	56.46	55.45	771	602	1.28	3.15	6.7
3214_3213	10	439	0.0051	3214	3213	58.80	56.56	711	704	1.01	2.98	7.1
3301_T83302-03	42.35	253	0.0003	3301	T83302-03	40.42	40.34	22,104	8,237	2.68	4.97	7.9
3302_3303	8	284	0.0027	3302	3303	57.46	56.70	446	282	1.58	2.85	8.9
3303_83301-01	16	213	0.0041	3303	83301-01	56.60	55.73	1,196	2,205	0.54	*1.91*	8.3
3304_83302-16	8	59	0.0561	3304	83302-16	53.26	49.96	810	1,288	0.63	8.69	7.5
3306_3307	8	97	0.0094	3306	3307	41.84	40.92	2,133	528	4.04	13.61	0.0
3307_T83302-52	42.35	375	0.0002	3307	T83302-52	40.82	40.74	21,266	6,764	3.14	4.78	11.2
3308_3303	12	499	0.0032	3308	3303	58.28	56.70	643	903	0.71	2.78	8.6
3312_3307	42.35	344	0.0039	3312	3307	42.26	40.92	19,190	28,839	0.67	4.32	13.5
3313_3312	42.35	88	0.0075	3313	3312	43.01	42.36	19,186	39,987	0.48	4.90	10.0
3402_83301-02	8	161	0.0043	3402	83301-02	46.24	45.55	343	357	0.96	2.46	17.9
3405_T83301-01	42.35	168	0.0033	3405	T83301-01	44.21	43.66	18,837	26,487	0.71	6.15	12.6
3408_3418	12	350	0.0033	3408	3418	53.78	52.64	295	915	0.32	*1.32*	8.3
3409_3405	42.35	388	0.0019	3409	3405	45.05	44.31	18,806	20,221	0.93	5.10	11.6
3413_T83293-01	18	50	0.2161	3413	T83293-01	56.40	45.52	4,074	21,975	0.19	5.11	13.1
3418_3503	15	370	0.0011	3418	3503	52.54	52.15	537	944	0.57	*1.77*	6.9
3501_83293-11	18	288	0.0158	3501	83293-11	61.95	57.40	4,034	5,943	0.68	8.04	7.4
3502_T83294-01	42.35	179	0.0009	3502	T83294-01	45.53	45.37	15,288	13,846	1.10	3.59	10.9
3503_3508	18	352	0.0078	3503	3508	52.05	49.31	816	4,172	0.20	3.67	15.0
3504_3502	42.35	332	0.0007	3504	3502	45.87	45.63	15,286	12,479	1.22	3.47	8.8
3505_3504	42.35	310	0.0007	3505	3504	46.19	45.97	15,282	12,305	1.24	3.47	8.4
3506_3505	42.35	360	0.0015	3506	3505	46.82	46.29	15,279	17,761	0.86	3.47	8.0
3507_3506	35.6	94	0.0074	3507	3506	47.61	46.92	6,677	24,996	0.27	2.13	7.9
3508_3509	18	172	0.0067	3508	3509	49.21	48.05	1,075	3,882	0.28	*1.35*	6.1
3509_3507	35.6	118	0.0020	3509	3507	47.95	47.71	6,677	13,162	0.51	3.91	10.2
3510_3509	30	15	0.0284	3510	3509	48.48	48.05	4,709	31,099	0.15	2.11	10.2
3602_83284-14	8	44	0.0943	3602	83284-14	153.95	149.81	160	1,670	0.10	6.74	2.7
3603_83284-08	8	130	0.0341	3603	83284-08	117.52	113.10	208	1,005	0.21	5.06	8.3
3604_3603	8	191	0.0929	3604	3603	135.32	117.62	189	1,657	0.11	7.02	6.2
3702_3804	15	319	0.0194	3702	3804	72.73	66.55	546	4,048	0.13	5.12	6.9
3704_3705	15	422	0.0133	3704	3705	85.65	80.05	383	3,348	0.11	4.04	6.5
3705_3702	15	343	0.0207	3705	3702	79.95	72.83	545	4,187	0.13	5.25	12.2
3707_3705	12	30	0.1907	3707	3705	85.78	80.05	82	7,002	0.01	5.12	6.0
3708_3705	6	229	0.0216	3708	3705	85.00	80.05	80	371	0.21	2.46	7.0

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Italic = Velocity < 2 fps

Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
3801_3905	18	604	0.0047	3801	3905	55.95	53.12	845	3,236	0.26	2.96	13.5
3802_3801	18	502	0.0078	3802	3801	59.95	56.05	744	4,167	0.18	3.97	6.2
3804_3802	15	645	0.0099	3804	3802	66.45	60.05	651	2,895	0.22	4.24	8.1
3901_4008	18	587	0.0019	3901	4008	52.70	51.60	940	2,046	0.46	2.46	14.1
3902_4011	24	356	0.0038	3902	4011	54.95	53.61	3,478	6,250	0.56	2.44	8.7
3903_3902	24	504	0.0097	3903	3902	59.95	55.05	3,437	10,034	0.34	4.14	7.5
3905_3901	18	97	0.0023	3905	3901	53.02	52.80	893	2,246	0.40	2.67	9.7
4001_4107	10	185	0.0015	4001	4107	49.15	48.88	868	377	2.30	3.54	6.6
4002_4001	12	441	0.0175	4002	4001	56.96	49.25	306	2,120	0.14	*0.86*	3.8
4003_4002	10	480	0.0108	4003	4002	62.27	57.06	304	1,027	0.30	3.64	9.9
4004_4005	10	485	0.0290	4004	4005	65.20	51.15	536	1,679	0.32	3.33	5.4
4005_4006	12	444	0.0018	4005	4006	51.05	50.25	537	680	0.79	2.00	8.0
4006_4001	18	353	0.0025	4006	4001	50.15	49.25	539	2,386	0.23	*0.68*	6.6
4007_4108	30	348	0.0022	4007	4108	50.00	49.25	4,705	8,567	0.55	2.65	7.1
4008_4009	18	70	0.0022	4008	4009	51.50	51.35	982	2,196	0.45	*1.82*	6.3
4009_4007	30	349	0.0027	4009	4007	51.05	50.10	4,673	9,637	0.48	4.23	7.1
4010_4009	24	421	0.0039	4010	4009	52.79	51.15	3,677	6,353	0.58	4.10	8.8
4011_4010	24	176	0.0048	4011	4010	53.73	52.89	3,647	7,040	0.52	5.03	7.5
4012_4011	10	474	0.0150	4012	4011	60.95	53.83	151	1,208	0.12	*0.61*	7.8
4101_3503	15	435	0.0050	4101	3503	54.33	52.15	277	2,056	0.13	2.18	6.8
4102_4101	15	480	0.0030	4102	4101	55.86	54.43	224	1,590	0.14	2.04	7.4
4103_4102	12	490	0.0108	4103	4102	61.24	55.96	222	1,664	0.13	3.28	5.1
4104_4105	12	381	0.0170	4104	4105	60.00	53.52	206	2,090	0.10	3.78	6.1
4105_4106	15	570	0.0040	4105	4106	53.42	51.15	208	1,836	0.11	2.19	12.4
4106_3508	15	441	0.0039	4106	3508	51.05	49.31	259	1,826	0.14	*1.72*	7.6
4107_3509	18	467	0.0016	4107	3509	48.78	48.05	904	1,869	0.48	*1.14*	7.5
4108_3510	30	494	0.0012	4108	3510	49.15	48.58	4,709	6,270	0.75	2.97	7.4
4201_3308	12	500	0.0013	4201	3308	59.05	58.38	264	587	0.45	*1.56*	5.3
4202_4201	8	98	0.0043	4202	4201	59.57	59.15	244	355	0.69	2.44	5.7
4203_4202	8	460	0.0059	4203	4202	62.37	59.67	228	417	0.55	2.72	6.9
4204_4203	8	503	0.0170	4204	4203	71.05	62.47	200	710	0.28	3.67	6.7
4205_4206	8	474	0.0141	4205	4206	67.50	60.81	196	646	0.30	3.62	6.7
4206_4207	8	487	0.0100	4206	4207	60.71	55.84	220	544	0.40	3.00	6.3
4207_3408	8	479	0.0039	4207	3408	55.74	53.88	244	338	0.72	2.35	6.1
4208_3418	8	435	0.0040	4208	3418	54.37	52.64	241	343	0.70	*1.53*	5.2
4209_4208	8	480	0.0041	4209	4208	56.45	54.47	210	349	0.60	2.33	8.2
4210_4209	8	481	0.0091	4210	4209	60.95	56.55	166	520	0.32	2.75	8.3
4301_3302	8	480	0.0035	4301	3302	59.24	57.56	446	321	1.39	2.84	6.2
4302_4301	8	480	0.0118	4302	4301	64.98	59.34	335	590	0.57	2.94	9.1
4303_4302	8	480	0.0133	4303	4302	71.46	65.08	240	627	0.38	3.74	9.0
4304_4305	8	495	0.0131	4304	4305	73.01	66.52	168	622	0.27	2.44	6.0

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
4305_4306	8	465	0.0020	4305	4306	66.42	65.47	196	246	0.80	*1.74*	7.2
4306_3308	8	454	0.0154	4306	3308	65.37	58.38	223	675	0.33	2.07	6.9
4404_4405	8	495	0.0240	4404	4405	81.80	69.95	948	842	1.13	6.05	0.0
4405_4407	8	469	0.0143	4405	4407	69.85	63.14	1,243	651	1.91	7.93	0.0
4407_83301-16	12	184	0.0033	4407	83301-16	63.04	62.43	1,244	922	1.35	3.53	3.4
4408_3214	8	481	0.0042	4408	3214	60.90	58.90	594	351	1.69	3.79	3.9
4410_83301-03	8	245	0.0146	4410	83301-03	70.03	66.46	415	657	0.63	4.43	5.9
4411_4410	8	463	0.0094	4411	4410	74.50	70.13	373	528	0.71	3.65	8.4
4503_4610	8	359	0.0142	4503	4610	75.30	70.20	891	648	1.37	5.69	0.0
4604_4715	10	549	0.0057	4604	4715	58.28	55.15	1,283	744	1.73	5.24	4.6
4606_4611	8	250	0.0016	4606	4611	74.95	74.55	229	217	1.06	*1.57*	1.8
4607_83304-09	8	406	0.0044	4607	83304-09	64.67	62.90	526	360	1.46	3.36	3.8
4608_4604	8	300	0.0235	4608	4604	65.45	58.38	1,088	834	1.30	6.95	0.0
4609_4604	8	273	0.0044	4609	4604	59.58	58.38	134	361	0.37	*0.85*	3.4
4610_4608	8	325	0.0140	4610	4608	70.10	65.55	1,011	643	1.57	6.45	0.0
4611_4607	8	362	0.0267	4611	4607	74.45	64.77	449	889	0.50	3.28	7.7
4612_4611	8	360	0.0048	4612	4611	76.27	74.55	168	376	0.45	2.33	8.4
4703_83304-12	8	422	0.0072	4703	83304-12	66.04	63.01	482	461	1.05	3.08	2.1
4707	8	453	0.0198	4705	4819	60.28	51.30	620	711	0.87	3.96	9.2
4708_2905	12	239	0.0173	4708	2905	51.13	47.00	756	2,108	0.36	2.14	7.6
4709_4705	8	298	0.0124	4709	4705	64.08	60.38	542	606	0.89	4.37	7.7
4710_83304-11	8	392	0.0045	4710	83304-11	66.62	64.86	638	365	1.75	4.07	4.0
4711_4710	8	297	0.0047	4711	4710	68.12	66.72	587	374	1.57	3.75	0.4
4712_4709	8	261	0.0093	4712	4709	66.62	64.18	477	526	0.91	3.80	7.8
4713_4708	8	295	0.0268	4713	4708	59.14	51.23	686	890	0.77	6.27	6.4
4715_2913	10	230	0.0785	4715	2913	55.05	36.97	1,372	2,763	0.50	5.60	10.6
4719_4712	8	258	0.0028	4719	4712	67.45	66.72	418	289	1.45	2.67	6.1
4801_4913	8	269	0.0413	4801	4913	47.12	36.02	63	1,105	0.06	3.83	10.6
4802_4805	30	242	0.0035	4802	4805	52.23	51.39	15,278	10,884	1.40	6.85	1.8
4803_4919	8	256	0.0420	4803	4919	63.54	52.77	532	1,115	0.48	3.40	4.8
4804_4802	8	254	0.0277	4804	4802	59.35	52.33	557	905	0.62	3.56	2.2
4805_4823	24	295	0.0036	4805	4823	51.29	50.22	15,918	6,129	2.60	11.15	0.9
4806_4914	15	469	0.0292	4806	4914	54.24	40.53	7	4,971	0.00	*1.62*	8.2
4807_4801	8	228	0.0181	4807	4801	51.34	47.22	17	731	0.02	*1.95*	11.1
4808_2807	8	325	0.0268	4808	2807	33.73	25.01	842	891	0.94	6.47	11.8
4810_4824	8	24	0.0404	4810	2808	49.05	48.10	717	1,093	0.66	7.44	13.7
4811_4808	8	369	0.0387	4811	4808	48.12	33.83	786	1,070	0.74	6.68	8.9
4812_4805	8	271	0.0115	4812	4805	54.52	51.39	638	584	1.09	4.07	0.0
4813_4803	8	530	0.0072	4813	4803	67.45	63.64	474	461	1.03	3.35	3.2
4814_4804	8	534	0.0103	4814	4804	64.94	59.45	501	552	0.91	3.71	1.8
4815_4812	8	316	0.0236	4815	4812	62.07	54.62	591	835	0.71	4.80	0.8

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
4819_4810	8	279	0.0074	4819	4810	51.21	49.15	692	466	1.48	4.41	18.3
4820_4811	8	357	0.0303	4820	4811	59.05	48.22	748	947	0.79	6.70	7.3
4823_4824	36	255	0.0079	4823	4824	50.12	48.10	15,947	26,705	0.60	4.96	3.9
4824_83304-08	36	241	0.0012	4824	83304-08	48.00	47.72	15,984	10,235	1.56	4.98	8.4
4901_4923	36	297	0.0002	4901	4923	12.31	12.24	12,520	4,608	2.72	3.93	0.0
4902_4909	28	152	0.0010	4902	4909	54.02	53.87	5,426	4,868	1.11	2.79	4.9
4905_4906	21	247	0.0151	4905	4906	45.28	41.56	109	8,761	0.01	2.78	12.1
4906_4912	18	257	0.0064	4906	4912	41.46	39.80	189	3,791	0.05	2.49	20.5
4908_U0033-S01	28	171	0.0011	4908	U0033-S01	53.41	53.22	5,456	5,112	1.07	2.81	2.3
4909_4908	28	208	0.0012	4909	4908	53.77	53.51	5,440	5,428	1.00	2.80	5.0
4912_4913	21	261	0.0141	4912	4913	39.70	36.02	261	8,461	0.03	3.54	12.6
4913_2807	21	270	0.0405	4913	2807	35.92	25.01	384	14,342	0.03	4.53	11.9
4914_4913	12	45	0.0982	4914	4913	40.43	36.02	60	5,025	0.01	3.97	5.5
4919_4802	30	263	0.0090	4919	4802	52.67	50.31	14,688	17,469	0.84	6.60	7.2
4923_24207	36	450	0.0004	4923	24207	12.14	11.97	12,519	5,835	2.15	3.93	0.0
5001_5009	36	475	0.0004	5001	5009	12.93	12.73	12,456	6,161	2.02	3.91	0.0
5002_5008	14	296	0.0104	5002	5008	57.86	54.80	10	2,461	0.00	*1.27*	13.0
5004_5006	24	280	0.0000	5004	5006	55.45	55.44	2,634	608	4.33	*1.87*	4.4
5006_5019	24	117	0.0001	5006	5019	55.34	55.33	2,709	942	2.88	*1.92*	4.4
5008_5010	8	305	0.0104	5008	5010	54.70	51.53	33	554	0.06	*1.94*	13.8
5009_4901	36	525	0.0004	5009	4901	12.63	12.41	12,455	6,145	2.03	3.91	0.0
5010_5013	14	299	0.0104	5010	5013	51.43	48.33	69	2,462	0.03	2.25	15.9
5012_5016	28	280	0.0004	5012	5016	54.80	54.70	5,149	2,902	1.77	2.64	4.7
5013_4905	14	266	0.0107	5013	4905	48.23	45.38	91	2,501	0.04	2.47	18.2
5016_4902	28	280	0.0017	5016	4902	54.60	54.12	5,174	6,342	0.82	2.66	0.0
5019_SE686-S01	24	13	0.0103	5019	SE686-S01	55.23	55.10	2,709	10,357	0.26	*1.92*	4.8
5101_5104	36	196	0.0012	5101	5104	13.57	13.34	12,393	10,287	1.20	3.90	0.0
5102_5105	20	522	0.0005	5102	5105	58.50	58.26	2,251	1,343	1.68	2.30	0.8
5103_5106	12	304	0.0022	5103	5106	60.66	60.00	184	747	0.25	*0.52*	3.9
5104_5001	36	597	0.0004	5104	5001	13.24	13.03	12,412	5,629	2.21	3.91	0.0
5105_5107	24	12	0.0083	5105	5107	58.16	58.06	2,262	9,248	0.24	4.98	4.0
5106_5107	12	21	0.1139	5106	5107	60.46	58.06	277	5,412	0.05	4.50	4.0
5107_5108	24	17	0.0894	5107	5108	57.96	56.45	2,531	30,445	0.08	*1.79*	4.0
5108_5004	24	252	0.0022	5108	5004	56.35	55.79	2,538	4,824	0.53	*1.80*	4.0
5201_5212	30	560	0.0021	5201	5212	2.37	1.20	12,052	8,441	1.43	5.46	5.4
5202_5207	20	396	0.0016	5202	5207	61.08	60.45	1,875	2,496	0.75	*1.91*	1.3
5203_5202	20	55	0.0016	5203	5202	61.27	61.18	1,836	2,540	0.72	*1.87*	1.3
5206_5208	12	246	0.0018	5206	5208	62.64	62.20	29	679	0.04	*0.08*	2.5
5207_5211	20	409	0.0010	5207	5211	60.35	59.95	1,887	1,958	0.96	*1.93*	2.0
5208_5210	20	241	0.0004	5208	5210	62.10	62.00	48	1,276	0.04	*0.05*	2.5
5210_5211	20	32	0.1221	5210	5218	65.90	62.00	52	21,873	0.00	4.20	2.5

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5211_5218	20	156	0.0051	5211	5216	61.90	61.10	1,899	4,477	0.42	*1.94*	2.3
5212_5215	36	241	0.0000	5212	5215	1.10	1.09	12,341	1,934	6.38	3.89	10.4
5215_ROEDERLS	36	27	0.0347	5215	ROEDERLS	0.99	0.05	12,376	55,921	0.22	3.90	12.6
5216_5217	20	28	0.0636	5216	5310	62.00	60.25	1,908	15,790	0.12	7.30	0.0
5217_5309	12	244	0.0004	5217	5309	60.15	60.05	103	324	0.32	*0.29*	0.2
5218_5217	12	189	0.0040	5218	5217	61.00	60.25	96	1,009	0.10	*1.02*	1.8
5219_5218	10	246	0.0159	5219	5218	65.01	61.10	35	1,244	0.03	2.02	2.5
5220_5219	8	128	0.0008	5220	5219	65.21	65.11	14	152	0.09	*0.60*	2.5
5223_17018	24	157	0.0104	5223	17018	12.49	10.86	10,244	10,373	0.99	7.33	2.1
5224_5223	24	341	0.0081	5224	5223	15.35	12.59	10,244	9,165	1.12	7.41	2.4
5225_5224	24	415	0.0089	5225	5224	19.15	15.45	10,244	9,612	1.07	7.26	0.0
5305_5306	8	132	0.0068	5305	5306	68.72	67.83	73	447	0.16	2.10	6.1
5306_5307	8	525	0.0041	5306	5307	67.73	65.60	121	347	0.35	*1.98*	7.0
5307_5220	20	277	0.0007	5307	5309	65.50	65.31	157	1,641	0.10	*1.04*	2.5
5309_5310	20	34	0.0349	5309	5310	59.85	58.67	267	11,701	0.02	*0.27*	0.0
5310_5320	24	299	0.0015	5310	5320	59.95	59.50	2,176	3,948	0.55	2.50	0.0
5318_5319	8	149	0.0040	5318	5319	60.00	59.40	30	345	0.09	*0.19*	2.3
5319_82254-01	8	28	0.0072	5319	5320	59.50	59.30	33	462	0.07	*0.21*	0.5
5320_82254-01	20	16	0.0062	5320	5327	59.40	59.30	2,228	4,918	0.45	4.16	0.0
5321_5327	10	20	0.1890	5321	5103	62.85	59.00	17	4,287	0.00	*0.07*	1.8
5322_5321	10	18	0.0028	5322	5321	63.00	62.95	12	522	0.02	*0.82*	2.6
5327_5102	20	222	0.0078	5327	5102	58.90	57.17	2,241	5,521	0.41	2.29	0.3
5407_5408	8	319	0.0049	5407	5408	69.20	67.64	94	380	0.25	*1.98*	5.6
5408_5410	8	466	0.0089	5408	5410	67.54	63.38	129	514	0.25	2.53	5.9
5410_5103	8	335	0.0075	5410	5103	63.28	60.76	153	472	0.32	2.46	1.2
5415_5106	8	458	0.0104	5415	5106	65.32	60.56	88	555	0.16	2.35	3.4
5416_5415	8	452	0.0034	5416	5415	66.95	65.42	66	317	0.21	*1.57*	6.3
5417_5416	8	468	0.0006	5417	5416	67.35	67.05	45	138	0.32	*0.77*	6.3
5419_5420	8	459	0.0035	5419	5420	70.86	69.25	43	322	0.13	*1.43*	4.0
5420_5421	8	454	0.0047	5420	5421	69.15	67.03	65	372	0.17	*1.75*	5.7
5421_5004	8	448	0.0254	5421	5004	66.93	55.55	86	867	0.10	*0.55*	6.4
5504_5505	8	458	0.0047	5504	5505	69.54	67.38	30	373	0.08	*1.31*	5.3
5505_5506	8	459	0.0009	5505	5506	67.28	66.88	46	161	0.29	*0.87*	6.8
5506_5006	8	451	0.0252	5506	5006	66.78	55.44	62	863	0.07	*0.39*	6.8
5601_4902	8	446	0.0289	5601	4902	67.00	54.12	243	924	0.26	*1.55*	6.5
5602_5601	8	33	0.0240	5602	5601	68.83	68.04	229	843	0.27	4.50	5.9
5603_5602	8	426	0.0050	5603	5602	70.12	67.99	98	385	0.25	*0.62*	4.6
5604_5603	8	463	0.0039	5604	5603	72.01	70.22	61	338	0.18	*1.63*	7.8
5605_5606	8	461	0.0030	5605	5606	72.78	71.40	50	297	0.17	*1.41*	7.0
5606_5607	8	424	0.0037	5606	5607	71.30	69.72	81	332	0.24	*1.75*	6.0
5607_5602	8	276	0.0025	5607	5602	69.62	68.93	110	272	0.40	*1.64*	5.1

Bold cells = pipe at capacity / manholes surcharged within 2' of rim.
If a mh is surcharged and the pipe is not at capacity, this is a result of the model recognizing a downstream problem.
Italic = Velocity < 2 fps

Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
5701_U0033-S04	8	190	0.0100	5701	U0033-S04	67.28	65.39	679	543	1.25	4.33	0.0
5703_5701	8	447	0.0013	5703	5701	67.95	67.38	573	194	2.95	3.65	0.0
5704_5703	8	423	0.0104	5704	5703	72.45	68.05	428	555	0.77	2.73	2.3
5705_5704	8	50	0.0105	5705	5704	73.07	72.55	354	556	0.64	3.48	2.1
5712_4813	8	521	0.0023	5712	4813	68.76	67.55	399	262	1.52	2.54	3.2
5713_83304-20	8	250	0.0064	5713	83304-20	68.54	66.95	391	434	0.90	3.12	4.4
5714_5712	8	293	0.0100	5714	5712	71.78	68.86	310	543	0.57	2.08	4.4
5806_5807	8	36	0.2807	5806	5807	85.09	75.04	233	2,881	0.08	7.55	7.7
5807_5714	8	326	0.0094	5807	5714	74.94	71.88	260	527	0.49	3.33	6.8
5808_5713	8	303	0.0054	5808	5713	70.28	68.64	349	400	0.87	2.86	4.7
5810_4703	8	297	0.0171	5810	4703	71.23	66.14	429	711	0.60	3.94	3.5
5811_5808	12	314	0.0064	5811	5808	72.40	70.38	302	1,286	0.23	2.58	7.3
5812_5806	8	326	0.0013	5812	5806	85.60	85.19	202	193	1.05	*1.40*	6.0
5814_5811	8	351	0.0392	5814	5811	86.29	72.50	251	1,077	0.23	5.17	7.3
5815_5810	8	324	0.0018	5815	5810	71.90	71.33	381	228	1.67	2.43	3.5
5817_4711	8	361	0.0063	5817	4711	70.49	68.22	538	432	1.25	3.44	1.6
5818_5815	8	358	0.0250	5818	5815	80.95	72.00	328	860	0.38	2.67	6.2
5819_5812	8	360	0.0149	5819	5812	91.07	85.70	149	664	0.22	*1.92*	6.8
5901_4719	8	361	0.0142	5901	4719	72.69	67.55	355	648	0.55	2.73	7.2
5903_5814	8	366	0.0292	5903	5814	97.06	86.39	196	929	0.21	4.70	6.4
5904_5903	8	354	0.0093	5904	5903	100.45	97.16	140	524	0.27	2.83	7.1
5905_5818	8	363	0.0515	5905	5818	99.78	81.05	272	1,234	0.22	6.32	7.5
5906_5817	8	363	0.0357	5906	5817	83.52	70.59	484	1,027	0.47	4.13	9.2
5907_5901	8	355	0.0205	5907	5901	80.05	72.79	302	778	0.39	4.65	7.1
5908_5906	8	360	0.0148	5908	5906	88.95	83.62	429	661	0.65	4.49	8.1
5909_5905	8	354	0.0108	5909	5905	103.70	99.88	216	565	0.38	3.36	8.5
5910_5908	8	360	0.0321	5910	5908	100.58	89.05	374	974	0.38	5.29	6.7
5911_5907	8	353	0.0507	5911	5907	98.04	80.15	248	1,225	0.20	6.13	7.2
5912_4606	8	360	0.0191	5912	4606	81.91	75.05	170	751	0.23	2.18	7.5
5914_5912	8	364	0.0238	5914	5912	90.69	82.01	116	839	0.14	3.76	7.2
5915_5911	8	370	0.0062	5915	5911	100.44	98.14	194	430	0.45	2.67	6.9
6003_5910	8	360	0.0274	6003	5910	110.54	100.68	320	900	0.36	5.26	7.1
6004_5915	8	362	0.0371	6004	5915	113.95	100.54	140	1,047	0.13	3.77	2.9
6005_6010	8	248	0.0066	6005	6010	96.42	94.80	0	440	0.00	0.00	7.1
6006_5914	8	328	0.0069	6006	5914	93.05	90.79	63	451	0.14	2.03	6.8
6007_4612	8	352	0.0251	6007	4612	85.20	76.37	116	861	0.13	3.14	5.3
6008_4503	8	353	0.0194	6008	4503	82.24	75.40	719	757	0.95	4.62	0.0
6010_6007	8	367	0.0256	6010	6007	94.70	85.30	65	870	0.07	3.26	7.7
6013_6004	6	695	0.0036	6013	6004	116.55	114.05	61	151	0.40	*1.63*	5.3
6014_6015	8	632	0.0222	6014	6015	116.91	102.90	221	810	0.27	4.40	5.9
6015_6016	8	291	0.0340	6015	6016	102.80	92.90	365	1,003	0.36	3.77	5.8

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Italic = Velocity < 2 fps

Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
6016_6020	8	272	0.0083	6016	6020	92.80	90.55	542	496	1.09	3.61	3.4
6020_6008	8	241	0.0336	6020	6008	90.45	82.34	593	996	0.60	5.54	5.8
6105_6106	8	173	0.0450	6105	6106	125.58	117.80	362	1,153	0.31	6.51	9.4
6106_6107	8	475	0.0426	6106	6107	117.70	97.46	460	1,122	0.41	5.67	4.5
6107_6108	8	481	0.0216	6107	6108	97.36	86.97	609	799	0.76	4.24	9.5
6108_4404	8	478	0.0104	6108	4404	86.87	81.90	755	554	1.36	4.82	0.0
6109_4411	8	482	0.0168	6109	4411	82.70	74.60	277	705	0.39	3.78	7.9
6110_6109	8	481	0.0263	6110	6109	95.42	82.80	180	881	0.20	4.42	9.4
6111_6110	8	480	0.0330	6111	6110	111.37	95.52	83	988	0.08	3.83	6.0
6201_4303	8	481	0.0127	6201	4303	77.69	71.56	142	614	0.23	3.18	9.1
6202_6201	8	480	0.0221	6202	6201	88.39	77.79	115	808	0.14	3.65	9.1
6203_6202	8	480	0.0322	6203	6202	103.95	88.49	89	976	0.09	3.88	9.2
6204_6205	8	493	0.0342	6204	6205	107.31	90.45	89	1,006	0.09	3.96	6.1
6205_6206	8	468	0.0250	6205	6206	90.35	78.64	114	860	0.13	3.81	9.1
6206_4304	8	480	0.0113	6206	4304	78.54	73.11	140	578	0.24	3.04	8.9
6207_4204	8	477	0.0128	6207	4204	77.25	71.15	172	615	0.28	3.37	7.2
6208_6207	8	481	0.0208	6208	6207	87.35	77.35	143	784	0.18	3.80	8.3
6209_6208	8	482	0.0282	6209	6208	101.03	87.45	110	913	0.12	3.92	9.9
6304_6305	8	481	0.0236	6304	6305	96.91	85.55	122	836	0.15	3.81	8.5
6305_6306	8	480	0.0224	6305	6306	85.45	74.69	147	815	0.18	3.94	8.3
6306_4205	8	480	0.0145	6306	4205	74.59	67.60	172	656	0.26	3.52	8.4
6307_4210	8	474	0.0241	6307	4210	72.48	61.05	118	844	0.14	3.80	8.5
6308_6307	8	487	0.0184	6308	6307	81.56	72.58	93	738	0.13	3.22	8.7
6309_6308	8	484	0.0254	6309	6308	93.93	81.66	68	867	0.08	3.29	11.6
6401_4103	12	467	0.0254	6401	4103	73.19	61.34	221	2,553	0.09	4.44	3.8
6402_6401	12	492	0.0178	6402	6401	82.03	73.29	187	2,138	0.09	3.72	11.7
6403_6402	12	320	0.0190	6403	6402	88.19	82.13	162	2,207	0.07	3.66	10.3
6404_6403	12	248	0.0347	6404	6403	96.91	88.29	143	2,988	0.05	4.36	10.4
6405_6406	8	471	0.0303	6405	6406	96.20	81.94	130	946	0.14	4.22	11.4
6406_6407	8	492	0.0266	6406	6407	81.84	68.74	157	887	0.18	4.27	7.5
6407_83294-05	8	238	0.0239	6407	83294-05	68.64	62.95	204	841	0.24	4.42	7.8
6408_83294-10	8	153	0.0021	6408	83294-10	64.32	64.00	302	249	1.22	*1.90*	16.2
6409_6408	8	490	0.0107	6409	6408	69.64	64.42	273	561	0.49	2.52	21.7
6410_6409	8	475	0.0419	6410	6409	89.67	69.74	244	1,114	0.22	5.20	18.5
6504_6505	8	482	0.0260	6504	6505	97.69	85.18	430	876	0.49	5.57	12.2
6505_6506	8	479	0.0249	6505	6506	85.08	73.17	459	857	0.53	5.56	6.9
6506_4004	8	475	0.0163	6506	4004	73.07	65.30	484	695	0.70	4.79	6.6
6507_4012	10	470	0.0253	6507	4012	72.95	61.05	125	1,569	0.08	3.83	7.2
6508_6507	8	475	0.0272	6508	6507	85.95	73.05	99	896	0.11	3.76	7.4
6509_6508	8	482	0.0278	6509	6508	99.45	86.05	72	906	0.08	3.45	10.2
6601_3903	21	445	0.0189	6601	3903	68.45	60.05	3,385	9,800	0.35	7.67	9.6

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CIty of Bellingham

Sanitary Sewer Model Results Representing the Future Scenario (Year 2026/Buildout within the UGA)

Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
6602_6601	21	296	0.0218	6602	6601	75.01	68.55	3,344	10,535	0.32	8.65	11.3
6603_6602	20	190	0.0357	6603	6602	81.90	75.11	3,325	11,831	0.28	10.10	9.8
6604_6603	8	464	0.0338	6604	6603	99.95	84.25	77	1,000	0.08	3.77	9.2
6605_6606	8	464	0.0337	6605	6606	98.95	83.33	146	998	0.15	*0.93*	11.1
6606_6603	24	349	0.0035	6606	6603	83.23	82.00	3,230	6,029	0.54	4.34	8.4
6608_6606	24	356	0.0027	6608	6606	84.05	83.10	3,051	5,256	0.58	2.15	5.3
6704_6608	24	353	0.0027	6704	6608	85.10	84.15	2,991	5,285	0.57	3.86	5.0
6707_6704	24	400	0.0036	6707	6704	86.63	85.20	2,926	6,084	0.48	4.11	7.4
6708_6707	8	471	0.0185	6708	6707	95.45	86.73	324	740	0.44	2.06	10.2
6803_6707	21	317	0.0130	6803	6707	90.53	86.41	2,566	8,130	0.32	2.38	9.8
6806_6807	8	419	0.0308	6806	6807	107.95	95.05	1,213	954	1.27	7.72	2.0
6807_6803	18	331	0.0131	6807	6803	94.95	90.63	2,534	5,404	0.47	6.70	9.3
6809_3704	15	474	0.0131	6809	3704	91.95	85.75	334	3,326	0.10	3.87	6.9
6810_6809	15	327	0.0303	6810	6809	101.95	92.05	283	5,057	0.06	4.95	6.3
6812_6807	18	332	0.0268	6812	6807	103.95	95.05	1,370	7,744	0.18	*1.72*	7.9
6901_6810	15	333	0.0177	6901	6810	107.95	102.05	255	3,871	0.07	3.97	8.8
6903_6812	18	330	0.0118	6903	6812	107.95	104.05	1,341	5,140	0.26	5.45	11.8
6906_6903	18	333	0.0268	6906	6903	116.95	108.05	1,289	7,733	0.17	6.71	8.5
6907_6906	18	320	0.0145	6907	6906	121.70	117.05	1,259	5,698	0.22	5.77	10.3
6908_6907	12	520	0.0085	6908	6907	126.20	121.80	362	1,475	0.25	2.22	8.3
7003_7004	18	497	0.0053	7003	7004	132.70	130.05	741	3,452	0.21	3.46	9.0
7004_7005	18	169	0.0371	7004	7005	130.00	123.75	932	9,103	0.10	6.52	11.3
7005_6907	18	172	0.0108	7005	6907	123.65	121.80	942	4,908	0.19	4.76	10.1
7007_7004	8	318	0.0634	7007	7004	150.29	130.10	248	1,369	0.18	6.53	10.8
7009_7010	8	173	0.0802	7009	7010	180.00	166.10	14	1,540	0.01	3.09	2.5
7010_7011	8	294	0.0338	7010	7011	166.00	156.05	18	1,000	0.02	*1.90*	6.0
7011_7012	8	510	0.0143	7011	7012	155.95	148.65	198	651	0.30	3.64	10.2
7012_7003	15	329	0.0483	7012	7003	148.45	132.55	542	6,390	0.08	*0.98*	10.4
7013_7012	8	171	0.1187	7013	7012	168.80	148.55	315	1,874	0.17	8.87	8.3
7108_7011	8	323	0.0945	7108	7011	186.80	156.28	175	1,672	0.10	6.90	5.0
7109_7108	8	301	0.0198	7109	7108	192.88	186.90	8	766	0.01	*1.60*	4.0
7110_7109	8	228	0.0307	7110	7109	199.98	192.98	5	953	0.01	*1.59*	6.5
7114_7108	8	165	0.0884	7114	7108	201.50	186.90	163	1,617	0.10	6.59	13.5
7116_7013	8	329	0.1242	7116	7013	209.80	168.90	311	1,916	0.16	8.97	7.8
7118_7116	8	134	0.1100	7118	7116	224.65	209.90	306	1,804	0.17	8.56	9.1
7119_7118	8	60	0.0594	7119	7118	228.30	224.75	305	1,326	0.23	6.85	12.6
7120_7114	8	164	0.0907	7120	7114	216.50	201.60	160	1,638	0.10	6.62	9.9
7121_7120	8	294	0.0267	7121	7120	224.45	216.60	154	888	0.17	4.24	12.9
7122_7121	8	257	0.0786	7122	7121	244.71	224.55	150	1,524	0.10	6.18	6.9
7123_7122	8	262	0.0618	7123	7122	261.00	244.81	13	1,352	0.01	2.74	6.5
7126_7119	8	140	0.1532	7126	7119	249.80	228.40	303	2,128	0.14	9.60	7.6

Bold cells = pipe at capacity / manholes surcharged within 2' of rim.

If a mh is surcharged and the pipe is not at capacity, this is a result of the model recognizing a downstream problem.

Italic = Velocity < 2 fps

Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
7127_7126	8	195	0.0997	7127	7126	269.30	249.90	300	1,717	0.17	8.21	8.9
7201_7308	8	164	0.0601	7201	7308	162.90	153.05	19	1,333	0.01	3.03	9.4
7202_7201	8	8	0.1490	7202	7201	164.20	163.00	17	2,099	0.01	4.06	9.0
7203_7202	8	406	0.0042	7203	7202	166.00	164.30	3	352	0.01	*0.71*	2.3
7204_7311	8	156	0.0267	7204	7311	156.70	152.55	29	888	0.03	2.59	10.4
7205_7204	8	241	0.0118	7205	7204	159.65	156.80	27	591	0.05	*1.92*	8.4
7208_7209	8	189	0.1141	7208	7209	186.70	165.10	22	1,837	0.01	3.97	8.8
7209_7205	8	149	0.0351	7209	7205	165.00	159.75	26	1,019	0.03	2.76	9.1
7213_7202	8	178	0.1448	7213	7202	190.05	164.30	12	2,069	0.01	3.56	5.1
7215_7213	8	144	0.1178	7215	7213	207.16	190.15	11	1,866	0.01	3.29	6.2
7216_7215	8	163	0.1118	7216	7215	225.50	207.26	7	1,818	0.00	2.78	10.3
7220_7208	8	322	0.0842	7220	7208	213.95	186.80	17	1,578	0.01	3.33	13.5
7223_7224	8	173	0.0839	7223	7224	261.20	246.72	5	1,574	0.00	2.21	12.6
7224_7220	8	162	0.2011	7224	7220	246.62	214.05	10	2,439	0.00	3.80	4.5
7301_6908	8	376	0.0204	7301	6908	133.95	126.30	320	776	0.41	4.71	8.1
7302_7301	8	425	0.0115	7302	7301	138.95	134.05	273	584	0.47	3.66	7.1
7303_7302	8	446	0.0110	7303	7302	143.95	139.05	222	570	0.39	3.41	13.3
7306_7307	8	420	0.0045	7306	7307	143.95	142.05	167	366	0.46	2.28	8.3
7307_7003	8	382	0.0239	7307	7003	141.95	132.80	181	841	0.22	*1.15*	8.5
7308_7012	15	425	0.0104	7308	7012	152.95	148.55	24	2,958	0.01	*1.31*	5.6
7309_7308	8	190	0.0079	7309	7308	154.55	153.05	2	484	0.00	*0.73*	3.0
7310_7311	8	205	0.0081	7310	7311	154.16	152.50	2	489	0.00	*0.60*	5.0
7311_7320	8	239	0.0327	7311	7320	152.40	144.60	153	983	0.16	3.89	5.9
7312_7311	8	271	0.0050	7312	7311	153.89	152.55	121	383	0.32	2.16	13.4
7313_7312	8	307	0.0532	7313	7312	170.34	153.99	117	1,255	0.09	4.55	8.3
7320_7306	8	113	0.0040	7320	7306	144.50	144.05	155	343	0.45	2.13	11.1
7504_7505	8	200	0.0418	7504	7505	162.98	154.62	983	1,111	0.88	7.55	5.3
7505_7506	8	459	0.0422	7505	7506	154.52	135.16	1,030	1,117	0.92	7.02	7.8
7506_7507	8	465	0.0280	7506	7507	135.06	122.05	1,095	910	1.20	6.97	0.0
7507_6806	8	479	0.0290	7507	6806	121.95	108.05	1,162	927	1.25	7.40	0.0
7605_6708	8	481	0.0404	7605	6708	114.95	95.55	267	1,092	0.24	5.67	12.3
7606_83202-07	8	393	0.0491	7606	83202-07	136.08	116.76	210	1,205	0.17	5.78	6.7
7701_6604	8	480	0.0436	7701	6604	120.95	100.05	50	1,135	0.04	3.63	6.1
7702_7701	8	322	0.0374	7702	7701	133.12	121.05	28	1,052	0.03	2.91	6.2
7703_7809	10	477	0.0023	7703	7809	159.58	158.48	321	474	0.68	*1.30*	6.2
7704_7703	10	356	0.0022	7704	7703	160.45	159.68	197	458	0.43	*1.67*	3.3
7705_7706	8	305	0.0460	7705	7706	135.26	121.25	57	1,166	0.05	3.84	6.8
7706_6605	8	483	0.0457	7706	6605	121.15	99.05	99	1,163	0.09	4.53	9.6
7709_7704	10	347	0.0022	7709	7704	161.33	160.55	173	467	0.37	*1.76*	6.4
7801_6410	8	482	0.0418	7801	6410	109.93	89.77	218	1,112	0.20	5.49	16.7
7802_7801	8	460	0.0419	7802	7801	129.28	110.03	193	1,113	0.17	5.32	19.1

Bold cells = pipe at capacity / manholes surcharged within 2' of rim.
If a mh is surcharged and the pipe is not at capacity, this is a result of the model recognizing a downstream problem.
Italic = Velocity < 2 fps

Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
7803_7802	8	461	0.0418	7803	7802	148.66	129.38	169	1,112	0.15	5.12	15.2
7804_7805	8	459	0.0557	7804	7805	158.27	132.72	352	1,283	0.27	6.98	6.8
7805_7806	8	461	0.0432	7805	7806	132.62	112.73	378	1,130	0.33	6.49	14.1
7806_6504	8	481	0.0308	7806	6504	112.63	97.79	402	955	0.42	5.83	13.5
7807_6509	8	480	0.0425	7807	6509	119.95	99.55	44	1,121	0.04	3.47	6.7
7808_7807	8	326	0.0366	7808	7807	132.00	120.05	23	1,041	0.02	2.69	8.0
7809_7804	8	39	0.0003	7809	7804	158.38	158.37	338	87	3.89	2.15	7.0
7901_6404	12	391	0.0532	7901	6404	117.78	97.01	124	3,697	0.03	4.85	9.6
7902_7901	12	464	0.0337	7902	7901	133.49	117.88	102	2,941	0.03	3.89	16.1
7903_7904	8	453	0.0251	7903	7904	156.49	145.15	57	861	0.07	3.10	6.2
7904_7905	8	463	0.0517	7904	7905	145.05	121.10	80	1,236	0.07	4.44	2.5
7905_6405	8	483	0.0511	7905	6405	121.00	96.30	105	1,229	0.09	4.78	5.8
8001_6209	8	468	0.0467	8001	6209	122.97	101.13	76	1,175	0.06	4.21	4.9
8002_8001	6	460	0.0316	8002	8001	137.60	123.07	51	449	0.11	3.38	5.8
8003_8002	6	418	0.0287	8003	8002	149.70	137.70	30	428	0.07	2.78	7.5
8004_8005	8	425	0.0415	8004	8005	151.93	134.27	45	1,108	0.04	3.46	8.2
8005_8006	8	458	0.0443	8005	8006	134.17	113.85	69	1,145	0.06	4.03	9.2
8006_6304	8	472	0.0355	8006	6304	113.75	97.01	94	1,024	0.09	4.08	13.9
8007_6309	8	480	0.0466	8007	6309	116.39	94.03	44	1,174	0.04	3.59	7.2
8008_8007	8	178	0.0270	8008	8007	121.30	116.49	26	894	0.03	2.54	6.4
8101_6203	8	480	0.0315	8101	6203	119.19	104.05	64	966	0.07	3.49	9.5
8102_8101	10	459	0.0267	8102	8101	131.54	119.29	41	1,611	0.03	2.79	10.9
8103_8102	8	462	0.0221	8103	8102	141.83	131.64	17	808	0.02	2.08	10.4
8104_8106	8	412	0.0392	8104	8106	148.70	132.54	20	1,077	0.02	2.65	8.7
8106_8107	8	460	0.0229	8106	8107	132.44	121.91	42	823	0.05	2.75	8.2
8107_6204	8	470	0.0307	8107	6204	121.81	107.41	65	952	0.07	3.47	6.5
8206_8207	8	365	0.0032	8206	8207	136.89	135.71	20	309	0.07	*1.09*	10.3
8207_8208	8	460	0.0107	8207	8208	135.61	130.70	169	562	0.30	3.13	13.6
8208_6105	8	302	0.0163	8208	6105	130.60	125.68	285	694	0.41	4.21	5.0
8210_6111	8	470	0.0291	8210	6111	125.14	111.47	59	928	0.06	3.31	8.2
8211_8210	8	455	0.0138	8211	8210	131.54	125.24	36	640	0.06	2.21	12.2
8212_8211	8	421	0.0256	8212	8211	142.45	131.64	15	871	0.02	2.09	7.5
8303_8420	8	325	0.0258	8303	8420	123.79	115.38	8	874	0.01	*1.73*	9.3
8304_U0081-S12	15	233	0.0197	8304	U0081-S12	117.84	113.24	5,706	4,082	1.40	10.36	9.0
8308_6003	8	550	0.0133	8308	6003	117.95	110.64	261	627	0.42	3.82	6.7
8310_8304	15	345	0.0275	8310	8304	127.44	117.94	5,700	4,823	1.18	10.35	4.3
8312_8308	8	238	0.0296	8312	8308	125.09	118.05	152	936	0.16	4.00	5.9
8313_6014	8	306	0.0224	8313	6014	123.88	117.01	75	814	0.09	2.97	5.5
8401_5819	8	323	0.0139	8401	5819	95.64	91.17	96	640	0.15	2.94	4.9
8402_8401	8	182	0.0015	8402	8401	96.00	95.74	56	207	0.27	*1.12*	6.6
8407_8408	8	96	0.0223	8407	8408	101.01	98.86	150	812	0.18	2.94	8.9

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Italic = Velocity < 2 fps

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Sanitary Sewer Model Results Representing the Future Scenario (Year 2026/Buildout within the UGA)

Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
8408_8410	8	441	0.0058	8408	8410	98.76	96.20	256	415	0.62	2.79	7.4
8410_U0033-S12	8	176	0.0215	8410	U0033-S12	96.10	92.30	473	798	0.59	3.02	7.1
8412_8410	8	327	0.0376	8412	8410	108.48	96.20	106	1,054	0.10	2.89	5.5
8414_5904	8	402	0.0090	8414	5904	104.18	100.55	85	517	0.16	2.43	6.0
8415_5909	8	364	0.0081	8415	5909	106.76	103.80	160	491	0.33	2.80	5.8
8417_8415	8	283	0.0084	8417	8415	109.25	106.86	108	499	0.22	2.54	9.0
8420_8412	8	329	0.0204	8420	8412	115.28	108.58	52	776	0.07	2.81	9.1
8601_5705	8	397	0.0021	8601	5705	74.00	73.17	198	249	0.79	*1.64*	1.6
8602_8601	8	186	0.0002	8602	8601	73.00	72.97	67	69	0.97	*0.43*	1.6
8609_U0023-S12	8	425	0.0030	8609	U0023-S12	76.44	75.15	208	300	0.69	*1.33*	5.5
8701_5604	8	457	0.0034	8701	5604	73.64	72.11	24	315	0.08	*1.18*	4.8
8702_8818	8	277	0.0039	8702	8818	71.79	70.70	34	341	0.10	*1.39*	5.6
8704_U0023-S08	8	116	0.0026	8704	U0023-S08	72.82	72.52	17	276	0.06	*0.45*	7.0
8708_8702	8	279	0.0077	8708	8702	74.04	71.89	26	477	0.05	*1.62*	5.9
8709_5605	8	461	0.0017	8709	5605	73.68	72.88	23	226	0.10	*0.93*	6.2
8712_8708	8	260	0.0078	8712	8708	76.18	74.14	17	482	0.04	*1.44*	3.7
8717_U0023-S10	10	455	0.0024	8717	U0023-S10	75.41	74.30	105	487	0.22	*0.70*	6.5
8801_5504	8	459	0.0040	8801	5504	71.48	69.64	13	344	0.04	*1.06*	3.4
8802_SE686-S06	8	133	0.0021	8802	SE686-S06	69.20	68.92	67	250	0.27	*0.42*	4.7
8811_SE686-S05	8	147	0.0069	8811	SE686-S05	69.99	68.98	16	452	0.04	*0.92*	4.8
8812_SE686-S06	8	146	0.0040	8812	SE686-S06	69.56	68.98	59	344	0.17	*0.38*	4.7
8818_8812	8	269	0.0035	8818	8812	70.60	69.66	51	321	0.16	*1.39*	5.2
8904_5407	8	594	0.0014	8904	5407	70.11	69.30	48	201	0.24	*1.05*	7.2
8905_8910	8	275	0.0028	8905	8910	71.71	70.94	47	288	0.16	*1.35*	5.6
8910_8913	8	275	0.0026	8910	8913	70.84	70.12	47	278	0.17	*1.30*	6.5
8911_5417	8	468	0.0035	8911	5417	69.10	67.45	21	323	0.06	*0.93*	5.8
8912_5419	8	462	0.0029	8912	5419	72.30	70.96	20	293	0.07	*1.07*	2.6
8913_8802	8	276	0.0026	8913	8802	70.02	69.30	58	278	0.21	*1.06*	4.6
8918_8919	27	260	0.0051	8918	8919	36.62	35.30	10,024	9,928	1.01	6.33	0.0
8919_8920	27	245	0.0069	8919	8920	35.20	33.50	10,026	11,618	0.86	5.61	1.2
8920_9007	24	367	0.0069	8920	9007	33.45	30.91	10,025	8,466	1.18	7.11	0.0
9001_5305	8	188	0.0111	9001	5305	70.91	68.82	47	573	0.08	2.21	4.4
9007_9008	24	377	0.0077	9007	9008	30.81	27.90	10,243	8,941	1.15	7.26	0.3
9008_82243-10	24	114	0.0135	9008	82243-10	27.70	26.16	10,243	11,818	0.87	8.43	3.0
9101_16604	12	448	0.0025	9101	16604	72.27	71.15	127	802	0.16	*1.63*	7.4
9102_9101	12	437	0.0027	9102	9101	73.54	72.37	86	828	0.10	*1.52*	8.7
9107_9108	24	398	0.0104	9107	9108	45.25	41.12	10,019	10,367	0.97	7.09	0.0
9108_9109	24	398	0.0034	9108	9109	41.02	39.67	10,020	5,932	1.69	7.09	0.0
9109_9110	24	403	0.0033	9109	9110	39.57	38.26	10,022	5,819	1.72	7.10	3.9
9110_8918	27	389	0.0037	9110	8918	38.16	36.72	10,024	8,470	1.18	5.61	2.4
9217_9302	8	286	0.0037	9217	9302	78.66	77.61	238	330	0.72	2.30	3.1

Bold cells = pipe at capacity / manholes surcharged within 2' of rim.

If a mh is surcharged and the pipe is not at capacity, this is a result of the model recognizing a downstream problem.

Italic = Velocity < 2 fps

Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
9220_9217	8	261	0.0036	9220	9217	79.69	78.76	155	324	0.48	2.04	5.0
9221_9220	8	269	0.0037	9221	9220	80.79	79.79	134	332	0.40	2.00	3.9
9302_82242-09	8	321	0.0033	9302	82242-09	77.51	76.45	281	312	0.90	2.23	3.5
9307_9221	8	425	0.0061	9307	9221	83.48	80.89	111	425	0.26	2.28	4.3
9310_9312	10	256	0.0026	9310	9312	77.52	76.85	37	504	0.07	*1.21*	7.3
9312_8717	10	460	0.0027	9312	8717	76.75	75.51	73	512	0.14	*1.48*	8.0
9405_9406	8	154	0.0128	9405	9406	85.45	83.47	42	616	0.07	2.24	4.4
9406_9407	8	558	0.0046	9406	9407	83.37	80.80	56	369	0.15	*1.70*	6.5
9407_9408	8	459	0.0059	9407	9408	80.70	77.97	75	419	0.18	2.02	4.1
9408_8609	8	462	0.0029	9408	8609	77.87	76.54	108	292	0.37	*1.66*	6.8
9416_U0023-S15	8	550	0.0011	9416	U0023-S15	82.00	81.38	22	182	0.12	*0.76*	7.8
9418_9416	8	135	0.0141	9418	9416	84.01	82.10	14	647	0.02	*1.69*	5.9
9504_U0023-S15	6	568	0.0033	9504	U0023-S15	83.26	81.38	21	145	0.14	*1.13*	2.9
9504_83194-10	8	218	0.0032	9504	83194-10	83.26	82.56	25	308	0.08	*1.15*	2.9
9505_83194-14	8	179	0.0032	9505	83194-14	85.30	84.72	26	310	0.09	*1.20*	5.8
9602_8407	8	102	0.0040	9602	8407	101.52	101.11	77	345	0.22	*1.77*	8.4
9609_9610	12	425	0.0002	9609	9610	121.95	121.88	692	206	3.36	*1.96*	8.5
9610_9611	12	258	0.0011	9610	9611	121.78	121.50	705	528	1.33	2.00	1.8
9611_9615	12	336	0.0012	9611	9615	121.40	121.00	717	553	1.30	2.03	1.7
9614_9615	12	45	0.0151	9614	9615	121.68	121.00	166	1,968	0.08	*0.58*	7.0
9615_9618	12	439	0.0055	9615	9618	120.90	118.48	888	1,191	0.75	3.70	5.9
09618_U0081-S11	12	427	0.0045	9618	U0081-S11	118.38	116.44	449	1,081	0.42	2.92	9.0
09618_U0088-S11	12	427	0.0045	9618	U0081-S11	118.38	116.44	449	1,081	0.42	2.92	9.0
9620_9614	8	408	0.0327	9620	9614	135.12	121.78	162	983	0.16	4.64	7.2
9702_9620	8	403	0.0331	9702	9620	148.57	135.22	148	989	0.15	4.54	6.6
9703_9702	8	453	0.0015	9703	9702	149.33	148.67	131	208	0.63	*1.40*	9.8
9712_8310	15	339	0.0195	9712	8310	134.14	127.54	5,688	4,055	1.40	10.32	0.0
9713_9712	15	34	0.0030	9713	9712	134.34	134.24	5,681	1,586	3.58	10.31	0.0
9714_9713	12	22	0.0009	9714	9713	134.40	134.38	1,854	485	3.82	5.26	1.6
9716_9714	12	497	0.0155	9716	9714	142.15	134.44	1,848	1,996	0.93	5.24	0.0
4717	18	410	0.0095	9802	9713	139.04	135.14	3,826	4,613	0.83	6.30	1.7
9802_9803	18	15	0.0530	9803	9802	139.94	139.14	3,826	10,885	0.35	4.82	1.6
9803_9804	18	509	0.0060	9804	9803	143.10	140.04	3,781	3,667	1.03	5.27	0.9
9804_9716	12	230	0.0124	9804	9716	145.10	142.25	1,840	1,784	1.03	5.38	0.9
9805_9804	18	34	0.0085	9805	9804	143.49	143.20	5,616	4,350	1.29	7.08	1.1
9811_9703	8	435	0.0026	9811	9703	150.54	149.43	119	275	0.43	*1.69*	6.7
9812_9811	8	535	0.0014	9812	9811	151.37	150.64	107	201	0.53	*1.30*	8.3
9814_8206	8	485	0.0052	9814	8206	139.54	136.99	8	394	0.02	*0.98*	7.9
9815_8212	8	431	0.0070	9815	8212	145.55	142.55	6	454	0.01	*1.01*	8.0
9816_9803	12	463	0.0117	9816	9803	145.45	140.04	48	1,734	0.03	*0.14*	6.6
9817_9816	10	291	0.0012	9817	9816	145.90	145.55	42	342	0.12	*0.95*	6.5

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
9901_8103	8	460	0.0143	9901	8103	148.52	141.93	8	651	0.01	*1.42*	8.9
9904_83191-04	18	353	0.0059	9904	83191-04	147.96	145.87	5,600	3,639	1.54	7.06	0.0
9905_9812	8	581	0.0017	9905	9812	152.44	151.47	86	222	0.39	*1.33*	7.3
9906_9904	18	310	0.0058	9906	9904	149.86	148.06	5,591	3,605	1.55	7.05	0.0
9907_8104	8	449	0.0042	9907	8104	150.70	148.80	11	354	0.03	*1.02*	9.2
9908_8003	8	441	0.0218	9908	8003	159.42	149.80	21	803	0.03	2.20	9.1
9909_83191-02	10	409	0.0111	9909	83191-02	156.14	151.60	30	1,039	0.03	*1.88*	8.3
9910_9906	18	245	0.0060	9910	9906	151.44	149.96	5,586	3,672	1.52	7.04	0.0
9911_9905	8	306	0.0024	9911	9905	153.29	152.54	69	268	0.26	*1.44*	5.5
10002_9910	18	358	0.0039	10002	9910	152.94	151.54	5,581	2,955	1.89	7.04	0.4
10003_9909	10	404	0.0109	10003	9909	160.64	156.24	21	1,028	0.02	*1.67*	8.7
10108_10109	8	255	0.0550	10108	10109	178.78	164.74	30	1,275	0.02	3.39	3.6
10109_10110	8	24	0.0634	10109	10110	164.64	163.10	34	1,370	0.02	3.68	7.8
10110_7903	8	465	0.0138	10110	7903	163.00	156.59	38	639	0.06	2.24	13.1
10112_T83204-01	8	5	0.0399	10112	T83204-01	167.70	167.50	0	1,086	0.00	0.00	9.9
10113_T83204-01	8	25	0.0709	10113	T83204-01	169.25	167.50	133	1,448	0.09	5.77	8.2
10204_10113	8	154	0.0295	10204	10113	173.85	169.30	126	935	0.13	4.16	6.4
10205_10204	8	460	0.0098	10205	10204	178.45	173.95	109	538	0.20	2.69	10.3
10206_10205	8	430	0.0030	10206	10205	179.84	178.55	96	298	0.32	*1.69*	8.9
10208_7703	8	461	0.0300	10208	7703	173.49	159.68	94	942	0.10	*0.60*	9.1
10209_10208	8	266	0.0027	10209	10208	174.31	173.59	63	283	0.22	*1.45*	8.1
10304_11005	15	465	0.0060	10304	11005	171.30	168.50	1,715	2,256	0.76	4.26	9.3
10305_10304	15	499	0.0060	10305	10304	174.40	171.40	1,698	2,253	0.75	4.28	5.0
10401_10505	8	492	0.0041	10401	10505	86.90	84.90	66	347	0.19	*1.70*	6.9
10404_10401	8	473	0.0035	10404	10401	88.65	87.00	46	321	0.14	*1.45*	6.2
10405_10406	8	215	0.0030	10405	10406	87.58	86.94	18	297	0.06	*1.05*	3.5
10406_9405	8	412	0.0031	10406	9405	86.84	85.55	32	304	0.10	*1.26*	3.0
10415_10405	8	105	0.0026	10415	10405	87.95	87.68	7	276	0.03	*0.76*	7.0
10502_10632	8	127	0.0051	10502	10632	77.54	76.89	25	389	0.06	*1.39*	5.1
10505_9307	8	419	0.0029	10505	9307	84.80	83.58	88	293	0.30	*1.63*	4.9
10507_10508	21	388	0.0066	10507	10508	70.06	67.50	6,247	5,795	1.08	6.12	1.3
10508_10628	18	405	0.0211	10508	10628	67.40	58.85	6,249	6,865	0.91	7.84	3.3
10601_16305	12	63	0.0056	10601	16305	76.20	75.85	0	1,198	0.00	0.00	11.3
10603_10619	21	23	0.0097	10603	10619	76.35	76.13	3,659	7,040	0.52	6.58	10.2
10604_10603	21	45	0.0276	10604	10603	77.68	76.45	2,446	11,849	0.21	4.06	9.3
10613_82241-03	8	328	0.0045	10613	82241-03	75.96	74.49	45	364	0.12	*1.58*	6.9
10619_10620	15	30	0.0307	10619	10620	76.03	75.11	3,659	5,095	0.72	9.51	10.5
10620_10621	15	72	0.0320	10620	10621	75.01	72.70	3,659	5,197	0.70	10.22	12.3
10621_10622	15	60	0.2286	10621	10622	72.60	58.79	3,661	13,899	0.26	14.70	8.8
10622_10623	15	87	0.0627	10622	10623	58.69	53.24	3,664	7,280	0.50	6.64	3.0
10623_10624	24	158	0.0171	10623	10624	53.93	51.21	10,018	13,328	0.75	7.95	0.7

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
10624_10625	24	256	0.0119	10624	10625	51.11	48.05	10,019	11,127	0.90	7.89	0.0
10625_9107	24	247	0.0105	10625	9107	47.95	45.35	10,019	10,436	0.96	7.87	1.0
10627_10623	21	338	0.0072	10627	10623	55.66	53.24	6,250	6,037	1.04	5.77	0.0
10628_10627	21	398	0.0075	10628	10627	58.75	55.76	6,250	6,185	1.01	6.32	2.5
10629_10630	8	72	0.0157	10629	10630	73.41	72.28	109	681	0.16	3.19	13.9
10630_10633	8	27	0.0097	10630	10633	72.18	71.91	109	535	0.20	2.68	13.8
10631_10623	8	60	0.0213	10631	10623	55.31	54.03	109	794	0.14	*0.70*	0.9
10632_10613	8	165	0.0044	10632	10613	76.79	76.06	33	362	0.09	*1.44*	5.6
10633_10631	8	31	0.5226	10633	10631	71.50	55.41	109	3,931	0.03	10.83	3.6
10635_10603	18	56	0.0018	10635	10603	76.55	76.45	1,223	2,006	0.61	2.65	10.1
10701_9609	12	217	0.0019	10701	9609	122.46	122.05	692	698	0.99	*1.96*	11.4
10702_10701	12	325	0.0003	10702	10701	122.65	122.56	673	265	2.54	*1.91*	5.0
10703_10702	12	250	0.0010	10703	10702	123.00	122.75	652	507	1.29	*1.85*	2.6
10705_83194-18	12	297	0.0024	10705	83194-18	124.20	123.50	465	778	0.60	2.02	6.0
10706_10705	12	242	0.0016	10706	10705	124.70	124.30	329	651	0.51	*1.79*	6.6
10902_9911	8	367	0.0032	10902	9911	154.55	153.39	51	307	0.17	*1.45*	8.9
10906_10002	18	290	0.0041	10906	10002	154.24	153.04	5,574	3,041	1.83	7.03	3.2
10907_10913	18	51	0.0258	10907	10913	157.28	155.98	1,846	7,596	0.24	2.32	3.4
10908_10907	15	186	0.0111	10908	10907	159.44	157.38	1,805	3,059	0.59	4.96	2.4
10909_10908	15	40	0.0566	10909	10908	161.81	159.54	1,805	6,917	0.26	6.62	2.5
10910_10909	15	150	0.0078	10910	10909	163.08	161.91	1,792	2,568	0.70	4.57	0.0
10912_10906	18	129	0.0027	10912	10906	154.69	154.34	5,574	2,466	2.26	7.02	0.0
10913_10912	18	267	0.0041	10913	10912	155.88	154.79	5,574	3,014	1.85	7.02	0.0
10914_10913	12	334	0.0257	10914	10913	164.55	155.98	3,737	2,569	1.45	10.57	0.0
11003_10910	15	420	0.0060	11003	10910	165.70	163.18	1,766	2,252	0.78	4.20	0.0
11005_11003	15	434	0.0060	11005	11003	168.40	165.80	1,737	2,251	0.77	4.24	5.5
11104_10305	15	506	0.0040	11104	10305	176.52	174.50	1,671	1,837	0.91	3.67	4.7
11105_11104	15	143	0.0041	11105	11104	177.20	176.62	1,647	1,852	0.89	3.68	2.8
11107_11105	15	486	0.0067	11107	11105	180.54	177.30	1,590	2,373	0.67	3.86	6.3
11201_11107	15	269	0.0018	11201	11107	181.12	180.64	1,563	1,228	1.27	2.83	5.9
11202_T83172-08	15	117	0.0236	11202	T83172-08	185.85	183.10	1,538	4,461	0.34	6.45	3.6
11604_83162-01	10	102	0.0128	11604	83162-01	274.75	273.44	911	1,115	0.82	5.07	7.9
11605_11604	8	486	0.0637	11605	11604	305.85	274.85	211	1,373	0.15	3.07	9.0
11606_83163-11	8	29	0.0127	11606	83163-11	271.00	270.63	22	612	0.04	*0.89*	6.0
11705_7709	8	412	0.0141	11705	7709	167.24	161.43	134	646	0.21	2.77	6.9
11801_11803	8	423	0.0234	11801	11803	338.25	328.35	122	832	0.15	3.79	21.2
11802_11803	8	380	0.0811	11802	11803	359.05	328.20	110	1,549	0.07	*0.70*	5.1
11803_11804	8	74	0.1102	11803	11804	328.25	320.10	237	1,805	0.13	4.84	12.9
11804_11807	8	376	0.0034	11804	11807	320.00	318.73	244	316	0.77	*1.55*	16.9
11805_13407	24	476	0.0029	11805	13407	314.78	313.42	1,463	5,443	0.27	3.27	4.7
11806_11805	15	150	0.0164	11806	11805	317.35	314.88	1,460	3,728	0.39	4.74	2.3

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
11807_11806	24	449	0.0026	11807	11806	318.63	317.45	1,459	5,221	0.28	3.17	7.1
11808_83212-03	24	42	0.0046	11808	83212-03	319.14	318.95	1,208	6,874	0.18	3.66	10.3
11902_11808	20	439	0.0042	11902	11808	321.10	319.24	1,204	4,074	0.30	3.62	10.8
12005_83293-18	12	417	0.0044	12005	83293-18	57.28	55.46	928	1,060	0.88	2.62	7.2
12303_83292-20	8	32	0.0917	12303	83292-20	68.95	66.04	227	1,647	0.14	*1.45*	5.9
12307_12303	8	33	0.0576	12307	12303	70.95	69.05	224	1,305	0.17	6.22	3.9
12308_12307	8	277	0.0036	12308	12307	72.05	71.05	204	327	0.63	2.20	2.6
12402_12403	15	82	0.0147	12402	12403	181.57	180.37	1,990	3,525	0.56	6.59	3.4
12403_12404	15	446	0.0522	12403	12404	180.27	156.96	1,991	6,644	0.30	10.53	7.3
12404_12405	15	608	0.0427	12404	12405	156.86	130.85	2,075	6,010	0.35	9.90	4.4
12405_83292-66	15	325	0.1241	12405	83292-66	130.75	90.39	2,077	10,242	0.20	11.27	5.6
12501_14006	8	321	0.0251	12501	14006	271.00	262.95	97	861	0.11	3.64	5.8
12502_12402	10	270	0.0125	12502	12402	185.05	181.67	1,947	1,104	1.76	7.93	2.5
12503_12502	10	385	0.0361	12503	12502	199.05	185.15	1,912	1,874	1.02	7.80	0.0
12504_12503	10	371	0.0428	12504	12503	215.05	199.15	1,870	2,041	0.92	8.21	5.3
12505_12504	10	201	0.0247	12505	12504	220.10	215.15	1,869	1,549	1.21	7.62	18.2
12506_12505	10	243	0.0467	12506	12505	231.55	220.20	1,844	2,131	0.87	7.63	26.2
12508_12506	10	165	0.0868	12508	12506	246.00	231.65	1,826	2,905	0.63	9.98	25.0
12608_12609	8	178	0.0110	12608	12609	277.70	275.75	60	570	0.11	*1.44*	10.9
12609_12508	10	195	0.1517	12609	12508	275.65	246.10	1,821	3,840	0.47	12.69	7.7
12610_12608	8	181	0.0701	12610	12608	290.50	277.80	26	1,440	0.02	3.53	13.7
12612_12613	8	112	0.0886	12612	12613	305.40	295.50	13	1,619	0.01	3.10	11.4
12613_12610	8	113	0.0425	12613	12610	295.40	290.60	22	1,122	0.02	2.80	12.1
12618_83283-07	10	86	0.0122	12618	83283-07	272.25	271.21	402	1,087	0.37	*1.64*	14.9
12703_12704	12	267	0.0333	12703	12704	315.95	307.05	115	2,928	0.04	4.03	10.7
12704_12706	12	170	0.0891	12704	12706	306.95	291.77	121	4,787	0.03	5.76	10.6
12706_12711	12	90	0.0121	12706	12711	291.67	290.59	127	1,761	0.07	2.90	11.8
12709_12618	8	334	0.0312	12709	12618	282.77	272.35	247	960	0.26	4.41	7.4
12710_12709	12	258	0.0123	12710	12709	286.02	282.87	171	1,775	0.10	3.18	11.3
12711_12710	12	363	0.0120	12711	12710	290.49	286.12	151	1,759	0.09	3.05	9.3
12712_12711	8	166	0.0118	12712	12711	292.54	290.59	3	590	0.01	*0.76*	13.6
12715_12717	8	310	0.0760	12715	12717	331.74	308.18	9	1,499	0.01	2.62	15.2
12717_12718	8	119	0.0938	12717	12718	308.08	296.92	15	1,666	0.01	3.31	14.5
12718_12711	8	136	0.0458	12718	12711	296.82	290.59	18	1,164	0.02	2.21	12.9
12802_12803	8	204	0.0113	12802	12803	330.73	328.43	212	577	0.37	3.40	11.5
12803_12804	8	234	0.0120	12803	12804	328.33	325.53	220	595	0.37	3.51	15.6
12804_12806	8	460	0.0280	12804	12806	325.43	312.53	226	910	0.25	4.81	13.5
12806_83283-13	24	69	0.0998	12806	83283-13	312.43	305.53	754	32,169	0.02	9.47	9.1
12808_12806	8	260	0.0347	12808	12806	321.56	312.53	526	1,013	0.52	6.52	5.8
12810_12808	8	215	0.0241	12810	12808	326.84	321.66	523	844	0.62	5.67	9.2
12811_12810	8	288	0.0130	12811	12810	330.68	326.94	518	620	0.84	4.43	11.1

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12901_12902	8	349	0.0384	12901	12902	378.20	364.78	341	1,066	0.32	6.05	9.0
12902_12903	8	364	0.0462	12902	12903	364.68	347.85	347	1,169	0.30	6.50	10.2
12903_12904	8	376	0.0421	12903	12904	347.75	331.89	352	1,116	0.32	3.09	9.1
12904_12811	8	222	0.0045	12904	12811	331.79	330.78	515	367	1.40	3.28	8.8
12906_12904	8	168	0.0052	12906	12904	332.76	331.89	161	392	0.41	*1.60*	8.9
12907_13107	8	223	0.0496	12907	13107	346.99	335.94	149	1,211	0.12	5.25	10.2
12908_12907	8	149	0.0067	12908	12907	348.09	347.09	147	445	0.33	2.55	9.1
12909_12908	8	442	0.0255	12909	12908	359.47	348.19	143	868	0.16	4.09	7.2
12910_12909	8	418	0.0093	12910	12909	363.45	359.57	137	524	0.26	2.81	6.3
13004_3707	12	4238	0.0371	13004	3707	243.00	85.88	20	3,087	0.01	2.45	9.4
13005_13004	12	12	0.1596	13005	13004	245.00	243.10	7	6,405	0.00	2.96	6.7
13006_13007	60	93	0.0096	13006	13007	252.00	251.10	2	115,081	0.00	0.00	5.5
13007_13008	24	13	0.0019	13007	13008	251.00	250.98	4	4,416	0.00	*0.47*	6.5
13008_13005	12	374	0.0154	13008	13005	250.88	245.10	7	1,993	0.00	*1.31*	11.6
13009_13007	60	138	0.0065	13009	13007	252.00	251.10	2	94,730	0.00	0.00	10.5
13010_13008	60	146	0.0617	13010	13008	260.00	250.98	3	291,024	0.00	0.00	12.5
13107_12906	8	281	0.0106	13107	12906	335.84	332.86	159	560	0.28	3.00	8.0
13108_13107	8	352	0.0115	13108	13107	339.97	335.94	7	582	0.01	*1.13*	6.8
13109_83282-12	10	198	0.1346	13109	83282-12	324.57	297.89	1,164	3,618	0.32	4.73	13.8
13203_13109	18	388	0.0043	13203	13109	326.35	324.67	1,160	3,112	0.37	3.63	11.2
13207_13203	15	133	0.0236	13207	13203	329.60	326.45	1,153	4,468	0.26	4.66	9.7
13208_13108	8	273	0.0127	13208	13108	343.53	340.07	2	612	0.00	*0.92*	9.3
13209_13210	8	63	0.0391	13209	13210	352.65	350.18	67	1,076	0.06	3.82	5.6
13210_13211	8	153	0.0606	13210	13211	350.08	340.81	69	1,339	0.05	4.49	7.1
13211_13212	8	114	0.0247	13211	13212	340.71	337.90	71	855	0.08	*0.45*	11.7
13212_13207	8	232	0.0351	13212	13207	337.84	329.70	1,138	1,019	1.12	7.41	9.5
13213_13207	8	294	0.0040	13213	13207	330.85	329.69	17	342	0.05	*0.72*	17.5
13214_13212	8	129	0.0039	13214	13212	338.44	337.94	1,077	338	3.18	6.85	1.3
13217_13218	8	186	0.0614	13217	13218	380.03	368.62	1,037	1,347	0.77	8.58	9.6
13218_13219	8	189	0.0473	13218	13219	368.52	359.55	1,039	1,183	0.88	8.25	7.6
13219_13214	8	352	0.0578	13219	13214	359.45	339.09	1,045	1,308	0.80	7.15	6.4
13221_13214	8	295	0.0043	13221	13214	339.80	338.54	27	355	0.08	*0.17*	0.0
13222_13213	8	97	0.0059	13222	13213	331.52	330.95	16	416	0.04	*1.29*	13.4
13223_13221	8	232	0.0044	13223	13221	340.93	339.90	19	362	0.05	*1.14*	2.7
13225_13222	8	297	0.0043	13225	13222	332.90	331.62	11	357	0.03	*1.02*	12.0
13226_13223	8	192	0.0125	13226	13223	343.43	341.03	14	609	0.02	*1.54*	4.7
13227_13226	8	178	0.0115	13227	13226	345.59	343.53	7	584	0.01	*1.28*	7.1
13228_13225	8	303	0.0065	13228	13225	334.97	333.00	6	438	0.01	*0.97*	10.3
13305_13402	10	113	0.0372	13305	13402	331.73	327.51	1,044	1,902	0.55	7.95	12.1
13306_13305	10	182	0.0261	13306	13305	336.60	331.83	1,039	1,594	0.65	6.93	7.6
13309_13306	12	293	0.0077	13309	13306	338.96	336.70	1,036	1,409	0.74	4.37	10.4

Bold cells = pipe at capacity / manholes surcharged within 2' of rim.
If a mh is surcharged and the pipe is not at capacity, this is a result of the model recognizing a downstream problem.
Italic = Velocity < 2 fps

Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
13310_13309	8	228	0.0070	13310	13309	340.66	339.06	26	456	0.06	*0.17*	6.7
13312_13310	8	302	0.0053	13312	13310	342.35	340.76	21	395	0.05	*1.34*	5.0
13314_13312	8	340	0.0066	13314	13312	344.69	342.45	12	441	0.03	*1.21*	4.8
13318_13309	8	133	0.0143	13318	13309	340.96	339.06	1,011	650	1.56	6.45	3.9
13321_13318	8	142	0.0688	13321	13318	350.82	341.06	1,010	1,426	0.71	6.54	6.3
13327_13328	8	32	0.1328	13327	13328	369.87	365.63	1,005	1,982	0.51	11.88	5.5
13328_13321	8	112	0.1300	13328	13321	365.53	350.92	1,008	1,960	0.51	10.81	6.6
13402_83281-10	18	101	0.1919	13402	83281-10	327.41	308.00	1,449	20,708	0.07	*1.83*	4.9
13403_83281-10	24	199	0.0011	13403	83281-10	308.22	308.00	1,530	3,377	0.45	2.34	8.1
13404_13403	24	252	0.0069	13404	13403	310.05	308.32	1,526	8,444	0.18	*1.08*	9.7
13405_13404	24	270	0.0030	13405	13404	310.97	310.15	1,515	5,610	0.27	3.38	18.3
13406_13405	24	376	0.0030	13406	13405	312.18	311.07	1,500	5,535	0.27	3.34	11.9
13407_13406	20	352	0.0030	13407	13406	313.32	312.28	1,482	3,405	0.44	3.36	5.3
13502_16313	18	238	0.0016	13502	16313	78.49	78.10	1,203	1,903	0.63	2.54	10.6
13505_82241-04	18	450	0.0026	13505	82241-04	80.42	79.24	2,367	2,423	0.98	3.48	8.4
13506_13505	18	502	0.0023	13506	13505	81.66	80.52	2,327	2,253	1.03	3.24	6.7
13508_13506	18	480	0.0026	13508	13506	83.00	81.76	2,277	2,405	0.95	3.43	11.1
13512_13502	18	285	0.0022	13512	13502	79.20	78.59	1,194	2,198	0.54	2.83	8.8
13604_13605	8	402	0.0050	13604	13605	74.00	72.00	45	384	0.12	*1.64*	9.8
13605_13606	8	326	0.0066	13605	13606	71.90	69.74	83	443	0.19	2.17	5.4
13606_13607	8	141	0.0055	13606	13607	69.64	68.86	109	404	0.27	2.19	5.3
13607_2121	8	155	0.0214	13607	2121	68.76	65.46	165	795	0.21	*1.05*	4.7
13709_2014	12	309	0.0079	13709	2014	153.35	150.90	1,231	1,429	0.86	4.56	5.9
13710_13709	12	343	0.0080	13710	13709	156.19	153.45	1,205	1,432	0.84	4.55	9.9
13801_13710	10	308	0.0460	13801	13710	170.25	156.11	965	2,114	0.46	3.94	4.2
13806_35601	8	243	0.0602	13806	35601	128.16	113.56	109	1,334	0.08	5.14	10.3
13809_13801	10	320	0.0353	13809	13801	181.65	170.35	926	1,852	0.50	7.56	10.4
13815_13809	10	305	0.0223	13815	13809	188.05	181.25	896	1,473	0.61	3.66	6.4
13816_13815	10	236	0.0161	13816	13815	191.95	188.15	455	1,252	0.36	4.14	5.9
13819_ST929-S03	10	10	0.0548	13819	ST929-S03	155.35	154.81	91	2,309	0.04	4.58	6.1
13823_35606	8	320	0.0150	13823	35606	121.20	116.40	94	666	0.14	3.00	6.4
13901_13816	8	124	0.0125	13901	13816	193.60	192.05	445	607	0.73	4.23	5.9
13902_13901	8	272	0.0092	13902	13901	196.20	193.70	434	521	0.83	3.72	10.6
13903_13902	8	347	0.0083	13903	13902	199.18	196.30	355	496	0.72	3.44	27.9
13904_13903	8	222	0.0997	13904	13903	221.40	199.28	91	1,717	0.05	3.38	30.9
14002_13903	8	301	0.1299	14002	13903	238.43	199.28	235	1,960	0.12	5.08	9.8
14003_14002	8	323	0.0329	14003	14002	249.15	238.53	209	987	0.21	5.00	8.1
14004_14003	8	183	0.0300	14004	14003	254.74	249.25	138	943	0.15	4.30	7.9
14006_14004	8	253	0.0317	14006	14004	262.85	254.84	124	968	0.13	4.24	2.3
14101_14102	8	305	0.0978	14101	14102	341.45	311.60	62	1,700	0.04	5.15	6.1
14102_14103	8	183	0.1093	14102	14103	311.50	291.53	71	1,798	0.04	5.57	5.8

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If a mh is surcharged and the pipe is not at capacity, this is a result of the model recognizing a downstream problem.
Italic = Velocity < 2 fps

CIty of Bellingham

Sanitary Sewer Model Results Representing the Future Scenario (Year 2026/Buildout within the UGA)

Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
14103_14105	8	128	0.1140	14103	14105	291.43	276.88	77	1,836	0.04	5.79	6.2
14105_12501	8	301	0.0188	14105	12501	276.78	271.10	88	746	0.12	3.19	4.1
14201_14202	15	400	0.0022	14201	14202	156.05	155.15	1,318	1,379	0.96	2.73	4.7
14202_14203	15	148	0.0019	14202	14203	155.05	154.77	1,691	1,263	1.34	3.06	5.4
14203_14204	15	241	0.0022	14203	14204	154.67	154.15	1,692	1,350	1.25	3.06	6.0
14204_14205	15	288	0.0022	14204	14205	154.05	153.41	1,693	1,371	1.23	3.06	9.3
14205_14206	15	287	0.0052	14205	14206	153.31	151.82	1,694	2,095	0.81	4.23	13.3
14206_2014	15	170	0.0049	14206	2014	151.72	150.89	1,694	2,030	0.83	4.12	7.3
14301_83312-09	12	67	0.0119	14301	83312-09	164.17	163.37	903	1,752	0.52	2.56	8.7
14303_14304	12	215	0.0072	14303	14304	159.69	158.15	1,072	1,356	0.79	3.54	6.9
14304_14305	15	404	0.0022	14304	14305	158.05	157.15	1,073	1,372	0.78	2.75	5.8
14305_14201	15	427	0.0021	14305	14201	157.05	156.15	1,075	1,335	0.80	2.62	5.4
14308_14303	12	461	0.0072	14308	14303	163.10	159.79	1,071	1,358	0.79	4.27	8.6
14401_14402	12	383	0.0181	14401	14402	174.95	168.03	685	2,154	0.32	4.21	14.0
14402_14301	12	412	0.0089	14402	14301	167.93	164.27	903	1,511	0.60	4.47	7.6
14501_14517	8	55	0.0308	14501	14517	191.20	189.50	411	954	0.43	5.86	11.0
14504_14509	8	365	0.0362	14504	14509	199.11	185.89	164	1,034	0.16	4.82	6.9
14507_14508	8	151	0.0132	14507	14508	184.13	182.13	445	625	0.71	2.84	5.8
14508_14513	8	507	0.0022	14508	14513	182.03	180.93	446	254	1.76	2.84	8.0
14509_14516	8	133	0.0150	14509	14516	185.79	183.79	180	667	0.27	3.62	8.8
14513_14401	10	300	0.0193	14513	14401	180.83	175.05	675	1,369	0.49	5.57	18.0
14516_14402	8	482	0.0325	14516	14402	183.69	168.03	202	980	0.21	*1.29*	8.8
14517_14507	8	92	0.0560	14517	14507	189.40	184.23	416	1,287	0.32	6.09	2.8
14601_14609	8	166	0.0930	14601	14609	218.44	203.04	353	1,659	0.21	7.68	8.8
14609_14610	8	333	0.0230	14609	14610	202.94	195.30	375	824	0.45	5.14	10.7
14610_14501	8	181	0.0215	14610	14501	195.20	191.30	399	798	0.50	5.10	3.2
14701_14704	8	209	0.0370	14701	14704	163.88	156.16	21	1,046	0.02	2.65	6.1
14702_14706	8	418	0.0181	14702	14706	150.80	143.25	8	731	0.01	*1.56*	13.8
14704_14705	8	391	0.0118	14704	14705	156.06	151.46	36	590	0.06	2.07	9.9
14705_14801	8	443	0.0059	14705	14801	151.36	148.74	53	418	0.13	*1.82*	6.9
14706_14802	8	299	0.0231	14706	14802	143.15	136.25	28	826	0.03	2.46	5.0
14801_14804	8	447	0.0193	14801	14804	148.64	140.02	75	756	0.10	3.07	3.9
14802_14803	8	324	0.0345	14802	14803	136.15	124.98	43	1,010	0.04	2.75	5.6
14803_14805	8	409	0.0017	14803	14805	124.88	124.18	58	225	0.26	*0.97*	0.0
14804_14902	8	276	0.0139	14804	14902	139.92	136.10	96	640	0.15	2.94	5.6
14805_14904	8	399	0.0018	14805	14904	124.08	123.35	69	233	0.30	*0.44*	0.0
14806_14914	12	296	0.0041	14806	14914	134.55	133.35	995	1,021	0.97	3.18	4.6
14901_15509	8	374	0.0344	14901	15509	133.02	120.15	132	1,009	0.13	3.68	14.0
14902_14901	8	389	0.0074	14902	14901	136.00	133.12	110	468	0.23	2.43	16.8
14904_14905	8	447	0.0115	14904	14905	123.25	118.10	1,077	583	1.85	6.85	1.5
14905_14908	8	436	0.0228	14905	14908	118.00	108.05	1,091	822	1.33	6.94	0.0

Bold cells = pipe at capacity / manholes surcharged within 2' of rim.

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Italic = Velocity < 2 fps

Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
14908_15002	8	444	0.0133	14908	15002	107.95	102.05	1,108	627	1.77	7.06	0.0
14910_14912	8	332	0.0032	14910	14912	135.88	134.83	33	305	0.11	*1.27*	4.1
14912_15003	8	236	0.0034	14912	15003	134.73	133.93	51	317	0.16	*1.49*	8.6
14914_14904	12	74	0.1330	14914	14904	133.25	123.35	1,000	5,847	0.17	2.83	4.0
15001_15604	8	359	0.0114	15001	15604	103.14	99.07	12	580	0.02	*1.48*	3.1
15002_15605	8	334	0.0103	15002	15605	101.95	98.50	1,120	553	2.03	7.14	0.0
15003_15007	8	267	0.0027	15003	15007	133.83	133.12	69	280	0.25	*1.48*	8.0
15007_15015	8	249	0.0162	15007	15015	133.02	128.99	82	692	0.12	2.96	5.4
15011_15113	8	415	0.0035	15011	15113	100.28	98.83	43	321	0.13	*1.42*	7.9
15012_15011	8	455	0.0221	15012	15011	110.43	100.38	24	808	0.03	2.29	7.2
15013_15012	8	55	0.0673	15013	15012	114.25	110.53	14	1,410	0.01	2.86	8.1
15015_15105	8	315	0.0158	15015	15105	128.45	123.46	104	684	0.15	3.15	7.4
15016_15015	8	200	0.0017	15016	15015	128.88	128.55	15	221	0.07	*0.80*	8.5
15105_15110	8	309	0.0155	15105	15110	123.36	118.55	113	678	0.17	3.21	7.4
15108_15109	10	361	0.0088	15108	15109	123.99	120.80	1,819	927	1.96	7.31	0.0
15109_15111	8	14	0.0653	15109	15111	120.70	119.78	1,819	1,390	1.31	11.42	0.8
15110_15112	8	357	0.0244	15110	15112	118.45	109.76	117	849	0.14	3.80	12.5
15111_82133-03	10	245	0.0243	15111	82133-03	119.68	113.72	2,002	1,538	1.30	8.07	2.8
15112_15114	8	341	0.0199	15112	15114	109.66	102.87	123	767	0.16	3.59	11.9
15113_15115	8	427	0.0030	15113	15115	98.73	97.44	61	299	0.20	*1.49*	3.3
15114_15115	8	352	0.0151	15114	15115	102.77	97.44	133	669	0.20	3.32	8.8
15115_15120	8	29	0.3179	15115	15120	97.34	88.26	200	3,066	0.07	*1.27*	4.9
15116_13508	18	460	0.0100	15116	13508	87.70	83.10	2,235	4,726	0.47	3.73	12.9
15117_15120	10	485	0.0210	15117	15120	98.43	88.26	2,015	1,428	1.41	8.15	4.0
15120_15116	15	37	0.0098	15120	15116	88.16	87.80	2,214	2,880	0.77	5.75	8.5
15204_82134-02	8	368	0.0149	15204	82134-02	131.45	125.96	171	665	0.26	3.55	10.8
15205_15204	8	290	0.0031	15205	15204	132.45	131.55	158	303	0.52	*1.95*	9.7
15206_15205	8	224	0.0009	15206	15205	132.75	132.55	120	163	0.74	*1.14*	4.8
15207_15206	12	256	0.0015	15207	15206	133.22	132.85	112	611	0.18	*1.17*	13.8
15301_15303	8	218	0.0018	15301	15303	131.96	131.58	50	228	0.22	*1.16*	8.8
15303_15308	8	384	0.0141	15303	15308	131.48	126.05	62	647	0.10	2.61	9.3
15306_15806	8	280	0.0612	15306	15806	107.15	90.05	168	1,345	0.13	5.85	7.2
15307_15306	8	300	0.0320	15307	15306	116.85	107.25	153	973	0.16	4.53	7.4
15308_15307	8	358	0.0251	15308	15307	125.95	116.95	137	862	0.16	4.03	9.7
15310_82142-01	8	335	0.0507	15310	82142-01	147.00	130.05	30	1,224	0.02	3.30	9.8
15506_15507	8	291	0.0343	15506	15507	108.05	98.06	207	1,008	0.21	5.06	8.4
15507_15602	8	303	0.0261	15507	15602	97.96	90.06	219	879	0.25	4.65	10.0
15508_15506	8	321	0.0313	15508	15506	118.20	108.15	175	962	0.18	4.66	6.9
15509_15508	8	453	0.0039	15509	15508	120.05	118.30	149	338	0.44	2.09	8.2
15601_16104	8	266	0.0112	15601	16104	76.33	73.36	255	574	0.44	3.55	8.3
15602_15601	8	466	0.0290	15602	15601	89.96	76.43	237	926	0.26	4.94	4.2

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Italic = Velocity < 2 fps

Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
15604_15606	8	377	0.0101	15604	15606	98.97	95.14	22	548	0.04	*1.70*	3.8
15605_15607	8	374	0.0199	15605	15607	98.40	90.95	1,128	767	1.47	7.19	0.0
15606_15609	8	373	0.0048	15606	15609	95.04	93.25	30	376	0.08	*1.43*	2.9
15607_82133-02	8	333	0.0086	15607	82133-02	90.85	87.98	1,135	505	2.25	7.24	0.0
15609_15702	8	393	0.0122	15609	15702	93.15	88.36	38	600	0.06	2.14	3.3
15701_15705	8	134	0.0439	15701	15705	87.52	81.64	44	1,140	0.04	3.51	3.4
15702_15701	8	75	0.0086	15702	15701	88.26	87.62	41	503	0.08	*1.93*	3.8
15703_15704	8	302	0.0101	15703	15704	86.01	82.95	1,154	548	2.11	7.36	0.0
15704_82133-01	8	26	0.0719	15704	82133-01	82.85	80.96	1,164	1,458	0.80	7.43	9.0
15705_15706	8	281	0.0067	15705	15706	81.54	79.64	47	446	0.11	*1.85*	10.6
15706_16205	8	273	0.0055	15706	16205	79.54	78.05	59	401	0.15	*1.83*	7.7
15710_13512	18	298	0.0020	15710	13512	79.90	79.30	1,180	2,123	0.56	2.75	5.7
15801_15802	12	203	0.0036	15801	15802	73.95	73.22	99	962	0.10	*1.72*	3.3
15802_15809	12	313	0.0016	15802	15809	73.12	72.62	120	640	0.19	*0.96*	8.6
15806_15807	8	280	0.0253	15806	15807	89.95	82.88	182	864	0.21	4.37	6.4
15807_15808	8	411	0.0168	15807	15808	82.78	75.88	200	705	0.28	3.87	4.4
15808_15809	8	386	0.0082	15808	15809	75.78	72.62	218	492	0.44	2.05	3.9
15809_15810	12	305	0.0017	15809	15810	72.52	72.00	354	661	0.54	*1.86*	7.1
15810_15901	12	406	0.0021	15810	15901	71.90	71.05	377	735	0.51	2.04	6.0
15901_15905	12	411	0.0017	15901	15905	70.95	70.25	415	662	0.63	*1.93*	1.2
15903_15906	8	255	0.0079	15903	15906	80.69	78.68	54	483	0.11	2.04	9.2
15905_16403	12	372	0.0019	15905	16403	70.15	69.45	455	695	0.65	2.05	1.5
15906_16001	8	327	0.0085	15906	16001	78.58	75.80	66	502	0.13	2.22	4.0
15907_15903	8	318	0.0050	15907	15903	82.38	80.79	35	384	0.09	*1.53*	7.0
16001_16002	8	331	0.0072	16001	16002	75.70	73.32	86	461	0.19	2.21	6.7
16002_16003	8	337	0.0044	16002	16003	73.22	71.73	106	362	0.29	*1.96*	7.6
16003_16103	8	365	0.0040	16003	16103	71.63	70.16	122	345	0.35	*0.99*	7.8
16101_16503	12	425	0.0018	16101	16503	68.40	67.63	617	682	0.90	*1.73*	2.0
16103_16101	12	452	0.0035	16103	16101	70.06	68.50	599	943	0.64	2.48	7.2
16104_16103	8	354	0.0088	16104	16103	73.26	70.16	267	509	0.52	*1.97*	11.4
16105_16103	12	459	0.0025	16105	16103	71.33	70.16	201	810	0.25	*1.47*	8.6
16203_16105	12	429	0.0028	16203	16105	72.65	71.43	182	855	0.21	*1.89*	8.1
16204_16203	8	258	0.0138	16204	16203	76.31	72.75	84	639	0.13	2.11	6.0
16205_16204	8	266	0.0058	16205	16204	77.95	76.41	74	414	0.18	2.00	3.8
16206_16203	8	377	0.0021	16206	16203	73.65	72.85	82	250	0.33	*1.41*	10.3
16207_16206	8	383	0.0041	16207	16206	75.32	73.75	59	348	0.17	*1.66*	7.0
16302_16207	8	372	0.0042	16302	16207	76.99	75.42	36	353	0.10	*1.45*	16.8
16303_9102	12	354	0.0023	16303	9102	74.45	73.64	34	770	0.04	*1.10*	12.1
16304_16303	12	323	0.0020	16304	16303	75.20	74.55	15	719	0.02	*0.82*	12.2
16305_16304	12	221	0.0020	16305	16304	75.75	75.30	2	724	0.00	*0.46*	11.7
16306_16302	8	426	0.0043	16306	16302	78.91	77.09	16	356	0.05	*1.15*	8.5

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If a mh is surcharged and the pipe is not at capacity, this is a result of the model recognizing a downstream problem.
Italic = Velocity < 2 fps

CIty of Bellingham

Sanitary Sewer Model Results Representing the Future Scenario (Year 2026/Buildout within the UGA)

Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
16313_82241-05	18	320	0.0018	16313	82241-05	78.00	77.43	1,215	1,996	0.61	2.64	11.1
16403_16405	12	409	0.0022	16403	16405	69.35	68.45	487	752	0.65	2.16	4.3
16405_16503	12	507	0.0014	16405	16503	68.35	67.63	511	604	0.85	*1.43*	0.8
16503_16504	18	351	0.0016	16503	16504	67.53	66.97	1,369	1,887	0.73	2.53	3.3
16504_16505	18	375	0.0015	16504	16505	66.87	66.31	1,386	1,828	0.76	2.47	0.5
16505_16506	18	454	0.0023	16505	16506	66.21	65.16	1,483	2,279	0.65	2.40	1.7
16506_16906	18	456	0.0014	16506	16906	65.06	64.41	1,624	1,778	0.91	2.49	0.6
16511_16503	12	453	0.0022	16511	16503	68.61	67.63	230	746	0.31	*0.65*	2.6
16603_16511	12	437	0.0024	16603	16511	69.75	68.71	207	782	0.26	*1.83*	6.0
16604_16603	12	475	0.0025	16604	16603	71.05	69.85	169	806	0.21	*1.77*	7.5
16701_16705	18	382	0.0017	16701	16705	55.32	54.67	1,107	1,951	0.57	2.54	3.3
16702_82232-05	8	134	0.0123	16702	82232-05	57.43	55.78	26	603	0.04	*0.16*	10.0
16702_16704	8	342	0.0024	16702	16704	57.43	56.62	11	265	0.04	*0.70*	10.0
16704_16709	8	429	0.0035	16704	16709	56.52	55.00	82	324	0.25	*1.65*	5.8
16705_16712	18	345	0.0016	16705	16712	54.57	54.01	1,193	1,904	0.63	*1.50*	10.6
16709_16712	8	205	0.0037	16709	16712	54.90	54.15	165	330	0.50	*1.05*	9.8
16712_82232-04	18	423	0.0021	16712	82232-04	54.05	53.16	1,446	2,162	0.67	2.90	10.0
16803_17014	18	383	0.0008	16803	17014	62.00	61.70	1,822	1,322	1.38	2.29	2.4
16804_16803	18	165	0.0032	16804	16803	62.62	62.10	1,821	2,655	0.69	2.28	2.3
16906_16907	18	472	0.0016	16906	16907	64.31	63.55	1,740	1,897	0.92	2.17	1.8
16907_16908	18	494	0.0005	16907	16908	63.45	63.22	1,806	1,020	1.77	2.26	2.0
16908_16804	18	139	0.0029	16908	16804	63.12	62.72	1,821	2,537	0.72	3.19	3.2
16917_5225	24	349	0.0105	16917	5225	22.90	19.25	10,244	10,415	0.98	7.39	3.5
17007_17016	30	102	0.0000	17007	17016	4.78	4.77	11,964	1,291	9.27	5.43	3.0
17008_17007	30	145	0.0018	17008	17007	5.14	4.88	11,969	7,902	1.51	5.43	4.7
17009_17008	24	86	0.0225	17009	17008	7.18	5.24	11,960	15,269	0.78	8.47	0.0
17010_17009	27	88	0.0165	17010	17009	8.73	7.28	11,960	17,918	0.67	9.75	5.8
17011_17010	27	177	0.0033	17011	17010	9.41	8.83	11,960	7,974	1.50	6.70	5.6
17012_17011	27	173	0.0055	17012	17011	10.47	9.51	11,959	10,382	1.15	6.70	2.8
17013_17012	8	116	0.0162	17013	17012	12.45	10.57	1,763	692	2.55	11.23	8.7
17014_5203	20	410	0.0010	17014	5203	61.76	61.37	1,836	1,931	0.95	*1.87*	0.0
17016_5201	30	424	0.0052	17016	5201	4.67	2.47	12,002	13,298	0.90	5.44	3.5
17018_17012	24	39	0.0125	17018	17012	10.76	10.27	10,244	11,370	0.90	7.26	2.9
17107_17113	8	162	0.0040	17107	17113	168.66	168.01	118	344	0.34	*1.99*	4.4
17108_17107	8	409	0.0462	17108	17107	187.67	168.76	85	1,169	0.07	3.26	3.5
17109_17108	8	292	0.0356	17109	17108	198.15	187.77	76	1,026	0.07	3.83	4.9
17111_17117	8	325	0.0436	17111	17117	212.89	198.74	16	1,136	0.01	2.58	4.5
17112_17113	8	33	0.0940	17112	17113	171.15	168.01	46	1,667	0.03	3.71	12.0
17113_17116	8	322	0.0163	17113	17116	167.91	162.67	176	694	0.25	3.70	13.3
17116_13710	8	398	0.0158	17116	13710	162.57	156.29	208	683	0.30	*1.33*	8.3
17117_17112	8	384	0.0713	17117	17112	198.64	171.25	31	1,452	0.02	3.73	6.0

Bold cells = pipe at capacity / manholes surcharged within 2' of rim.

If a mh is surcharged and the pipe is not at capacity, this is a result of the model recognizing a downstream problem.

Italic = Velocity < 2 fps

Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
17208_13815	8	157	0.0311	17208	13815	193.03	188.13	431	960	0.45	*4.23*	8.8
17209_17208	8	340	0.0167	17209	17208	198.80	193.13	418	702	0.59	4.68	27.3
17210_17209	8	298	0.1682	17210	17209	248.95	198.90	389	2,230	0.17	7.77	9.5
17211_17210	8	344	0.1013	17211	17210	283.85	249.05	373	1,731	0.22	8.81	2.8
17212_17211	8	350	0.0601	17212	17211	304.95	283.95	357	1,333	0.27	7.21	4.2
17213_17212	8	158	0.1573	17213	17212	329.95	305.05	265	2,156	0.12	9.34	8.0
17214_17213	8	196	0.1690	17214	17213	363.12	330.05	16	2,236	0.01	3.62	5.0
17304_17306	8	135	0.1430	17304	17306	334.00	314.65	9	2,056	0.00	3.26	3.9
17306_17308	8	144	0.0571	17306	17308	314.55	306.30	13	1,300	0.01	2.67	2.9
17308_17309	8	85	0.0988	17308	17309	306.20	297.85	16	1,709	0.01	3.45	4.0
17309_17310	8	138	0.1490	17309	17310	297.75	277.15	19	2,099	0.01	4.21	4.0
17310_17311	8	343	0.1264	17310	17311	277.05	233.65	26	1,934	0.01	4.35	6.0
17311_17312	8	136	0.0124	17311	17312	233.55	231.86	39	606	0.06	2.17	8.7
17312_13902	8	331	0.1072	17312	13902	231.76	196.25	49	1,780	0.03	*0.31*	9.3
17321_17322	8	95	0.1561	17321	17322	328.95	314.05	61	2,149	0.03	6.05	4.9
17322_17323	8	263	0.0951	17322	17323	313.95	288.95	66	1,677	0.04	5.19	7.0
17323_13904	8	378	0.1782	17323	13904	288.85	221.50	76	2,296	0.03	6.74	6.4
17324_17321	8	170	0.1722	17324	17321	358.24	329.05	57	2,257	0.03	6.13	4.6
17325_17324	8	190	0.0574	17325	17324	369.24	358.34	52	1,303	0.04	4.05	7.8
17326_17325	8	116	0.1961	17326	17325	392.13	369.34	47	2,408	0.02	6.05	2.6
17327_17326	8	276	0.1181	17327	17326	424.80	392.23	40	1,869	0.02	4.80	5.1
17404_14003	8	356	0.1312	17404	14003	295.91	249.25	58	1,970	0.03	4.85	4.9
17405_17404	8	352	0.1254	17405	17404	340.18	296.01	33	1,925	0.02	4.65	5.0
17406_17405	8	298	0.0803	17406	17405	364.23	340.28	22	1,541	0.01	3.50	6.0
17410_17406	8	181	0.0062	17410	17406	365.47	364.33	13	430	0.03	*1.23*	5.9
17502_17109	8	201	0.0646	17502	17109	211.21	198.25	69	1,382	0.05	4.59	2.9
17601_17602	8	249	0.0436	17601	17602	421.76	410.91	30	1,135	0.03	3.12	4.0
17602_17603	8	343	0.0489	17602	17603	410.81	394.07	42	1,202	0.03	3.59	4.0
17603_17604	8	410	0.0888	17603	17604	393.97	357.54	58	1,621	0.04	4.87	4.4
17604_17605	8	172	0.0318	17604	17605	357.44	351.98	68	970	0.07	3.56	9.9
17605_17212	8	388	0.1207	17605	17212	351.88	305.05	78	1,889	0.04	4.78	5.5
17606_17213	8	384	0.1250	17606	17213	378.00	330.05	245	1,923	0.13	8.42	5.3
17607_17606	8	328	0.0937	17607	17606	408.89	378.10	241	1,665	0.14	7.56	6.1
17616_17607	8	202	0.1357	17616	17607	436.40	408.99	237	2,003	0.12	8.58	4.4
17703_18114	8	237	0.0619	17703	18114	135.74	121.05	23	1,353	0.02	3.26	4.9
17705_18118	8	410	0.0197	17705	18118	144.98	136.92	71	763	0.09	3.05	2.5
17706_17708	8	409	0.0025	17706	17708	152.57	151.55	60	272	0.22	*1.39*	4.2
17707_17705	8	250	0.0195	17707	17705	149.95	145.08	67	759	0.09	2.99	2.4
17708_17707	8	268	0.0052	17708	17707	151.45	150.05	65	393	0.17	*1.86*	5.6
17710_17703	8	193	0.0071	17710	17703	137.21	135.84	21	458	0.04	*1.48*	4.7
17711_17710	8	237	0.0082	17711	17710	139.25	137.31	18	492	0.04	*1.50*	3.2

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
17717_20508	8	362	0.0499	17717	20508	111.95	93.91	27	1,214	0.02	3.16	8.0
17720_15301	8	343	0.0162	17720	15301	137.63	132.06	38	693	0.05	2.28	2.1
17723_17720	8	332	0.0145	17723	17720	142.52	137.73	24	654	0.04	*1.98*	6.0
17802_17706	8	319	0.0059	17802	17706	154.56	152.67	57	418	0.14	*1.87*	8.9
17803_17802	8	243	0.0265	17803	17802	161.11	154.66	52	885	0.06	3.09	5.8
17804_17803	8	198	0.0092	17804	17803	163.04	161.21	49	523	0.09	2.09	6.8
17805_17804	8	365	0.0028	17805	17804	164.17	163.14	45	289	0.16	*1.34*	5.7
17812_14701	8	311	0.0110	17812	14701	167.40	163.98	7	571	0.01	*1.25*	4.5
17901_18107	8	386	0.0049	17901	18107	139.95	138.07	23	379	0.06	*1.34*	7.4
17902_17901	8	486	0.0383	17902	17901	158.67	140.05	16	1,064	0.02	2.49	3.3
18102_18111	10	317	0.0026	18102	18111	116.93	116.10	116	505	0.23	*1.67*	5.3
18103_18102	8	402	0.0033	18103	18102	118.35	117.03	109	311	0.35	*1.81*	4.6
18104_18103	8	62	0.0339	18104	18103	120.56	118.45	30	1,001	0.03	*1.91*	4.0
18105_18104	8	149	0.0307	18105	18104	125.25	120.66	29	953	0.03	2.74	3.6
18106_18105	8	158	0.0303	18106	18105	130.15	125.35	28	947	0.03	2.69	3.1
18107_18106	8	257	0.0300	18107	18106	137.97	130.25	27	942	0.03	2.64	6.2
18108_18103	8	392	0.0309	18108	18103	130.55	118.45	77	956	0.08	2.94	2.8
18110_18111	8	180	0.0221	18110	18111	120.12	116.15	28	808	0.04	2.11	7.2
18111_20604	10	197	0.0023	18111	20604	116.00	115.55	142	471	0.30	*1.68*	8.6
18114_18110	8	279	0.0026	18114	18110	120.95	120.22	26	278	0.09	*1.11*	6.4
18118_18108	8	322	0.0192	18118	18108	136.82	130.65	75	753	0.10	3.07	3.0
18302_10706	10	212	0.0125	18302	10706	127.45	124.80	258	1,103	0.23	2.27	14.8
18303_18302	8	292	0.0415	18303	18302	139.65	127.55	231	1,107	0.21	5.59	15.1
18304_18303	10	260	0.0046	18304	18303	140.95	139.75	192	670	0.29	2.36	13.7
18305_18304	10	86	0.0191	18305	18304	142.70	141.05	191	1,362	0.14	3.93	12.1
18306_18305	8	256	0.0049	18306	18305	144.05	142.80	85	380	0.22	*1.96*	5.7
18401_7303	8	450	0.0293	18401	7303	157.25	144.05	159	931	0.17	4.27	6.7
18403_7313	8	234	0.0194	18403	7313	174.98	170.44	112	757	0.15	3.45	8.7
18404_18403	10	306	0.0193	18404	18403	180.98	175.08	105	1,368	0.08	3.30	9.0
18405_18404	10	214	0.0018	18405	18404	181.46	181.08	96	418	0.23	*1.38*	8.1
18406_18405	10	202	0.0064	18406	18405	182.85	181.56	90	788	0.11	2.14	7.0
18407_18406	10	349	0.0161	18407	18406	188.58	182.95	85	1,252	0.07	2.91	8.5
18508_17214	8	177	0.1352	18508	17214	387.13	363.22	10	2,000	0.00	3.28	3.0
18511_18508	8	167	0.0864	18511	18508	401.61	387.23	5	1,598	0.00	2.30	6.0
18523_17616	8	118	0.1300	18523	17616	451.90	436.50	233	1,960	0.12	8.41	5.5
18524_18523	8	34	0.0234	18524	18523	452.80	452.00	231	831	0.28	4.54	4.5
18532_18524	8	144	0.0810	18532	18524	464.60	452.90	229	1,548	0.15	7.08	3.5
18533_18532	8	333	0.0411	18533	18532	478.40	464.70	224	1,103	0.20	5.52	8.3
18534_18533	8	173	0.0058	18534	18533	479.50	478.50	116	414	0.28	2.26	7.8
18535_18534	8	166	0.0114	18535	18534	481.50	479.60	110	581	0.19	2.85	10.8
18540_18554	8	246	0.0932	18540	18554	458.90	436.00	12	1,660	0.01	3.06	7.6

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
18543_17327	8	80	0.1194	18543	17327	434.40	424.90	31	1,879	0.02	4.48	5.0
18554_18543	8	188	0.0075	18554	18543	435.90	434.50	19	470	0.04	*1.47*	6.8
18701_18702	8	124	0.0064	18701	18702	324.20	323.40	48	436	0.11	*1.83*	7.3
18702_18703	8	161	0.0056	18702	18703	323.30	322.40	64	406	0.16	*1.88*	11.5
18703_18704	8	241	0.0131	18703	18704	322.30	319.15	67	622	0.11	2.59	9.3
18704_18709	8	361	0.0263	18704	18709	319.05	309.55	86	882	0.10	3.57	9.7
18706_18704	8	166	0.0863	18706	18704	333.55	319.20	15	1,598	0.01	3.19	9.5
18707_18706	8	84	0.0144	18707	18706	334.85	333.65	13	652	0.02	*1.66*	7.6
18709_18711	8	387	0.0115	18709	18711	309.45	305.00	93	583	0.16	2.71	12.6
18711_18712	8	185	0.1290	18711	18712	304.90	281.07	155	1,953	0.08	7.43	11.5
18712_7127	8	134	0.0862	18712	7127	280.97	269.40	297	1,597	0.19	7.78	11.8
18714_18711	8	329	0.1610	18714	18711	358.00	305.00	59	2,182	0.03	6.04	3.9
18716_18721	8	357	0.0298	18716	18721	346.55	335.90	9	939	0.01	*1.88*	8.9
18717_18716	8	164	0.0204	18717	18716	350.00	346.65	6	778	0.01	*1.44*	7.8
18721_18707	8	157	0.0054	18721	18707	335.80	334.95	12	401	0.03	*1.14*	12.1
18723_18724	8	69	0.0958	18723	18724	350.43	343.80	12	1,683	0.01	3.12	5.0
18724_18702	8	192	0.1057	18724	18702	343.70	323.40	14	1,768	0.01	2.80	6.0
18727_18723	8	177	0.1311	18727	18723	373.72	350.53	11	1,969	0.01	3.37	6.0
18728_18727	8	26	0.1231	18728	18727	377.00	373.82	6	1,908	0.00	2.76	4.3
18731_18714	8	335	0.0370	18731	18714	370.49	358.10	55	1,046	0.05	3.52	2.3
18732_18731	8	94	0.0107	18732	18731	371.59	370.59	39	562	0.07	2.06	2.2
18804_18731	8	232	0.0621	18804	18731	385.00	370.59	13	1,355	0.01	2.73	2.5
18806_18804	8	110	0.0444	18806	18804	390.00	385.10	9	1,147	0.01	2.20	4.0
18812_18815	8	293	0.0453	18812	18815	336.89	323.60	14	1,158	0.01	*1.65*	4.6
18815_18816	8	235	0.0128	18815	18816	323.55	320.55	70	615	0.11	2.61	6.3
18816_18817	8	234	0.0053	18816	18817	320.45	319.20	71	398	0.18	*1.92*	6.6
18817_FIRLS	8	179	0.0025	18817	FIRLS	319.10	318.65	71	273	0.26	*1.46*	2.2
18819_FIRLS	8	9	0.0785	18819	FIRLS	319.35	318.65	23	1,524	0.02	3.55	4.5
18820_18819	8	255	0.0084	18820	18819	321.59	319.45	14	498	0.03	*1.40*	6.0
18822_11801	8	145	0.0838	18822	11801	350.50	338.35	23	1,574	0.01	3.29	11.9
18823_18820	8	240	0.0741	18823	18820	339.50	321.69	6	1,481	0.00	2.31	7.1
18901_18902	8	214	0.0273	18901	18902	335.20	329.35	27	898	0.03	2.55	10.5
18902_18903	8	170	0.0061	18902	18903	329.25	328.22	32	424	0.08	*1.59*	7.1
18903_18904	8	306	0.0051	18903	18904	328.12	326.55	39	389	0.10	*1.59*	9.2
18904_18701	8	266	0.0081	18904	18701	326.45	324.30	46	489	0.09	*1.96*	11.4
18913_18901	8	158	0.0704	18913	18901	346.45	335.30	21	1,442	0.01	3.33	5.5
18914_18913	8	226	0.0064	18914	18913	348.00	346.55	18	436	0.04	*1.37*	11.1
18915_18914	8	302	0.0078	18915	18914	350.45	348.10	13	480	0.03	*1.31*	12.0
19010_19016	8	180	0.0356	19010	19016	334.00	327.60	30	1,027	0.03	2.92	5.9
19011_19020	8	189	0.0294	19011	19020	345.70	340.15	18	932	0.02	2.34	5.8
19012_19011	8	137	0.0157	19012	19011	347.95	345.80	14	680	0.02	*1.74*	4.0

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
19016_19017	8	235	0.0060	19016	19017	327.50	326.10	39	420	0.09	*1.67*	7.2
19017_18815	8	242	0.0097	19017	18815	326.00	323.65	48	536	0.09	2.11	11.4
19020_19010	8	151	0.0394	19020	19010	340.05	334.10	23	1,079	0.02	2.78	5.1
19101_18712	8	309	0.0048	19101	18712	282.54	281.07	139	375	0.37	2.21	5.8
19102_19101	8	160	0.0131	19102	19101	284.74	282.64	136	623	0.22	3.18	5.5
19106_19107	8	240	0.0196	19106	19107	320.25	315.55	107	761	0.14	3.42	7.1
19107_19108	8	295	0.0169	19107	19108	315.45	310.45	111	708	0.16	3.29	6.9
19108_19109	8	272	0.0266	19108	19109	310.35	303.10	117	887	0.13	3.92	7.0
19109_19110	8	246	0.0092	19109	19110	303.00	300.73	124	523	0.24	2.72	4.3
19110_19111	8	237	0.0156	19110	19111	300.63	296.94	129	679	0.19	3.32	6.8
19111_19102	8	198	0.0607	19111	19102	296.84	284.84	133	1,340	0.10	5.44	12.8
19119_19106	8	259	0.0525	19119	19106	333.95	320.35	57	1,246	0.05	4.04	10.7
19120_19119	8	295	0.0108	19120	19119	337.25	334.05	53	566	0.09	2.26	10.1
19126_18732	8	210	0.0213	19126	18732	376.16	371.69	37	793	0.05	2.59	3.8
19127_19126	8	167	0.0401	19127	19126	382.97	376.26	34	1,089	0.03	3.15	4.4
19128_19127	8	135	0.0151	19128	19127	385.10	383.07	30	668	0.05	2.16	3.4
19202_19128	8	186	0.0342	19202	19128	391.56	385.20	27	1,006	0.03	2.76	2.8
19203_19202	8	278	0.0314	19203	19202	400.40	391.66	21	964	0.02	2.51	3.9
19204_19203	8	268	0.0021	19204	19203	401.07	400.50	16	251	0.06	*0.89*	4.1
19205_19204	8	93	0.0242	19205	19204	403.43	401.17	10	846	0.01	*1.83*	3.0
19206_19205	8	159	0.0150	19206	19205	405.92	403.53	7	665	0.01	*1.40*	3.8
19213_18822	8	293	0.0379	19213	18822	361.70	350.60	18	1,058	0.02	2.56	18.1
19214_19213	8	178	0.0322	19214	19213	367.55	361.80	13	976	0.01	2.20	14.9
19216_19214	8	255	0.0108	19216	19214	370.40	367.65	7	564	0.01	*1.25*	18.1
19222_19303	8	410	0.0216	19222	19303	379.45	370.60	31	799	0.04	2.47	10.5
19223_19222	8	207	0.0203	19223	19222	383.75	379.55	26	774	0.03	2.28	7.6
19224_19225	8	153	0.0089	19224	19225	386.96	385.60	16	512	0.03	*1.47*	3.3
19225_19223	8	288	0.0057	19225	19223	385.50	383.85	21	412	0.05	*1.37*	6.9
19301_11802	8	399	0.0103	19301	11802	363.25	359.15	103	551	0.19	2.69	9.4
19302_19301	8	155	0.0119	19302	19301	365.20	363.35	96	593	0.16	2.78	6.3
19303_19302	8	181	0.0287	19303	19302	370.50	365.30	91	921	0.10	3.75	8.2
19304_19303	8	164	0.0615	19304	19303	380.25	370.20	55	1,348	0.04	*0.35*	8.6
19305_19304	8	181	0.0644	19305	19304	392.00	380.35	52	1,381	0.04	4.22	6.5
19306_19305	8	166	0.0543	19306	19305	401.10	392.10	49	1,267	0.04	3.91	8.1
19311_19306	8	239	0.0955	19311	19306	424.10	401.30	24	1,680	0.01	3.85	5.1
19312_19311	8	194	0.0046	19312	19311	425.10	424.20	21	371	0.06	*1.27*	8.1
19401_19402	18	34	0.0182	19401	19402	323.56	322.94	934	6,373	0.15	*1.17*	11.0
19402_11902	20	434	0.0038	19402	11902	322.84	321.20	1,194	3,851	0.31	3.47	11.5
19408_19409	15	267	0.0492	19408	19409	342.86	329.71	921	6,448	0.14	8.29	3.7
19409_19401	15	250	0.0238	19409	19401	329.61	323.66	927	4,483	0.21	6.41	7.5
19410_19402	10	104	0.0021	19410	19402	323.16	322.94	261	454	0.58	*1.69*	4.6

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
19411_19410	10	368	0.0029	19411	19410	324.32	323.26	259	529	0.49	2.15	5.3
19412_19411	10	215	0.0021	19412	19411	324.87	324.42	256	451	0.57	*1.90*	3.9
19413_19412	10	67	0.0052	19413	19412	325.32	324.97	254	711	0.36	2.58	4.9
19414_19408	15	90	0.0477	19414	19408	347.26	342.96	916	6,346	0.14	8.19	5.1
19415_19414	18	142	0.0056	19415	19414	348.16	347.36	914	3,544	0.26	3.74	11.4
19416_19415	18	116	0.0061	19416	19415	348.97	348.26	891	3,701	0.24	3.83	9.4
19417_19415	8	62	0.2105	19417	19415	361.37	348.26	22	2,495	0.01	*0.14*	9.0
19418_19417	8	318	0.1378	19418	19417	405.34	361.47	21	2,019	0.01	4.18	6.0
19419_19418	8	53	0.1085	19419	19418	411.20	405.44	16	1,792	0.01	3.58	4.8
19502_19503	8	292	0.0055	19502	19503	411.33	409.72	281	404	0.69	2.78	5.4
19503_19504	8	303	0.0122	19503	19504	409.62	405.92	296	601	0.49	3.82	4.3
19504_19505	8	226	0.0472	19504	19505	405.82	395.16	306	1,182	0.26	6.33	6.1
19505_19506	8	25	0.0632	19505	19506	395.06	393.45	311	1,367	0.23	7.06	8.8
19506_19507	8	372	0.0200	19506	19507	393.35	385.90	319	770	0.41	4.68	8.7
19507_12901	8	401	0.0187	19507	12901	385.80	378.30	334	743	0.45	4.62	7.7
19511_19512	8	414	0.0375	19511	19512	390.08	374.55	121	1,053	0.12	4.48	12.3
19512_12910	8	399	0.0273	19512	12910	374.45	363.55	130	899	0.14	4.09	8.7
19601_17601	8	303	0.1277	19601	17601	460.57	421.86	19	1,944	0.01	3.98	5.1
19805_13209	8	322	0.0603	19805	13209	372.15	352.75	65	1,336	0.05	4.41	5.5
19806_19805	8	485	0.0553	19806	19805	399.05	372.25	58	1,279	0.05	4.12	7.5
19906_13217	8	199	0.0885	19906	13217	397.71	380.13	1,031	1,618	0.64	9.70	8.6
20018_19906	8	243	0.0662	20018	19906	413.91	397.81	1,022	1,400	0.73	9.51	9.2
20107_13327	8	154	0.1042	20107	13327	386.00	369.97	1,004	1,756	0.57	11.19	6.0
20109_83273-12	10	324	0.0163	20109	83273-12	315.96	310.70	693	1,257	0.55	2.83	3.6
20401_83274-02	10	236	0.0036	20401	83274-02	318.14	317.29	679	592	1.15	2.77	1.8
20402_20401	8	225	0.0033	20402	20401	318.98	318.24	679	312	2.18	4.33	9.2
20403_20402	8	167	0.1065	20403	20402	336.86	319.08	661	1,774	0.37	4.49	1.9
20404_20403	8	167	0.0110	20404	20403	338.80	336.96	658	571	1.15	4.20	7.5
20413_LAKESIDELS	8	102	0.0823	20413	LAKESIDELS	319.48	311.10	9	1,560	0.01	*0.06*	6.9
20414_20413	8	58	0.0802	20414	20413	324.25	319.58	3	1,540	0.00	*1.98*	3.9
20501_82234-01	12	204	0.0027	20501	82234-01	84.07	83.53	166	826	0.20	*1.82*	11.2
20504_20505	12	508	0.0034	20504	20505	82.13	80.38	201	941	0.21	2.12	2.4
20505_82234-06	12	266	0.0100	20505	82234-06	80.28	77.62	201	1,604	0.13	3.10	1.5
20506_20702	12	355	0.0003	20506	20702	74.35	74.25	79	269	0.29	*0.66*	7.7
20507_20506	8	494	0.0168	20507	20506	82.75	74.45	70	705	0.10	*1.77*	7.9
20508_20507	8	373	0.0294	20508	20507	93.81	82.85	48	932	0.05	3.13	9.9
20602_20501	10	210	0.1413	20602	20501	113.88	84.17	166	3,707	0.04	5.22	4.5
20604_20602	10	536	0.0027	20604	20602	115.45	113.98	147	516	0.28	*1.82*	6.6
20702_15801	12	341	0.0003	20702	15801	74.15	74.05	84	275	0.31	*0.68*	5.5
20801_20802	8	268	0.0808	20801	20802	384.81	363.20	1,686	1,545	1.09	10.75	3.0
20802_20803	8	426	0.1171	20802	20803	363.10	313.14	1,706	1,861	0.92	10.88	13.4

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
20803_20804	8	224	0.0577	20803	20804	313.04	300.10	1,724	1,307	1.32	10.99	0.0
20804_20805	10	353	0.0227	20804	20805	300.00	292.00	1,739	1,485	1.17	7.10	0.0
20805_20819	10	115	0.0504	20805	20819	291.90	286.10	1,751	2,213	0.79	8.71	9.8
20819_12609	10	283	0.0362	20819	12609	286.00	275.75	1,758	1,877	0.94	8.71	6.1
20901_20902	8	354	0.0396	20901	20902	424.06	410.05	1,488	1,082	1.38	9.49	0.0
20902_20903	8	340	0.0396	20902	20903	409.95	396.47	1,518	1,082	1.40	9.68	0.0
20904_20903	8	314	0.0196	20903	20904	396.37	390.22	1,648	761	2.17	10.51	0.0
20904_20801	8	314	0.0166	20904	20801	390.12	384.91	1,667	701	2.38	10.63	0.0
21002_21003	8	255	0.0115	21002	21003	355.89	352.96	167	584	0.29	3.21	10.0
21003_21004	8	350	0.0204	21003	21004	352.86	345.73	176	776	0.23	4.00	9.6
21004_12802	8	367	0.0404	21004	12802	345.63	330.83	201	1,093	0.18	5.32	9.1
21005_21004	8	79	0.0228	21005	21004	347.53	345.73	20	821	0.02	*1.90*	10.4
21007_21005	8	168	0.1128	21007	21005	366.53	347.63	16	1,826	0.01	3.62	9.0
21013_25113	8	103	0.0108	21013	25113	374.01	372.90	142	564	0.25	3.00	9.6
21021_21022	8	124	0.0182	21021	21022	403.06	400.80	129	733	0.18	3.52	6.7
21022_21023	8	141	0.1293	21022	21023	400.70	382.50	133	1,955	0.07	7.12	3.2
21023_21013	8	127	0.0651	21023	21013	382.40	374.11	138	1,387	0.10	5.65	9.4
21025_21021	8	251	0.0048	21025	21021	404.37	403.16	117	378	0.31	2.13	10.4
21026_21025	8	164	0.0245	21026	21025	408.50	404.47	109	851	0.13	3.74	6.3
21107_21114	24	113	0.0017	21107	21114	84.63	84.44	6,037	4,175	1.45	4.25	5.4
21108_21107	24	314	0.0027	21108	21107	85.57	84.73	6,010	5,269	1.14	4.23	9.5
21110_21112	20	344	0.0050	21110	21112	87.74	86.00	5,954	4,448	1.34	6.04	9.1
21112_21108	20	26	0.0089	21112	21108	85.90	85.67	6,010	5,894	1.02	6.10	9.3
21114_21115	24	56	0.0012	21114	21115	84.34	84.27	6,049	3,594	1.68	4.26	3.4
21115_21116	24	58	0.0019	21115	21116	84.17	84.06	6,054	4,417	1.37	4.26	2.7
21116_21117	21	49	0.0085	21116	21117	83.96	83.54	6,087	6,571	0.93	5.94	3.8
21117_21118	21	203	0.0064	21117	21118	83.44	82.15	6,092	5,691	1.07	6.01	3.8
21118_21119	18	400	0.0203	21118	21119	82.05	73.95	6,109	6,731	0.91	7.65	4.1
21119_10507	21	409	0.0090	21119	10507	73.85	70.16	6,150	6,771	0.91	5.99	3.6
21201_21202	8	115	0.0098	21201	21202	101.40	100.28	424	537	0.79	3.32	0.1
21202_21203	8	245	0.0042	21202	21203	100.18	99.14	424	354	1.20	2.70	5.6
21203_21207	8	241	0.0037	21203	21207	99.04	98.16	424	330	1.29	2.70	0.0
21204_21110	20	344	0.0050	21204	21110	89.54	87.84	5,883	4,407	1.33	5.97	8.6
21205_21204	20	339	0.0051	21205	21204	91.37	89.64	5,827	4,469	1.30	5.92	4.7
21206_21205	18	280	0.0107	21206	21205	94.47	91.47	5,788	4,889	1.18	7.26	2.7
21207_21206	18	307	0.0100	21207	21206	97.65	94.57	5,749	4,739	1.21	7.22	0.3
21209_21207	21	373	0.0040	21209	21207	99.23	97.75	5,327	4,494	1.19	4.91	3.2
21301_21302	8	321	0.0267	21301	21302	113.07	104.50	285	888	0.32	3.54	6.7
21302_21303	8	384	0.0036	21302	21303	104.40	103.00	327	328	1.00	2.33	0.0
21303_21201	8	358	0.0039	21303	21201	102.90	101.50	382	340	1.12	2.46	0.0
21304_21305	8	113	0.0040	21304	21305	115.76	115.31	230	343	0.67	2.34	6.1

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
21305_21301	8	21	0.0961	21305	21301	115.21	113.17	230	1,686	0.14	*7.23*	5.1
21501_21502	10	154	0.0127	21501	21502	319.68	317.72	24	1,112	0.02	*1.84*	12.0
21502_83224-46	10	134	0.0334	21502	83224-46	317.62	313.14	26	1,801	0.01	*0.11*	12.0
21503_83224-20	8	167	0.0155	21503	83224-20	332.05	329.46	14	677	0.02	*1.71*	7.9
21507_21503	8	167	0.0404	21507	21503	338.88	332.15	8	1,093	0.01	2.01	7.0
21509_21531	10	40	0.1206	21509	21531	361.74	356.95	690	3,425	0.20	10.94	4.8
21510_21512	10	320	0.0317	21510	21512	325.00	314.86	697	1,756	0.40	6.76	8.3
21512_83224-46	21	232	0.0017	21512	83224-46	313.54	313.14	850	2,962	0.29	2.37	5.7
21513_21514	21	102	0.0016	21513	21514	314.28	314.12	152	2,829	0.05	*1.39*	2.3
21513_50515	18	321	0.0015	21513	50515	314.23	313.74	190	1,843	0.10	*1.50*	2.3
21514_21512	12	181	0.0021	21514	21512	314.02	313.64	153	734	0.21	*0.43*	3.0
21515_21513	18	180	0.0015	21515	21513	314.60	314.33	339	1,831	0.18	*1.76*	4.4
21516_21515	8	182	0.0324	21516	21515	320.57	314.70	13	978	0.01	*0.08*	8.0
21518_21516	8	204	0.0191	21518	21516	324.59	320.67	8	752	0.01	*1.57*	2.0
21519_21518	8	289	0.0867	21519	21518	349.73	324.69	6	1,601	0.00	2.46	3.3
21522_83224-10	10	119	0.0332	21522	83224-10	394.00	390.05	522	1,797	0.29	6.22	8.1
21531_21510	10	301	0.1053	21531	21510	356.85	325.10	693	3,200	0.22	9.55	6.0
21602_21515	18	149	0.0010	21602	21515	314.85	314.70	325	1,498	0.22	*1.51*	5.3
21607_21709	8	239	0.0927	21607	21709	353.15	331.02	69	1,656	0.04	5.20	6.8
21704_21602	18	274	0.0006	21704	21602	315.11	314.95	321	1,143	0.28	*1.24*	3.8
21705_21704	18	98	0.0003	21705	21704	315.24	315.21	318	826	0.39	*0.97*	3.6
21706_STA76-S01	18	73	0.0021	21706	STA76-S01	315.69	315.54	315	2,150	0.15	*1.74*	3.4
21707_21706	18	275	0.0004	21707	21706	315.90	315.79	313	923	0.34	*1.05*	12.5
21708_21707	18	73	0.0012	21708	21707	316.09	316.00	311	1,661	0.19	*1.26*	16.0
21709_21708	8	101	0.1462	21709	21708	330.92	316.21	71	2,079	0.03	*0.45*	4.1
21801_19106	8	225	0.0238	21801	19106	325.70	320.35	46	838	0.05	2.86	15.9
21802_21801	8	212	0.0272	21802	21801	331.58	325.80	41	897	0.05	2.90	15.9
21803_21802	8	214	0.0564	21803	21802	343.73	331.68	37	1,291	0.03	3.64	12.9
21804_21803	8	287	0.0104	21804	21803	346.81	343.83	13	554	0.02	*1.47*	14.1
21809_21810	8	137	0.0462	21809	21810	375.00	368.68	7	1,169	0.01	2.04	7.5
21810_21811	8	96	0.0216	21810	21811	368.58	366.52	8	799	0.01	*1.67*	13.9
21811_21804	8	78	0.2499	21811	21804	366.42	346.91	10	2,718	0.00	4.10	11.0
21814_21803	8	136	0.1405	21814	21803	363.00	343.83	21	2,038	0.01	4.22	9.5
21815_21814	8	125	0.0557	21815	21814	370.06	363.10	20	1,283	0.02	2.99	7.0
21823_21815	8	278	0.1100	21823	21815	400.76	370.16	17	1,804	0.01	3.63	5.0
21827_21823	8	226	0.0719	21827	21823	417.10	400.86	13	1,458	0.01	2.89	4.5
21829_83212-12	8	197	0.1008	21829	83212-12	361.90	342.00	44	1,727	0.03	4.69	5.4
21830_21829	8	141	0.1053	21830	21829	376.90	362.00	40	1,765	0.02	4.62	10.0
21834_21909	8	238	0.0055	21834	21909	423.30	422.00	1	402	0.00	*0.59*	8.0
21835_21827	8	172	0.0157	21835	21827	419.91	417.20	10	681	0.01	*1.55*	11.6
21836_21835	8	307	0.0388	21836	21835	431.90	420.01	8	1,071	0.01	*1.98*	10.4

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
21906_21830	8	186	0.1042	21906	21830	396.40	377.00	37	1,756	0.02	4.50	16.0
21907_21906	8	162	0.0765	21907	21906	408.90	396.50	35	1,504	0.02	3.96	8.1
21908_21907	8	189	0.0476	21908	21907	418.00	409.00	27	1,186	0.02	3.11	9.4
21909_21907	8	223	0.0523	21909	21907	421.90	410.25	6	1,244	0.00	*1.99*	6.6
21917_21918	8	178	0.0192	21917	21918	402.13	398.72	3	753	0.00	*1.13*	9.8
21918_21919	8	161	0.0122	21918	21919	398.62	396.65	8	602	0.01	*1.36*	6.3
21919_19224	8	214	0.0443	21919	19224	396.55	387.06	12	1,145	0.01	2.39	10.2
21925_21908	8	273	0.0755	21925	21908	438.70	418.10	24	1,494	0.02	3.51	3.4
22001_19306	8	326	0.1159	22001	19306	438.95	401.20	22	1,852	0.01	3.98	8.8
22003_22001	8	185	0.1232	22003	22001	461.80	439.05	17	1,909	0.01	3.75	2.6
22101_22102	15	133	0.0008	22101	22102	318.10	318.00	137	798	0.17	*1.08*	3.1
22102_22103	15	138	0.0009	22102	22103	317.90	317.78	140	858	0.16	*1.14*	4.0
22103_22104	15	186	0.0016	22103	22104	317.68	317.38	140	1,176	0.12	*1.43*	5.1
22104_22105	15	315	0.0013	22104	22105	317.28	316.86	141	1,055	0.13	*1.33*	2.5
22105_22106	15	174	0.0011	22105	22106	316.76	316.57	144	960	0.15	*1.20*	2.7
22106_21708	18	159	0.0025	22106	21708	316.58	316.19	241	2,360	0.10	*1.79*	23.1
22107_22106	8	115	0.1214	22107	22106	330.69	316.68	97	1,895	0.05	*0.62*	15.7
22109_83222-01	8	330	0.0056	22109	83222-01	335.94	334.11	24	405	0.06	*1.42*	2.9
22110_22109	8	331	0.0060	22110	22109	338.04	336.04	4	423	0.01	*0.82*	2.3
22111_22109	8	214	0.0962	22111	22109	356.67	336.04	18	1,687	0.01	3.54	7.0
22112_22111	8	295	0.1360	22112	22111	396.95	356.77	15	2,005	0.01	3.78	9.2
22114_83221-20	8	283	0.0471	22114	83221-20	357.01	343.70	41	1,180	0.04	3.53	2.8
22201_22202	15	428	0.0014	22201	22202	313.36	312.77	105	1,079	0.10	*1.24*	13.6
22202_22203	15	204	0.0016	22202	22203	312.67	312.35	113	1,151	0.10	*1.32*	19.0
22203_22204	15	262	0.0014	22203	22204	312.25	311.89	114	1,084	0.10	*1.27*	3.0
22204_22205	15	172	0.0013	22204	22205	311.79	311.57	114	1,028	0.11	*1.23*	2.2
22205_22206	15	104	0.0012	22205	22206	311.47	311.35	115	987	0.12	*1.19*	3.6
22206_22207	15	225	0.0015	22206	22207	311.25	310.91	135	1,131	0.12	*1.38*	9.5
22207_SILVERBEACH	15	207	0.0009	22207	SILVERBEACH	310.81	310.63	137	856	0.16	*1.13*	7.0
22208_22206	8	153	0.1227	22208	22206	330.45	311.67	18	1,905	0.01	3.81	3.3
22209_22208	8	220	0.1328	22209	22208	359.80	330.55	15	1,982	0.01	3.74	5.2
22210_22209	8	309	0.0968	22210	22209	389.80	359.90	11	1,692	0.01	3.00	5.0
22301_22302	15	239	0.0015	22301	22302	315.77	315.42	74	1,113	0.07	*1.15*	14.0
22302_22303	15	352	0.0013	22302	22303	315.32	314.87	81	1,040	0.08	*1.12*	13.1
22303_22304	15	398	0.0014	22303	22304	314.77	314.23	86	1,071	0.08	*1.16*	8.8
22304_22201	15	496	0.0013	22304	22201	314.13	313.46	94	1,068	0.09	*1.19*	4.5
22401_21209	18	177	0.0128	22401	21209	101.60	99.33	5,325	5,346	1.00	6.69	1.5
22402_82131-02	8	10	0.0147	22402	82131-02	104.05	103.91	1,167	660	1.77	7.45	0.0
22403_22402	8	49	0.0051	22403	22402	104.40	104.15	1,167	390	2.99	7.45	0.0
22404_22403	8	431	0.0079	22404	22403	107.90	104.50	647	483	1.34	4.11	0.0
22405_22404	8	250	0.0103	22405	22404	110.58	108.00	639	553	1.16	4.08	0.1

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22406_22405	8	280	0.0118	22406	22405	114.00	110.68	637	592	1.08	4.27	0.0
22406_83184-28	10	45	0.0285	22406	83184-28	114.34	113.06	1,674	1,664	1.01	6.83	0.0
22408_82131-02	18	569	0.0070	22408	82131-02	107.85	103.87	4,121	3,951	1.04	5.17	3.1
22409_22408	18	338	0.0127	22409	22408	112.25	107.95	4,084	5,332	0.77	5.82	0.0
22410_83184-28	18	297	0.0181	22410	83184-28	118.45	113.06	2,393	6,365	0.38	4.57	3.4
22503_U0069-S06	8	275	0.0236	22503	U0069-S06	148.92	142.42	98	836	0.12	3.57	6.5
22504_22503	8	254	0.0151	22504	22503	152.87	149.02	97	669	0.15	3.04	10.0
22602_U0005-S02	8	157	0.0453	22602	U0005-S02	538.00	530.89	149	1,157	0.13	3.20	7.1
22605_22606	8	380	0.0863	22605	22606	485.00	452.25	1,414	1,597	0.89	10.24	11.5
22606_20901	8	263	0.1062	22606	20901	452.15	424.16	1,454	1,772	0.82	9.28	9.7
22704_22706	8	181	0.0160	22704	22706	585.00	582.10	114	688	0.17	3.25	6.0
22706_22707	8	132	0.0372	22706	22707	582.00	577.10	117	1,049	0.11	4.42	4.2
22707_22708	8	70	0.0207	22707	22708	577.00	575.56	119	783	0.15	3.61	8.3
22708_22709	8	237	0.0606	22708	22709	575.46	561.10	125	1,339	0.09	5.35	7.3
22709_22712	8	129	0.1082	22709	22712	561.00	547.00	129	1,789	0.07	6.63	1.9
22712_22713	8	279	0.0136	22712	22713	546.90	543.10	135	635	0.21	3.22	6.2
22713_22602	8	187	0.0261	22713	22602	543.00	538.10	143	879	0.16	4.13	6.8
23004_22704	8	296	0.0605	23004	22704	602.99	585.10	99	1,338	0.07	5.00	6.4
23201_22406	8	363	0.0110	23201	22406	118.10	114.10	2,200	571	3.86	14.02	0.0
23202_23201	8	341	0.0170	23202	23201	124.00	118.20	2,196	710	3.09	13.99	0.0
23203_23202	14	280	0.0162	23203	23202	128.65	124.10	2,196	3,081	0.71	4.57	1.0
23205_83073-02	8	279	0.0140	23205	83073-02	134.00	130.10	1,341	643	2.09	8.56	0.0
23206_23205	8	283	0.0099	23206	23205	136.90	134.10	1,329	541	2.46	8.48	0.0
23207_23210	15	178	0.0041	23207	23210	124.27	123.55	2,374	1,851	1.28	4.30	8.6
23208_23207	15	369	0.0024	23208	23207	125.27	124.37	2,374	1,436	1.65	4.30	2.9
23209_23208	12	289	0.0152	23209	23208	129.77	125.37	2,373	1,979	1.20	6.71	0.0
23210_22410	18	428	0.0115	23210	22410	123.45	118.55	2,380	5,060	0.47	6.28	7.4
23301_23206	8	257	0.0026	23301	23206	137.68	137.00	1,296	280	4.63	8.27	0.0
23302_23303	8	372	0.0213	23302	23303	146.70	138.80	1,274	793	1.61	8.13	0.1
23303_23301	8	85	0.0108	23303	23301	138.70	137.78	1,286	565	2.28	8.21	0.0
23304_23302	12	109	0.0905	23304	23302	156.70	146.80	1,261	4,822	0.26	7.10	0.0
23305_23304	12	193	0.0156	23305	23304	159.81	156.80	1,253	2,003	0.63	5.68	2.4
23306_23305	12	323	0.0064	23306	23305	161.98	159.91	1,239	1,283	0.97	4.09	0.0
23308_23306	12	190	0.0040	23308	23306	162.84	162.08	1,226	1,014	1.21	3.48	9.4
23309_23308	10	191	0.0357	23309	23308	169.77	162.94	1,217	1,863	0.65	4.97	7.3
23402_15207	8	329	0.0285	23402	15207	142.67	133.32	77	917	0.08	2.71	4.9
23403_23402	8	27	0.0935	23403	23402	145.27	142.77	72	1,662	0.04	5.30	3.2
23504_23505	8	357	0.0025	23504	23505	152.44	151.55	29	271	0.11	*1.13*	4.0
23505_23403	8	169	0.0360	23505	23403	151.45	145.37	55	1,032	0.05	3.50	3.1
23601_23602	12	432	0.0096	23601	23602	164.28	160.13	907	1,571	0.58	4.61	15.2
23602_82141-03	10	279	0.0444	23602	82141-03	160.03	147.62	947	2,078	0.46	8.22	10.2

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23603_23604	10	399	0.0210	23603	23604	143.98	135.58	970	1,430	0.68	3.94	13.0
23604_14806	10	252	0.0033	23604	14806	135.48	134.65	982	566	1.74	3.99	0.0
23701_23703	12	328	0.0003	23701	23703	165.91	165.82	898	266	3.38	2.52	8.5
23702_23701	12	362	0.0144	23702	23701	171.24	166.01	896	1,927	0.47	2.52	7.1
23703_23704	12	283	0.0024	23703	23704	165.72	165.04	901	786	1.15	2.53	7.5
23704_23601	12	343	0.0016	23704	23601	164.94	164.38	906	650	1.39	2.55	12.4
23802_23803	12	311	0.0010	23802	23803	157.10	156.80	884	498	1.77	2.48	8.7
23803_WMAPLEWOODLS	12	25	0.0059	23803	WMAPLEWOODL	156.70	156.55	895	1,230	0.73	3.80	13.6
23901_23902	12	405	0.0017	23901	23902	158.50	157.80	833	666	1.25	2.34	7.2
23902_23802	12	388	0.0013	23902	23802	157.70	157.20	836	576	1.45	2.34	5.4
24001_24004	12	332	0.0012	24001	24004	159.95	159.55	826	556	1.48	2.33	0.0
24002_23901	12	313	0.0016	24002	23901	159.10	158.60	831	641	1.30	2.34	0.2
24004_24002	12	84	0.0030	24004	24002	159.45	159.20	828	874	0.95	2.40	0.5
24101_24103	8	186	0.0260	24101	24103	150.20	145.36	85	877	0.10	3.55	9.7
24102_24101	8	421	0.0021	24102	24101	151.20	150.30	0	251	0.00	*0.26*	8.8
24103_18306	8	182	0.0061	24103	18306	145.26	144.15	85	423	0.20	2.11	9.7
24201_24202	8	372	0.0003	24201	24202	3.40	3.30	0	89	0.00	0.00	8.9
24202_HILTONLS	15	16	0.0062	24202	HILTONLS	3.20	3.10	612	2,281	0.27	3.51	13.9
24203_24202	10	38	0.0208	24203	24202	4.09	3.30	612	1,423	0.43	5.60	13.0
24206_2806	36	225	0.0002	24206	2806	11.69	11.64	13,058	4,474	2.92	4.10	0.7
24207_24206	36	292	0.0003	24207	24206	11.87	11.79	13,060	4,966	2.63	4.11	0.1
24308_24312	21	468	0.0022	24308	24312	2.45	1.41	36	3,361	0.01	*0.03*	7.9
24310_24311	8	107	0.0009	24310	24311	1.70	1.60	197	166	1.19	*1.25*	7.8
24311_24312	12	263	0.0003	24311	24312	1.50	1.41	219	297	0.74	*0.62*	7.9
24312_5212	21	367	0.0003	24312	5212	1.31	1.20	282	1,234	0.23	*0.26*	7.8
24403_24310	12	152	0.0007	24403	24310	1.90	1.80	197	411	0.48	*0.56*	7.7
24501_24516	8	315	0.0321	24501	24516	424.07	413.95	166	975	0.17	4.38	6.4
24502_24503	8	199	0.0221	24502	24503	447.12	442.73	13	808	0.02	*1.93*	3.0
24503_24514	8	119	0.0374	24503	24514	442.63	438.17	16	1,052	0.02	2.46	6.9
24504_24502	8	284	0.0457	24504	24502	460.21	447.22	10	1,162	0.01	2.28	3.1
24507_24508	8	174	0.0450	24507	24508	454.00	446.16	39	1,154	0.03	3.42	4.3
24508_24510	8	160	0.0425	24508	24510	438.90	432.10	133	1,121	0.12	4.81	10.1
24510_24511	8	68	0.0428	24510	24511	432.00	429.10	134	1,125	0.12	4.83	3.6
24511_24512	8	168	0.0194	24511	24512	429.00	425.75	136	757	0.18	3.66	7.7
24512_24513	8	77	0.0325	24512	24513	425.65	423.15	139	981	0.14	4.43	2.2
24513_24517	8	284	0.0179	24513	24517	423.05	417.95	156	728	0.21	3.58	2.8
24514_24513	8	133	0.1121	24514	24513	438.07	423.15	18	1,821	0.01	3.06	4.1
24515_21522	10	427	0.0306	24515	21522	407.17	394.10	516	1,725	0.30	6.15	10.0
24516_24521	10	149	0.0380	24516	24521	413.85	408.18	504	1,922	0.26	6.61	10.7
24517_24516	10	305	0.0128	24517	24516	417.85	413.95	346	1,115	0.31	4.02	4.3
24518_24517	10	334	0.0086	24518	24517	420.81	417.95	191	912	0.21	2.95	4.8

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
24519_24518	10	203	0.0086	24519	24518	422.66	420.91	191	916	0.21	2.95	16.0
24521_24515	10	43	0.0186	24521	24515	408.08	407.27	508	1,346	0.38	5.11	13.5
24601_24602	8	197	0.0268	24601	24602	484.01	478.71	42	891	0.05	2.91	7.0
24602_24603	8	327	0.0154	24602	24603	478.61	473.58	49	675	0.07	2.44	3.8
24603_24609	8	227	0.0131	24603	24609	473.48	470.51	147	621	0.24	3.25	6.3
24604_24603	8	398	0.0747	24604	24603	503.30	473.58	94	1,486	0.06	5.17	8.3
24606_24616	8	310	0.0232	24606	24616	510.92	503.73	7	829	0.01	*1.61*	4.0
24609_24610	8	300	0.0879	24609	24610	470.41	444.07	152	1,612	0.09	6.46	8.2
24610_24501	8	422	0.0469	24610	24501	443.97	424.17	159	1,178	0.13	5.24	3.4
24612_24504	8	242	0.1075	24612	24504	486.35	460.31	6	1,782	0.00	2.57	4.0
24616_24920	8	359	0.0078	24616	24920	503.63	500.83	14	481	0.03	*1.36*	3.8
24707_24708	8	378	0.0594	24707	24708	518.63	496.15	13	1,326	0.01	2.68	3.0
24708_24601	8	270	0.0442	24708	24601	496.05	484.11	38	1,144	0.03	3.37	10.0
24709_24708	8	255	0.0299	24709	24708	503.77	496.15	21	940	0.02	2.46	8.0
24710_24709	8	225	0.0929	24710	24709	524.74	503.87	16	1,657	0.01	3.35	6.1
24713_24811	8	365	0.0354	24713	24811	531.46	518.53	15	1,024	0.01	2.12	9.0
24803_24810	8	308	0.0191	24803	24810	532.45	526.57	26	752	0.03	2.25	10.0
24808_24809	8	270	0.0100	24808	24809	460.40	457.71	30	543	0.06	*1.86*	10.9
24809_24816	8	179	0.0043	24809	24816	457.61	456.84	38	357	0.11	*1.48*	8.1
24810_83153-13	8	51	0.0148	24810	83153-13	526.47	525.71	38	662	0.06	2.30	5.9
24811_24901	8	387	0.0014	24811	24901	518.38	517.85	73	202	0.36	*1.18*	8.8
24816_25401	8	181	0.0042	24816	25401	456.74	455.98	44	353	0.13	*1.54*	9.2
24901_83153-15	8	336	0.0399	24901	83153-15	517.75	504.34	81	1,087	0.07	4.07	6.9
24905_24906	8	150	0.0393	24905	24906	486.90	481.00	16	1,079	0.02	2.51	9.6
24906_24908	8	116	0.0508	24906	24908	480.90	475.00	22	1,226	0.02	2.98	10.5
24908_24909	8	171	0.0228	24908	24909	474.90	471.00	26	821	0.03	2.39	13.0
24909_25402	8	251	0.0615	24909	25402	470.90	455.50	33	1,348	0.02	2.98	6.5
24912_24926	8	270	0.0219	24912	24926	494.90	489.00	16	804	0.02	2.04	7.5
24920_24921	8	103	0.0563	24920	24921	500.73	494.93	20	1,291	0.02	3.01	9.7
24921_24922	8	102	0.1800	24921	24922	494.83	476.47	22	2,307	0.01	4.67	7.1
24922_24923	8	152	0.0393	24922	24923	476.37	470.40	26	1,078	0.02	2.89	12.9
24923_24507	8	337	0.0480	24923	24507	470.30	454.10	34	1,192	0.03	3.35	12.1
24924_25006	8	272	0.0290	24924	25006	470.54	462.64	49	927	0.05	3.13	4.5
24925_24924	8	193	0.0083	24925	24924	472.24	470.64	35	496	0.07	*1.83*	4.1
24926_24925	8	187	0.0886	24926	24925	488.90	472.34	27	1,619	0.02	3.89	3.5
25006_25008	8	214	0.0373	25006	25008	462.54	454.57	65	1,050	0.06	3.71	4.8
25008_25009	8	322	0.0074	25008	25009	454.47	452.10	92	467	0.20	2.32	7.1
25009_25010	8	327	0.0089	25009	25010	452.00	449.10	93	512	0.18	2.48	7.8
25010_25011	8	323	0.0256	25010	25011	449.00	440.73	94	871	0.11	3.63	5.9
25011_24508	8	194	0.0084	25011	24508	440.63	439.00	94	499	0.19	2.44	16.2
25014_24519	10	89	0.0061	25014	24519	423.30	422.76	190	767	0.25	2.60	13.4

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
25018_25008	10	24	0.1018	25018	25008	457.04	454.57	27	3,145	0.01	2.79	5.0
25103_25105	12	231	0.0041	25103	25105	343.05	342.10	87	1,027	0.09	*1.78*	19.8
25105_25106	12	102	0.0971	25105	25106	342.00	332.10	96	4,996	0.02	5.55	8.7
25106_12703	12	337	0.0473	25106	12703	332.00	316.05	104	3,488	0.03	4.42	5.4
25111_25114	8	252	0.0133	25111	25114	360.40	357.05	155	627	0.25	3.32	6.9
25112_25111	8	81	0.1454	25112	25111	372.33	360.50	149	2,074	0.07	7.34	3.1
25113_25112	8	68	0.0054	25113	25112	372.80	372.43	145	400	0.36	2.35	9.6
25114_21002	8	117	0.0082	25114	21002	356.95	355.99	160	492	0.33	2.81	6.6
25202_21607	8	129	0.0247	25202	21607	356.44	353.25	65	855	0.08	3.22	7.7
25401_25402	8	219	0.0040	25401	25402	455.88	455.00	50	345	0.14	*0.32*	7.2
25402_25403	8	325	0.0055	25402	25403	455.40	453.60	87	405	0.21	2.06	6.9
25403_83153-25	8	48	0.1119	25403	83153-25	453.50	448.10	99	1,819	0.05	6.20	3.9
25601_22403	8	386	0.0087	25601	22403	107.79	104.45	554	506	1.09	3.53	4.3
25602_25601	8	246	0.0052	25602	25601	109.16	107.89	547	390	1.40	3.49	0.0
25701_25014	10	402	0.0030	25701	25014	424.61	423.40	190	540	0.35	2.01	2.6
25702_25701	10	340	0.0210	25702	25701	432.05	424.91	77	1,428	0.05	3.11	5.3
25703_25702	10	181	0.0287	25703	25702	437.35	432.15	70	1,672	0.04	3.37	9.1
25704_25703	10	364	0.0551	25704	25703	457.50	437.45	64	2,314	0.03	4.12	5.2
25705_25704	8	149	0.0258	25705	25704	461.40	457.55	29	873	0.03	2.56	6.0
25706_25705	8	335	0.0013	25706	25705	461.95	461.50	26	199	0.13	*0.88*	9.9
25707_25708	8	265	0.0588	25707	25708	510.10	494.50	9	1,319	0.01	2.38	8.8
25708_25709	8	317	0.0881	25708	25709	494.40	466.50	12	1,615	0.01	3.00	5.7
25709_25704	8	195	0.0452	25709	25704	466.40	457.60	33	1,156	0.03	3.25	9.7
25710_25709	8	112	0.0343	25710	25709	470.40	466.55	20	1,007	0.02	2.53	7.1
25711_25710	8	362	0.0510	25711	25710	488.96	470.50	18	1,228	0.01	2.83	4.7
25712_25701	10	398	0.0371	25712	25701	439.48	424.71	120	1,899	0.06	3.12	10.0
25803_25711	8	275	0.0804	25803	25711	511.19	489.06	10	1,542	0.01	2.79	9.8
25901_25706	8	291	0.0351	25901	25706	472.25	462.05	21	1,018	0.02	2.60	8.1
25902_25901	10	303	0.0299	25902	25901	481.40	472.35	14	1,705	0.01	2.12	9.5
26101_14601	8	199	0.0976	26101	14601	237.95	218.54	331	1,699	0.19	8.41	5.8
26102_26101	8	142	0.2126	26102	26101	268.20	238.05	313	2,508	0.12	10.92	6.9
26103_26102	8	190	0.0273	26103	26102	273.49	268.30	236	899	0.26	4.83	3.9
26306_U0102-S03	8	369	0.0047	26306	U0102-S03	145.37	143.63	90	373	0.24	*1.96*	7.8
26308_MITCHELLLS	8	309	0.0272	26308	MITCHELLLS	143.62	135.20	712	897	0.79	4.51	9.0
26309_26308	10	356	0.0105	26309	26308	147.45	143.72	710	1,010	0.70	4.46	4.5
26310_26309	10	164	0.0035	26310	26309	148.13	147.55	680	585	1.16	2.76	3.0
26402_26310	10	267	0.0008	26402	26310	148.45	148.23	678	285	2.38	2.76	4.5
26403_26402	10	320	0.0002	26403	26402	148.61	148.55	669	130	5.13	2.73	1.7
26404_26403	10	151	0.0057	26404	26403	149.56	148.71	669	742	0.90	2.73	2.9
26606_26607	8	251	0.0234	26606	26607	166.40	160.52	82	833	0.10	3.38	9.0
26607_22504	8	491	0.0152	26607	22504	160.42	152.97	89	670	0.13	2.97	9.1

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26703_26706	15	101	0.0048	26703	26706	6.08	5.60	360	2,005	0.18	2.75	9.2
26704_26703	15	223	0.0011	26704	26703	6.42	6.18	360	955	0.38	*1.61*	8.4
26706_POSTPOINT_WW	15	68	0.0030	26706	POSTPOINT_WW	5.50	5.30	360	1,580	0.23	*1.97*	9.1
26708_POSTPOINT_WW	8	566	0.0143	26708	POSTPOINT_WW	13.40	5.30	167	650	0.26	*1.07*	6.5
26709_26704	24	509	0.0034	26709	26704	8.27	6.52	360	5,969	0.06	*1.56*	5.5
26806_26709	24	531	0.0023	26806	26709	9.60	8.37	274	4,902	0.06	*1.87*	4.5
26807_26708	30	550	0.0031	26807	26708	15.20	13.50	89	10,264	0.01	*1.43*	7.1
26808_72022-01	15	108	0.0439	26808	72022-01	20.99	16.25	7	6,090	0.00	*1.80*	5.9
26901_30137	60	373	0.0175	26901	30137	37.43	30.89	50,832	155,271	0.33	5.75	6.0
26902_26807	30	552	0.0041	26902	26807	17.56	15.30	42	11,811	0.00	*1.25*	7.3
26903_26806	24	520	0.0043	26903	26806	11.95	9.70	247	6,700	0.04	2.26	2.4
26904_26903	24	328	0.0067	26904	26903	14.25	12.05	208	8,322	0.03	2.50	12.5
26905_26904	24	52	0.0656	26905	26904	17.78	14.35	208	26,080	0.01	5.54	9.2
26907_26902	30	218	0.0174	26907	26902	21.45	17.66	42	24,337	0.00	2.07	11.0
26908_26907	24	344	0.0010	26908	26907	21.89	21.55	22	3,201	0.01	*0.65*	2.5
26910_26901	60	718	0.0012	26910	26901	38.40	37.53	50,804	40,789	1.25	5.75	32.2
26911_26910	24	170	0.0053	26911	26910	54.02	53.12	6,413	7,406	0.87	5.91	3.1
26915_T72013-02	8	24	0.2837	26915	T72013-02	45.88	39.10	97	2,896	0.03	*0.62*	10.8
26917_T72013-01	18	29	0.3319	26917	T72013-01	48.91	39.40	119	27,234	0.00	*0.15*	10.0
26918_26917	18	232	0.0745	26918	26917	66.30	49.01	119	12,902	0.01	5.09	6.9
26920_26905	18	237	0.0473	26920	26905	29.07	17.88	0	10,279	0.00	0.00	15.7
26921_TCONNECTION	15	65	0.0025	26921	JMMYTCONNEC	39.67	39.51	543	1,439	0.38	*0.99*	4.0
26922_26921	15	199	0.0536	26922	26921	50.47	39.77	534	6,733	0.08	*0.97*	13.7
26923_26905	15	229	0.0341	26923	26905	24.45	16.64	189	5,370	0.04	*0.34*	5.1
26924_T72013-01	60	271	0.0004	26924	JMMYTCONNEC	39.62	39.51	44,522	23,614	1.89	5.02	1.9
27001_SE680-S03	15	143	0.0178	27001	SE680-S03	30.40	27.85	158	3,883	0.04	3.45	14.4
27002_26924	60	390	0.0019	27002	26924	40.45	39.72	44,523	50,713	0.88	5.02	4.5
27003_27002	60	154	0.0024	27003	27002	40.92	40.55	44,523	57,248	0.78	5.03	10.4
27005_27001	15	331	0.0057	27005	27001	32.40	30.50	158	2,202	0.07	2.32	19.8
27006_27005	15	216	0.0025	27006	27005	33.03	32.50	139	1,441	0.10	*1.65*	14.2
27007_27006	15	243	0.0045	27007	27006	34.23	33.13	104	1,956	0.05	*1.88*	27.2
27008_27007	15	171	0.0142	27008	27007	36.76	34.33	82	3,470	0.02	2.62	15.4
27009_27003	60	732	0.0028	27009	27003	43.07	41.02	44,512	62,030	0.72	5.86	4.2
27010_27008	15	248	0.0097	27010	27008	39.28	36.86	66	2,866	0.02	2.15	10.1
27101_27010	15	288	0.0092	27101	27010	42.03	39.38	44	2,788	0.02	*1.86*	8.7
27102_27101	15	360	0.0044	27102	27101	43.71	42.13	14	1,928	0.01	*1.03*	5.2
27104_27118	60	288	0.0090	27104	27118	46.90	44.30	44,501	111,235	0.40	5.04	4.8
27105_27104	18	15	0.0541	27105	27104	47.79	47.00	87	10,994	0.01	*0.11*	3.1
27106_27102	10	307	0.0037	27106	27102	44.94	43.81	0	599	0.00	0.00	7.1
27107_27105	18	199	0.0070	27107	27105	49.28	47.89	87	3,944	0.02	*1.12*	11.9
27108_27107	12	11	0.0715	27108	27107	50.15	49.38	81	4,288	0.02	4.74	12.5

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27109_27108	12	262	0.0119	27109	27108	53.36	50.25	78	1,746	0.04	2.49	17.9
27112_27109	8	45	0.1980	27112	27109	62.35	53.46	2	2,419	0.00	2.10	10.5
27115_27104	48	378	0.0190	27115	27104	54.18	47.00	44,426	89,124	0.50	9.62	10.3
27118_27009	60	946	0.0011	27118	27009	44.20	43.17	44,513	38,670	1.15	5.02	1.5
27201_27907	12	299	0.0000	27201	27907	55.89	55.89	64	59	1.09	*0.19*	13.0
27202_27201	12	240	0.0053	27202	27201	57.26	55.99	21	1,163	0.02	*0.06*	12.0
27203_27202	12	237	0.0149	27203	27202	60.89	57.36	13	1,956	0.01	*1.56*	12.0
27204_27218	48	401	0.0075	27204	27218	65.00	61.99	44,419	56,025	0.79	11.01	7.4
27205_27203	8	30	0.0114	27205	27203	61.32	60.99	-	580	0.00	0.00	11.0
27206_T72014-35	12	44	0.0569	27206	T72014-35	69.24	66.71	142	3,825	0.04	*0.40*	9.9
27213_27214	10	263	0.0873	27213	27214	118.59	95.64	134	2,914	0.05	6.04	6.9
27214_27215	10	98	0.1015	27214	27215	95.54	85.64	137	3,141	0.04	6.42	3.9
27215_27206	10	116	0.1396	27215	27206	85.54	69.34	140	3,684	0.04	7.22	6.9
27218_27115	48	651	0.0117	27218	27115	61.89	54.28	44,422	69,892	0.64	13.12	6.1
27302_T82363-02	60	195	0.0008	27302	T82363-02	67.97	67.82	43,963	32,498	1.35	4.99	8.7
27306_82363-05	8	197	0.0105	27306	82363-05	127.80	125.73	57	558	0.10	2.30	8.4
122	48	401	0.0184	27401	T82362-01	79.33	71.94	43,944	87,710	0.50	7.79	5.9
27610_27722	8	365	0.0150	27610	27722	184.74	179.24	7	667	0.01	*1.40*	6.0
27617_27619	8	162	0.0248	27617	27619	372.83	368.82	29	857	0.03	2.53	5.0
27619_27622	8	339	0.0307	27619	27622	368.72	358.31	40	953	0.04	3.01	4.0
27622_28732	8	375	0.0213	27622	28732	358.21	350.23	58	793	0.07	2.95	3.9
27707_T82362-47	60	147	0.0142	27707	T82362-47	71.29	69.21	43,951	139,666	0.31	4.99	0.5
27720_27834	8	287	0.0169	27720	27834	151.45	146.61	24	707	0.03	2.10	6.0
27721_27720	8	447	0.0350	27721	27720	167.20	151.55	19	1,018	0.02	2.53	6.0
27722_27721	8	422	0.0281	27722	27721	179.14	167.30	13	912	0.01	2.10	6.0
27723_82362-15	8	438	0.0356	27723	82362-15	202.56	186.97	20	1,027	0.02	2.57	3.6
27804_27805	8	347	0.1084	27804	27805	117.69	80.05	44	1,790	0.02	4.58	3.5
27805_27806	8	59	0.0034	27805	27806	79.95	79.75	51	317	0.16	*1.48*	7.4
27806_T72014-01	8	18	0.6961	27806	T72014-01	79.65	67.23	52	4,537	0.01	*0.33*	7.8
27807_T82363-02	8	15	0.7958	27807	T82363-02	79.40	67.82	354	4,851	0.07	2.26	3.0
27832_27839	8	102	0.0693	27832	27839	145.08	138.04	247	1,431	0.17	6.84	7.9
27833_27832	8	167	0.1645	27833	27832	172.65	145.18	241	2,206	0.11	9.24	4.1
27834_27839	8	359	0.0237	27834	27839	146.51	137.99	29	837	0.03	*1.48*	6.0
27839_82363-03	8	42	0.0650	27839	82363-03	137.94	135.23	275	1,387	0.20	6.90	4.3
27907_27109	12	177	0.0132	27907	27109	55.79	53.46	71	1,839	0.04	2.51	15.9
27908_72014-01	8	240	0.0815	27908	72014-01	85.63	66.10	33	1,552	0.02	4.01	9.1
27911_27908	8	373	0.0309	27911	27908	97.27	85.73	26	957	0.03	2.65	12.0
27925_27926	10	374	0.0249	27925	27926	150.20	140.89	117	1,555	0.08	3.74	4.9
27926_27213	10	384	0.0576	27926	27213	140.79	118.69	126	2,366	0.05	5.13	3.9
28011_28012	8	279	0.0202	28011	28012	110.19	104.55	85	773	0.11	3.24	9.9
28012_28013	8	281	0.0516	28012	28013	104.45	89.94	115	1,235	0.09	4.93	7.9

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
28013_28106	8	273	0.0377	28013	28106	89.84	79.55	135	1,056	0.13	4.63	7.9
28106_SE686-S08	12	277	0.0878	28106	SE686-S08	79.45	55.15	158	4,750	0.03	6.22	7.9
28108_26922	12	279	0.0965	28108	26922	77.47	50.57	348	4,980	0.07	8.13	8.8
28110_26918	18	278	0.0551	28110	26918	81.71	66.40	109	11,095	0.01	4.47	9.9
28113_72013-06	12	280	0.0657	28113	72013-06	88.17	69.74	76	4,111	0.02	4.50	12.0
28114_28113	8	183	0.0728	28114	28113	101.60	88.27	66	1,467	0.04	4.72	2.1
28117_28114	8	392	0.0014	28117	28114	102.23	101.70	50	200	0.25	*1.06*	9.8
28118_28110	18	291	0.0656	28118	28110	100.89	81.81	100	12,103	0.01	4.62	8.2
28119_28120	12	180	0.0774	28119	28120	95.46	81.50	336	4,462	0.08	7.45	11.2
28120_28108	12	99	0.0388	28120	28108	81.40	77.57	341	3,158	0.11	5.86	11.4
28121_28106	10	279	0.0875	28121	28106	103.95	79.55	14	2,917	0.00	3.07	7.0
28204_26911	24	448	0.0086	28204	26911	57.95	54.12	6,381	9,418	0.68	5.38	2.9
28205_28204	24	61	0.0312	28205	28204	59.95	58.05	6,381	17,992	0.35	6.15	8.7
28206_28205	24	64	0.1555	28206	28205	69.95	60.05	6,175	40,143	0.15	11.69	9.3
28207_72124-06	8	66	0.0481	28207	72124-06	104.95	101.80	201	1,192	0.17	5.66	3.6
28212_28206	24	388	0.0055	28212	28206	72.20	70.05	6,157	7,583	0.81	5.99	6.3
28301_28302	12	225	0.0183	28301	28302	83.88	79.77	1,552	2,168	0.72	6.40	3.8
28302_28303	12	200	0.0145	28302	28303	79.67	76.77	1,571	1,928	0.81	5.05	10.5
28303_28212	24	196	0.0219	28303	28212	76.60	72.30	6,157	15,075	0.41	4.36	2.5
28306_28307	8	139	0.0036	28306	28307	91.20	90.70	19	326	0.06	*1.14*	10.8
28307_28308	8	167	0.0041	28307	28308	90.60	89.91	30	350	0.09	*1.37*	6.8
28308_28309	8	309	0.0312	28308	28309	89.81	80.15	48	961	0.05	3.20	7.6
28309_28310	8	48	0.0168	28309	28310	80.05	79.25	60	704	0.08	2.74	7.8
28310_28303	24	108	0.0142	28310	28303	78.30	76.77	4,594	12,124	0.38	8.00	2.9
28311_28310	24	409	0.0135	28311	28310	84.71	79.20	4,535	11,823	0.38	7.83	12.2
28316_28311	24	266	0.0180	28316	28311	89.60	84.81	4,517	13,667	0.33	8.48	8.8
28403_28118	18	262	0.0240	28403	28118	107.28	100.99	88	7,327	0.01	3.13	11.0
28404_28403	12	306	0.0072	28404	28403	109.58	107.38	71	1,361	0.05	2.04	6.8
28405_28119	12	320	0.0365	28405	28119	107.25	95.56	328	3,064	0.11	5.67	10.4
28406_28404	12	110	0.0056	28406	28404	110.30	109.68	68	1,203	0.06	*1.84*	11.9
28408_28406	12	128	0.0751	28408	28406	120.01	110.40	64	4,395	0.01	4.49	13.0
28410_28408	10	173	0.0881	28410	28408	135.35	120.11	50	2,927	0.02	4.52	9.0
28412_28410	10	167	0.0536	28412	28410	144.42	135.45	35	2,282	0.02	3.41	13.0
28413_28405	12	292	0.0293	28413	28405	115.92	107.35	324	2,746	0.12	5.23	11.8
28419_28413	12	324	0.0214	28419	28413	122.95	116.02	310	2,345	0.13	4.61	13.8
28420_28412	8	140	0.0455	28420	28412	150.87	144.52	21	1,160	0.02	2.84	11.0
28422_28420	8	179	0.0470	28422	28420	159.37	150.97	7	1,178	0.01	2.04	8.0
28424_28117	8	212	0.0105	28424	28117	104.56	102.33	36	557	0.06	*1.85*	2.2
28606_28611	8	364	0.0143	28606	28611	171.56	166.36	0	650	0.00	0.00	4.5
28607_28609	6	82	0.0520	28607	28609	177.31	173.06	87	576	0.15	4.70	3.6
28609_27925	6	153	0.1484	28609	27925	172.96	150.30	96	973	0.10	7.03	3.4

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
28611_72014-07	8	368	0.0468	28611	72014-07	166.26	149.03	10	1,177	0.01	2.28	4.3
28617_28607	8	240	0.1737	28617	28607	219.18	177.41	74	2,267	0.03	6.63	2.5
28618_28617	8	90	0.0500	28618	28617	223.76	219.28	63	1,215	0.05	4.09	4.9
28625_28618	8	134	0.1844	28625	28618	248.54	223.86	56	2,335	0.02	6.24	5.0
28626_28625	8	187	0.1350	28626	28625	273.88	248.64	39	1,998	0.02	4.99	5.0
28706_27833	8	415	0.0216	28706	27833	181.70	172.75	228	799	0.29	4.40	3.8
28707_28706	8	81	0.1499	28707	28706	193.95	181.80	192	2,106	0.09	7.77	7.5
28708_28707	8	63	0.4028	28708	28707	219.45	194.05	189	3,451	0.05	11.80	6.0
28709_28708	8	33	0.2382	28709	28708	227.44	219.55	189	2,654	0.07	9.80	4.9
28710_28709	8	162	0.0872	28710	28709	241.70	227.54	184	1,606	0.11	6.82	4.2
28711_28710	8	443	0.1151	28711	28710	292.76	241.80	179	1,845	0.10	7.46	4.9
28712_28711	8	339	0.1052	28712	28711	328.51	292.86	34	1,764	0.02	4.42	5.0
28713_28712	8	70	0.0859	28713	28712	334.65	328.61	24	1,594	0.02	3.72	4.7
28715_28716	8	136	0.3067	28715	28716	335.67	294.11	35	3,011	0.01	4.80	3.2
28716_28711	8	106	0.0108	28716	28711	294.01	292.86	135	565	0.24	2.96	5.8
28717_28716	8	322	0.0983	28717	28716	325.77	294.11	96	1,705	0.06	5.39	3.9
28721_28717	8	417	0.0509	28721	28717	347.11	325.87	89	1,227	0.07	4.56	4.4
28724_28715	8	194	0.3607	28724	28715	405.86	335.77	31	3,266	0.01	6.61	6.4
28729_28724	8	241	0.0485	28729	28724	417.64	405.96	16	1,198	0.01	2.66	3.4
28731_28732	8	294	0.0965	28731	28732	378.60	350.23	13	1,689	0.01	2.96	6.0
28732_28721	8	169	0.0173	28732	28721	350.13	347.21	84	716	0.12	3.06	6.9
28807_28626	8	142	0.1728	28807	28626	298.52	273.98	28	2,260	0.01	4.92	9.0
28813_28807	8	179	0.1806	28813	28807	330.95	298.62	19	2,311	0.01	4.49	5.0
28820_28821	8	154	0.0144	28820	28821	359.31	357.08	24	653	0.04	*1.98*	3.7
28821_28822	8	165	0.0064	28821	28822	356.98	355.93	32	435	0.07	*1.62*	7.0
28822_28914	8	409	0.0039	28822	28914	355.83	354.25	55	337	0.16	*1.59*	4.1
28914_28915	8	201	0.0959	28914	28915	354.15	334.85	86	1,684	0.05	5.43	2.3
28915_28933	8	96	0.0078	28915	28933	334.75	334.00	101	481	0.21	2.43	6.8
28916_28917	8	195	0.1234	28916	28917	305.57	281.47	140	1,910	0.07	7.12	6.9
28917_28918	8	99	0.1116	28917	28918	281.37	270.32	152	1,817	0.08	7.04	7.9
28918_28919	8	136	0.2741	28918	28919	270.22	233.01	160	2,847	0.06	9.81	8.9
28919_28920	8	73	0.4480	28919	28920	232.91	200.31	166	3,640	0.05	11.77	2.9
28920_72012-04	8	123	0.2531	28920	72012-04	200.21	168.99	169	2,736	0.06	9.69	5.9
28933_28916	8	249	0.1135	28933	28916	333.90	305.67	119	1,832	0.06	6.58	5.9
29006_29030	8	124	0.0126	29006	29030	161.58	160.01	7	611	0.01	*1.28*	6.0
29009_29010	10	160	0.0160	29009	29010	159.26	156.69	16	1,248	0.01	*1.75*	5.0
29010_72012-21	12	120	0.0878	29010	72012-21	156.59	146.07	229	4,752	0.05	6.95	4.8
29011_28419	12	362	0.0334	29011	28419	135.13	123.05	285	2,929	0.10	5.27	11.8
29021_29024	10	63	0.0480	29021	29024	160.35	157.35	211	2,159	0.10	5.04	4.8
29024_29010	10	86	0.0065	29024	29010	157.25	156.69	213	793	0.27	2.75	4.7
29026_72012-05	8	183	0.0028	29026	72012-05	161.45	160.93	33	290	0.11	*1.23*	10.9

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
29030_29009	8	32	0.0173	29030	29009	159.91	159.36	11	714	0.02	*1.66*	6.0
29202_72121-11	30	380	0.0036	29202	72121-11	92.90	91.52	4,360	11,130	0.39	3.87	16.0
29209_29215	8	261	0.0074	29209	29215	99.07	97.15	45	466	0.10	*0.88*	8.9
29211_29202	30	316	0.0025	29211	29202	93.78	93.00	4,311	9,165	0.47	4.10	20.4
29212_29211	30	263	0.0027	29212	29211	94.58	93.88	4,288	9,516	0.45	4.21	21.7
29213_29212	30	101	0.0018	29213	29212	94.86	94.68	4,277	7,775	0.55	3.61	10.5
29214_29213	8	60	0.0199	29214	29213	96.46	95.27	655	767	0.85	4.18	10.5
29215_29214	30	173	0.0028	29215	29214	97.05	96.56	652	9,832	0.07	2.51	7.5
29216_29215	30	86	0.0096	29216	29215	97.98	97.15	603	18,109	0.03	3.22	6.7
29217_29216	30	136	0.0018	29217	29216	98.32	98.08	599	7,751	0.08	2.09	12.3
29218_29217	30	183	0.0004	29218	29217	98.50	98.42	595	3,858	0.15	*1.27*	13.3
29302_29303	8	273	0.0638	29302	29303	121.54	104.14	19	1,374	0.01	3.12	9.9
29303_29304	8	146	0.0274	29303	29304	104.04	100.05	21	900	0.02	2.39	7.0
29304_29305	8	131	0.0369	29304	29305	99.95	95.12	22	1,045	0.02	*0.14*	10.0
29305_29213	30	379	0.0002	29305	29213	95.02	94.96	3,619	2,303	1.57	*1.64*	12.1
29306_29305	15	41	0.0183	29306	29305	95.87	95.12	619	3,937	0.16	*1.12*	10.5
29307_29306	15	203	0.0098	29307	29306	97.95	95.97	615	2,871	0.21	2.50	8.7
29308_29307	15	212	0.0113	29308	29307	100.44	98.05	610	3,089	0.20	4.36	5.7
29310_29308	15	96	0.0046	29310	29308	100.98	100.54	605	1,967	0.31	3.14	7.6
29311_29310	8	39	0.0199	29311	29310	101.86	101.08	176	767	0.23	2.21	6.9
29312_29311	8	237	0.0035	29312	29311	102.80	101.96	173	323	0.54	2.10	7.0
29316_29318	18	384	0.0087	29316	29318	104.69	101.34	170	4,416	0.04	*0.21*	10.1
29318_29319	30	209	0.0057	29318	29319	101.34	100.15	1,399	13,938	0.10	*0.63*	11.3
4709	30	516	0.0058	29319	S27	100.15	97.16	2,984	14,051	0.21	5.06	12.6
29320_29319	15	430	0.0002	29320	29319	107.30	107.20	1,786	443	4.03	3.24	4.4
29416_29218	15	277	0.0331	29416	29218	107.75	98.60	586	5,288	0.11	*1.06*	8.3
29417_29416	15	308	0.0354	29417	29416	118.75	107.85	568	5,470	0.10	6.42	3.5
29418_29417	15	292	0.0483	29418	29417	132.95	118.85	549	6,389	0.09	7.09	9.5
29419_29418	15	279	0.0414	29419	29418	144.58	133.05	533	5,913	0.09	6.66	12.5
29420_29419	12	27	0.0161	29420	29419	145.12	144.68	527	2,035	0.26	4.85	7.0
29506_29508	8	136	0.1416	29506	29508	271.23	252.04	32	2,046	0.02	4.82	4.3
29508_29509	8	50	0.0821	29508	29509	251.94	247.86	32	1,558	0.02	3.85	5.4
29509_29510	15	57	0.1385	29509	29510	247.76	239.90	433	10,817	0.04	9.19	9.6
29510_29511	15	196	0.0199	29510	29511	239.80	235.90	437	4,104	0.11	4.85	13.9
29511_29512	15	288	0.0137	29511	29512	235.80	231.85	450	3,406	0.13	4.29	11.4
29512_29513	15	265	0.0719	29512	29513	231.75	212.71	468	7,797	0.06	7.79	10.5
29513_29514	15	278	0.0711	29513	29514	212.61	192.85	486	7,754	0.06	7.84	9.7
29514_29517	15	268	0.1752	29514	29517	192.75	145.80	503	12,168	0.04	4.81	5.8
29517_29420	15	287	0.0017	29517	29420	145.70	145.22	517	1,196	0.43	2.09	28.5
29609_29610	8	328	0.0633	29609	29610	188.35	167.59	10	1,368	0.01	2.51	8.0
29610_29611	8	286	0.0533	29610	29611	167.49	152.25	19	1,255	0.02	*0.12*	15.0

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29611_29612	10	311	0.0163	29611	29612	152.45	147.37	390	1,260	0.31	4.54	9.6
29612_29714	10	506	0.0493	29612	29714	147.27	122.29	401	2,190	0.18	*1.64*	7.1
29615_29611	10	246	0.0157	29615	29611	156.41	152.55	213	1,235	0.17	3.78	13.1
29616_29611	8	257	0.0038	29616	29611	153.53	152.55	149	336	0.45	2.08	12.7
29617_29616	8	392	0.0072	29617	29616	156.45	153.63	138	461	0.30	2.57	10.8
29618_29617	8	150	0.0494	29618	29617	163.96	156.55	130	1,208	0.11	4.90	12.9
29619_29615	10	573	0.0139	29619	29615	164.50	156.51	208	1,164	0.18	3.60	15.3
29620_29619	10	276	0.0572	29620	29619	180.40	164.60	205	2,357	0.09	5.91	6.3
29621_29620	10	280	0.0235	29621	29620	187.07	180.50	195	1,511	0.13	4.25	8.9
29622_29623	8	244	0.0310	29622	29623	203.95	196.37	62	958	0.06	3.44	5.9
29623_29624	8	323	0.0409	29623	29624	196.27	183.05	88	1,100	0.08	4.21	5.9
29624_29618	8	257	0.0737	29624	29618	182.95	164.06	128	1,476	0.09	5.77	6.9
29713_72012-15	15	27	0.0112	29713	72012-15	110.46	110.16	420	3,082	0.14	3.91	6.3
29714_29713	10	446	0.0265	29714	29713	122.29	110.46	413	1,605	0.26	*1.69*	9.2
29715_29716	8	238	0.0225	29715	29716	136.72	131.37	123	815	0.15	3.75	5.6
29716_29717	8	273	0.0053	29716	29717	131.27	129.81	132	398	0.33	2.28	6.1
29717_29718	8	297	0.0053	29717	29718	129.71	128.15	147	395	0.37	2.33	6.9
29718_29719	8	351	0.0358	29718	29719	128.05	115.50	161	1,029	0.16	4.78	5.9
29719_29312	8	127	0.0984	29719	29312	115.40	102.90	167	1,706	0.10	4.62	2.0
29723_29320	8	86	0.0458	29723	29320	111.19	107.27	10	1,164	0.01	*1.18*	7.0
29728_29715	8	265	0.0049	29728	29715	138.11	136.82	115	380	0.30	2.13	12.7
29729_29728	8	54	0.0424	29729	29728	140.50	138.21	107	1,120	0.10	4.21	6.9
29805_29318	20	441	0.0011	29805	29318	108.60	108.10	1,232	2,108	0.58	2.23	5.5
29806_29805	20	494	0.0014	29806	29805	109.38	108.70	1,228	2,315	0.53	2.40	12.3
29807_73074-17	15	281	0.0052	29807	73074-17	117.65	116.20	1,762	2,089	0.84	4.25	14.9
29809_29810	15	173	0.0182	29809	29810	115.03	111.87	1,770	3,923	0.45	6.94	4.3
29810_29320	15	211	0.0214	29810	29320	111.77	107.27	1,770	4,249	0.42	3.21	6.5
29812_29316	8	67	0.0248	29812	29316	107.16	105.50	123	856	0.14	3.88	9.7
29813_29812	8	366	0.0069	29813	29812	111.64	109.10	123	453	0.27	2.46	5.2
29814_29813	8	430	0.0107	29814	29813	116.36	111.74	123	564	0.22	2.88	6.3
29902_29806	15	393	0.0095	29902	29806	113.23	109.48	1,225	2,840	0.43	3.21	10.0
29904_29807	18	435	0.0013	29904	29807	118.33	117.75	1,758	1,727	1.02	2.48	10.5
29905_V0025-S02	18	69	0.0235	29905	V0025-S02	122.85	121.24	1,746	7,247	0.24	7.50	4.2
29907_29902	15	127	0.0104	29907	29902	114.65	113.33	1,223	2,960	0.41	5.12	10.9
29908_29909	15	328	0.0193	29908	29909	132.95	126.60	1,214	4,042	0.30	6.42	6.6
29909_29910	15	155	0.0370	29909	29910	126.50	120.75	1,215	5,592	0.22	6.91	9.6
29910_29907	15	493	0.0120	29910	29907	120.65	114.75	1,221	3,179	0.38	5.39	10.8
29911_29910	8	16	0.2043	29911	29910	125.59	122.25	5	2,458	0.00	3.07	9.4
29912_29911	8	170	0.0123	29912	29911	127.79	125.69	5	604	0.01	*1.16*	8.9
29914_29918	8	173	0.0218	29914	29918	137.70	133.93	13	803	0.02	*1.89*	7.2
29915_29905	18	170	0.0271	29915	29905	127.56	122.95	1,745	7,779	0.22	7.91	6.6

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Italic = Velocity < 2 fps

Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
29916_29915	30	17	0.0059	29916	29915	127.76	127.66	1,732	14,199	0.12	4.37	6.7
29917_29915	15	130	0.0464	29917	29915	133.69	127.66	13	6,263	0.00	*0.02*	6.7
29918_29917	8	30	0.0012	29918	29917	133.83	133.79	13	187	0.07	*0.68*	8.1
29919_29916	30	228	0.0054	29919	29916	129.10	127.86	1,732	13,616	0.13	4.24	15.3
29922_29904	18	154	0.0076	29922	29904	119.60	118.43	1,756	4,120	0.43	2.21	7.2
30004_30005	8	58	0.1287	30004	30005	78.48	71.05	43	1,951	0.02	5.09	4.0
30005_30006	8	160	0.0779	30005	30006	70.95	58.53	55	1,517	0.04	4.59	6.2
30006_30117	8	415	0.0070	30006	30117	58.43	55.53	73	454	0.16	*1.27*	5.4
30014_30004	8	431	0.0419	30014	30004	96.63	78.58	34	1,113	0.03	3.20	5.3
30015_30014	8	214	0.0809	30015	30014	114.05	96.73	11	1,547	0.01	2.88	4.4
30019_72124-08	8	277	0.0681	30019	72124-08	142.95	124.05	159	1,419	0.11	5.99	3.2
30104_30116	12	343	0.0241	30104	30116	65.83	57.55	1,300	2,491	0.52	7.14	9.6
30105_30104	12	153	0.0268	30105	30104	70.03	65.93	1,294	2,623	0.49	7.41	11.0
30107_30115	8	396	0.0201	30107	30115	56.24	48.29	51	770	0.07	2.16	9.0
30112_T72022-01	12	50	0.0073	30112	T72022-01	33.95	33.59	1,510	1,367	1.11	4.28	1.9
30113_30112	12	95	0.0115	30113	30112	35.14	34.05	1,507	1,718	0.88	4.85	4.6
30114_30113	12	27	0.0063	30114	30113	35.41	35.24	1,502	1,272	1.18	4.26	4.8
30115_30114	12	314	0.0403	30115	30114	48.19	35.51	1,495	3,221	0.46	4.57	6.3
30116_30117	12	67	0.0287	30116	30117	57.45	55.54	1,361	2,716	0.50	7.71	5.0
30117_30115	12	160	0.0445	30117	30115	55.43	48.29	1,439	3,383	0.43	9.21	6.8
30119_30120	8	15	0.0453	30119	30120	64.72	64.06	54	1,157	0.05	3.78	5.2
30120_30116	8	143	0.0447	30120	30116	63.96	57.55	57	1,150	0.05	*1.78*	5.9
30121_30119	8	172	0.1080	30121	30119	83.36	64.82	51	1,787	0.03	5.03	5.9
30122_30121	8	149	0.1366	30122	30121	103.84	83.46	42	2,010	0.02	5.16	9.1
30137_T72022-01	60	55	0.0013	30137	T72022-01	30.84	30.77	50,836	41,659	1.22	5.75	1.8
30201_30202	10	212	0.0928	30201	30202	125.50	105.83	172	3,003	0.06	6.65	6.9
30202_30203	10	246	0.0465	30202	30203	105.73	94.30	180	2,127	0.08	3.42	6.8
30203_30204	10	355	0.0619	30203	30204	94.20	72.19	1,111	2,454	0.45	4.54	4.4
30204_30205	12	356	0.0024	30204	30205	72.07	71.22	1,240	783	1.58	3.52	2.0
30205_30105	12	373	0.0038	30205	30105	71.56	70.13	1,277	995	1.28	3.62	3.5
30206_30205	8	152	0.0716	30206	30205	82.58	71.66	37	1,456	0.03	*1.32*	4.9
30207_30206	8	136	0.0052	30207	30206	83.39	82.68	21	394	0.05	*1.33*	4.6
30208_30207	8	147	0.0177	30208	30207	86.09	83.49	16	723	0.02	*1.89*	10.0
30209_30208	8	54	0.0216	30209	30208	87.37	86.19	11	800	0.01	*1.81*	8.0
30210_30209	8	123	0.0405	30210	30209	92.45	87.47	9	1,094	0.01	2.08	7.0
30223_30105	8	119	0.1944	30223	30105	93.26	70.11	16	2,398	0.01	*1.68*	2.8
30301_30408	10	378	0.0041	30301	30408	56.49	54.95	39	629	0.06	*1.42*	9.7
30307_30323	12	190	0.0047	30307	30323	96.52	95.62	919	1,103	0.83	3.50	4.1
30308_30307	12	220	0.0059	30308	30307	97.92	96.62	913	1,233	0.74	3.83	3.9
30309_30308	12	282	0.0041	30309	30308	99.17	98.02	896	1,024	0.88	3.27	1.5
30315_30317	8	179	0.0579	30315	30317	146.95	136.58	154	1,309	0.12	5.60	6.4

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
30317_30201	8	150	0.0723	30317	30201	136.48	125.60	164	1,463	0.11	6.17	5.8
30323_30203	12	254	0.0048	30323	30203	95.52	94.30	925	1,111	0.83	3.52	4.4
30401_30402	8	186	0.0610	30401	30402	49.28	37.93	137	1,344	0.10	5.52	5.6
30402_72112-05	8	70	0.0184	30402	72112-05	37.83	36.54	146	737	0.20	3.66	6.2
30403_72112-04	8	26	0.1897	30403	72112-04	41.60	36.65	435	2,368	0.18	2.77	8.5
30403_30404	10	103	0.0226	30403	30404	41.60	39.28	175	1,483	0.12	4.07	8.5
30404_30405	8	107	0.0121	30404	30405	39.18	37.89	180	599	0.30	3.35	7.7
30405_30406	10	68	0.0341	30405	30406	37.79	35.47	190	1,820	0.10	2.77	10.4
30406_EDGEMOORELS	10	320	0.0012	30406	EDGEMOORELS	35.37	35.00	199	335	0.60	*1.43*	7.2
30408_EDGEMOORELS	10	162	0.1226	30408	EDGEMOORELS	54.85	35.00	69	3,452	0.02	5.03	3.5
30414_30403	10	273	0.0870	30414	30403	65.45	41.70	599	2,908	0.21	9.35	7.5
30511_30315	8	358	0.0069	30511	30315	149.53	147.05	54	452	0.12	*1.95*	3.8
30512_30315	8	375	0.0533	30512	30315	167.00	147.05	85	1,255	0.07	4.57	7.0
30513_30512	8	321	0.0569	30513	30512	185.38	167.10	67	1,297	0.05	4.36	5.9
30516_30511	8	394	0.0197	30516	30511	157.40	149.63	39	764	0.05	2.56	3.1
30705_30019	8	405	0.0333	30705	30019	149.59	136.10	148	993	0.15	*0.94*	2.8
30706_30705	8	233	0.0292	30706	30705	156.47	149.69	122	928	0.13	4.10	8.3
30707_30706	8	102	0.1280	30707	30706	169.66	156.57	105	1,945	0.05	6.62	5.0
30708_30707	8	130	0.0817	30708	30707	180.42	169.76	75	1,555	0.05	5.13	4.8
30714_30708	8	317	0.0037	30714	30708	181.68	180.52	53	329	0.16	*1.54*	4.9
30715_30706	8	208	0.0036	30715	30706	157.31	156.57	13	324	0.04	*1.01*	4.2
30805_30714	8	227	0.0034	30805	30714	182.55	181.78	35	317	0.11	*1.33*	6.6
30901_30902	8	300	0.0295	30901	30902	99.48	90.64	390	934	0.42	2.49	5.2
30902_30911	12	143	0.0031	30902	30911	90.54	90.10	1,350	888	1.52	3.82	0.0
30903_30904	12	42	0.0017	30903	30904	89.53	89.46	1,399	653	2.14	3.93	2.1
30904_30905	12	487	0.0028	30904	30905	89.36	88.00	1,449	847	1.71	4.09	1.2
30905_30906	12	246	0.0032	30905	30906	87.90	87.11	1,475	908	1.62	4.18	6.0
30906_28301	12	414	0.0073	30906	28301	87.01	83.98	1,535	1,371	1.12	4.43	4.0
30908_30910	8	178	0.0488	30908	30910	102.60	93.91	19	1,201	0.02	2.55	4.8
30910_30911	8	164	0.0227	30910	30911	93.81	90.10	23	819	0.03	*0.15*	2.6
30911_30903	12	355	0.0010	30911	30903	90.00	89.63	1,388	518	2.68	3.90	0.0
31106_31117	8	249	0.0172	31106	31117	149.22	144.94	293	712	0.41	4.33	3.0
31107_31117	8	91	0.0452	31107	31117	149.03	144.94	56	1,156	0.05	2.64	5.9
31108_31107	8	366	0.1265	31108	31107	195.40	149.13	49	1,934	0.03	5.24	7.0
31109_31108	8	363	0.0317	31109	31108	207.01	195.50	30	969	0.03	2.79	7.9
31115_30901	8	493	0.0757	31115	30901	136.93	99.58	383	1,496	0.26	7.99	5.0
31117_31115	8	261	0.0300	31117	31115	144.84	137.03	363	941	0.39	5.62	7.4
31118_31907	8	178	0.0547	31118	31907	121.61	111.86	382	1,271	0.30	6.76	7.4
31119_31118	8	102	0.0784	31119	31118	129.72	121.71	378	1,523	0.25	8.06	5.9
31120_31119	8	154	0.0810	31120	31119	142.32	129.82	372	1,548	0.24	8.13	5.9
31121_31120	8	136	0.1850	31121	31120	167.50	142.42	366	2,339	0.16	10.87	7.1

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
31201_31312	10	387	0.0013	31201	31312	307.31	306.81	225	355	0.63	*1.53*	9.7
31202_31201	10	295	0.0018	31202	31201	307.93	307.41	161	414	0.39	*1.47*	8.7
31203_31202	10	167	0.0007	31203	31202	308.15	308.03	161	264	0.61	*1.13*	8.9
31207_31203	10	404	0.0021	31207	31203	309.11	308.25	128	455	0.28	*1.26*	21.4
31208_31207	10	294	0.0014	31208	31207	309.62	309.21	0	368	0.00	0.00	7.9
31209_31208	10	109	0.0010	31209	31208	309.83	309.72	0	313	0.00	0.00	7.7
31210_31209	10	116	0.0027	31210	31209	310.24	309.93	0	510	0.00	0.00	5.4
31309_31310	8	430	0.0173	31309	31310	349.55	342.09	91	716	0.13	3.13	7.9
31310_31311	10	134	0.2742	31310	31311	341.99	305.12	114	5,163	0.02	4.12	6.0
31311_31404	10	254	0.0028	31311	31404	305.02	304.30	366	525	0.70	2.32	27.5
31312_31311	10	290	0.0055	31312	31311	306.71	305.12	251	730	0.34	2.08	10.4
31404_S0175-S02	18	230	0.0472	31404	S0175-S02	304.20	293.34	366	10,269	0.04	4.39	7.9
31406_31407	12	281	0.0817	31406	31407	295.88	272.88	0	4,584	0.00	0.00	7.6
31407_31408	10	303	0.0481	31407	31408	272.78	258.21	0	2,161	0.00	0.00	11.9
31408_31409	12	129	0.0193	31408	31409	258.11	255.62	0	2,229	0.00	0.00	7.1
31409_31518	18	445	0.0054	31409	31518	255.52	253.13	0	3,464	0.00	0.00	5.8
31410_31605	8	368	0.0460	31410	31605	256.79	239.85	127	1,167	0.11	4.88	4.9
31506_31309	8	353	0.0080	31506	31309	352.47	349.65	68	486	0.14	2.19	4.9
31507_31506	8	241	0.0202	31507	31506	357.45	352.57	48	773	0.06	2.75	4.9
31508_31507	8	362	0.0026	31508	31507	358.49	357.55	25	276	0.09	*1.09*	4.9
31510_29506	8	158	0.1327	31510	29506	292.28	271.33	26	1,981	0.01	4.43	7.0
31515_29509	24	408	0.0013	31515	29509	248.37	247.86	392	3,609	0.11	*1.68*	13.7
31517_S0117-S01	18	175	0.0015	31517	S0117-S01	252.46	252.21	0	1,805	0.00	0.00	8.6
31518_31517	15	113	0.0041	31518	31517	253.03	252.56	0	1,861	0.00	0.00	12.4
31605_31606	8	372	0.0203	31605	31606	239.75	232.19	127	775	0.16	3.65	9.6
31606_31607	8	371	0.0284	31606	31607	232.09	221.55	127	916	0.14	4.11	9.9
31607_31608	8	183	0.1529	31607	31608	221.45	193.45	175	2,126	0.08	8.19	10.9
31608_29621	8	206	0.0299	31608	29621	193.35	187.17	184	941	0.20	4.66	14.8
31701_31703	10	416	0.0040	31701	31703	98.40	96.75	559	621	0.90	2.87	5.0
31703_30414	10	233	0.1332	31703	30414	96.65	65.55	599	3,598	0.17	10.89	5.2
31719_72112-03	8	395	0.0039	31719	72112-03	171.00	169.47	44	339	0.13	*1.49*	6.2
31801_31802	8	400	0.0241	31801	31802	188.18	178.54	99	845	0.12	3.61	8.3
31802_31803	8	170	0.0488	31802	31803	178.44	170.12	118	1,202	0.10	4.87	3.7
31803_72123-19	8	408	0.0091	31803	72123-19	170.02	166.30	128	519	0.25	2.75	11.9
31808_31106	8	353	0.0256	31808	31106	158.34	149.32	272	869	0.31	4.91	6.4
31810_31808	8	228	0.0183	31810	31808	162.42	158.27	169	735	0.23	*1.08*	3.0
31813_72123-19	8	174	0.0507	31813	72123-19	175.12	166.30	24	1,224	0.02	2.49	7.6
31815_31813	8	184	0.0750	31815	31813	188.99	175.22	15	1,489	0.01	3.08	5.5
31819_32125	8	235	0.0566	31819	32125	209.26	195.95	19	1,293	0.01	2.96	4.9
31901_31912	12	67	0.0129	31901	31912	91.74	90.88	568	1,818	0.31	2.48	3.9
31905_31912	8	39	0.1510	31905	31912	96.75	90.88	395	2,113	0.19	2.52	2.6

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
31907_31911	8	131	0.0182	31907	31911	111.76	109.38	386	733	0.53	4.74	5.7
31911_31905	8	165	0.0752	31911	31905	109.28	96.85	392	1,491	0.26	7.76	5.8
31912_30902	12	77	0.0018	31912	30902	90.78	90.64	961	682	1.41	2.72	0.5
31917_31918	8	225	0.0426	31917	31918	139.95	130.35	491	1,122	0.44	6.92	7.8
31918_31919	8	117	0.0838	31918	31919	130.25	120.44	502	1,574	0.32	8.93	3.3
31919_STA74-S01	8	133	0.0696	31919	STA74-S01	120.34	111.12	515	1,434	0.36	8.40	6.3
31920_31921	8	200	0.0499	31920	31921	102.12	92.14	554	1,215	0.46	4.95	10.0
31921_31901	12	52	0.0039	31921	31901	92.04	91.84	566	996	0.57	2.66	1.2
32001_32002	8	127	0.0225	32001	32002	81.55	78.69	83	815	0.10	3.35	5.8
32002_32003	8	153	0.0560	32002	32003	78.59	70.00	91	1,287	0.07	4.09	5.7
32003_32004	8	336	0.0037	32003	32004	69.90	68.64	100	333	0.30	*1.86*	4.2
32004_32005	8	313	0.0041	32004	32005	68.54	67.27	114	346	0.33	*1.98*	3.7
32005_30401	8	419	0.0425	32005	30401	67.17	49.38	130	1,121	0.12	4.77	10.2
32015_32017	8	230	0.0526	32015	32017	128.31	116.18	23	1,248	0.02	*1.55*	3.4
32016_32020	10	311	0.0065	32016	32020	102.53	100.49	517	798	0.65	3.47	6.6
32017_32018	8	21	0.0250	32017	32018	116.08	115.55	506	859	0.59	5.71	6.0
32018_32016	8	148	0.0865	32018	32016	115.45	102.63	506	1,600	0.32	6.04	6.8
32020_31701	10	333	0.0057	32020	31701	100.39	98.50	533	743	0.72	3.22	4.3
32105_32017	8	219	0.1147	32105	32017	141.19	116.08	477	1,842	0.26	3.05	5.1
32107_32015	8	193	0.1037	32107	32015	148.40	128.41	7	1,751	0.00	2.69	4.0
32109_32110	8	153	0.0193	32109	32110	206.00	203.05	413	756	0.55	4.93	3.6
32110_32111	8	379	0.0512	32110	32111	202.95	183.55	428	1,230	0.35	7.15	4.2
32111_32112	8	394	0.0406	32111	32112	183.45	167.43	448	1,096	0.41	6.64	4.4
32112_32113	8	187	0.0325	32112	32113	167.33	161.25	456	981	0.47	6.15	4.7
32113_32105	8	171	0.1158	32113	32105	161.15	141.29	470	1,851	0.25	9.86	3.6
32115_32109	8	131	0.0110	32115	32109	207.72	206.28	96	570	0.17	2.71	7.1
32116_32115	8	238	0.0468	32116	32115	218.86	207.72	88	1,177	0.07	*0.56*	7.2
32120_32121	8	198	0.0512	32120	32121	230.40	220.27	37	1,230	0.03	3.52	6.0
32121_32123	8	254	0.0381	32121	32123	220.17	210.50	51	1,061	0.05	3.49	6.0
32123_32125	8	209	0.0691	32123	32125	210.40	195.95	61	1,429	0.04	4.53	7.0
32125_72112-06	8	113	0.0600	32125	72112-06	195.85	189.05	84	1,332	0.06	4.75	7.9
32201_32001	8	607	0.0360	32201	32001	103.50	81.65	63	1,032	0.06	3.64	12.3
32206_49607	8	214	0.0999	32206	49607	139.52	118.10	56	1,719	0.03	5.02	3.3
32207_32206	8	217	0.0247	32207	32206	145.00	139.62	46	855	0.05	2.91	13.7
32401_32810	8	365	0.0071	32401	32810	150.71	148.13	73	457	0.16	2.14	6.9
32403_32401	8	168	0.0088	32403	32401	152.30	150.81	48	510	0.09	2.05	8.9
32602_STA84-S01	10	79	0.0071	32602	STA84-S01	137.54	136.98	1,200	832	1.44	4.90	9.7
32608_29912	8	199	0.0548	32608	29912	138.77	127.89	3	1,273	0.00	*1.69*	7.7
32615_29914	8	306	0.0302	32615	29914	147.04	137.80	11	945	0.01	2.04	6.3
32616_32608	8	202	0.1785	32616	32608	175.01	138.87	2	2,296	0.00	2.14	2.4
32618_32619	12	189	0.0375	32618	32619	178.39	171.32	1,189	3,106	0.38	8.22	3.6

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32619_32602	10	311	0.1079	32619	32602	171.22	137.64	1,196	3,239	0.37	4.89	3.5
32621_32616	8	95	0.0095	32621	32616	176.00	175.11	1	529	0.00	*0.56*	6.5
32622_32624	8	94	0.0231	32622	32624	166.07	163.90	1	827	0.00	*0.76*	9.7
32624_32625	8	300	0.0018	32624	32625	163.80	163.25	2	233	0.01	*0.48*	8.7
32625_32615	8	342	0.0468	32625	32615	163.15	147.14	9	1,177	0.01	2.23	8.3
32626_32625	8	132	0.0300	32626	32625	166.50	162.55	5	942	0.01	*0.03*	3.5
32701_32618	12	332	0.0247	32701	32618	186.68	178.49	1,189	2,518	0.47	7.04	0.0
32702_32701	8	306	0.0990	32702	32701	217.09	186.78	1,089	1,711	0.64	6.95	9.6
32703_32702	8	365	0.0099	32703	32702	220.79	217.19	20	540	0.04	*1.01*	8.0
32704_32703	8	218	0.0229	32704	32703	225.90	220.89	17	823	0.02	2.12	11.3
32705_32704	8	359	0.0402	32705	32704	240.44	226.00	15	1,091	0.01	2.44	11.9
32706_32705	8	348	0.0272	32706	32705	250.01	240.54	12	897	0.01	*1.99*	8.3
32707_32706	8	314	0.1158	32707	32706	286.50	250.11	6	1,850	0.00	2.76	7.0
32709_73071-04	8	148	0.1255	32709	73071-04	281.30	262.75	1	1,928	0.00	*1.59*	14.2
32711_32702	8	152	0.1542	32711	32702	240.64	217.19	3	2,136	0.00	*0.02*	6.0
32810_29729	8	351	0.0212	32810	29729	148.03	140.60	99	791	0.13	3.45	16.7
32901_29922	8	368	0.0057	32901	29922	121.79	119.70	9	409	0.02	*0.06*	5.6
32902_32901	8	299	0.0138	32902	32901	126.00	121.89	6	638	0.01	*1.30*	5.1
33008_29919	30	360	0.0044	33008	29919	130.78	129.20	1,731	12,212	0.14	3.92	15.3
33009_73063-02	30	122	0.0065	33009	73063-02	133.20	132.40	1,725	14,925	0.12	4.52	8.6
33010_33009	30	516	0.0019	33010	33009	134.27	133.30	1,721	8,003	0.22	2.89	2.4
33011_33010	30	65	0.0139	33011	33010	135.27	134.37	1,688	21,741	0.08	2.99	2.8
33012_32626	8	65	0.0236	33012	32626	168.14	166.60	5	836	0.01	*1.42*	3.4
33103_33011	24	339	0.0057	33103	33011	137.29	135.37	1,688	7,657	0.22	4.36	5.1
33104_33103	24	350	0.0329	33104	33103	148.91	137.39	1,660	18,478	0.09	4.95	6.3
33105_33104	24	374	0.0048	33105	33104	150.82	149.01	1,628	7,071	0.23	4.07	16.8
33106_33105	24	224	0.0016	33106	33105	151.28	150.92	1,603	4,082	0.39	2.72	12.7
33107_33106	24	239	0.0016	33107	33106	151.75	151.38	1,524	4,029	0.38	2.66	7.4
33108_73063-04	18	311	0.0324	33108	73063-04	164.95	154.87	1,506	8,510	0.18	8.09	15.9
33203_33108	24	491	0.0037	33203	33108	166.88	165.05	1,481	6,226	0.24	3.62	10.6
33204_33203	24	534	0.0034	33204	33203	168.77	166.98	1,445	5,893	0.25	3.45	12.4
33205_33204	24	216	0.0508	33205	33204	179.82	168.87	1,408	22,946	0.06	*1.00*	6.4
33301_33302	8	414	0.0215	33301	33302	259.58	250.65	54	798	0.07	2.91	9.4
33302_33303	6	302	0.0052	33302	33303	250.55	248.97	54	182	0.30	*1.81*	9.1
33303_73061-08	15	84	0.0135	33303	73061-08	248.87	247.75	54	3,376	0.02	2.27	7.9
33304_33305	8	217	0.0047	33304	33305	245.40	244.38	54	373	0.15	*1.70*	16.9
33305_33306	8	272	0.0016	33305	33306	244.28	243.84	54	218	0.25	*1.16*	12.8
33306_33307	8	101	0.0026	33306	33307	243.74	243.48	54	275	0.20	*0.98*	5.4
33307_33801	15	178	0.0188	33307	33801	243.38	240.02	652	3,990	0.16	5.34	10.1
33308_33307	8	85	0.0807	33308	33307	250.33	243.48	498	1,544	0.32	8.78	6.7
33309_33308	8	129	0.1155	33309	33308	265.28	250.43	479	1,848	0.26	9.90	11.1

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33310_33309	8	134	0.1356	33310	33309	283.54	265.38	475	2,003	0.24	10.46	9.6
33311_33310	8	154	0.0674	33311	33310	294.00	283.64	467	1,412	0.33	8.09	8.0
33312_33311	8	257	0.1045	33312	33311	320.95	294.10	90	1,758	0.05	3.71	6.7
33313_33312	8	290	0.0481	33313	33312	335.00	321.05	82	1,192	0.07	4.35	10.3
33314_33313	8	212	0.0796	33314	33313	351.97	335.10	72	1,534	0.05	5.01	9.0
33315_33314	8	283	0.0100	33315	33314	354.89	352.07	61	543	0.11	2.29	10.3
33316_33315	8	85	0.0146	33316	33315	356.23	354.99	53	657	0.08	2.51	2.0
33320_33307	8	396	0.0436	33320	33307	260.75	243.48	99	1,136	0.09	3.45	9.1
33321_33320	8	295	0.0455	33321	33320	274.25	260.85	76	1,160	0.07	4.18	6.6
33322_33321	8	255	0.0376	33322	33321	283.95	274.35	76	1,054	0.07	3.91	7.4
33323_33322	8	315	0.0301	33323	33322	293.55	284.05	58	944	0.06	3.34	10.4
33409_33311	8	306	0.1288	33409	33311	333.51	294.13	373	1,952	0.19	9.60	6.2
33410_33409	8	245	0.0668	33410	33409	349.97	333.61	364	1,405	0.26	7.52	7.2
33411_33410	8	323	0.0551	33411	33410	367.89	350.07	350	1,277	0.27	6.95	9.1
33412_33411	8	261	0.0650	33412	33411	384.96	367.99	338	1,386	0.24	7.30	7.4
33421_33412	8	261	0.0206	33421	33412	390.44	385.06	327	781	0.42	4.76	7.0
33502_33503	8	217	0.0834	33502	33503	430.06	411.93	270	1,570	0.17	6.93	7.1
33503_33504	8	318	0.0159	33503	CP23	411.83	406.76	284	686	0.41	4.17	5.8
33504_33421	8	254	0.0258	33504	33421	397.07	390.54	319	873	0.37	5.13	5.1
33801_33802	15	184	0.0428	33801	33802	239.92	232.04	652	6,013	0.11	*1.18*	4.6
33802_33803	15	57	0.2300	33802	33803	232.49	219.34	1,003	13,941	0.07	14.69	7.1
33803_33804	15	52	0.1087	33803	33804	219.24	213.60	1,003	9,583	0.10	11.27	2.2
33804_33805	15	274	0.0985	33804	33805	213.50	186.52	1,003	9,124	0.11	5.70	2.9
33805_73061-01	24	260	0.0031	33805	73061-01	186.42	185.61	1,003	5,675	0.18	3.03	8.8
33901_33903	8	125	0.0483	33901	33903	261.04	255.01	178	1,195	0.15	5.48	10.9
33903_33907	8	383	0.1919	33903	33907	254.91	181.48	196	2,382	0.08	*1.25*	6.9
33906_33907	24	140	0.0026	33906	33907	181.89	181.53	1,166	5,163	0.23	2.82	15.3
33907_33908	24	392	0.0020	33907	33908	181.43	180.65	1,372	4,540	0.30	2.82	20.3
33908_33205	24	210	0.0030	33908	33205	180.55	179.92	1,391	5,579	0.25	3.29	15.1
33909_33906	24	342	0.0022	33909	33906	182.73	181.99	1,124	4,734	0.24	2.75	10.7
34101_32702	10	326	0.0368	34101	32702	229.18	217.19	1,066	1,890	0.56	7.73	7.2
34103_34101	8	329	0.1145	34103	34101	266.95	229.28	1,050	1,840	0.57	10.87	5.7
34104_34105	10	326	0.0318	34104	34105	324.68	314.34	1,037	1,757	0.59	7.47	13.1
34105_34106	10	333	0.0319	34105	34106	314.24	303.60	1,039	1,762	0.59	7.49	18.5
34106_34103	8	327	0.1115	34106	34103	303.50	267.05	1,048	1,816	0.58	11.24	5.6
34107_34106	8	164	0.0153	34107	34106	306.12	303.60	9	673	0.01	*0.92*	6.0
34108_34107	8	147	0.0681	34108	34107	316.21	306.22	8	1,419	0.01	2.43	6.5
34111_34101	8	321	0.0175	34111	34101	234.77	229.15	14	719	0.02	*0.09*	5.9
34204_34205	8	322	0.0647	34204	34205	399.50	378.70	78	1,383	0.06	4.76	4.1
34205_34206	8	332	0.0196	34205	34206	378.60	372.10	81	761	0.11	3.16	8.8
34206_34207	8	315	0.0292	34206	34207	372.00	362.81	83	929	0.09	2.67	5.0

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34207_34104	8	290	0.1306	34207	34104	362.71	324.78	1,031	1,965	0.52	10.38	7.0
34208_34207	10	325	0.0271	34208	34207	371.01	362.19	947	1,623	0.58	3.87	9.6
34209_34208	8	46	0.1264	34209	34208	376.98	371.11	943	1,933	0.49	9.95	5.2
34210_34209	8	295	0.1010	34210	34209	406.84	377.08	893	1,728	0.52	10.78	5.2
34211_34210	8	341	0.1439	34211	34210	456.00	406.94	875	2,063	0.42	11.67	13.6
34212_34211	8	196	0.1432	34212	34211	484.20	456.10	873	2,058	0.42	12.22	8.3
34213_34205	8	179	0.1660	34213	34205	409.04	379.35	2	2,216	0.00	2.23	8.5
34217_34210	8	62	0.0300	34217	34210	408.88	407.02	13	942	0.01	*1.50*	7.4
34218_34210	8	158	0.0654	34218	34210	417.31	406.94	4	1,391	0.00	*0.03*	5.1
34219_34218	8	153	0.0363	34219	34218	422.97	417.41	4	1,036	0.00	*1.53*	4.0
34220_34219	8	178	0.0972	34220	34219	440.37	423.07	2	1,695	0.00	*1.91*	6.8
34301_34302	12	270	0.0079	34301	34302	488.44	486.32	824	1,424	0.58	4.19	8.8
34302_34212	12	161	0.0079	34302	34212	485.57	484.30	871	1,426	0.61	4.25	8.8
34306_73084-14	8	307	0.0759	34306	73084-14	515.90	492.60	23	1,498	0.02	3.48	10.0
34401_34402	12	186	0.0061	34401	CP1	492.84	491.71	800	1,250	0.64	2.27	9.8
34402_34301	12	312	0.0058	34402	34301	490.34	488.54	821	1,217	0.67	3.71	5.7
34501_34401	12	415	0.0058	34501	34401	495.34	492.94	789	1,219	0.65	3.68	11.5
34502_34501	12	247	0.0092	34502	34501	497.72	495.44	774	1,541	0.50	4.26	9.6
34503_34502	12	285	0.0080	34503	34502	500.10	497.82	741	1,434	0.52	4.10	2.1
34505_34601	8	266	0.0377	34505	34601	491.00	480.97	17	1,055	0.02	2.48	6.4
34506_34505	8	275	0.0888	34506	34505	515.52	491.10	4	1,621	0.00	2.16	8.0
34601_34602	8	329	0.0379	34601	34602	480.87	468.39	28	1,059	0.03	2.52	8.8
34602_73082-11	8	83	0.0368	34602	73082-11	468.29	465.22	205	1,043	0.20	5.17	9.0
34605_73082-12	12	405	0.0045	34605	73082-12	461.81	460.00	420	1,071	0.39	2.85	2.7
34702_34605	10	368	0.0162	34702	34605	467.86	461.91	420	1,254	0.34	4.53	4.3
34703_34702	10	298	0.0218	34703	34702	474.47	467.96	420	1,457	0.29	5.14	5.5
34704_34703	10	15	0.0220	34704	34703	474.90	474.57	420	1,462	0.29	5.16	10.2
34705_34704	8	448	0.0152	34705	34704	481.79	475.00	31	670	0.05	*0.20*	18.6
34706_34704	8	184	0.0131	34706	34704	477.42	475.00	371	623	0.59	4.15	12.6
34707_34706	8	142	0.0128	34707	34706	479.33	477.52	325	614	0.53	3.97	9.6
34803_34705	8	226	0.0851	34803	34705	501.15	481.89	31	1,586	0.02	3.96	4.9
34805_34707	8	405	0.0817	34805	34707	512.52	479.43	317	1,555	0.20	6.62	9.9
34809_34805	8	216	0.0689	34809	34805	527.48	512.62	316	1,428	0.22	7.32	10.8
34810_34803	8	349	0.0049	34810	34803	502.95	501.25	31	379	0.08	*1.45*	5.9
34811_34810	8	374	0.0140	34811	34810	508.29	503.05	31	644	0.05	2.11	5.0
34812_34809	8	179	0.0104	34812	34809	529.44	527.58	315	554	0.57	3.65	7.6
34901_34811	8	377	0.0032	34901	34811	509.58	508.39	30	305	0.10	*1.24*	9.9
35004_32120	8	86	0.0671	35004	32120	236.26	230.50	26	1,409	0.02	3.47	6.9
35101_35102	8	46	0.0545	35101	35102	65.55	63.05	8	1,269	0.01	*1.56*	16.4
35102_SHOREWOODLS	8	25	0.0040	35102	SHOREWOODLS	62.95	62.85	82	344	0.24	*1.80*	16.3
35103_35102	8	324	0.0400	35103	35102	76.00	63.05	60	1,087	0.06	3.38	6.7

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
35104_35103	8	116	0.0854	35104	35103	86.00	76.10	45	1,589	0.03	4.46	5.4
35107_30204	8	265	0.0173	35107	30204	76.77	72.19	97	715	0.14	*0.92*	17.5
35108_35102	8	156	0.1475	35108	35102	86.00	63.05	6	2,089	0.00	*1.95*	7.9
35401_35402	8	353	0.0075	35401	35402	268.36	265.72	25	470	0.05	*1.59*	9.3
35402_33301	8	393	0.0151	35402	33301	265.62	259.68	40	669	0.06	2.34	6.8
35403_33323	8	298	0.0393	35403	33323	305.35	293.65	52	1,078	0.05	3.55	7.0
35404_35403	8	442	0.0429	35404	35403	324.40	305.45	43	1,126	0.04	3.46	5.5
35405_35404	8	458	0.0318	35405	35404	339.05	324.50	41	970	0.04	3.06	8.4
35501_33316	8	301	0.0101	35501	33316	359.37	356.33	47	546	0.09	2.13	7.5
35503_35501	8	132	0.0101	35503	35501	360.80	359.47	40	547	0.07	2.04	9.3
35508_35503	8	270	0.0428	35508	35503	372.46	360.90	32	1,125	0.03	3.17	7.6
35510_35508	8	252	0.1878	35510	35508	419.87	372.56	21	2,357	0.01	4.64	7.4
35516_35522	8	140	0.1180	35516	35522	390.22	373.65	14	1,868	0.01	3.52	7.1
35518_35516	8	169	0.1066	35518	35516	408.39	390.32	13	1,776	0.01	3.30	7.1
35520_35518	8	164	0.0465	35520	35518	416.09	408.49	12	1,172	0.01	2.39	6.1
35521_35520	8	219	0.0534	35521	35520	427.87	416.19	9	1,257	0.01	2.30	6.1
35522_46903	8	500	0.0096	35522	46903	373.55	368.73	15	533	0.03	*1.50*	6.0
35601_35602	8	226	0.0639	35601	35602	113.46	99.00	204	1,374	0.15	6.29	18.9
35602_35603	8	247	0.0886	35602	35603	98.90	77.00	204	1,619	0.13	7.07	10.9
35603_35604	8	268	0.0478	35603	35604	76.90	64.08	271	1,189	0.23	5.28	16.0
35604_35605	10	308	0.0078	35604	35605	63.98	61.58	315	870	0.36	3.27	10.5
35605_83293-07	10	242	0.0090	35605	83293-07	61.48	59.31	316	935	0.34	2.35	5.4
35606_35601	8	315	0.0079	35606	35601	116.30	113.81	94	484	0.19	2.39	16.0
35709_83214-01	8	106	0.0704	35709	83214-01	230.48	223.03	61	1,443	0.04	4.55	16.9
35710_35709	10	79	0.0036	35710	35709	230.87	230.58	59	590	0.10	*1.54*	13.5
35711_35710	8	121	0.0041	35711	35710	231.43	230.93	46	347	0.13	*1.54*	5.8
35713_35710	8	174	0.0910	35713	35710	246.76	230.97	12	1,640	0.01	2.55	5.7
37402_23209	12	334	0.0012	37402	23209	130.28	129.87	2,329	565	4.12	6.59	0.0
37403_37402	12	115	0.0006	37403	37402	130.45	130.38	2,329	393	5.92	6.59	0.0
37404_37403	12	181	0.0260	37404	37403	135.27	130.55	2,329	2,588	0.90	6.58	1.0
37405_37404	12	82	0.0111	37405	37404	136.28	135.37	2,329	1,691	1.38	6.58	1.8
37406_37405	12	365	0.0405	37406	37405	151.18	136.38	1,596	3,227	0.49	4.52	3.6
37407_82122-19	12	119	0.0028	37407	82122-19	156.48	156.15	1,571	844	1.86	4.45	4.6
40108_40110	8	362	0.0231	40108	40110	137.80	129.45	58	826	0.07	3.04	4.3
40110_40113	8	288	0.0411	40110	40113	129.35	117.51	106	1,102	0.10	3.08	9.2
40113_21304	10	278	0.0056	40113	21304	117.41	115.86	222	736	0.30	2.63	18.7
40901_23309	12	400	0.0031	40901	23309	171.09	169.87	1,203	886	1.36	3.41	9.0
40902_40901	12	397	0.0031	40902	40901	172.41	171.19	1,183	889	1.33	3.35	8.0
40903_40902	12	402	0.0030	40903	40902	173.73	172.51	1,163	883	1.32	3.30	0.4
40904_40903	12	387	0.0028	40904	40903	174.90	173.83	1,140	841	1.35	3.23	0.0
41001_40904	8	193	0.0209	41001	40904	179.82	175.80	1,096	785	1.40	6.99	0.0

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
41002_41001	8	238	0.0238	41002	41001	185.58	179.92	1,096	839	1.31	6.99	0.0
41003_41002	8	456	0.0289	41003	41002	198.85	185.68	1,065	924	1.15	6.80	0.0
41004_41003	10	429	0.0028	41004	41003	200.16	198.95	1,036	524	1.98	4.23	2.9
41005_41004	10	382	0.0028	41005	41004	201.49	200.41	1,007	524	1.92	4.11	0.0
41101_41005	10	203	0.0010	41101	41005	201.80	201.59	1,007	317	3.18	4.11	0.0
42801_W0073-S03	18	252	0.0020	42801	W0073-S03	98.85	98.34	3,610	2,126	1.70	4.55	7.4
42802_42801	18	234	0.0047	42802	42801	100.05	98.95	3,610	3,245	1.11	4.54	2.2
42803_42802	18	476	0.0027	42803	42802	101.43	100.15	3,609	2,451	1.47	4.54	9.3
43301_42803	18	417	0.0031	43301	42803	102.82	101.53	2,618	2,628	1.00	3.29	5.4
43302_STB22-S01	18	257	0.0023	43302	STB22-S01	103.72	103.12	2,596	2,284	1.14	3.27	1.7
43303_S0147-S01	18	264	0.0006	43303	S0147-S01	104.30	104.15	2,546	1,127	2.26	3.21	0.5
45501_45502	8	390	0.0455	45501	45502	186.61	168.87	353	1,160	0.30	6.50	8.1
45502_31917	8	423	0.0679	45502	31917	168.77	140.05	434	1,417	0.31	7.95	8.4
45601_45701	8	252	0.0393	45601	45701	44.95	35.05	191	1,078	0.18	5.19	8.3
45602_45601	8	108	0.2400	45602	45601	71.06	45.05	190	2,664	0.07	9.85	11.8
45701_BRIZALS	8	28	0.0236	45701	BRIZALS	34.95	34.30	218	836	0.26	*1.39*	12.3
45702_45701	8	314	0.0459	45702	45701	49.45	35.05	17	1,165	0.01	2.05	12.9
45712_45702	8	223	0.2620	45712	45702	107.91	49.55	10	2,783	0.00	4.22	14.2
45713_45712	8	69	0.2512	45713	45712	125.45	108.01	9	2,726	0.00	4.02	6.7
45714_45713	8	161	0.0576	45714	45713	134.80	125.55	3	1,305	0.00	*1.69*	16.4
45901_32207	8	299	0.0783	45901	32207	168.55	145.10	35	1,522	0.02	4.01	14.5
45902_45901	8	348	0.0635	45902	45901	190.75	168.65	19	1,370	0.01	3.08	9.7
45903_45902	8	39	0.1002	45903	45902	194.75	190.85	7	1,721	0.00	2.70	7.1
46803_46901	8	394	0.0334	46803	46901	377.71	364.55	18	994	0.02	2.43	9.4
46804_46803	8	61	0.1578	46804	46803	387.48	377.81	13	2,160	0.01	3.79	7.1
46807_46804	8	153	0.0638	46807	46804	397.33	387.58	12	1,373	0.01	2.71	7.1
46810_35521	8	309	0.0092	46810	35521	430.80	427.97	6	521	0.01	*1.14*	3.9
46901_46902	8	225	0.0364	46901	46902	364.45	356.25	21	1,038	0.02	2.62	8.4
46902_35405	8	436	0.0390	46902	35405	356.15	339.15	39	1,074	0.04	3.24	6.9
46903_46902	8	60	0.2063	46903	46902	368.63	356.25	17	2,470	0.01	4.49	7.1
47101_47102	8	308	0.0006	47101	47102	5.47	5.27	0	136	0.00	0.00	8.5
47102_24201	8	293	0.0057	47102	24201	5.17	3.50	0	411	0.00	0.00	7.9
49501_49502	8	260	0.0059	49501	49502	101.93	100.41	143	416	0.34	2.23	10.3
49502_49504	8	249	0.0055	49502	49504	100.31	98.94	256	403	0.64	2.73	15.4
49504_ARBUTUSLS	8	6	0.0640	49504	ARBUTUSLS	98.84	98.44	312	1,375	0.23	7.10	3.4
49602_49501	8	195	0.0035	49602	49501	102.72	102.03	91	323	0.28	*1.77*	7.7
49603_49602	8	155	0.0044	49603	49602	103.50	102.82	91	360	0.25	*1.92*	3.8
49604_49603	8	180	0.0130	49604	49603	105.94	103.60	78	619	0.13	2.70	6.3
49607_49604	8	191	0.0626	49607	49604	118.00	106.04	69	1,361	0.05	4.55	5.9
49701_82361-10	60	812	0.0026	49701	82361-10	3.95	1.80	43,700	60,294	0.72	7.46	11.8
49801_1315	10	289	0.0003	49801	1315	9.80	9.70	0	184	0.00	*0.09*	5.2

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49802_49801	10	207	0.0005	49802	49801	10.00	9.90	0	216	0.00	*0.10*	5.0
49803_49802	10	333	0.0003	49803	49802	10.20	10.10	0	171	0.00	*0.08*	5.8
49804_49803	10	261	0.0004	49804	49803	10.40	10.30	0	193	0.00	0.00	2.1
49805_49804	10	104	0.0010	49805	49804	10.60	10.50	-	306	0.00	0.00	4.4
49806_49805	10	185	0.0005	49806	49805	10.80	10.70	-	229	0.00	0.00	4.2
49902_49903	8	380	0.0253	49902	49903	195.00	185.40	145	864	0.17	4.10	4.2
49903_49904	8	400	0.0370	49903	49904	185.30	170.50	176	1,046	0.17	4.97	3.4
49904_7007	8	472	0.0423	49904	7007	170.40	150.39	219	1,119	0.20	5.54	2.5
49909_7009	8	488	0.0244	49909	7009	192.00	180.10	10	850	0.01	*1.85*	4.1
50014_7122	8	405	0.0142	50014	7122	250.56	244.81	133	648	0.21	3.24	6.9
50015_50014	8	403	0.0087	50015	50014	254.14	250.66	126	506	0.25	2.68	6.8
50016_50015	8	394	0.0082	50016	50015	257.47	254.24	114	492	0.23	2.55	7.8
50017_50016	8	281	0.0162	50017	50016	262.11	257.57	102	692	0.15	3.16	5.7
50024_7123	8	339	0.0189	50024	7123	267.50	261.10	8	747	0.01	*1.55*	5.0
50103_50017	8	329	0.0381	50103	50017	274.75	262.21	90	1,062	0.08	4.13	8.4
50104_50103	8	287	0.0335	50104	50103	284.46	274.85	75	996	0.08	3.74	11.8
50105_50104	8	286	0.0462	50105	50104	297.77	284.56	63	1,169	0.05	3.98	9.7
50106_50105	8	234	0.0391	50106	50105	307.01	297.87	42	1,075	0.04	3.32	9.9
50109_50106	8	199	0.0518	50109	50106	317.40	307.11	35	1,237	0.03	3.45	9.7
50408_50409	15	224	0.0588	50408	50409	378.25	365.10	884	7,047	0.13	8.73	5.8
50409_50410	15	153	0.0943	50409	50410	365.00	350.60	888	8,929	0.10	6.22	3.3
50410_19416	18	240	0.0060	50410	19416	350.50	349.07	889	3,648	0.24	3.79	3.4
50411_19413	10	195	0.0255	50411	19413	330.40	325.42	253	1,575	0.16	4.29	5.0
50412_50423	12	50	0.0187	50412	50423	308.06	307.13	249	2,190	0.11	4.12	13.6
50413_50418	8	291	0.0152	50413	50418	342.41	337.98	13	671	0.02	*1.66*	5.0
50416_50420	8	324	0.0770	50416	50420	370.52	345.56	8	1,509	0.01	2.58	5.0
50417_50412	20	113	0.0109	50417	50412	309.40	308.16	248	6,545	0.04	3.21	13.3
50418_50502	8	106	0.0511	50418	50502	337.88	332.47	25	1,229	0.02	3.12	4.5
50420_50514	8	413	0.0782	50420	50514	345.46	313.14	14	1,520	0.01	*0.09*	7.1
50421_MARTINLS	12	23	0.0088	50421	MARTINLS	305.30	305.10	252	1,501	0.17	*0.71*	17.1
50423_50421	12	273	0.0060	50423	50421	307.03	305.40	250	1,238	0.20	2.75	14.1
50501_50417	12	269	0.0072	50501	50417	311.44	309.50	246	1,362	0.18	2.93	13.4
50502_50501	8	90	0.2306	50502	50501	332.37	311.54	26	2,611	0.01	*0.17*	7.3
50513_50520	12	346	0.0013	50513	50520	312.70	312.26	214	572	0.37	*1.50*	5.4
50514_50513	12	236	0.0010	50514	50513	313.04	312.80	210	512	0.41	*1.38*	2.8
50515_50514	12	216	0.0023	50515	50514	313.64	313.14	194	774	0.25	*1.78*	3.2
50520_50521	20	113	0.0021	50520	50521	312.16	311.92	215	2,902	0.07	*1.64*	4.5
50521_50501	12	204	0.0014	50521	50501	311.82	311.54	218	592	0.37	*1.55*	7.6
52401_37407	15	318	0.0021	52401	37407	157.26	156.58	1,539	1,339	1.15	2.79	8.2
52402_52401	15	256	0.0018	52402	52401	157.81	157.36	1,477	1,226	1.20	2.68	9.3
52403_52402	15	301	0.0025	52403	52402	158.65	157.91	1,476	1,442	1.02	2.80	9.8

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52404_52403	15	231	0.0023	52404	52403	159.29	158.75	1,475	1,398	1.06	2.89	2.9
52701_52702	18	754	0.0016	52701	52702	107.09	105.89	2,288	1,882	1.22	2.88	0.7
52702_52703	18	116	0.0100	52702	52703	105.79	104.63	2,323	4,723	0.49	2.93	0.0
52703_43303	18	63	0.0021	52703	43303	104.53	104.40	2,546	2,142	1.19	3.20	0.2
52704_52703	8	99	0.0057	52704	52703	105.20	104.63	268	412	0.65	*1.71*	7.1
52705_52704	8	287	0.1194	52705	52704	139.55	105.30	248	1,879	0.13	5.69	7.2
52706_52705	8	254	0.0276	52706	52705	146.65	139.65	246	903	0.27	4.90	9.5
52801_52701	18	409	0.0029	52801	52701	108.36	107.19	2,287	2,533	0.90	2.87	2.2
52802_52801	18	375	0.0020	52802	52801	109.22	108.46	1,082	2,128	0.51	*1.98*	8.6
52803_52802	18	251	0.0032	52803	52802	110.11	109.32	1,061	2,654	0.40	3.04	3.9
52804_52801	12	238	0.0135	52804	52801	111.95	108.73	1,205	1,864	0.65	4.96	10.5
52805_52804	12	271	0.1302	52805	52804	147.30	112.05	1,204	5,784	0.21	7.85	6.9
52903_52803	18	395	0.0021	52903	52803	111.06	110.21	1,028	2,191	0.47	2.61	6.7
52904_52903	18	516	0.0055	52904	52903	114.00	111.16	1,027	3,506	0.29	3.04	5.4
52905_52904	18	308	0.0073	52905	52904	116.35	114.10	1,026	4,043	0.25	4.25	8.1
53004_52905	12	396	0.0112	53004	52905	120.90	116.45	1,026	1,699	0.60	5.04	3.5
53005_53004	12	334	0.0057	53005	53004	122.90	121.00	1,025	1,211	0.85	3.85	3.5
53101_53005	10	356	0.0031	53101	53005	124.10	123.00	1,025	548	1.87	4.15	2.3
53102_53101	10	418	0.0055	53102	53101	126.49	124.20	1,025	730	1.40	4.14	0.0
53105_53102	10	415	0.0023	53105	53102	127.54	126.59	1,024	472	2.17	4.14	0.0
53106_53105	10	353	0.0039	53106	53105	129.01	127.64	1,024	613	1.67	4.15	0.0
53201_53306	10	416	0.0026	53201	53306	166.52	165.45	115	500	0.23	*1.66*	8.2
53202_V0010-S03	10	215	0.0034	53202	V0010-S03	167.63	166.90	115	575	0.20	*1.83*	7.1
53301_52805	12	358	0.0375	53301	52805	160.83	147.40	1,193	3,105	0.38	8.22	11.3
53302_53301	15	422	0.0037	53302	53301	162.51	160.93	1,184	1,778	0.67	3.45	11.7
53303_53302	15	415	0.0019	53303	53302	162.68	161.88	1,024	1,276	0.80	*1.85*	6.5
53304_53303	15	432	0.0019	53304	53303	163.62	162.78	1,013	1,278	0.79	2.57	5.5
53305_53302	10	381	0.0049	53305	53302	164.49	162.61	154	693	0.22	*0.62*	10.2
53306_53305	10	303	0.0025	53306	53305	165.35	164.59	144	494	0.29	*1.75*	9.3
53401_53304	12	475	0.0054	53401	53304	166.30	163.72	993	1,183	0.84	3.29	3.0
53402_53401	12	387	0.0019	53402	53401	167.06	166.32	876	704	1.24	2.46	13.2
53403_53402	12	385	0.0021	53403	53402	167.95	167.16	860	726	1.18	2.41	12.3
53404_53403	12	271	0.0024	53404	53403	168.69	168.05	841	779	1.08	2.51	5.1
53405_53401	10	447	0.0027	53405	53401	167.61	166.40	106	513	0.21	*0.79*	12.0
53501_53405	10	447	0.0026	53501	53405	168.87	167.71	84	502	0.17	*1.52*	11.5
53502_53501	10	453	0.0026	53502	53501	170.17	168.97	52	508	0.10	*1.34*	8.7
53603_83171-03	8	57	0.0123	53603	83171-03	144.30	143.60	888	603	1.47	5.63	4.1
53604_53603	8	238	0.0649	53604	53603	159.84	144.40	888	1,385	0.64	6.19	7.9
53605_53604	8	273	0.0557	53605	53604	175.15	159.94	887	1,284	0.69	8.78	6.1
53606_53605	10	330	0.0033	53606	53605	176.33	175.25	856	564	1.52	3.48	5.8
53607_53606	10	417	0.0026	53607	53606	177.50	176.43	832	499	1.67	3.38	0.4

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
53801_53903	8	388	0.0085	53801	53903	174.35	171.04	611	502	1.22	3.87	1.6
53802_53801	8	403	0.0062	53802	53801	176.95	174.45	571	428	1.33	3.62	2.7
53803_S0271-S03	8	302	0.0025	53803	S0271-S03	178.25	177.49	529	273	1.94	3.36	0.6
53901_53404	12	253	0.0023	53901	53404	169.37	168.79	829	770	1.08	2.49	1.5
53902_53901	8	49	0.0032	53902	53901	169.63	169.47	829	306	2.71	5.23	0.7
53903_53902	10	425	0.0002	53903	53902	169.83	169.73	645	151	4.26	2.62	3.5
54001_50109	8	161	0.0040	54001	50109	318.14	317.50	27	344	0.08	*1.30*	13.8
54002_54001	8	199	0.0058	54002	54001	319.39	318.24	19	413	0.05	*1.33*	12.1
54003_54002	8	153	0.0039	54003	54002	320.09	319.49	16	341	0.05	*1.11*	7.3
54004_54003	8	129	0.0064	54004	54003	321.01	320.19	12	434	0.03	*1.20*	7.2
54005_54004	8	210	0.0282	54005	54004	327.02	321.11	8	913	0.01	*1.79*	5.6
54502_52706	8	353	0.0028	54502	52706	147.72	146.75	241	285	0.84	2.04	16.8
54503_X0034-S13	8	236	0.0139	54503	X0034-S13	151.74	148.45	230	642	0.36	3.49	8.0
48TH_FM_OUT_34503	8	1108	0.0326	48TH_FM_OUT	34503	501.35	465.17	713	983	0.73	4.54	7.7
48THLS_48TH	12	34	0.0058	48THLS	48TH	459.40	459.20	653	1,225	0.53	3.53	13.5
72011-06_31515	21	266	0.0071	72011-06	31515	250.35	248.47	366	5,999	0.06	2.35	16.8
72012-04_29021	8	124	0.0683	72012-04	29021	168.89	160.45	171	1,421	0.12	6.12	4.9
72012-05_29021	8	147	0.0025	72012-05	29021	160.83	160.45	38	274	0.14	*1.23*	7.2
72012-15_29310	15	449	0.0200	72012-15	29310	110.06	101.08	426	4,110	0.10	3.32	2.0
72012-21_29011	12	127	0.0844	72012-21	29011	145.97	135.23	232	4,658	0.05	6.88	5.8
72013-05_26915	8	262	0.0112	72013-05	26915	48.92	45.98	97	576	0.17	2.73	11.7
72013-06_72013-05	8	281	0.0735	72013-06	72013-05	69.64	49.02	87	1,474	0.06	5.15	10.0
72014-01_72014-02	8	101	0.0550	72014-01	72014-02	66.00	60.45	38	1,275	0.03	3.63	6.4
72014-02_27201	8	32	0.1383	72014-02	27201	60.35	55.99	38	2,022	0.02	*0.24*	11.5
72014-06_72014-10	8	89	0.1596	72014-06	72014-10	169.37	155.19	18	2,172	0.01	4.21	9.5
72014-07_27804	8	393	0.0792	72014-07	27804	148.93	117.79	32	1,531	0.02	3.93	3.7
72014-10_72014-07	8	55	0.1111	72014-10	72014-07	155.09	149.03	23	1,812	0.01	3.97	3.9
72022-01_26807	15	359	0.0024	72022-01	26807	16.15	15.30	28	1,414	0.02	*1.02*	7.6
72112-01_30403	8	159	0.0591	72112-01	30403	51.08	41.70	11	1,321	0.01	*1.91*	6.1
72112-03_31808	8	281	0.0389	72112-03	31808	169.37	158.44	77	1,072	0.07	3.31	7.3
72112-04_72112-05	12	92	0.0001	72112-04	72112-05	36.55	36.54	435	167	2.61	*1.23*	12.3
72112-05_WILLOWLS	8	13	0.2240	72112-05	WILLOWLS	36.44	33.49	583	2,574	0.23	11.39	9.1
72112-06_31801	8	73	0.0091	72112-06	31801	188.95	188.28	88	520	0.17	2.47	9.5
72121-10_28316	30	149	0.0036	72121-10	28316	90.24	89.70	4,497	11,119	0.40	4.78	13.6
72121-11_72121-10	30	461	0.0023	72121-11	72121-10	91.42	90.34	4,450	8,927	0.50	4.05	11.5
72123-03_72123-04	8	163	0.0176	72123-03	72123-04	249.95	247.09	83	721	0.11	3.06	2.6
72123-04_72123-05	8	242	0.0622	72123-04	72123-05	246.99	231.92	98	1,356	0.07	5.03	3.7
72123-05_72123-21	8	182	0.0385	72123-05	72123-21	231.82	224.80	123	1,067	0.11	3.06	6.4
72123-06_72123-07	8	303	0.0048	72123-06	72123-07	223.75	222.29	227	378	0.60	2.52	3.5
72123-07_72123-22	8	369	0.0222	72123-07	72123-22	222.19	213.99	237	811	0.29	3.64	3.5
72123-13_72123-14	8	87	0.1650	72123-13	72123-14	218.40	204.12	32	2,209	0.01	5.08	1.4

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
72123-14_72123-15	8	379	0.0092	72123-14	72123-15	204.02	200.53	44	522	0.08	*1.96*	9.7
72123-15_72123-16	8	377	0.0671	72123-15	72123-16	200.43	175.11	334	1,409	0.24	7.36	6.8
72123-16_72123-17	8	81	0.0486	72123-16	72123-17	175.01	171.06	347	1,198	0.29	5.85	2.6
72123-17_31121	8	275	0.0122	72123-17	31121	170.96	167.60	355	601	0.59	3.99	8.3
72123-19_31810	8	184	0.0200	72123-19	31810	166.20	162.52	161	768	0.21	3.88	7.5
72123-20_72123-15	8	274	0.0438	72123-20	72123-15	212.54	200.53	276	1,138	0.24	5.99	4.1
72123-21_72123-06	8	205	0.0041	72123-21	72123-06	224.70	223.85	207	350	0.59	2.33	6.6
72123-22_72123-20	8	265	0.0047	72123-22	72123-20	213.89	212.64	261	374	0.70	2.58	3.2
72123-26_72123-03	8	186	0.0293	72123-26	72123-03	255.50	250.05	68	931	0.07	3.46	4.6
72124-06_28205	8	115	0.3614	72124-06	28205	101.70	60.05	208	3,269	0.06	*1.33*	5.7
72124-08_28207	8	493	0.0383	72124-08	28207	123.95	105.05	185	1,065	0.17	5.10	2.5
73053-04_73062-09	8	221	0.0957	73053-04	73062-09	505.91	484.71	144	1,683	0.09	6.14	6.7
73053-05_73053-04	8	130	0.1349	73053-05	73053-04	523.61	506.01	138	1,997	0.07	7.31	2.5
73053-07_73053-05	8	333	0.0854	73053-07	73053-05	552.18	523.71	132	1,590	0.08	6.15	7.5
73054-01_STA91-S04	8	266	0.0668	73054-01	CP44	339.16	321.36	23	1,406	0.02	3.32	5.8
73054-01_83323-70	8	138	0.0754	73054-01	83323-70	339.16	328.77	24	1,494	0.02	3.53	5.8
73061-01_33909	24	162	0.0165	73061-01	33909	185.51	182.83	1,096	13,086	0.08	3.15	8.0
73061-02_73061-01	8	338	0.0114	73061-02	73061-01	189.45	185.61	93	579	0.16	2.18	2.9
73061-03_73061-02	8	331	0.0113	73061-03	73061-02	193.30	189.55	63	579	0.11	2.42	3.9
73061-08_33304	10	77	0.0280	73061-08	33304	247.65	245.50	54	1,649	0.03	3.10	4.9
73061-09_33802	8	308	0.0038	73061-09	33802	233.77	232.59	351	337	1.04	2.45	7.9
73061-10_73061-09	8	80	0.0080	73061-10	73061-09	234.51	233.87	351	487	0.72	3.13	9.9
73061-11_73061-10	8	175	0.0722	73061-11	73061-10	247.25	234.61	322	1,462	0.22	5.32	6.2
73061-12_73061-11	8	172	0.0591	73061-12	73061-11	257.50	247.35	322	1,322	0.24	6.97	6.4
73061-13_73061-12	8	370	0.1001	73061-13	73061-12	294.63	257.60	294	1,720	0.17	8.19	5.3
73061-14_73061-13	8	327	0.0958	73061-14	73061-13	326.07	294.73	273	1,683	0.16	7.90	3.5
73062-01_35401	8	229	0.0122	73062-01	35401	271.27	268.46	10	602	0.02	*1.43*	6.5
73062-02_73062-01	8	229	0.0024	73062-02	73062-01	271.92	271.37	8	266	0.03	*0.75*	3.4
73062-03_73062-02	8	71	0.0206	73062-03	73062-02	273.48	272.02	6	780	0.01	*1.46*	2.7
73062-06_46807	8	36	0.1039	73062-06	46807	401.17	397.43	11	1,753	0.01	3.14	7.0
73062-08_33502	8	343	0.1305	73062-08	33502	474.92	430.16	254	1,965	0.13	8.63	8.4
73062-09_73062-08	8	366	0.0262	73062-09	73062-08	484.61	475.02	240	880	0.27	4.78	7.6
73062-10_73062-11	8	286	0.0259	73062-10	73062-11	500.54	493.14	77	875	0.09	3.44	9.7
73062-11_73062-09	8	292	0.0280	73062-11	73062-09	492.90	484.71	87	910	0.10	3.55	4.5
73063-02_33008	30	363	0.0039	73063-02	33008	132.30	130.88	1,728	11,573	0.15	3.77	13.7
73063-04_33107	24	90	0.0323	73063-04	33107	154.77	151.85	1,517	18,301	0.08	*1.07*	7.3
73071-01_34108	8	363	0.0821	73071-01	34108	346.09	316.31	8	1,558	0.01	2.59	4.0
73071-04_73071-13	8	43	0.1106	73071-04	73071-13	262.65	257.93	2	1,809	0.00	*1.74*	9.8
73071-13_32711	8	140	0.1222	73071-13	32711	257.83	240.74	2	1,901	0.00	*1.97*	9.0
73074-02_29814	8	106	0.0106	73074-02	29814	117.58	116.46	120	560	0.21	2.84	6.4
73074-03_73074-02	8	329	0.0093	73074-03	73074-02	120.73	117.68	120	524	0.23	2.71	6.6

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73074-04_73074-03	8	280	0.0065	73074-04	73074-03	122.65	120.83	118	439	0.27	2.37	8.0
73074-05_73074-04	8	308	0.0047	73074-05	73074-04	124.18	122.75	116	371	0.31	2.09	8.4
73074-06_73074-05	8	44	0.0111	73074-06	73074-05	124.77	124.28	113	572	0.20	2.84	7.5
73074-07_73074-06	8	131	0.0449	73074-07	73074-06	130.76	124.87	113	1,152	0.10	4.68	6.1
73074-08_29316	8	284	0.0044	73074-08	29316	106.04	104.79	44	361	0.12	*1.56*	8.3
73074-09_73074-07	8	372	0.0113	73074-09	73074-07	135.05	130.86	81	578	0.14	2.60	7.9
73074-10_73074-09	8	284	0.0341	73074-10	73074-09	144.82	135.15	67	1,004	0.07	3.65	8.7
73074-17_29809	15	201	0.0048	73074-17	29809	116.10	115.13	1,766	2,021	0.87	4.14	8.0
73081-01_73081-02	8	246	0.1115	73081-01	73081-02	615.96	588.58	12	1,816	0.01	3.32	6.9
73081-02_73081-03	8	137	0.1164	73081-02	73081-03	588.48	572.54	27	1,855	0.01	4.26	8.8
73081-03_73082-06	8	372	0.0049	73081-03	73082-06	572.44	570.60	28	382	0.07	*1.41*	7.1
73081-07_73081-01	8	122	0.1221	73081-07	73081-01	630.94	616.06	11	1,900	0.01	3.31	6.9
73081-08_73094-04	8	309	0.0350	73081-08	73094-04	572.84	562.04	1	1,017	0.00	*1.01*	9.6
73081-09_73094-11	8	58	0.1629	73081-09	73094-11	555.93	546.44	128	2,195	0.06	7.63	4.0
73082-04_34812	8	151	0.0321	73082-04	34812	534.37	529.54	314	974	0.32	5.27	8.9
73082-05_73082-04	12	269	0.0039	73082-05	73082-04	535.51	534.47	313	998	0.31	2.50	11.6
73082-06_73082-07	8	120	0.1094	73082-06	73082-07	570.50	557.35	33	1,798	0.02	4.44	11.9
73082-07_73082-08	8	314	0.0796	73082-07	73082-08	557.25	532.24	35	1,534	0.02	4.01	7.1
73082-08_73082-09	8	342	0.1210	73082-08	73082-09	532.14	490.71	36	1,892	0.02	4.70	2.9
73082-09_73082-10	8	265	0.0857	73082-09	73082-10	490.61	467.93	38	1,592	0.02	4.22	6.8
73082-10_73082-11	8	48	0.0447	73082-10	73082-11	467.83	465.68	38	1,150	0.03	3.36	10.4
73082-11_48THLS	8	20	0.2828	73082-11	48THLS	465.12	459.50	235	2,892	0.08	*1.50*	12.0
73082-12_48THLS	12	18	0.0222	73082-12	48THLS	459.90	459.50	420	2,390	0.18	4.26	12.3
73084-01_34306	8	357	0.1009	73084-01	34306	552.04	516.00	21	1,728	0.01	3.74	11.0
73084-02_73084-01	8	188	0.0982	73084-02	73084-01	570.57	552.14	19	1,704	0.01	3.58	7.3
73084-03_73084-12	8	285	0.0708	73084-03	73084-12	509.39	489.25	23	1,447	0.02	3.40	5.6
73084-04_73084-03	8	143	0.0650	73084-04	73084-03	518.82	509.49	21	1,387	0.02	3.23	6.4
73084-06_73084-04	8	141	0.0040	73084-06	73084-04	519.48	518.92	21	343	0.06	*1.20*	10.4
73084-09_73084-02	8	172	0.0806	73084-09	73084-02	584.52	570.67	17	1,544	0.01	3.25	8.5
73084-10_73084-09	8	40	0.0369	73084-10	73084-09	586.10	584.62	16	1,045	0.02	2.42	7.5
73084-11_73084-10	8	232	0.1027	73084-11	73084-10	610.00	586.20	14	1,742	0.01	3.37	6.6
73084-12_73084-13	8	171	0.0072	73084-12	73084-13	489.15	487.91	24	462	0.05	*1.55*	3.8
73084-13_34302	8	89	0.0241	73084-13	34302	487.81	485.67	48	843	0.06	*0.30*	10.2
73084-14_73084-13	8	146	0.0314	73084-14	73084-13	492.50	487.91	24	964	0.02	2.59	9.9
73084-16_73084-06	8	148	0.0225	73084-16	73084-06	522.91	519.58	19	815	0.02	2.16	6.5
73093-10_73082-05	12	424	0.0028	73093-10	73082-05	536.79	535.61	310	846	0.37	2.21	17.8
73093-11_73093-10	12	180	0.0033	73093-11	73093-10	537.48	536.89	298	917	0.33	2.32	5.6
73094-01_73094-02	8	158	0.0800	73094-01	73094-02	603.81	591.20	4	1,538	0.00	2.08	4.9
73094-02_73094-03	8	195	0.0815	73094-02	73094-03	591.10	575.17	5	1,553	0.00	2.25	6.2
73094-03_73094-04	8	144	0.0902	73094-03	73094-04	575.07	562.04	6	1,633	0.00	2.49	3.7
73094-04_73094-05	8	100	0.0320	73094-04	73094-05	561.94	558.73	8	973	0.01	*1.85*	5.6

Bold cells = pipe at capacity / manholes surcharged within 2' of rim.
If a mh is surcharged and the pipe is not at capacity, this is a result of the model recognizing a downstream problem.
Italic = Velocity < 2 fps

CIty of Bellingham
Sanitary Sewer Model Results Representing the Future Scenario (Year 2026/Buildout within the UGA)

Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
73094-05_73094-06	8	151	0.0927	73094-05	73094-06	558.63	544.66	8	1,656	0.00	2.09	5.3
73094-06_73094-12	10	252	0.0150	73094-06	73094-12	544.56	540.79	138	1,206	0.11	3.27	6.8
73094-11_73094-06	8	57	0.0298	73094-11	73094-06	546.34	544.63	129	939	0.14	4.19	5.8
73094-12_73093-11	12	86	0.0029	73094-12	SY9	539.00	538.75	207	864	0.24	*0.58*	7.7
82012-01_82012-02	8	373	0.0152	82012-01	82012-02	153.86	148.19	180	670	0.27	2.64	13.4
82012-02_82013-01	10	300	0.0049	82012-02	82013-01	147.88	146.40	1,228	691	1.78	5.01	9.5
82012-03_82012-02	10	365	0.0045	82012-03	82012-02	149.60	147.98	361	658	0.55	*1.46*	12.5
82012-04_82012-03	10	395	0.0028	82012-04	82012-03	150.82	149.70	360	525	0.69	2.24	12.0
82012-05_82012-04	10	366	0.0075	82012-05	82012-04	153.67	150.92	327	855	0.38	2.70	14.6
82012-06_82012-05	10	284	0.0034	82012-06	82012-05	154.75	153.77	326	577	0.57	2.43	22.7
82012-08_82012-09	8	294	0.0036	82012-08	82012-09	153.24	152.19	-	325	0.00	0.00	13.4
82012-09_82012-04	8	82	0.0096	82012-09	82012-04	152.09	151.31	0	532	0.00	*0.35*	12.0
82013-01_82013-06	10	76	0.0284	82013-01	82013-06	146.25	144.10	1,305	1,662	0.79	6.50	13.1
82013-02_82013-01	10	300	0.0147	82013-02	82013-01	150.82	146.40	77	1,197	0.06	*0.32*	5.9
82013-03_82013-02	10	300	0.0032	82013-03	82013-02	151.87	150.92	59	557	0.11	*1.48*	2.9
82013-06_HORTONLS	8	4	0.0461	82013-06	HORTONLS	144.00	143.80	1,305	1,167	1.12	8.32	10.2
82013-18_82012-02	12	376	0.0023	82013-18	82012-02	148.85	147.98	694	773	0.90	2.24	14.8
82013-19_82013-18	12	274	0.0020	82013-19	82013-18	149.50	148.95	679	718	0.95	2.17	11.8
82013-20_82013-19	12	279	0.0019	82013-20	82013-19	150.14	149.60	667	705	0.95	2.18	11.3
82013-21_82013-20	12	404	0.0027	82013-21	82013-20	151.32	150.24	643	829	0.78	2.48	11.0
82013-22_82013-21	12	264	0.0035	82013-22	82013-21	152.36	151.42	643	954	0.67	2.80	7.7
82013-23_82013-22	12	368	0.0022	82013-23	82013-22	153.22	152.41	207	753	0.28	*0.58*	10.1
82013-24_82013-23	12	227	0.0023	82013-24	82013-23	153.84	153.32	185	768	0.24	*1.73*	10.1
82013-25_82013-24	12	227	0.0032	82013-25	82013-24	154.67	153.94	177	909	0.19	*1.99*	5.0
82013-27_MEADOWBROOK	8	70	0.1255	82013-27	ADOWBROOKC	135.38	126.60	34	1,926	0.02	3.93	9.6
82112-08_82112-09	8	328	0.0044	82112-08	82112-09	170.21	168.75	1,058	362	2.92	6.75	0.0
82112-09_WESTBAKERVI	10	44	0.0057	82112-09	ESTBAKERVIEW	168.65	168.40	1,191	745	1.60	4.83	6.8
82121-03_82121-36	15	304	0.0027	82121-03	82121-36	161.62	160.80	1,412	1,506	0.94	2.56	5.9
82121-04_82121-03	12	465	0.0037	82121-04	82121-03	163.42	161.72	1,386	971	1.43	3.93	4.8
82121-05_82121-04	10	418	0.0276	82121-05	82121-04	175.06	163.52	1,335	1,637	0.82	5.45	7.4
82121-06_82121-05	10	307	0.0228	82121-06	82121-05	182.16	175.16	1,306	1,489	0.88	6.86	4.4
82121-07_82121-08	8	367	0.0085	82121-07	82121-08	160.32	157.20	179	501	0.36	2.93	13.0
82121-08_82012-01	8	510	0.0062	82121-08	82012-01	157.10	153.96	180	427	0.42	2.61	7.6
82121-13_82121-14	8	203	0.0051	82121-13	82121-14	171.03	169.99	52	389	0.13	*1.72*	3.8
82121-14_82121-04	8	181	0.0351	82121-14	82121-04	169.89	163.52	52	1,019	0.05	*0.33*	4.9
82121-18_82121-07	8	121	0.0102	82121-18	82121-07	161.66	160.42	179	549	0.33	3.13	10.6
82121-19_82121-18	8	178	0.0024	82121-19	82121-18	162.19	161.76	179	268	0.67	*1.83*	11.1
82121-24_82121-13	8	118	0.0072	82121-24	82121-13	171.98	171.13	52	461	0.11	*1.94*	3.3
82121-36_82122-14	15	308	0.0013	82121-36	82122-14	160.70	160.31	1,432	1,034	1.38	2.60	4.1
82122-14_82122-31	15	281	0.0009	82122-14	82122-31	160.21	159.95	1,433	893	1.60	2.60	4.0
82122-16_82122-26	14	164	0.0105	82122-16	82122-26	151.60	149.88	666	2,476	0.27	4.37	10.3

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Italic = Velocity < 2 fps

Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
82122-17_37405	12	183	0.0547	82122-17	37405	146.40	136.38	732	3,749	0.20	2.06	10.8
82122-19_37406	12	216	0.0221	82122-19	37406	156.05	151.28	1,596	2,384	0.67	7.24	5.1
82122-26_82122-17	12	348	0.0094	82122-26	82122-17	149.78	146.50	708	1,557	0.45	4.30	8.3
82122-31_52404	15	188	0.0024	82122-31	52404	159.85	159.39	1,451	1,436	1.01	2.97	3.1
82124-21_82121-19	8	289	0.0029	82124-21	82121-19	163.12	162.29	125	292	0.43	*1.79*	9.9
82124-22_82124-21	8	259	0.0033	82124-22	82124-21	164.08	163.22	125	313	0.40	*1.89*	5.6
82124-23_82124-22	8	207	0.0049	82124-23	82124-22	165.20	164.18	89	382	0.23	*1.99*	11.6
82124-24_82124-23	8	312	0.0284	82124-24	82124-23	174.16	165.30	89	916	0.10	3.71	13.2
82124-25_82124-24	8	92	0.0026	82124-25	82124-24	174.50	174.26	64	278	0.23	*1.44*	12.0
82131-02_22401	18	166	0.0127	82131-02	22401	103.81	101.70	5,306	5,329	1.00	7.34	0.0
82131-06_82131-07	14	337	0.0032	82131-06	82131-07	154.53	153.43	665	1,378	0.48	2.84	17.4
82131-07_82131-08	14	327	0.0028	82131-07	82131-08	153.33	152.41	665	1,282	0.52	2.69	18.0
82131-08_82131-09	14	145	0.0028	82131-08	82131-09	152.31	151.90	666	1,288	0.52	2.70	17.7
82131-09_82122-16	14	46	0.0022	82131-09	82122-16	151.80	151.70	666	1,131	0.59	2.45	11.1
82133-01_15710	18	384	0.0022	82133-01	15710	80.86	80.00	1,164	2,236	0.52	2.85	10.9
82133-02_15703	8	325	0.0054	82133-02	15703	87.88	86.11	1,144	401	2.85	7.30	0.0
82133-03_15117	10	310	0.0486	82133-03	15117	113.62	98.53	2,006	2,175	0.92	8.11	10.4
82134-02_15111	8	283	0.0243	82134-02	15111	125.86	118.98	181	848	0.21	*1.15*	5.6
82134-03_15108	10	300	0.0330	82134-03	15108	133.99	124.09	1,810	1,792	1.01	7.25	0.0
82134-04_82134-03	10	210	0.0341	82134-04	82134-03	141.25	134.09	1,801	1,820	0.99	7.89	0.0
82134-05_82134-04	10	145	0.0157	82134-05	82134-04	143.63	141.35	1,792	1,234	1.45	7.17	1.0
82134-06_82134-05	10	191	0.0257	82134-06	82134-05	148.63	143.73	1,780	1,580	1.13	7.11	0.0
82134-07_U0058-S01	10	220	0.0455	82134-07	U0058-S01	164.50	154.47	1,748	2,104	0.83	9.02	5.9
82134-08_82134-07	8	403	0.0515	82134-08	82134-07	185.34	164.60	1,715	1,234	1.39	10.72	0.0
82134-22_82134-23	10	266	0.0023	82134-22	82134-23	160.50	159.88	470	474	0.99	2.21	6.3
82134-23_82134-24	10	331	0.0028	82134-23	82134-24	159.78	158.86	470	520	0.90	2.33	6.7
82134-24_82134-25	10	328	0.0024	82134-24	82134-25	158.64	157.85	574	484	1.19	2.33	12.2
82134-25_82134-26	10	186	0.0028	82134-25	82134-26	157.75	157.23	593	521	1.14	2.43	10.8
82134-26_82134-27	10	412	0.0028	82134-26	82134-27	157.13	155.97	594	523	1.13	2.44	2.9
82134-27_82131-06	10	387	0.0032	82134-27	82131-06	155.87	154.63	613	559	1.10	2.60	5.5
82141-03_23603	10	109	0.0315	82141-03	23603	147.52	144.08	959	1,749	0.55	7.02	10.1
82141-05_82134-08	15	547	0.0036	82141-05	82134-08	187.40	185.44	1,665	1,742	0.96	3.43	0.0
82141-06_82141-05	15	465	0.0040	82141-06	82141-05	189.36	187.50	1,660	1,840	0.90	3.60	3.7
82141-07_82141-06	15	476	0.0040	82141-07	82141-06	191.36	189.46	1,608	1,836	0.88	3.60	0.0
82142-01_15308	8	349	0.0112	82142-01	15308	129.95	126.05	55	575	0.10	2.32	16.9
82144-01_17805	8	185	0.0055	82144-01	17805	165.28	164.27	41	402	0.10	*1.65*	4.6
82144-02_82144-01	8	86	0.0042	82144-02	82144-01	165.74	165.38	39	353	0.11	*1.48*	4.1
82144-03_82144-02	8	272	0.0042	82144-03	82144-02	166.99	165.84	29	353	0.08	*1.36*	2.9
82144-04_82144-03	8	164	0.0036	82144-04	82144-03	167.68	167.09	26	327	0.08	*1.24*	2.2
82144-05_82144-04	8	363	0.0039	82144-05	82144-04	169.21	167.78	19	341	0.06	*1.18*	5.0
82144-06_82144-05	8	150	0.0008	82144-06	82144-05	169.43	169.31	19	157	0.12	*0.68*	7.9

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
82144-07_82144-06	8	94	0.0029	82144-07	82144-06	169.80	169.53	19	292	0.06	*1.05*	3.3
82144-08_82144-07	8	17	0.0272	82144-08	82144-07	170.36	169.90	19	897	0.02	2.30	3.3
82144-09_82144-08	8	372	0.0005	82144-09	82144-08	170.65	170.46	12	121	0.10	*0.49*	10.5
82144-10_82144-13	8	101	0.0070	82144-10	82144-13	171.81	171.10	6	456	0.01	*1.02*	13.1
82144-13_82144-09	8	191	0.0013	82144-13	82144-09	171.00	170.75	6	199	0.03	*0.57*	12.3
82232-02_17013	8	109	0.3625	82232-02	17013	51.93	12.55	1,763	3,274	0.54	11.23	4.7
82232-03_82232-02	18	127	0.0018	82232-03	82232-02	52.26	52.03	1,580	2,009	0.79	2.80	14.2
82232-04_82232-03	18	388	0.0018	82232-04	82232-03	53.06	52.36	1,545	2,008	0.77	2.79	10.9
82232-05_16701	15	83	0.0031	82232-05	16701	55.68	55.42	1,097	1,626	0.67	3.17	12.2
82232-06_82232-05	15	280	0.0033	82232-06	82232-05	56.70	55.78	1,057	1,667	0.63	3.20	6.2
82232-07_82232-06	16	346	0.0118	82232-07	82232-06	60.87	56.80	1,056	3,743	0.28	3.52	6.6
82232-08_82232-07	15	266	0.0048	82232-08	82232-07	62.25	60.97	963	2,016	0.48	3.61	9.6
82232-09_82232-08	15	162	0.0095	82232-09	82232-08	63.89	62.35	917	2,831	0.32	4.20	10.2
82232-11_82232-02	10	148	0.0007	82232-11	82232-02	59.59	59.49	160	256	0.63	*1.10*	7.4
82234-01_20504	12	145	0.0083	82234-01	20504	83.43	82.23	201	1,458	0.14	2.89	6.3
82234-02_82234-15	8	26	0.0163	82234-02	82234-15	84.50	84.08	-	694	0.00	0.00	5.5
82234-03_82234-07	15	220	0.0050	82234-03	82234-07	67.31	66.22	789	2,047	0.39	3.46	12.1
82234-04_82234-03	12	320	0.0075	82234-04	82234-03	69.85	67.45	224	1,388	0.16	2.05	9.9
82234-05_82234-04	12	452	0.0040	82234-05	82234-04	71.75	69.95	223	1,012	0.22	2.30	7.9
82234-06_82234-05	12	397	0.0143	82234-06	82234-05	77.52	71.85	210	1,915	0.11	3.56	4.9
82234-07_82232-09	15	548	0.0039	82234-07	82232-09	66.12	63.99	847	1,813	0.47	3.22	13.3
82234-15_82234-01	8	363	0.0012	82234-15	82234-01	83.98	83.53	18	192	0.09	*0.74*	5.9
82241-03_10629	8	230	0.0038	82241-03	10629	74.39	73.51	87	336	0.26	*1.80*	10.4
82241-04_10604	21	529	0.0026	82241-04	10604	79.14	77.78	2,420	3,615	0.67	3.58	9.8
82241-05_10635	18	370	0.0018	82241-05	10635	77.33	76.65	1,216	2,027	0.60	2.67	11.8
82241-11_82241-03	8	283	0.0043	82241-11	82241-03	75.71	74.51	42	355	0.12	*1.52*	6.6
82241-17_10415	8	15	0.0305	82241-17	10415	88.50	88.05	4	950	0.00	*1.44*	6.5
82242-07_5705	8	157	0.0061	82242-07	5705	74.12	73.17	77	423	0.18	*1.45*	2.1
82242-09_82242-10	8	388	0.0030	82242-09	82242-10	76.35	75.20	318	296	1.07	2.15	4.7
82242-10_U0023-S09	8	333	0.0036	82242-10	U0023-S09	75.10	73.90	338	327	1.03	2.15	4.0
82243-07_82243-17	10	89	0.0047	82243-07	82243-17	61.06	60.64	120	673	0.18	2.08	10.2
82243-08_82243-07	10	317	0.0039	82243-08	82243-07	62.39	61.16	108	616	0.18	*1.89*	9.9
82243-09_82243-08	10	175	0.0033	82243-09	82243-08	63.07	62.49	84	567	0.15	*1.66*	9.2
82243-10_16917	24	240	0.0124	82243-10	16917	26.06	23.10	10,243	11,316	0.91	8.70	2.6
82243-12_82243-09	10	161	0.0031	82243-12	82243-09	63.67	63.17	65	549	0.12	*1.51*	8.6
82243-17_82232-11	10	350	0.0024	82243-17	82232-11	60.54	59.69	160	486	0.33	*1.49*	10.8
82251-05_24203	10	379	0.0029	82251-05	24203	5.30	4.19	251	534	0.47	2.14	3.2
82251-06_82251-05	10	404	0.0027	82251-06	82251-05	6.50	5.40	251	514	0.49	2.08	10.6
82251-07_82251-06	10	324	0.0057	82251-07	82251-06	8.45	6.60	251	745	0.34	2.74	8.7
82251-08_82251-07	10	271	0.0006	82251-08	82251-07	8.70	8.55	251	232	1.08	*1.08*	7.9
82251-09_82251-08	10	351	0.0007	82251-09	82251-08	9.05	8.80	251	263	0.95	*1.20*	7.8

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
82251-10_82251-12	10	151	0.0040	82251-10	82251-12	10.50	9.90	140	622	0.23	*1.90*	6.7
82251-12_WA543-S01	8	179	0.0022	82251-12	WA543-S01	9.80	9.40	166	257	0.64	*1.74*	7.3
82252-01_2702	10	376	0.0016	82252-01	2702	5.15	4.55	0	394	0.00	0.00	0.0
82252-02_82252-01	10	212	0.0104	82252-02	82252-01	7.45	5.25	-	1,003	0.00	0.00	1.8
82252-04_CSTLS	10	10	0.1007	82252-04	CSTLS	2.01	0.99	1,330	3,128	0.43	9.13	13.3
82254-01_5327	8	295	0.0007	82254-01	5321	59.20	59.00	5	142	0.03	*0.03*	0.0
82254-11_U0039-S01	12	350	0.0003	82254-11	U0039-S01	2.50	2.40	120	271	0.44	*0.34*	7.7
82361-04_82361-05	8	123	0.1678	82361-04	82361-05	159.96	139.32	15	2,227	0.01	4.08	5.0
82361-05_1218	8	52	0.1324	82361-05	1218	139.22	132.37	20	1,979	0.01	4.10	2.2
82361-08_82361-09	12	139	0.0071	82361-08	82361-09	7.47	6.49	154	1,348	0.11	2.54	9.8
82361-09_82361-10	12	39	0.1181	82361-09	82361-10	6.39	1.80	256	5,509	0.05	*0.72*	10.4
82361-10_OAK	60	15	0.0273	82361-10	OAK	1.70	1.30	43,903	193,601	0.23	4.98	13.4
82362-04_228	8	34	0.0989	82362-04	228	251.07	247.72	139	1,710	0.08	6.56	3.2
82362-07_82362-12	8	157	0.0100	82362-07	82362-12	130.70	129.13	50	545	0.09	2.17	2.7
82362-08_82362-07	8	153	0.0155	82362-08	82362-07	133.18	130.80	44	677	0.07	2.44	2.3
82362-09_82362-22	8	312	0.0627	82362-09	82362-22	163.78	144.20	36	1,362	0.03	3.73	3.9
82362-10_82362-09	8	440	0.0257	82362-10	82362-09	175.21	163.88	29	872	0.03	2.58	4.0
82362-11_82362-10	8	140	0.0596	82362-11	82362-10	183.69	175.31	20	1,328	0.01	3.06	4.9
82362-12_27306	8	30	0.0376	82362-12	27306	129.03	127.90	55	1,055	0.05	3.55	5.6
82362-15_28706	8	428	0.0118	82362-15	28706	186.87	181.80	31	591	0.05	*1.63*	5.9
82362-16_27723	8	130	0.0193	82362-16	27723	205.18	202.66	12	755	0.02	*1.80*	8.6
82362-17_82362-16	8	133	0.0262	82362-17	82362-16	208.76	205.28	9	880	0.01	*1.79*	8.9
82362-22_82362-08	8	204	0.0531	82362-22	82362-08	144.10	133.28	40	1,253	0.03	3.64	3.0
82362-24_T82362-47	8	45	0.1036	82362-24	T82362-47	73.87	69.21	9	1,750	0.01	*1.15*	2.4
82363-01_27807	8	29	0.0414	82363-01	27807	80.69	79.50	354	1,107	0.32	6.28	2.8
82363-02_82363-01	8	105	0.2744	82363-02	82363-01	109.50	80.79	346	2,849	0.12	11.36	8.4
82363-03_82363-02	8	90	0.2846	82363-03	82363-02	135.13	109.60	279	2,901	0.10	11.70	5.6
82363-04_82363-02	8	271	0.0406	82363-04	82363-02	120.63	109.60	65	1,096	0.06	3.83	4.2
82363-05_82363-04	8	165	0.0298	82363-05	82363-04	125.63	120.73	62	938	0.07	3.39	6.0
83063-01_41101	10	8	0.0133	83063-01	41101	202.00	201.90	1,102	1,135	0.97	5.24	0.0
83063-02_83063-01	10	272	0.0246	83063-02	83063-01	208.81	202.10	1,115	1,547	0.72	4.12	0.0
83072-01_83181-11	12	204	0.0053	83072-01	83181-11	171.29	170.22	533	1,163	0.46	3.03	5.7
83073-02_23203	8	100	0.0126	83073-02	23203	130.00	128.75	1,347	611	2.21	8.60	0.0
83073-09_83073-16	10	80	0.0074	83073-09	83073-16	151.03	150.44	758	846	0.90	3.37	7.7
83073-10_83073-09	10	90	0.0041	83073-10	83073-09	151.50	151.13	758	631	1.20	3.07	7.5
83073-13_83073-10	10	262	0.0034	83073-13	83073-10	152.49	151.60	744	574	1.30	3.01	14.5
83073-14_83073-13	10	304	0.0044	83073-14	83073-13	153.92	152.59	714	652	1.10	2.97	10.7
83073-16_83073-18	10	290	0.0045	83073-16	83073-18	150.34	149.03	825	663	1.25	3.34	0.0
83073-17_83184-11	10	31	0.0131	83073-17	83184-11	147.58	147.17	839	1,129	0.74	4.32	9.9
83073-18_83073-17	10	284	0.0044	83073-18	83073-17	148.93	147.68	835	654	1.28	3.39	0.0
83074-01_40904	8	166	0.0158	83074-01	40904	177.63	175.00	43	685	0.06	*0.27*	6.1

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Italic = Velocity < 2 fps

Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
83074-02_83074-01	8	175	0.1162	83074-02	83074-01	198.04	177.73	31	1,854	0.02	4.43	8.9
83074-03_83074-02	8	266	0.0060	83074-03	83074-02	199.75	198.14	31	423	0.07	*1.57*	2.6
83082-01_83082-07	8	131	0.0015	83082-01	83082-07	179.00	178.80	497	212	2.34	3.16	0.0
83082-02_U0099-S03	8	55	0.0083	83082-02	U0099-S03	180.18	179.72	465	495	0.94	2.96	0.8
83082-03_83082-02	8	327	0.0169	83082-03	83082-02	185.70	180.18	465	707	0.66	2.96	7.9
83082-04_83082-03	8	183	0.0185	83082-04	83082-03	189.19	185.80	465	740	0.63	4.99	12.3
83082-05_83082-06	8	273	0.0118	83082-05	83082-06	195.66	192.45	465	590	0.79	4.17	16.4
83082-06_83082-04	8	368	0.0083	83082-06	83082-04	192.35	189.29	465	496	0.94	3.60	10.5
83082-07_53803	8	201	0.0017	83082-07	53803	178.70	178.35	516	227	2.27	3.28	0.0
83093-01_83164-02	8	399	0.0065	83093-01	83164-02	138.22	135.64	261	437	0.60	2.91	7.1
83152-04_25712	10	120	0.1159	83152-04	25712	453.47	439.58	119	3,357	0.04	6.44	7.0
83152-05_83152-04	8	64	0.0271	83152-05	83152-04	455.29	453.57	117	896	0.13	3.95	7.6
83152-06_83152-19	8	344	0.0809	83152-06	83152-19	491.08	463.25	109	1,547	0.07	*0.70*	9.1
83152-07_83152-06	8	327	0.0947	83152-07	83152-06	522.13	491.18	108	1,673	0.06	6.01	7.3
83152-19_83152-05	8	62	0.1285	83152-19	83152-05	463.35	455.39	117	1,949	0.06	6.85	3.5
83152-20_83152-19	8	58	0.0086	83152-20	83152-19	463.95	463.45	9	505	0.02	*1.25*	5.9
83152-21_83152-20	8	90	0.0056	83152-21	83152-20	464.55	464.05	9	406	0.02	*1.07*	3.4
83152-22_83152-21	8	203	0.0039	83152-22	83152-21	465.45	464.65	6	341	0.02	*0.81*	3.7
83152-23_83152-22	8	131	0.0057	83152-23	83152-22	466.30	465.55	3	412	0.01	*0.73*	3.3
83153-01_24912	8	88	0.0330	83153-01	24912	497.91	495.00	10	988	0.01	2.03	4.0
83153-13_24811	8	339	0.0210	83153-13	24811	525.61	518.48	47	789	0.06	*1.97*	6.9
83153-15_24604	8	86	0.0091	83153-15	24604	504.19	503.40	89	520	0.17	2.48	13.1
83153-16_83153-15	8	303	0.0145	83153-16	83153-15	508.68	504.29	7	655	0.01	*1.20*	11.1
83153-21_24710	8	122	0.0468	83153-21	24710	530.57	524.84	11	1,176	0.01	2.38	5.0
83153-25_83153-27	8	111	0.0171	83153-25	83153-27	448.00	446.10	100	711	0.14	3.20	10.9
83153-27_83153-34	8	112	0.0170	83153-27	83153-34	446.00	444.10	106	709	0.15	3.25	5.4
83153-34_83154-14	8	145	0.0737	83153-34	83154-14	444.00	433.30	108	1,477	0.07	5.43	2.5
83153-35_25018	10	407	0.0009	83153-35	25018	457.50	457.14	19	294	0.06	*0.67*	2.4
83154-05_83154-09	8	257	0.0605	83154-05	83154-09	415.65	400.10	140	1,337	0.10	5.52	2.3
83154-06_83154-05	8	177	0.0558	83154-06	83154-05	425.61	415.75	133	1,285	0.10	5.29	5.1
83154-08_83154-06	8	423	0.0088	83154-08	83154-06	430.35	426.61	125	511	0.24	2.69	3.9
83154-09_83154-19	8	285	0.0630	83154-09	83154-19	400.00	382.05	147	1,365	0.11	5.68	4.8
83154-14_83154-08	8	344	0.0080	83154-14	83154-08	433.20	430.45	116	486	0.24	2.54	3.0
83154-19_83154-20	8	350	0.0176	83154-19	83154-20	381.95	375.79	154	722	0.21	3.66	6.0
83154-20_83154-22	8	22	0.1204	83154-20	83154-22	375.69	373.10	156	1,887	0.08	7.27	5.8
83154-21_83154-24	10	221	0.0039	83154-21	83154-24	359.53	358.66	248	619	0.40	2.31	2.6
83154-22_83154-21	8	267	0.0502	83154-22	83154-21	373.00	359.63	236	1,218	0.19	4.59	6.7
83154-24_83154-25	10	135	0.0041	83154-24	83154-25	358.56	358.01	381	628	0.61	2.69	6.0
83154-25_83154-26	10	158	0.0040	83154-25	83154-26	357.91	357.29	384	620	0.62	2.66	4.6
83154-26_83154-38	10	168	0.0042	83154-26	83154-38	357.19	356.48	409	639	0.64	2.77	9.3
83154-30_83154-31	8	190	0.0430	83154-30	83154-31	393.29	385.14	71	1,127	0.06	4.00	4.1

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
83154-31_83154-37	8	123	0.0686	83154-31	83154-37	385.04	376.60	75	1,424	0.05	4.81	6.7
83154-32_83154-30	8	274	0.0070	83154-32	83154-30	395.30	393.39	64	454	0.14	2.05	4.1
83154-37_83154-22	8	124	0.0274	83154-37	83154-22	376.50	373.10	79	899	0.09	3.53	3.4
83154-38_83154-39	10	223	0.0046	83154-38	83154-39	356.38	355.36	409	667	0.61	2.86	11.9
83154-39_83154-40	10	198	0.0041	83154-39	83154-40	355.26	354.46	409	628	0.65	2.73	14.9
83154-40_83154-41	10	361	0.0040	83154-40	83154-41	354.36	352.91	409	625	0.66	2.72	13.1
83154-41_83154-42	8	425	0.0396	83154-41	83154-42	352.81	336.01	410	1,082	0.38	6.41	14.3
83154-42_83154-43	8	284	0.0335	83154-42	83154-43	335.91	326.40	410	995	0.41	6.02	4.5
83154-43_83154-44	8	296	0.0202	83154-43	83154-44	326.30	320.32	410	773	0.53	4.99	5.9
83154-44_83161-09	8	444	0.0519	83154-44	83161-09	320.22	297.20	410	1,238	0.33	4.64	5.7
83154-45_83154-24	8	225	0.0387	83154-45	83154-24	367.37	358.66	130	1,070	0.12	2.08	7.0
83154-46_83154-45	8	377	0.0265	83154-46	83154-45	377.47	367.47	124	886	0.14	3.98	12.4
83154-48_83154-46	8	220	0.0067	83154-48	83154-46	379.05	377.57	108	446	0.24	2.35	10.7
83154-65_83154-48	8	258	0.0072	83154-65	83154-48	381.00	379.15	41	460	0.09	*1.81*	12.0
83154-66_83154-65	8	295	0.0335	83154-66	83154-65	391.00	381.10	23	995	0.02	2.64	8.6
83154-70_83154-32	8	234	0.0555	83154-70	83154-32	408.40	395.40	51	1,281	0.04	3.98	4.0
83154-71_83154-70	8	133	0.0736	83154-71	83154-70	418.28	408.50	44	1,476	0.03	4.21	4.0
83154-72_83154-71	8	114	0.0375	83154-72	83154-71	422.66	418.38	41	1,052	0.04	3.25	4.0
83154-73_83154-72	8	158	0.0491	83154-73	83154-72	430.51	422.76	32	1,205	0.03	3.31	8.0
83154-74_83154-73	8	75	0.0088	83154-74	83154-73	431.27	430.61	24	510	0.05	*1.66*	5.0
83154-75_83154-74	8	103	0.0102	83154-75	83154-74	432.42	431.37	23	549	0.04	*1.73*	4.2
83154-76_83154-75	8	104	0.0616	83154-76	83154-75	438.90	432.52	21	1,350	0.02	3.15	3.9
83161-01_11604	10	348	0.0097	83161-01	11604	278.21	274.85	704	969	0.73	4.31	5.1
83161-02_83161-01	10	409	0.0128	83161-02	83161-01	283.53	278.31	685	1,114	0.61	4.77	4.6
83161-03_83161-02	10	406	0.0101	83161-03	83161-02	287.73	283.63	683	991	0.69	4.36	4.6
83161-04_83161-03	10	404	0.0012	83161-04	83161-03	288.33	287.83	683	347	1.97	2.76	8.1
83161-05_83161-10	10	355	0.0069	83161-05	83161-10	291.61	289.16	660	819	0.80	3.33	5.6
83161-06_83161-05	10	380	0.0055	83161-06	83161-05	293.81	291.71	659	733	0.90	3.38	5.6
83161-07_83161-06	10	435	0.0049	83161-07	83161-06	296.06	293.91	659	693	0.95	3.22	3.3
83161-08_83161-07	10	200	0.0021	83161-08	83161-07	296.57	296.16	659	447	1.47	2.66	2.1
83161-09_83161-08	10	62	0.0070	83161-09	83161-08	297.10	296.67	658	824	0.80	2.67	1.8
83161-10_83161-04	10	39	0.0163	83161-10	83161-04	289.06	288.43	660	1,258	0.52	2.66	7.9
83162-01_83163-11	10	248	0.0109	83162-01	83163-11	273.34	270.63	912	1,031	0.88	4.75	8.5
83162-04_83162-09	8	190	0.0173	83162-04	83162-09	404.12	400.82	24	716	0.03	2.10	6.7
83162-05_11605	8	313	0.0039	83162-05	11605	307.17	305.95	210	339	0.62	2.28	7.9
83162-06_83162-05	8	244	0.1137	83162-06	83162-05	335.03	307.27	170	1,833	0.09	4.63	10.7
83162-07_X0074-S07	8	94	0.2353	83162-07	X0074-S07	383.15	361.00	170	2,638	0.06	9.46	9.2
83162-08_83162-07	8	63	0.0143	83162-08	83162-07	384.15	383.25	170	650	0.26	3.49	9.5
83162-09_83162-08	8	124	0.1152	83162-09	83162-08	400.72	386.45	87	1,846	0.05	6.03	5.1
83162-10_83162-09	8	190	0.0971	83162-10	83162-09	419.23	400.82	61	1,694	0.04	5.11	4.7
83162-11_83162-08	8	176	0.0043	83162-11	83162-08	385.00	384.25	78	356	0.22	*1.82*	10.0

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
83162-12_83162-11	8	213	0.0201	83162-12	83162-11	389.37	385.10	73	771	0.09	3.09	5.0
83162-13_83162-12	8	127	0.0512	83162-13	83162-12	395.97	389.47	53	1,231	0.04	3.91	12.3
83162-14_83162-13	8	139	0.0201	83162-14	83162-13	398.87	396.07	50	771	0.06	2.76	8.1
83162-15_83162-14	8	148	0.0542	83162-15	83162-14	407.01	398.97	36	1,266	0.03	3.55	5.0
83162-17_83162-10	8	344	0.0857	83162-17	83162-10	448.78	419.33	55	1,591	0.03	4.75	5.9
83162-18_83162-15	8	41	0.1910	83162-18	83162-15	415.01	407.11	27	2,377	0.01	5.07	2.1
83162-19_83162-24	8	71	0.0314	83162-19	83162-24	420.00	417.79	24	963	0.02	2.59	4.9
83162-24_83162-18	8	81	0.0319	83162-24	83162-18	417.69	415.11	25	972	0.03	2.65	4.0
83162-26_83214-23	8	138	0.0058	83162-26	83214-23	288.35	287.54	189	416	0.45	2.59	6.3
83162-27_83162-26	8	84	0.0059	83162-27	83162-26	288.95	288.45	188	418	0.45	2.60	8.2
83162-28_83162-27	8	215	0.0889	83162-28	83162-27	308.15	289.05	184	1,622	0.11	5.35	9.2
83162-30_X0078-S09	8	208	0.1098	83162-30	X0078-S09	349.45	326.57	169	1,802	0.09	7.21	8.0
83162-31_83162-30	8	159	0.0546	83162-31	83162-30	358.20	349.55	169	1,270	0.13	5.62	9.1
83162-32_83214-33	8	158	0.0039	83162-32	83214-33	281.97	281.35	41	340	0.12	*1.46*	16.0
83162-33_83162-32	8	169	0.0040	83162-33	83162-32	282.75	282.07	40	345	0.12	*1.48*	2.3
83162-34_83162-33	8	97	0.0046	83162-34	83162-33	283.30	282.85	40	370	0.11	*1.55*	9.4
83162-35_83162-38	8	50	0.1309	83162-35	83162-38	400.35	393.85	73	1,967	0.04	5.98	7.1
83162-36_83162-35	8	171	0.0620	83162-36	83162-35	411.05	400.45	71	1,354	0.05	4.57	6.7
83162-37_83162-36	8	106	0.0038	83162-37	83162-36	411.55	411.15	69	334	0.21	*1.68*	6.0
83162-38_83162-31	8	90	0.3937	83162-38	83162-31	393.75	358.30	168	3,412	0.05	11.29	6.8
83162-41_83211-50	8	201	0.0252	83162-41	83211-50	449.34	444.27	38	863	0.04	2.77	5.9
83162-42_83162-41	8	272	0.0133	83162-42	83162-41	453.06	449.44	34	628	0.05	2.14	4.9
83162-43_83162-42	8	154	0.0067	83162-43	83162-42	454.19	453.16	31	445	0.07	*1.63*	8.2
83162-44_83162-43	8	27	0.0037	83162-44	83162-43	454.39	454.29	28	329	0.09	*1.28*	6.3
83162-45_83162-44	8	177	0.1081	83162-45	83162-44	473.65	454.49	27	1,788	0.01	4.14	8.8
83162-49_83162-60	8	207	0.0907	83162-49	83162-60	465.83	447.00	34	1,638	0.02	4.17	6.1
83162-50_83162-49	8	143	0.0837	83162-50	83162-49	477.91	465.93	26	1,573	0.02	3.77	4.5
83162-53_83162-38	8	322	0.0037	83162-53	83162-38	395.05	393.85	90	332	0.27	*1.80*	7.2
83162-54_83162-53	8	233	0.0059	83162-54	83162-53	396.52	395.15	72	417	0.17	*1.99*	6.4
83162-55_83162-54	8	61	0.3535	83162-55	83162-54	418.10	396.62	72	3,233	0.02	7.51	10.4
83162-56_83162-55	8	29	0.3784	83162-56	83162-55	429.27	418.20	54	3,345	0.02	7.91	8.2
83162-57_83162-56	8	42	0.1329	83162-57	83162-56	434.92	429.37	54	1,982	0.03	5.48	4.8
83162-58_83162-57	8	31	0.0110	83162-58	83162-57	435.36	435.02	51	570	0.09	2.26	7.6
83162-59_83162-58	8	100	0.0090	83162-59	83162-58	436.36	435.46	40	515	0.08	*1.96*	6.7
83162-60_83162-59	8	160	0.0653	83162-60	83162-59	446.90	436.46	38	1,389	0.03	3.85	7.4
83162-61_83162-17	8	158	0.1147	83162-61	83162-17	467.03	448.88	41	1,841	0.02	4.81	5.8
83162-70_83162-04	8	348	0.0418	83162-70	83162-04	418.78	404.22	15	1,112	0.01	2.49	8.7
83162-75_83162-17	12	127	0.0035	83162-75	83162-17	449.15	448.71	10	942	0.01	*0.03*	8.6
83163-02_83172-03	12	395	0.0247	83163-02	83172-03	217.53	207.76	1,400	2,522	0.56	6.07	5.2
83163-03_83163-02	12	142	0.0236	83163-03	B11	221.51	218.17	1,350	2,463	0.55	3.81	9.0
83163-04_83163-03	12	234	0.0150	83163-04	83163-03	225.13	221.61	1,330	1,965	0.68	5.98	8.8

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
83163-05_83163-04	12	418	0.0160	83163-05	83163-04	231.93	225.23	1,299	2,030	0.64	6.10	4.9
83163-06_83163-05	12	389	0.0111	83163-06	83163-05	236.33	232.03	1,255	1,686	0.74	5.24	15.5
83163-07_S0253-S01	12	150	0.0553	83163-07	S0253-S01	244.93	236.63	1,092	3,771	0.29	3.08	9.4
83163-08_83163-07	12	388	0.0161	83163-08	83163-07	251.26	245.03	1,064	2,031	0.52	5.82	9.5
83163-09_83163-08	12	307	0.0150	83163-09	83163-08	255.97	251.36	1,027	1,965	0.52	5.63	8.9
83163-10_83163-09	12	322	0.0139	83163-10	83163-09	260.53	256.07	992	1,888	0.53	5.41	13.3
83163-11_83163-10	12	403	0.0246	83163-11	83163-10	270.53	260.63	953	2,512	0.38	6.26	4.0
83164-02_BAKERVWVALL	8	184	0.0353	83164-02	AKERVWVALLEY	135.54	129.06	336	1,021	0.33	2.14	4.5
83164-05_BAKERVWVALL	8	82	0.0013	83164-05	AKERVWVALLEY	129.16	129.06	262	193	1.35	*1.66*	12.1
83171-01_53202	8	340	0.0047	83171-01	53202	169.32	167.73	40	372	0.11	*1.50*	5.5
83171-03_53106	8	332	0.0434	83171-03	53106	143.50	129.11	923	1,133	0.81	5.85	3.4
83172-01_11202	12	375	0.0207	83172-01	11202	193.72	185.95	1,519	2,308	0.66	6.99	8.1
83172-02_83172-01	12	375	0.0171	83172-02	83172-01	200.24	193.82	1,486	2,098	0.71	6.45	8.3
83172-03_T83172-09	12	296	0.0120	83172-03	T83172-09	207.66	204.10	1,437	1,756	0.82	5.55	9.2
83172-06_T83172-09	8	11	0.1179	83172-06	T83172-09	205.35	204.10	14	1,867	0.01	*1.46*	7.0
83173-02_JAMESLS	8	312	0.0493	83173-02	JAMESLS	111.12	95.75	1	1,208	0.00	*0.01*	17.9
83173-03_83173-02	8	312	0.0080	83173-03	83173-02	113.72	111.22	1	487	0.00	*0.59*	6.7
83173-04_83173-03	8	320	0.0059	83173-04	83173-03	115.72	113.82	1	418	0.00	*0.49*	7.6
83173-05_83173-04	8	322	0.0086	83173-05	83173-04	118.59	115.82	0	504	0.00	*0.51*	4.1
83173-06_83173-05	8	317	0.0392	83173-06	83173-05	131.09	118.69	0	1,077	0.00	*0.72*	3.0
83173-07_83173-06	8	117	0.0506	83173-07	83173-06	137.09	131.19	0	1,223	0.00	0.00	3.0
83173-08_83204-09	8	284	0.0048	83173-08	83204-09	155.03	153.67	37	377	0.10	*1.53*	15.5
83174-01_54503	8	317	0.0096	83174-01	54503	154.89	151.84	219	533	0.41	3.24	6.2
83174-02_83174-01	8	218	0.0042	83174-02	83174-01	155.90	154.99	219	352	0.62	2.37	7.4
83174-03_83174-02	8	404	0.0040	83174-03	83174-02	157.60	156.00	205	342	0.60	2.28	8.5
83174-05_83174-03	8	192	0.0039	83174-05	83174-03	158.45	157.70	193	340	0.57	2.24	13.7
83174-06_83174-05	8	406	0.0065	83174-06	83174-05	161.19	158.55	185	438	0.42	2.68	8.5
83174-07_83174-06	8	390	0.0067	83174-07	83174-06	163.90	161.29	170	445	0.38	2.65	5.8
83174-08_83174-07	8	277	0.0043	83174-08	83174-07	165.18	164.00	25	355	0.07	*0.99*	12.2
83174-11_83174-07	8	321	0.0058	83174-11	83174-07	165.85	164.00	133	413	0.32	2.35	3.0
BV57P	8	184	0.0040	83181-01	83181-10	153.88	153.14	32	344	0.09	*1.06*	13.2
83181-10_83184-22	8	271	0.0040	83181-10	83184-22	153.13	152.05	125	344	0.36	2.02	9.7
83181-11_83181-12	12	495	0.0026	83181-11	83181-12	170.12	168.82	540	821	0.66	2.48	6.8
83181-12_U0043-S01	12	145	0.0083	83181-12	U0043-S01	168.72	167.52	573	1,459	0.39	3.88	5.8
83182-01_JAMESLS	8	258	0.0016	83182-01	JAMESLS	96.17	95.75	145	220	0.66	*0.93*	25.5
83184-02_83184-03	8	113	0.0368	83184-02	83184-03	144.44	140.26	844	1,044	0.81	7.41	2.6
83184-03_23203	8	44	0.2616	83184-03	23203	140.16	128.75	844	2,781	0.30	5.36	6.5
83184-04_22406	8	203	0.0577	83184-04	22406	126.01	114.30	70	1,306	0.05	*0.45*	5.5
83184-05_83184-04	10	104	0.0311	83184-05	83184-04	129.35	126.11	70	1,740	0.04	3.47	13.7
83184-06_83184-05	10	244	0.0398	83184-06	83184-05	139.17	129.45	62	1,967	0.03	3.65	3.2
83184-07_83184-06	10	350	0.0202	83184-07	83184-06	146.34	139.27	62	1,401	0.04	2.87	5.1

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
83184-11_83184-02	8	311	0.0079	83184-11	83184-02	146.99	144.54	844	483	1.75	5.35	9.3
83184-13_25602	8	333	0.0039	83184-13	25602	110.56	109.26	538	340	1.58	3.43	6.6
83184-15_83184-13	8	196	0.0429	83184-15	83184-13	119.07	110.66	528	1,126	0.47	4.85	5.0
83184-16_83184-15	8	198	0.0045	83184-16	83184-15	120.06	119.17	517	365	1.42	3.30	8.5
83184-17_83184-16	8	193	0.0044	83184-17	83184-16	121.00	120.16	500	359	1.39	3.19	9.9
83184-19_83184-17	8	295	0.0847	83184-19	83184-17	146.05	121.10	479	1,582	0.30	3.05	6.2
83184-20_83184-19	8	163	0.0166	83184-20	83184-19	148.86	146.15	469	701	0.67	4.79	4.1
83184-21_83184-20	8	271	0.0044	83184-21	83184-20	150.15	148.96	457	360	1.27	2.90	6.6
83184-22_83184-21	8	384	0.0042	83184-22	83184-21	151.85	150.25	438	351	1.25	2.75	8.5
83184-28_22409	18	66	0.0092	83184-28	22409	112.96	112.35	4,052	4,545	0.89	6.41	4.9
83191-02_83191-06	10	75	0.0103	83191-02	83191-06	151.50	150.73	35	1,000	0.04	*1.92*	8.4
83191-03_83182-01	8	83	0.2431	83191-03	83182-01	116.37	96.27	145	2,681	0.05	5.02	15.0
83191-04_9804	18	390	0.0056	83191-04	9805	145.77	143.59	5,611	3,534	1.59	7.07	0.0
83191-06_83191-07	10	76	0.0110	83191-06	83191-07	150.63	149.80	35	1,032	0.03	*1.96*	9.3
83191-07_83191-08	10	93	0.0384	83191-07	83191-08	149.70	146.14	35	1,931	0.02	*1.90*	9.4
83191-08_9817	10	213	0.0002	83191-08	9817	146.04	146.00	36	135	0.26	*0.47*	6.5
83193-03_U0023-S16	8	396	0.0017	83193-03	U0023-S16	79.10	78.43	234	224	1.04	*1.62*	5.2
83194-08_U0100-S04	8	38	0.0018	83194-08	U0100-S04	80.53	80.46	214	232	0.92	*1.53*	1.0
83194-09_83194-08	8	147	0.0040	83194-09	83194-08	81.22	80.63	159	345	0.46	*1.81*	1.3
83194-10_83194-09	8	237	0.0048	83194-10	83194-09	82.46	81.32	138	377	0.37	2.06	1.0
83194-14_9504	8	380	0.0033	83194-14	9504	84.62	83.36	35	313	0.11	*1.31*	5.0
83194-18_10703	12	65	0.0046	83194-18	10703	123.40	123.10	506	1,093	0.46	*1.44*	2.1
83201-02_83201-03	8	85	0.0176	83201-02	83201-03	194.60	193.10	92	722	0.13	3.16	5.2
83201-03_83201-17	8	307	0.0351	83201-03	83201-17	193.00	182.22	93	1,019	0.09	4.04	9.4
83201-06_83201-39	8	264	0.0220	83201-06	83201-39	190.49	184.69	669	807	0.83	5.54	0.3
83201-13_83201-43	8	216	0.0163	83201-13	83201-43	179.52	176.00	774	695	1.11	4.92	3.0
83201-14_83201-15	8	272	0.0216	83201-14	83201-15	173.87	168.00	775	799	0.97	4.92	3.6
83201-15_83201-16	8	157	0.0100	83201-15	83201-16	167.90	166.33	858	545	1.57	5.46	1.2
83201-16_7504	8	289	0.0109	83201-16	7504	166.23	163.08	946	567	1.67	6.03	2.4
83201-17_83201-18	8	317	0.0312	83201-17	83201-18	182.12	172.23	93	961	0.10	3.88	5.0
83201-18_83201-19	8	263	0.0049	83201-18	83201-19	172.13	170.83	94	382	0.25	*1.87*	5.2
83201-19_83201-20	8	265	0.0045	83201-19	83201-20	170.73	169.53	94	366	0.26	*1.80*	4.3
83201-20_83201-15	8	287	0.0050	83201-20	83201-15	169.43	168.00	95	384	0.25	*0.60*	4.6
83201-28_83201-06	8	38	0.0065	83201-28	83201-06	190.84	190.59	645	440	1.47	4.10	2.6
83201-30_83201-28	8	120	0.0160	83201-30	83201-28	192.86	190.94	554	689	0.80	4.03	0.7
83201-31_11705	8	51	0.0175	83201-31	11705	168.22	167.34	120	719	0.17	3.40	7.8
83201-32_83201-31	8	93	0.0150	83201-32	83201-31	169.71	168.32	107	666	0.16	3.12	2.6
83201-33_83201-49	8	253	0.0221	83201-33	83201-49	176.98	171.40	80	808	0.10	3.28	7.8
83201-34_83201-33	8	188	0.0219	83201-34	83201-33	181.18	177.08	55	804	0.07	2.93	7.9
83201-35_83201-34	8	176	0.0171	83201-35	83201-34	184.29	181.28	51	711	0.07	2.63	7.8
83201-36_83201-35	8	94	0.0063	83201-36	83201-35	184.98	184.39	36	431	0.08	*1.67*	7.4

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83201-39_83201-42	8	211	0.0180	83201-39	83201-42	184.59	180.79	707	730	0.97	4.50	0.0
83201-42_83201-13	8	130	0.0082	83201-42	83201-13	180.69	179.62	774	493	1.57	4.93	0.3
83201-43_83201-44	8	18	0.0056	83201-43	83201-44	175.90	175.80	774	408	1.90	4.93	0.0
83201-44_83201-14	8	120	0.0144	83201-44	83201-14	175.70	173.97	775	653	1.19	4.92	0.3
83201-49_83201-32	8	103	0.0145	83201-49	83201-32	171.30	169.81	94	655	0.14	2.97	11.0
83201-56_83204-61	8	225	0.0039	83201-56	83204-61	191.12	190.23	38	342	0.11	*1.43*	11.6
83201-58_83201-56	8	140	0.0175	83201-58	83201-56	193.67	191.22	16	719	0.02	*1.87*	11.3
83201-64_83201-36	8	200	0.0481	83201-64	83201-36	194.70	185.08	29	1,192	0.02	3.21	8.0
83202-04_83202-06	8	261	0.0278	83202-04	83202-06	163.51	156.25	101	907	0.11	3.31	8.8
83202-05_7606	8	389	0.0483	83202-05	7606	155.00	136.18	160	1,195	0.13	5.30	10.1
83202-06_83202-05	8	252	0.0042	83202-06	83202-05	156.15	155.10	129	351	0.37	2.07	3.6
83202-07_7605	8	36	0.0450	83202-07	7605	116.66	115.05	233	1,153	0.20	5.76	7.3
83202-16_83202-04	8	305	0.0124	83202-16	83202-04	167.40	163.61	78	606	0.13	2.67	3.9
83202-21_83202-22	8	277	0.0249	83202-21	83202-22	144.55	137.63	18	859	0.02	2.19	7.9
83202-22_7705	8	42	0.0521	83202-22	7705	137.53	135.36	37	1,242	0.03	3.54	8.3
83203-01_83203-02	8	303	0.0263	83203-01	83203-02	155.11	147.15	61	881	0.07	3.23	7.4
83203-02_83203-03	8	151	0.0512	83203-02	83203-03	147.05	139.32	83	1,230	0.07	4.47	5.3
83203-03_7902	8	77	0.0732	83203-03	7902	139.22	133.59	83	1,472	0.06	5.07	8.2
83203-04_83203-01	8	77	0.0003	83203-04	83203-01	155.23	155.21	44	88	0.50	*0.56*	11.9
83203-05_83203-04	8	208	0.0080	83203-05	83203-04	157.00	155.33	39	487	0.08	*1.27*	11.5
83203-06_83202-21	8	111	0.0170	83203-06	83202-21	146.54	144.65	4	710	0.01	*1.19*	6.8
83203-08_8008	8	160	0.0666	83203-08	8008	132.04	121.40	16	1,404	0.01	2.99	6.0
83204-06_83191-03	8	312	0.0447	83204-06	83191-03	130.40	116.47	145	1,150	0.13	5.02	11.9
83204-07_83204-06	8	308	0.0433	83204-07	83204-06	143.82	130.50	145	1,131	0.13	4.96	8.9
83204-08_83204-07	8	399	0.0219	83204-08	83204-07	152.66	143.92	145	805	0.18	3.89	6.7
83204-09_83204-08	8	361	0.0022	83204-09	83204-08	153.57	152.76	59	257	0.23	*1.33*	5.8
83204-17_10209	8	59	0.0413	83204-17	10209	176.83	174.41	52	1,105	0.05	3.36	6.7
83204-18_83204-17	8	334	0.0251	83204-18	83204-17	185.31	176.93	40	862	0.05	2.80	2.1
83204-23_10206	8	191	0.0063	83204-23	10206	181.14	179.94	81	431	0.19	2.10	11.2
83204-24_83204-23	8	369	0.0163	83204-24	83204-23	187.25	181.24	66	694	0.10	2.78	9.5
83204-25_83204-60	8	132	0.0033	83204-25	83204-60	189.85	189.41	52	315	0.16	*1.48*	10.0
83204-60_83204-24	8	233	0.0084	83204-60	83204-24	189.31	187.35	52	498	0.10	2.05	8.1
83204-61_83204-25	8	97	0.0019	83204-61	83204-25	190.13	189.95	38	237	0.16	*1.11*	9.7
83211-02_21925	8	173	0.0556	83211-02	21925	448.43	438.80	21	1,282	0.02	3.04	10.0
83211-05_83211-02	8	66	0.1715	83211-05	83211-02	459.87	448.53	19	2,252	0.01	4.36	7.9
83211-06_83211-05	8	161	0.1120	83211-06	83211-05	477.96	459.97	16	1,820	0.01	3.57	9.6
83211-21_83224-38	8	241	0.0178	83211-21	83224-38	492.45	488.15	55	726	0.08	2.73	9.9
83211-22_83211-21	8	138	0.0877	83211-22	83211-21	504.66	492.55	43	1,610	0.03	4.45	7.4
83211-23_83211-22	8	163	0.1300	83211-23	83211-22	526.02	504.76	39	1,961	0.02	4.95	2.7
83211-25_83211-23	8	146	0.0549	83211-25	83211-23	534.15	526.12	34	1,274	0.03	3.50	7.5
83211-26_83211-25	8	353	0.0043	83211-26	83211-25	535.76	534.25	23	355	0.06	*1.27*	7.2

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Italic = Velocity < 2 fps

Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
83211-32_83211-38	8	401	0.1131	83211-32	83211-38	399.71	354.37	28	1,829	0.02	4.25	12.7
83211-33_83211-32	8	295	0.1021	83211-33	83211-32	429.92	399.81	20	1,738	0.01	3.74	8.6
83211-34_83211-33	8	146	0.0695	83211-34	83211-33	440.14	430.02	17	1,434	0.01	3.07	9.8
83211-38_83211-68	8	302	0.1189	83211-38	83211-68	354.27	318.39	34	1,875	0.02	4.62	4.2
83211-40_83214-36	8	66	0.0396	83211-40	83214-36	291.14	288.54	6	1,082	0.01	*1.86*	6.6
83211-46_83211-40	8	132	0.0131	83211-46	83211-40	292.96	291.24	4	622	0.01	*1.09*	7.2
83211-47_83211-34	8	193	0.0086	83211-47	83211-34	441.89	440.24	16	503	0.03	*1.47*	10.0
83211-50_83211-67	8	53	0.1930	83211-50	83211-67	444.17	433.88	57	2,389	0.02	6.36	9.0
83211-65_83162-37	8	304	0.0043	83211-65	83162-37	412.95	411.65	65	355	0.18	*1.73*	5.1
83211-66_83211-65	8	53	0.1958	83211-66	83211-65	423.34	413.05	65	2,407	0.03	6.04	7.4
83211-67_83211-66	8	85	0.1222	83211-67	83211-66	433.78	423.44	57	1,901	0.03	5.42	15.7
83211-68_83214-23	8	309	0.0994	83211-68	83214-23	318.29	287.54	40	1,715	0.02	4.50	6.3
83212-03_11807	24	49	0.0025	83212-03	11807	318.85	318.73	1,208	5,064	0.24	2.95	8.0
83212-12_19120	8	123	0.0369	83212-12	19120	341.90	337.35	47	1,045	0.05	3.37	10.3
83214-01_83214-02	8	78	0.0124	83214-01	83214-02	222.93	221.97	61	605	0.10	2.47	5.3
83214-02_83214-03	8	27	0.0207	83214-02	83214-03	221.87	221.31	61	782	0.08	2.96	5.1
83214-03_83214-05	8	211	0.0871	83214-03	83214-05	221.21	202.82	66	1,605	0.04	5.03	4.9
83214-04_18407	8	108	0.0781	83214-04	18407	197.13	188.68	72	1,520	0.05	4.96	5.0
83214-05_83214-04	8	146	0.0377	83214-05	83214-04	202.72	197.23	70	1,056	0.07	3.82	4.6
83214-06_35713	8	246	0.0151	83214-06	35713	250.56	246.86	9	667	0.01	*1.48*	8.9
83214-09_83201-30	8	317	0.0128	83214-09	83201-30	202.22	198.16	535	616	0.87	4.41	4.2
83214-10_83214-09	8	337	0.0233	83214-10	83214-09	210.15	202.32	534	829	0.64	5.32	6.4
83214-12_83214-10	8	333	0.0178	83214-12	83214-10	216.17	210.25	493	725	0.68	4.97	10.2
83214-13_83214-12	8	336	0.0294	83214-13	83214-12	229.13	219.27	423	932	0.45	5.80	7.0
83214-16_83214-13	8	402	0.0170	83214-16	83214-13	236.09	229.23	370	710	0.52	4.58	6.6
83214-17_83214-16	8	31	0.0101	83214-17	83214-16	236.50	236.19	331	546	0.61	3.65	4.9
83214-19_83214-17	8	381	0.0095	83214-19	83214-17	240.24	236.60	331	531	0.62	3.57	6.4
83214-20_83214-19	8	374	0.0203	83214-20	83214-19	247.94	240.34	330	775	0.43	4.75	5.8
83214-21_83214-20	8	286	0.0431	83214-21	83214-20	260.34	248.04	308	1,129	0.27	6.13	6.5
83214-22_83214-37	8	36	0.0243	83214-22	83214-37	279.57	278.70	306	847	0.36	4.97	9.2
83214-23_83214-22	8	104	0.0745	83214-23	83214-22	287.44	279.67	231	1,484	0.16	6.58	6.4
83214-27_18401	8	139	0.0128	83214-27	18401	159.13	157.35	119	615	0.19	3.03	8.2
83214-28_83214-27	8	162	0.0109	83214-28	83214-27	160.99	159.23	82	567	0.14	2.58	3.8
83214-29_83214-34	8	128	0.0025	83214-29	83214-34	165.57	165.25	54	274	0.20	*1.36*	5.6
83214-33_83214-22	8	47	0.0335	83214-33	83214-22	281.25	279.67	41	995	0.04	2.18	9.5
83214-34_83214-28	8	236	0.0171	83214-34	83214-28	165.15	161.09	82	712	0.11	3.03	6.6
83214-36_83214-23	8	49	0.0183	83214-36	83214-23	288.44	287.54	6	735	0.01	*1.17*	5.8
83214-37_83214-21	8	232	0.0784	83214-37	83214-21	278.60	260.44	307	1,522	0.20	7.60	3.8
83221-05_83221-17	8	160	0.1247	83221-05	83221-17	410.00	390.10	16	1,921	0.01	3.71	5.6
83221-08_83221-20	8	167	0.1492	83221-08	83221-20	368.65	343.70	20	2,101	0.01	4.26	4.2
83221-13_22114	8	233	0.0442	83221-13	22114	367.40	357.11	39	1,143	0.03	3.38	4.2

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
83221-14_83221-13	8	317	0.0580	83221-14	83221-13	385.90	367.50	34	1,310	0.03	3.57	5.0
83221-15_83221-14	8	289	0.0498	83221-15	83221-14	400.40	386.00	30	1,213	0.02	3.25	2.5
83221-16_83221-15	8	164	0.0343	83221-16	83221-15	406.12	400.50	27	1,007	0.03	2.77	7.0
83221-17_83221-08	8	160	0.1327	83221-17	83221-08	390.00	368.75	18	1,981	0.01	3.96	8.1
83221-20_22107	8	9	1.4366	83221-20	22107	343.60	330.79	62	6,518	0.01	13.16	3.5
83222-01_22107	8	337	0.0096	83222-01	22107	334.01	330.79	34	531	0.06	*1.91*	8.0
83222-02_83222-01	8	39	0.3351	83222-02	83222-01	347.15	334.11	9	3,148	0.00	4.46	3.9
83222-03_83222-02	8	131	0.1544	83222-03	83222-02	367.49	347.25	7	2,137	0.00	3.11	4.1
83222-04_83222-03	8	273	0.0735	83222-04	83222-03	387.64	367.59	5	1,475	0.00	2.16	6.0
83222-10_22112	8	152	0.0818	83222-10	22112	409.50	397.05	12	1,556	0.01	2.93	7.8
83224-01_21509	10	380	0.0479	83224-01	21509	380.03	361.84	687	2,158	0.32	7.83	8.6
83224-03_83224-04	8	140	0.0959	83224-03	83224-04	413.55	400.15	118	1,684	0.07	*0.75*	5.9
83224-04_83224-05	8	175	0.0696	83224-04	83224-05	400.20	388.05	162	1,435	0.11	6.06	5.9
83224-05_83224-01	8	350	0.0223	83224-05	83224-01	387.95	380.13	166	813	0.20	3.60	9.3
83224-06_83224-04	8	45	0.0183	83224-06	83224-04	401.13	400.30	41	736	0.06	2.53	6.5
83224-07_83224-06	8	141	0.0047	83224-07	83224-06	401.90	401.23	41	375	0.11	*1.57*	12.4
83224-08_83224-07	8	80	0.0193	83224-08	83224-07	403.55	402.00	40	756	0.05	2.56	4.6
83224-09_83224-08	8	160	0.0772	83224-09	83224-08	416.00	403.65	36	1,511	0.02	4.01	5.8
83224-10_S0123-S01	10	175	0.0135	83224-10	S0123-S01	389.95	387.60	526	1,144	0.46	4.57	8.4
83224-16_83224-09	8	123	0.0832	83224-16	83224-09	426.32	416.10	34	1,569	0.02	4.05	2.1
83224-17_83224-16	8	330	0.0186	83224-17	83224-16	432.56	426.42	31	742	0.04	2.34	9.8
83224-18_83224-17	8	314	0.0696	83224-18	83224-17	454.53	432.66	22	1,435	0.02	3.37	7.1
83224-19_83224-18	8	283	0.0250	83224-19	83224-18	461.70	454.63	16	860	0.02	2.14	10.6
83224-20_21501	8	158	0.0607	83224-20	21501	329.36	319.78	18	1,340	0.01	3.03	10.0
83224-26_83224-19	8	403	0.0241	83224-26	83224-19	471.49	461.80	11	844	0.01	*1.87*	9.0
83224-27_83224-26	8	333	0.0508	83224-27	83224-26	488.50	471.59	6	1,225	0.00	2.01	9.0
83224-38_83224-40	8	396	0.0066	83224-38	83224-40	488.05	485.45	70	440	0.16	2.05	6.8
83224-40_83224-41	8	316	0.0496	83224-40	83224-41	485.35	469.67	78	1,211	0.06	4.33	2.0
83224-41_X0035-S11	8	316	0.0570	83224-41	X0035-S11	469.57	451.56	84	1,298	0.06	4.66	4.6
83224-45_83224-03	8	261	0.0558	83224-45	83224-03	428.23	413.65	116	1,285	0.09	5.08	5.2
83224-46_NORTHSHOREL	10	26	0.0402	83224-46	NORTHSHORELS	313.04	312.00	878	1,977	0.44	7.83	12.9
83273-04_83273-10	10	12	0.0779	83273-04	83273-10	312.12	311.20	285	2,753	0.10	*1.16*	9.3
83273-05_83273-04	8	379	0.0133	83273-05	83273-04	317.26	312.22	285	627	0.45	3.83	9.7
83273-06_83273-05	8	311	0.0177	83273-06	83273-05	322.87	317.36	276	724	0.38	4.31	7.2
83273-07_83273-06	8	155	0.0195	83273-07	83273-06	326.00	322.97	270	759	0.36	4.43	8.7
83273-08_83273-07	8	143	0.0203	83273-08	83273-07	329.00	326.10	268	775	0.35	4.50	8.6
83273-09_83273-08	8	93	0.0011	83273-09	83273-08	329.20	329.10	250	179	1.40	*1.59*	8.3
83273-10_83273-11	10	258	0.0016	83273-10	83273-11	311.50	311.10	294	388	0.76	*1.20*	10.9
83273-11_83273-12	10	193	0.0016	83273-11	83273-12	311.00	310.70	294	389	0.76	*1.20*	11.5
83273-12_FLYNNLS	10	10	0.0097	83273-12	FLYNNLS	310.60	310.50	998	974	1.02	4.07	10.9
83274-01_LAKESIDELS	8	251	0.0128	83274-01	LAKESIDELS	314.32	311.10	2	616	0.00	*0.01*	13.5

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
83274-02_20109	10	325	0.0035	83274-02	20109	317.19	316.06	692	582	1.19	2.82	1.5
83274-03_LAKESIDELS	8	193	0.0049	83274-03	LAKESIDELS	312.05	311.10	647	381	1.70	4.13	7.8
83274-04_83274-03	8	224	0.0137	83274-04	83274-03	315.23	312.15	644	637	1.01	4.11	8.8
83274-05_83274-04	6	203	0.0148	83274-05	83274-04	318.34	315.33	641	307	2.09	7.27	1.3
83281-07_83282-17	28	249	0.0032	83281-07	83282-17	304.47	303.68	2,898	8,642	0.34	2.81	7.5
83281-08_83281-07	28	388	0.0030	83281-08	83281-07	305.72	304.57	2,891	8,386	0.34	3.97	8.9
83281-09_83281-08	28	303	0.0030	83281-09	83281-08	306.74	305.82	2,883	8,437	0.34	3.98	14.2
83281-10_83281-09	28	347	0.0031	83281-10	83281-09	307.90	306.84	2,877	8,494	0.34	4.00	8.8
83282-02_83282-03	28	40	0.0007	83282-02	83282-03	302.02	301.99	2,915	3,985	0.73	2.27	7.3
83282-03_83282-15	28	404	0.0031	83282-03	83282-15	301.89	300.62	2,918	8,605	0.34	4.05	6.2
83282-09_83283-12	28	272	0.0031	83282-09	83283-12	295.34	294.50	4,120	8,532	0.48	4.40	9.3
83282-10_83282-09	28	246	0.0030	83282-10	83282-09	296.18	295.44	4,110	8,425	0.49	4.36	6.0
83282-11_83282-10	28	143	0.0030	83282-11	83282-10	296.71	296.28	4,107	8,418	0.49	4.36	8.0
83282-12_83282-11	28	267	0.0031	83282-12	83282-11	297.65	296.81	4,103	8,618	0.48	4.43	5.8
83282-13_83282-12	28	123	0.0028	83282-13	83282-12	298.10	297.75	2,936	8,197	0.36	3.40	3.7
83282-14_83282-13	28	371	0.0033	83282-14	83282-13	299.44	298.20	2,923	8,884	0.33	4.15	6.2
83282-15_83282-14	28	309	0.0032	83282-15	83282-14	300.52	299.54	2,920	8,648	0.34	4.07	5.6
83282-16_83282-02	28	371	0.0032	83282-16	83282-02	303.30	302.12	2,915	8,656	0.34	*1.52*	7.9
83282-17_83282-16	28	121	0.0015	83282-17	83282-16	303.58	303.40	2,902	5,926	0.49	3.07	11.0
83283-01_83292-28	18	324	0.0214	83283-01	83292-28	211.66	204.70	5,302	6,922	0.77	8.80	18.2
83283-02_83283-01	18	251	0.0788	83283-02	83283-01	231.56	211.76	5,301	13,268	0.40	9.30	11.3
83283-03_83283-02	20	459	0.0257	83283-03	83283-02	243.46	231.66	5,299	10,042	0.53	10.38	9.3
83283-04_83283-03	18	231	0.0208	83283-04	83283-03	248.36	243.56	5,297	6,817	0.78	9.49	16.4
83283-05_83283-04	24	263	0.0593	83283-05	83283-04	264.06	248.46	5,296	24,783	0.21	3.74	10.8
83283-06_83283-05	24	174	0.0058	83283-06	83283-05	265.16	264.16	5,295	7,725	0.69	5.90	16.1
83283-07_83283-06	24	88	0.0666	83283-07	83283-06	271.11	265.26	5,294	26,278	0.20	3.74	15.7
83283-09_83283-07	28	476	0.0244	83283-09	83283-07	282.80	271.21	4,892	23,969	0.20	9.80	11.9
83283-10_83283-09	28	398	0.0233	83283-10	83283-09	292.18	282.90	4,888	23,444	0.21	9.64	19.7
83283-11_83283-10	28	433	0.0030	83283-11	83283-10	293.58	292.28	4,125	8,412	0.49	4.36	3.6
83283-12_83283-11	28	281	0.0026	83283-12	83283-11	294.40	293.68	4,122	7,767	0.53	4.10	4.4
83283-13_83283-10	24	45	0.2907	83283-13	83283-10	305.43	292.28	765	54,893	0.01	*0.54*	11.7
83284-05_3602	8	193	0.0204	83284-05	3602	158.00	154.05	154	777	0.20	3.86	4.0
83284-06_83284-05	8	328	0.0455	83284-06	83284-05	173.03	158.10	101	1,160	0.09	4.55	5.9
83284-07_83284-06	8	243	0.0242	83284-07	83284-06	179.00	173.13	46	846	0.05	2.88	5.9
83284-08_6901	8	181	0.0273	83284-08	6901	113.00	108.05	225	899	0.25	4.77	8.3
83284-14_3604	8	199	0.0717	83284-14	3604	149.71	135.42	169	1,456	0.12	6.20	6.8
83291-03_3707	8	158	0.0120	83291-03	3707	87.77	85.88	44	595	0.07	2.22	4.9
83291-04_83291-03	8	217	0.0087	83291-04	83291-03	89.75	87.87	28	506	0.05	*1.73*	3.9
83291-05_83291-04	8	162	0.0241	83291-05	83291-04	93.74	89.85	17	845	0.02	2.14	2.9
83291-13_12308	8	151	0.0023	83291-13	12308	72.50	72.15	139	262	0.53	*1.70*	4.7
83292-01_83292-62	8	325	0.0021	83292-01	83292-62	76.80	76.11	430	250	1.72	2.74	0.1

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83292-02_83292-01	8	155	0.0124	83292-02	83292-01	78.82	76.90	373	605	0.62	2.52	0.0
83292-07_83292-02	8	345	0.0130	83292-07	83292-02	83.42	78.92	336	621	0.54	3.88	7.0
83292-08_83292-07	8	207	0.0415	83292-08	83292-07	92.12	83.52	138	1,108	0.12	3.40	5.8
83292-09_83292-08	8	182	0.1391	83292-09	83292-08	117.58	92.22	128	2,028	0.06	7.23	5.4
83292-10_83292-09	8	97	0.1196	83292-10	83292-09	129.32	117.68	85	1,881	0.04	6.06	4.9
83292-13_83292-10	8	73	0.0446	83292-13	83292-10	132.66	129.42	75	1,148	0.07	4.13	3.9
83292-16_83292-07	8	211	0.0341	83292-16	83292-07	90.69	83.52	178	1,004	0.18	3.81	7.8
83292-17_83293-19	30	407	0.0048	83292-17	83293-19	59.70	57.73	7,986	12,854	0.62	6.14	3.3
83292-18_W0033-S01	30	23	0.0008	83292-18	W0033-S01	61.76	61.74	7,980	5,153	1.55	3.61	2.9
83292-19_83292-18	28	397	0.0048	83292-19	83292-18	63.78	61.86	7,833	10,689	0.73	4.07	8.0
83292-20_83292-19	28	434	0.0048	83292-20	83292-19	65.94	63.88	7,830	10,585	0.74	6.03	7.5
83292-21_83292-20	28	364	0.0054	83292-21	83292-20	68.00	66.04	7,605	11,269	0.67	5.77	3.0
83292-22_83292-66	18	24	0.0041	83292-22	83292-66	90.49	90.39	5,488	3,037	1.81	6.88	4.7
83292-23_83292-55	8	128	0.0540	83292-23	83292-55	107.37	100.45	66	1,264	0.05	4.26	4.9
83292-24_83292-23	8	172	0.0938	83292-24	83292-23	123.59	107.47	57	1,666	0.03	4.94	4.9
83292-25_83292-67	18	61	0.0755	83292-25	83292-67	135.17	130.59	5,306	12,989	0.41	15.53	4.2
83292-26_83292-25	18	304	0.1589	83292-26	83292-25	183.56	135.27	5,306	18,842	0.28	15.59	6.4
83292-27_83292-26	18	130	0.1223	83292-27	83292-26	199.61	183.66	5,304	16,529	0.32	17.83	4.2
83292-28_83292-27	20	341	0.0143	83292-28	83292-27	204.60	199.71	5,304	7,497	0.71	8.29	3.9
83292-29_83292-56	8	85	0.0211	83292-29	83292-56	104.62	102.82	34	790	0.04	2.51	5.1
83292-30_83292-29	8	102	0.1219	83292-30	83292-29	117.14	104.72	22	1,899	0.01	4.05	3.9
83292-31_83292-30	8	211	0.1099	83292-31	83292-30	140.39	117.24	12	1,802	0.01	3.23	6.0
83292-44_83292-45	8	35	0.0365	83292-44	83292-45	197.19	195.90	23	1,039	0.02	2.72	6.8
83292-45_83292-48	8	231	0.1012	83292-45	83292-48	195.80	172.46	40	1,730	0.02	4.58	6.0
83292-48_83292-49	8	119	0.1452	83292-48	83292-49	172.36	155.02	56	2,072	0.03	5.74	4.6
83292-49_83292-13	8	230	0.0963	83292-49	83292-13	154.92	132.76	75	1,687	0.04	5.41	5.5
83292-51_83292-16	8	162	0.0165	83292-51	83292-16	93.45	90.79	166	697	0.24	3.65	9.8
83292-52_83292-51	8	91	0.0049	83292-52	83292-51	94.00	93.55	139	382	0.36	2.25	8.5
83292-53_83292-52	8	110	0.0048	83292-53	83292-52	94.63	94.10	125	378	0.33	2.17	8.3
83292-54_83292-53	8	51	0.0199	83292-54	83292-53	95.74	94.73	114	767	0.15	3.51	6.0
83292-55_83292-54	8	74	0.0607	83292-55	83292-54	100.35	95.84	112	1,339	0.08	5.18	4.9
83292-56_83292-55	8	101	0.0225	83292-56	83292-55	102.72	100.45	41	815	0.05	2.71	7.2
83292-58_83292-24	8	102	0.0902	83292-58	83292-24	132.88	123.69	50	1,633	0.03	4.70	4.9
83292-59_83292-58	8	174	0.0277	83292-59	83292-58	137.81	132.98	42	905	0.05	2.95	4.9
83292-60_83292-59	8	82	0.0570	83292-60	83292-59	142.61	137.91	31	1,298	0.02	3.48	4.9
83292-61_83292-60	8	91	0.1009	83292-61	83292-60	151.94	142.71	22	1,728	0.01	3.83	4.9
83292-62_83293-10	8	166	0.0043	83292-62	83293-10	76.01	75.30	430	357	1.21	2.74	2.3
83292-66_83292-21	18	253	0.0864	83292-66	83292-21	90.00	68.10	7,572	13,895	0.54	9.52	5.3
83292-67_83292-22	18	299	0.1334	83292-67	83292-22	130.49	90.59	5,460	17,266	0.32	6.85	4.2
83293-07_83293-24	12	146	0.0089	83293-07	83293-24	59.21	57.92	876	1,509	0.58	4.44	5.2
83293-08_83293-07	8	264	0.0273	83293-08	83293-07	66.51	59.31	510	898	0.57	4.33	3.6

Bold cells = pipe at capacity / manholes surcharged within 2' of rim.
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Italic = Velocity < 2 fps

Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
83293-09_83293-08	8	263	0.0244	83293-09	83293-08	73.04	66.61	510	849	0.60	5.66	3.6
83293-10_83293-09	8	457	0.0045	83293-10	83293-09	75.20	73.14	509	366	1.39	3.24	1.5
83293-11_3413	18	31	0.0255	83293-11	3413	57.30	56.50	4,068	7,543	0.54	9.68	11.8
83293-14_83293-15	8	342	0.0291	83293-14	83293-15	104.05	94.08	634	928	0.68	6.38	6.8
83293-15_83293-16	8	108	0.0841	83293-15	83293-16	93.98	84.89	659	1,577	0.42	6.99	9.0
83293-16_2112	8	406	0.0168	83293-16	2112	84.79	77.96	668	705	0.95	5.12	9.2
83293-18_83294-06	30	516	0.0102	83293-18	83294-06	55.36	50.10	8,902	18,644	0.48	6.14	10.1
83293-19_83293-18	30	435	0.0050	83293-19	83293-18	57.63	55.46	7,990	13,030	0.61	6.21	4.4
83293-24_12005	12	49	0.0090	83293-24	12005	57.82	57.38	927	1,518	0.61	3.86	6.6
83294-04_4104	12	95	0.0174	83294-04	4104	61.75	60.10	205	2,117	0.10	3.80	9.5
83294-05_83294-04	12	144	0.0069	83294-05	83294-04	62.85	61.85	205	1,331	0.15	2.73	9.4
83294-06_3506	30	497	0.0062	83294-06	3506	50.00	46.92	9,008	14,525	0.62	4.07	11.9
83294-10_R83294-03	8	74	0.0074	83294-10	R83294-03	63.90	63.35	303	468	0.65	3.17	12.1
83301-01_3212	16	306	0.0006	83301-01	3212	55.63	55.45	1,246	845	1.48	*1.99*	6.7
83301-02_T83301-01	8	52	0.0346	83301-02	T83301-01	45.45	43.66	364	1,011	0.36	2.32	19.7
83301-03_4408	8	247	0.0217	83301-03	4408	66.36	61.00	480	801	0.60	3.41	7.3
83301-14_3208	12	65	0.0223	83301-14	3208	59.00	57.56	1,245	2,394	0.52	3.53	0.7
83301-15_83301-14	12	20	0.0692	83301-15	83301-14	60.46	59.10	1,244	4,217	0.30	8.51	0.5
83301-16_83301-15	12	145	0.0122	83301-16	83301-15	62.33	60.56	1,244	1,773	0.70	4.68	0.0
83301-19_4406	8	283	0.0001	83301-19	4405	70.13	70.10	38	60	0.64	*0.33*	0.0
83302-02_3211	8	89	0.0102	83302-02	3211	48.10	47.20	892	548	1.63	5.69	9.6
83302-03_83302-02	12	68	0.0168	83302-03	83302-02	49.35	48.20	830	2,079	0.40	3.36	9.4
83302-10_83302-11	8	320	0.0789	83302-10	83302-11	94.01	68.75	192	1,527	0.13	6.66	11.3
83302-11_3402	8	412	0.0541	83302-11	3402	68.65	46.34	318	1,265	0.25	3.76	19.8
83302-12_83302-03	8	86	0.0035	83302-12	83302-03	49.75	49.45	830	321	2.58	5.29	9.8
83302-13_83302-12	6	110	0.0014	83302-13	83302-12	50.00	49.85	830	93	8.90	9.41	0.0
83302-14_83302-13	10	114	0.0127	83302-14	83302-13	51.55	50.10	771	1,110	0.69	3.15	0.0
83302-15_3304	8	236	0.0460	83302-15	3304	64.20	53.36	786	1,166	0.67	7.99	8.5
83302-16_T83302-52	8	51	0.1775	83302-16	T83302-52	49.86	40.74	874	2,291	0.38	5.58	7.3
83302-21_83302-22	20	114	0.0215	83302-21	83302-22	42.55	40.10	3,068	9,172	0.33	3.13	11.0
83302-22_2319	42.35	134	0.0005	83302-22	2319	40.00	39.93	25,107	10,572	2.37	5.66	11.7
83302-31_2310	20	52	0.1551	83302-31	2310	64.17	56.10	2,380	24,656	0.10	14.54	6.6
83302-40_T83302-56	8	179	0.0086	83302-40	T83302-56	101.23	99.68	111	505	0.22	*1.60*	11.8
83302-41_2311	20	254	0.0442	83302-41	2311	88.59	77.37	1,134	13,156	0.09	6.33	8.6
83303-01_49701	60	729	0.0010	83303-01	49701	4.81	4.05	43,700	37,844	1.15	4.95	11.6
83303-02_83303-01	60	73	0.0112	83303-02	83303-01	5.29	4.48	42,173	123,790	0.34	4.78	17.2
83303-03_83303-02	60	374	0.0008	83303-03	83303-02	5.68	5.39	41,484	32,638	1.27	4.70	8.6
83303-05_2605	60	107	0.0006	83303-05	2605	7.11	7.05	40,434	27,814	1.45	4.59	6.5
83303-11_2517	12	221	0.0219	83303-11	2517	74.30	69.45	890	2,374	0.37	5.48	12.5
83304-04_83304-05	42	37	0.0766	83304-04	83304-05	16.67	13.85	19,668	125,321	0.16	8.61	9.3
83304-05_83304-06	36	74	0.0210	83304-05	83304-06	13.75	12.20	19,668	43,498	0.45	6.14	4.6

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
83304-06_2829	36	616	0.0024	83304-06	2829	12.10	10.59	19,668	14,842	1.33	6.12	3.3
83304-08_83304-10	36	258	0.0005	83304-08	83304-10	47.62	47.50	16,077	6,478	2.48	5.01	5.0
83304-09_4713	8	368	0.0096	83304-09	4713	62.80	59.24	614	534	1.15	3.92	5.3
83304-10_2905	30	258	0.0016	83304-10	2905	47.40	47.00	16,154	7,272	2.22	7.26	9.7
83304-11_4820	8	349	0.0160	83304-11	4820	64.76	59.15	691	689	1.00	5.00	7.1
83304-12_4815	8	299	0.0025	83304-12	4815	62.91	62.17	534	270	1.98	3.41	0.0
83304-14_3010	8	228	0.0025	83304-14	3010	58.80	58.22	482	273	1.76	3.07	6.1
83304-15_83304-14	8	170	0.0058	83304-15	83304-14	59.88	58.90	402	414	0.97	2.56	7.2
83304-16_83304-15	8	262	0.0042	83304-16	83304-15	61.07	59.98	205	350	0.58	*1.98*	4.4
83304-20_4814	8	271	0.0067	83304-20	4814	66.85	65.04	445	444	1.00	3.23	2.8
83312-06_14513	8	321	0.1188	83312-06	14513	219.08	180.93	208	1,875	0.11	*1.33*	3.8
83312-09_14308	12	51	0.0174	83312-09	14308	164.08	163.20	1,070	2,112	0.51	4.90	8.6
83314-03_1601	10	151	0.0917	83314-03	1601	114.28	100.43	540	2,986	0.18	9.21	8.1
83314-06_1119	10	34	0.0406	83314-06	1119	155.40	154.02	278	1,987	0.14	5.73	6.9
83314-13_1507	12	313	0.0066	83314-13	1507	57.53	55.45	329	1,306	0.25	2.92	14.6
83314-15_1003	8	206	0.0631	83314-15	1003	229.54	216.53	114	1,366	0.08	5.28	4.9
83314-20_83314-06	8	218	0.0982	83314-20	83314-06	176.95	155.50	274	1,705	0.16	7.98	3.7
83314-22_1007	8	531	0.0369	83314-22	1007	152.65	133.05	440	1,045	0.42	6.38	6.7
83314-25_83314-26	8	59	0.2458	83314-25	83314-26	178.69	164.10	132	2,696	0.05	8.92	6.6
83314-26_1716	8	256	0.0314	83314-26	1716	164.00	155.97	178	963	0.19	4.70	17.5
83314-34_83314-37	8	150	0.1661	83314-34	83314-37	113.73	88.77	12	2,216	0.01	3.78	6.0
83314-37_1105	8	77	0.2137	83314-37	1105	88.67	72.12	19	2,514	0.01	4.75	6.0
83314-40_1123	8	231	0.0561	83314-40	1123	223.05	210.10	226	1,288	0.18	6.18	4.6
83321-07_14101	8	165	0.0405	83321-07	14101	348.24	341.55	52	1,095	0.05	3.59	6.4
83321-09_83321-07	8	230	0.0487	83321-09	83321-07	359.54	348.34	44	1,200	0.04	3.63	14.2
83321-10_83321-09	8	140	0.1413	83321-10	83321-09	379.43	359.64	34	2,044	0.02	4.90	12.6
83322-02_83322-55	8	132	0.0659	83322-02	83322-55	489.03	480.35	104	1,396	0.07	5.22	3.6
83322-04_83322-02	8	407	0.0497	83322-04	83322-02	509.32	489.13	95	1,212	0.08	4.61	4.4
83322-05_83322-04	8	413	0.0240	83322-05	83322-04	519.34	509.42	79	843	0.09	3.38	5.5
83322-07_23004	8	252	0.0066	83322-07	23004	604.74	603.09	94	440	0.21	2.23	5.0
83322-14_18535	8	343	0.0138	83322-14	18535	486.35	481.60	105	640	0.16	3.01	13.9
83322-15_83322-14	8	91	0.1123	83322-15	83322-14	496.70	486.45	100	1,822	0.05	6.22	5.4
83322-16_83322-15	8	188	0.0212	83322-16	83322-15	500.80	496.80	78	793	0.10	3.22	10.9
83322-17_83322-16	8	154	0.1133	83322-17	83322-16	518.37	500.90	73	1,830	0.04	5.69	11.3
83322-23_83322-17	8	162	0.0601	83322-23	83322-17	528.23	518.47	66	1,333	0.05	4.42	8.8
83322-24_83322-23	8	140	0.0289	83322-24	83322-23	532.38	528.33	58	925	0.06	3.29	15.0
83322-30_83322-24	8	292	0.0324	83322-30	83322-24	541.96	532.48	49	979	0.05	3.25	5.8
83322-31_83322-30	8	322	0.0282	83322-31	83322-30	551.14	542.06	34	914	0.04	2.79	6.9
83322-41_83322-42	8	299	0.0220	83322-41	83322-42	536.60	530.02	50	807	0.06	2.86	5.8
83322-42_83322-43	8	121	0.0301	83322-42	83322-43	529.92	526.27	60	943	0.06	3.37	7.5
83322-43_83322-05	8	161	0.0419	83322-43	83322-05	526.17	519.44	67	1,113	0.06	3.90	5.8

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
83322-55_18533	8	13	0.1343	83322-55	18533	480.25	478.50	107	1,993	0.05	6.54	4.0
83323-01_83323-21	8	237	0.0983	83323-01	83323-21	200.40	177.10	128	1,705	0.08	6.40	5.8
83323-02_83323-01	8	240	0.0379	83323-02	83323-01	209.60	200.50	120	1,058	0.11	4.48	6.6
83323-03_83323-02	8	118	0.0016	83323-03	83323-02	208.32	208.13	52	218	0.24	*0.33*	19.3
83323-04_83323-03	8	277	0.0066	83323-04	83323-03	210.24	208.42	52	441	0.12	*0.33*	12.8
83323-07_83323-04	8	106	0.2116	83323-07	83323-04	232.70	210.34	52	2,502	0.02	6.38	8.2
83323-08_83323-07	8	179	0.0938	83323-08	83323-07	249.59	232.80	51	1,666	0.03	4.80	17.8
83323-09_83323-08	8	135	0.0936	83323-09	83323-08	262.35	249.69	44	1,664	0.03	4.57	8.9
83323-10_83323-09	8	176	0.0283	83323-10	83323-09	267.44	262.45	33	914	0.04	2.76	7.3
83323-11_83323-10	8	141	0.0058	83323-11	83323-10	268.36	267.54	28	415	0.07	*1.51*	5.5
83323-12_83323-11	8	237	0.0138	83323-12	83323-11	271.72	268.46	19	639	0.03	*1.81*	4.7
83323-16_83323-02	8	125	0.1414	83323-16	83323-02	227.40	209.70	61	2,045	0.03	5.83	5.1
83323-17_83323-16	8	157	0.1546	83323-17	83323-16	251.80	227.50	55	2,138	0.03	5.84	3.5
83323-18_83323-66	8	166	0.0733	83323-18	83323-66	272.94	260.75	47	1,472	0.03	4.29	10.8
83323-19_83323-32	8	161	0.0395	83323-19	83323-32	291.59	285.24	38	1,080	0.04	3.23	6.0
83323-20_83323-19	8	123	0.0411	83323-20	83323-19	296.73	291.69	33	1,103	0.03	3.14	6.0
83323-21_83312-09	8	367	0.0350	83323-21	83312-09	177.00	164.18	166	1,017	0.16	*1.06*	9.1
83323-22_83312-06	8	330	0.1109	83323-22	83312-06	255.81	219.18	193	1,811	0.11	7.53	4.4
83323-23_83323-22	8	299	0.0518	83323-23	83323-22	271.40	255.91	173	1,238	0.14	5.57	7.5
83323-24_STA91-S01	8	134	0.0929	83323-24	STA91-S01	297.02	284.60	97	1,657	0.06	5.77	4.1
83323-25_83323-67	8	120	0.0510	83323-25	83323-67	312.55	306.45	47	1,229	0.04	3.77	6.7
83323-27_19601	8	88	0.0390	83323-27	19601	464.12	460.67	14	1,075	0.01	2.37	4.0
83323-32_83323-18	8	129	0.0935	83323-32	83323-18	285.14	273.04	43	1,663	0.03	4.53	12.3
83323-35_83323-20	8	47	0.0196	83323-35	83323-20	297.75	296.83	30	761	0.04	2.35	6.0
83323-36_83323-62	8	30	0.3101	83323-36	83323-62	316.79	307.38	18	3,028	0.01	5.33	5.8
83323-37_83323-36	8	190	0.1641	83323-37	83323-36	348.05	316.89	18	2,203	0.01	4.27	8.6
83323-40_83323-37	8	140	0.2827	83323-40	83323-37	387.82	348.15	18	2,891	0.01	5.12	8.6
83323-53_83323-16	8	26	0.1776	83323-53	83323-16	232.10	227.50	5	2,292	0.00	3.02	5.0
83323-62_83323-35	8	105	0.0896	83323-62	83323-35	307.28	297.85	27	1,627	0.02	3.87	8.6
83323-66_83323-17	8	121	0.0725	83323-66	83323-17	260.65	251.90	51	1,465	0.04	4.38	7.5
83323-67_83323-24	10	167	0.0546	83323-67	83323-24	306.25	297.12	92	2,304	0.04	4.58	8.6
83323-68_83323-25	8	149	0.0562	83323-68	83323-25	321.05	312.65	42	1,289	0.03	3.78	5.3
83323-69_83323-67	8	394	0.0419	83323-69	83323-67	322.86	306.35	40	1,113	0.04	3.35	3.3
83323-70_83323-69	8	146	0.0390	83323-70	83323-69	328.67	322.96	32	1,074	0.03	3.06	6.3
83334-01_25103	12	124	0.0040	83334-01	25103	343.65	343.15	78	1,019	0.08	*1.71*	4.5
83334-05_83334-01	8	161	0.0053	83334-05	83334-01	344.60	343.75	73	395	0.19	*1.93*	2.6
83334-06_83334-05	8	138	0.0043	83334-06	83334-05	345.29	344.70	62	355	0.17	*1.70*	7.0
83334-09_83334-06	8	247	0.0050	83334-09	83334-06	346.62	345.39	57	384	0.15	*1.75*	9.5
A1P	8	153	0.0608	A1	X0079-S02	365.70	356.40	-	1,341	0.00	0.00	9.0
A2P	8	77	0.0117	A2	A1	366.70	365.80	-	588	0.00	0.00	11.2
A3P	8	255	0.0114	A3	A2	369.90	367.00	-	580	0.00	0.00	14.0

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
A4P	8	1801	0.0610	A4	A3	479.83	370.00	-	1,343	0.00	0.00	8.1
A5P	8	3312	0.0501	A5	A4	645.83	479.93	-	1,217	0.00	0.00	8.1
ARBUTUSLS_ARBUTUS	8	11	0.0321	ARBUTUSLS	ARBUTUS	98.34	98.00	312	974	0.32	5.53	3.9
B1P	8	483	0.0050	B1	83214-20	250.46	248.04	24	385	0.06	*1.37*	21.4
B10P	8	287	0.0118	B10	B9	252.83	249.43	20	592	0.03	*1.75*	8.0
83193	12	107	0.0050	B11	83163-02	218.17	217.63	1,367	1,139	1.20	3.86	9.5
B12P	8	791	0.0050	B12	B11	222.22	218.27	8	384	0.02	*0.05*	24.1
B13P	8	431	0.0050	B13	11105	179.46	177.30	31	385	0.08	*0.20*	13.2
B14P	8	840	0.0241	B14	B13	199.83	179.56	31	845	0.04	2.56	8.0
B15P	8	1148	0.0256	B15	B13	208.93	179.56	-	870	0.00	0.00	8.0
B16P	8	92	0.0412	B16	83201-30	196.75	192.96	19	1,104	0.02	*0.12*	0.8
B17P	8	197	0.0040	B17	B16	197.64	196.85	19	344	0.06	*1.19*	3.4
B18P	8	75	0.0040	B18	B17	198.04	197.74	19	344	0.06	*1.18*	5.1
B19P	8	100	0.0272	B19	B18	200.86	198.14	19	897	0.02	2.32	10.0
B2P	8	806	0.0405	B2	83214-16	268.83	236.19	43	1,094	0.04	3.07	8.0
B20P	8	353	0.0183	B20	83172-06	211.90	205.45	-	735	0.00	0.00	10.9
B21P	8	264	0.0169	B21	B20	216.40	211.95	-	706	0.00	0.00	11.8
B22P	8	524	0.0271	B22	B21	230.69	216.50	-	895	0.00	0.00	8.1
B3P	8	308	0.0050	B3	83214-13	230.67	229.13	7	385	0.02	*0.04*	5.2
B4P	8	357	0.0050	B4	B3	232.56	230.77	7	385	0.02	*0.93*	4.3
B5P	8	198	0.0050	B5	S0253-S01	237.62	236.63	104	385	0.27	*0.67*	14.9
B6P	8	1033	0.0475	B6	B5	286.83	237.72	58	1,186	0.05	3.22	8.0
B7P	8	317	0.0264	B7	B5	246.09	237.72	47	884	0.05	2.45	16.7
B8P	8	514	0.0479	B8	B7	270.83	246.19	27	1,191	0.02	3.12	8.0
B9P	8	628	0.0050	B9	B7	249.33	246.19	20	385	0.05	*1.29*	5.0
BAKERVWVALLEYLS_BAKE	10	58	0.0017	AKERVWVALLEY	BAKERVWVLY	128.96	128.86	597	411	1.45	2.43	11.1
BRITTONLOOPLS_BRITTO	10	26	0.0190	BRITTONLOOPL	BRITTONLOOP	277.50	277.00	182	1,359	0.13	3.86	19.5
BRIZALS_BRIZA	8	10	0.0206	BRIZALS	BRIZA	34.20	34.00	218	780	0.28	*1.39*	6.8
BV1P	8	50	0.0050	BV1	BAKERVIEWLS	156.25	156.00	93	385	0.24	2.02	15.5
BV10P	8	828	0.0278	BV10	BV9	190.93	167.89	16	907	0.02	*1.92*	7.9
BV11P	8	89	0.0051	BV11	BV9	168.34	167.89	33	387	0.09	*1.51*	8.5
BV12P	8	495	0.0050	BV12	BV11	170.91	168.44	33	384	0.09	*1.50*	8.9
BV13P	8	226	0.0050	BV13	BV12	172.14	171.01	33	385	0.09	*1.50*	9.7
BV14P	8	669	0.0511	BV14	BV13	206.43	172.24	23	1,229	0.02	3.05	7.9
BV15P	8	126	0.0050	BV15	BV13	172.87	172.24	-	384	0.00	0.00	6.1
BV16P	8	619	0.0321	BV16	U0043-S02	183.93	164.09	18	974	0.02	*0.12*	7.9
BV17P	8	70	0.0986	BV17	BV16	190.93	184.03	-	1,707	0.00	0.00	8.0
BV18P	8	584	0.0135	BV18	BV17	198.93	191.03	-	632	0.00	0.00	8.0
BV19P	8	40	0.0050	BV19	O2	131.60	131.40	6	385	0.01	*0.89*	15.3
BV2P	8	329	0.0050	BV2	BV1	158.00	156.35	-	385	0.00	0.00	14.4
BV20P	8	120	0.0050	BV20	BV19	132.30	131.70	6	385	0.01	*0.89*	14.6

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
BV21P	8	209	0.0050	BV21	BV20	133.44	132.40	6	384	0.01	*0.88*	13.4
BV22P	8	554	0.0050	BV22	S0115-S01	172.77	170.00	29	385	0.07	*1.44*	12.0
83183	10	102	0.0078	BV23	STA85-S04	163.50	162.70	644	871	0.74	2.99	14.0
BV24P	8	268	0.0643	BV24	BV23	180.83	163.60	11	1,379	0.01	*0.07*	8.1
BV25P	8	560	0.0275	BV25	BV24	196.33	180.93	5	902	0.01	*1.50*	8.1
BV26P	8	619	0.0612	BV26	BV24	218.83	180.93	7	1,346	0.00	2.21	8.1
BV27P	8	76	0.0050	BV27	83073-13	152.97	152.59	7	385	0.02	*0.74*	14.2
BV28P	8	269	0.0253	BV28	83073-16	157.40	150.59	69	865	0.08	*0.44*	8.8
BV29P	8	486	0.0288	BV29	BV28	171.58	157.60	69	922	0.07	3.45	8.8
BV3P	8	695	0.0050	BV3	BV1	159.83	156.35	25	385	0.07	*1.35*	7.0
BV30P	8	325	0.0061	BV30	BV29	173.65	171.68	65	423	0.15	*1.95*	16.4
BV31P	8	185	0.0034	BV31	BV30	174.91	174.28	60	317	0.19	*1.55*	12.8
BV32P	8	174	0.0032	BV32	BV31	175.49	174.93	60	309	0.19	*1.52*	7.7
BV33P	8	150	0.0032	BV33	BV32	175.97	175.49	52	308	0.17	*0.33*	6.0
BV34P	8	634	0.0050	BV34	BV33	179.30	176.13	33	385	0.09	*1.50*	10.5
BV35P	8	970	0.0387	BV35	BV34	216.93	179.40	33	1,070	0.03	3.07	7.9
BV36P	8	185	0.0050	BV36	BV34	180.33	179.40	-	386	0.00	0.00	19.6
BV37P	8	51	0.0178	BV37	BV29	172.59	171.68	4	726	0.01	*1.24*	8.4
BV38P	8	100	0.0140	BV38	BV37	174.09	172.69	4	643	0.01	*1.14*	9.9
BV39P	8	18	0.0039	BV39	BV33	176.20	176.13	19	339	0.06	*1.16*	4.9
BV4P	8	643	0.0050	BV4	BV1	159.57	156.35	68	385	0.18	*1.84*	13.2
BV40P	8	23	0.0039	BV40	BV39	176.39	176.30	19	340	0.06	*1.17*	4.9
BV41P	8	175	0.0040	BV41	BV40	177.15	176.45	19	344	0.05	*1.17*	6.3
BV42P	8	300	0.0522	BV42	BV41	192.74	177.09	19	1,242	0.02	*0.12*	13.5
BV43P	8	128	0.1241	BV43	BV42	208.73	192.84	19	1,916	0.01	3.90	8.1
BV44P	10	332	0.0104	BV44	83184-07	150.50	147.06	39	1,004	0.04	*1.98*	8.2
BV45P	10	390	0.0106	BV45	BV44	154.73	150.61	39	1,013	0.04	*1.99*	6.3
BV46P	12	466	0.0041	BV46	BV45	157.02	155.12	39	1,024	0.04	*1.39*	15.5
BV47P	12	32	0.0166	BV47	BV46	157.65	157.12	33	2,063	0.02	2.17	16.0
BV48P	12	176	0.0244	BV48	BV47	161.94	157.65	21	2,503	0.01	*0.06*	11.4
BV49P	8	255	0.0259	BV49	BV48	168.55	161.94	21	876	0.02	2.34	5.9
BV5P	8	484	0.0050	BV5	BV4	162.09	159.67	68	385	0.18	*1.85*	13.2
BV50P	8	350	0.0045	BV50	BV47	159.21	157.65	12	363	0.03	*0.08*	2.7
BV51P	8	26	0.0088	BV51	BV50	159.43	159.20	12	511	0.02	*0.08*	3.4
BV52P	8	214	0.0046	BV52	BV51	160.41	159.43	12	368	0.03	*1.08*	9.9
BV53P	8	172	0.0040	BV53	BV52	161.09	160.41	12	342	0.04	*1.03*	4.6
BV54P	8	184	0.0049	BV54	BV53	162.00	161.09	12	382	0.03	*0.08*	7.3
BV55P	8	35	0.0063	BV55	BV54	162.22	162.00	12	431	0.03	*0.95*	8.3
BV56P	8	396	0.0043	BV56	BV32	177.38	175.66	8	358	0.02	*0.94*	4.2
BV58P	8	343	0.0040	BV58	83181-01	155.46	154.08	32	345	0.09	*1.37*	6.8
BV59P	8	301	0.0041	BV59	BV58	156.88	155.66	20	346	0.06	*1.20*	7.6

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BV6P	8	131	0.0050	BV6	BV5	162.84	162.19	68	383	0.18	*1.84*	14.9
BV60P	8	312	0.0040	BV60	BV59	158.31	157.06	20	344	0.06	*1.20*	15.9
BV61P	8	226	0.0075	BV61	BV60	160.11	158.41	20	472	0.04	*1.49*	15.8
BV62P	8	162	0.0258	BV62	BV61	169.48	165.30	20	874	0.02	2.30	7.5
BV63P	8	400	0.0040	BV63	BV62	171.28	169.68	20	344	0.06	*1.20*	7.4
BV64P	8	165	0.0042	BV64	S0044-S02	174.60	173.90	6	354	0.02	*0.87*	4.6
BV65P	8	254	0.0039	BV65	BV64	175.80	174.80	6	341	0.02	*0.85*	7.5
BV66P	8	181	0.0039	BV66	BV65	176.70	176.00	6	338	0.02	*0.84*	6.6
BV7P	8	309	0.0050	BV7	BV6	164.49	162.94	68	385	0.18	*1.85*	13.8
BV8P	8	377	0.0050	BV8	BV7	166.47	164.59	68	384	0.18	*1.85*	16.3
BV9P	8	244	0.0050	BV9	BV8	167.79	166.57	68	385	0.18	*1.85*	13.9
C08702_8701	8	163	0.0016	C08702	8701	74.00	73.74	4	216	0.02	*0.54*	3.2
C08708_8709	8	160	0.0016	C08708	8709	74.04	73.78	4	219	0.02	*0.54*	5.9
C08905_8904	8	153	0.0084	C08905	8904	71.50	70.21	9	499	0.02	*0.95*	5.9
C08913_8912	8	159	0.0042	C08913	8912	73.07	72.40	5	353	0.01	*0.78*	1.9
C72111-01_26808	12	287	0.0500	C72111-01	26808	35.46	21.09	-	3,585	0.00	0.00	7.0
C82234-01_82234-02	8	312	0.0025	C82234-01	82234-02	85.37	84.60	-	270	0.00	0.00	5.4
C83311-02_1810	10	63	0.0106	C83311-02	1810	161.92	161.25	0	1,013	0.00	*0.37*	10.1
CAM1P	10	50	0.0050	CAM1	CAITACMIDDLEL	99.55	99.30	440	697	0.63	3.01	25.0
CAM2P	8	724	0.0050	CAM2	CAM1	103.27	99.65	323	385	0.84	2.74	13.2
CAM3P	8	430	0.0050	CAM3	CAM2	105.52	103.37	323	385	0.84	2.74	10.9
CAM4P	8	2530	0.0205	CAM4	CAM1	151.43	99.65	121	778	0.16	*0.77*	7.8
CAN1P	8	635	0.0050	CAN1	CAM3	108.80	105.62	303	385	0.79	2.71	5.7
CAN2P	8	332	0.0618	CAN2	CAN1	129.43	108.90	303	1,352	0.22	*1.91*	7.8
CAN3P	8	2632	0.0074	CAN3	CAN2	148.93	129.53	303	467	0.65	3.16	7.6
CAN4P	8	364	0.0050	CAN4	CAN3	150.85	149.03	303	385	0.79	2.72	18.1
CAN5P	8	163	0.0050	CAN5	CAN4	151.77	150.95	85	386	0.22	*0.54*	19.9
CAN6P	8	896	0.0050	CAN6	CAN5	156.35	151.87	85	385	0.22	*1.97*	12.4
CAN7P	8	756	0.0050	CAN7	CAN6	160.23	156.45	85	385	0.22	*1.97*	13.0
CAS1P	8	50	0.0050	CAS1	CAITACSOUTHLS	125.25	125.00	252	385	0.66	2.61	9.3
CAS10P	8	851	0.0050	CAS10	CAS9	154.39	150.13	88	385	0.23	*1.99*	18.3
CAS11P	8	626	0.0050	CAS11	CAS10	157.62	154.49	88	385	0.23	*1.99*	13.1
CAS2P	8	994	0.0050	CAS2	CAS1	130.32	125.35	252	385	0.66	2.61	16.7
CAS3P	8	264	0.0050	CAS3	CAS2	131.74	130.42	252	385	0.66	2.61	17.3
CAS4P	8	398	0.0050	CAS4	CAS3	133.83	131.84	252	385	0.66	2.61	16.2
CAS5P	8	795	0.0050	CAS5	CAS4	137.91	133.93	213	385	0.55	2.51	13.2
CAS6P	8	1027	0.0050	CAS6	CAS5	143.14	138.01	213	384	0.55	2.51	11.4
CAS7P	8	796	0.0050	CAS7	CAS6	147.22	143.24	213	385	0.55	2.52	14.8
CAS8P	8	211	0.0050	CAS8	CAS7	148.38	147.32	213	385	0.55	2.52	19.2
CAS9P	8	311	0.0050	CAS9	CAS8	150.03	148.48	88	384	0.23	*1.65*	21.7
83201	12	401	0.0032	CP1	34402	491.71	490.44	814	902	0.90	2.90	6.0

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CP10P	8	199	0.0050	CP10	CP9	762.43	761.43	17	385	0.04	*1.23*	23.9
CP101P	8	346	0.1010	CP101	83323-22	290.76	255.81	7	1,728	0.00	*0.04*	7.2
CP102P	8	96	0.0833	CP102	34502	507.00	499.00	2	1,569	0.00	*1.65*	6.5
CP103P	8	268	0.0284	CP103	CP102	515.11	507.50	2	916	0.00	*1.13*	6.6
CP104P	8	303	0.1119	CP104	SD425-S20	723.70	689.80	2	1,819	0.00	*0.01*	18.2
CP105P	8	151	0.1306	CP105	SD425-S09	685.06	665.34	4	1,966	0.00	2.54	6.2
CP106P	8	122	0.1103	CP106	CP105	698.58	685.12	4	1,807	0.00	2.39	5.8
CP107P	8	75	0.0128	CP107	CP106	699.54	698.58	4	615	0.01	*1.13*	8.0
CP108P	8	99	0.1630	CP108	CP107	715.70	699.56	4	2,196	0.00	2.74	6.1
CP109P	8	88	0.1366	CP109	CP108	727.76	715.74	4	2,010	0.00	2.58	6.7
CP11P	8	219	0.2087	CP11	CP10	808.24	762.53	17	2,484	0.01	4.51	14.2
CP110P	8	97	0.1238	CP110	CP109	739.93	727.92	4	1,914	0.00	2.49	4.9
CP12P	8	230	0.0050	CP12	CP11	809.49	808.34	17	385	0.04	*1.22*	27.3
CP13P	8	148	0.0050	CP13	CP12	810.33	809.59	17	385	0.04	*1.22*	8.0
CP14P	8	618	0.1963	CP14	S0190-S02	573.83	452.52	28	2,409	0.01	5.15	8.0
CP15P	8	39	0.0051	CP15	CP14	574.13	573.93	19	389	0.05	*1.29*	12.7
CP16P	8	628	0.0573	CP16	CP15	610.33	574.33	6	1,302	0.00	2.09	8.1
CP17P	8	375	0.0469	CP17	CP15	591.83	574.23	13	1,178	0.01	2.51	8.0
CP18P	8	379	0.1633	CP18	CP17	653.83	591.93	13	2,198	0.01	3.88	8.1
CP19P	8	374	0.0050	CP19	CP18	655.80	653.93	13	385	0.03	*1.15*	13.5
CP2P	8	188	0.0050	CP2	CP1	492.75	491.81	15	385	0.04	*0.09*	5.6
CP20P	8	165	0.1238	CP20	CP19	676.33	655.90	13	1,914	0.01	3.52	8.1
83203	8	157	0.0498	CP21	X0033-S02	382.87	375.05	177	1,214	0.15	5.53	6.4
CP22P	8	518	0.0596	CP22	CP21	413.83	382.97	6	1,327	0.00	2.16	8.1
83205	8	208	0.0449	CP23	33504	406.50	397.17	309	1,152	0.27	6.23	7.7
CP24P	8	349	0.0450	CP24	CP23	422.29	406.60	28	1,153	0.02	3.09	9.6
CP25P	8	555	0.1179	CP25	CP24	487.83	422.39	4	1,867	0.00	2.34	8.1
CP26P	8	289	0.0050	CP26	CP24	423.83	422.39	22	384	0.06	*1.34*	8.0
CP27P	8	628	0.1256	CP27	CP26	502.83	423.93	6	1,927	0.00	2.75	8.1
CP28P	8	326	0.0150	CP28	CP26	428.83	423.93	17	667	0.02	*1.80*	8.0
CP29P	8	646	0.1709	CP29	CP28	539.33	428.93	4	2,248	0.00	2.72	8.1
CP3P	8	710	0.0050	CP3	CP2	496.40	492.85	15	385	0.04	*1.18*	16.4
CP30P	8	284	0.1863	CP30	CP28	481.83	428.93	13	2,347	0.01	3.98	8.1
CP31P	8	638	0.1425	CP31	CP30	572.83	481.93	8	2,053	0.00	3.17	8.1
CP32P	8	505	0.1642	CP32	CP30	564.83	481.93	5	2,203	0.00	2.79	8.1
CP33P	8	646	0.1190	CP33	CP32	641.83	564.93	5	1,877	0.00	2.49	8.1
CP34P	8	267	0.0448	CP34	X0053-S02	359.73	347.78	19	1,150	0.02	2.73	14.0
CP35P	8	267	0.0768	CP35	CP34	380.24	359.73	19	1,507	0.01	*0.12*	7.5
CP36P	8	190	0.1000	CP36	CP35	399.24	380.24	19	1,720	0.01	*0.12*	5.7
CP37P	8	150	0.0050	CP37	CP36	400.09	399.34	19	385	0.05	*1.27*	16.2
CP38P	8	89	0.0051	CP38	CP37	400.64	400.19	19	387	0.05	*1.27*	8.2

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Italic = Velocity < 2 fps

Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
CP39P	8	203	0.1088	CP39	CP38	422.83	400.74	19	1,794	0.01	3.72	8.1
CP4P	8	159	0.0050	CP4	X0077-S15	608.98	608.18	28	386	0.07	*1.44*	25.3
CP40P	8	141	0.1447	CP40	CP39	443.33	422.93	19	2,068	0.01	4.11	8.1
CP41P	8	425	0.1315	CP41	CP40	499.33	443.43	19	1,972	0.01	3.97	8.1
CP42P	8	320	0.1175	CP42	CP41	536.93	499.33	19	1,864	0.01	3.82	8.0
CP43P	8	343	0.0347	CP43	CP42	548.83	536.93	19	1,013	0.02	2.50	8.0
CP44P	8	41	0.0661	CP44	STA91-S04	321.34	318.63	33	1,398	0.02	3.71	7.5
CP45P	8	453	0.0050	CP45	CP44	323.71	321.44	11	385	0.03	*1.09*	21.6
CP46P	8	283	0.1414	CP46	CP45	363.83	323.81	11	2,045	0.01	3.50	8.1
CP47P	8	147	0.0500	CP47	83323-68	328.70	321.35	11	1,216	0.01	2.42	6.3
CP48P	8	339	0.1653	CP48	CP47	384.83	328.80	11	2,211	0.00	3.67	8.1
CP49P	8	617	0.0865	CP49	CP48	438.33	384.93	6	1,600	0.00	2.48	8.1
CP5P	8	311	0.1986	CP5	CP4	670.83	609.08	28	2,423	0.01	5.20	8.0
CP50P	8	172	0.1381	CP50	83323-40	411.58	387.82	10	2,021	0.01	*0.07*	7.3
CP51P	8	90	0.0381	CP51	CP50	415.01	411.58	10	1,062	0.01	2.15	9.4
CP52P	8	189	0.0994	CP52	CP51	433.80	415.01	10	1,715	0.01	*0.07*	5.3
CP53P	8	217	0.0508	CP53	CP52	444.80	433.80	10	1,226	0.01	2.38	5.1
CP54P	8	125	0.0982	CP54	CP53	457.08	444.80	10	1,704	0.01	*0.07*	5.4
CP55P	8	645	0.0430	CP55	CP54	484.83	457.08	10	1,128	0.01	2.24	8.1
CP56P	8	190	0.1040	CP56	U0076-S01	484.79	465.07	3	1,753	0.00	*0.02*	8.6
CP57P	8	250	0.0064	CP57	CP56	486.40	484.79	3	437	0.01	*0.77*	8.3
CP58P	8	212	0.0087	CP58	CP57	488.25	486.40	3	508	0.01	*0.02*	6.0
CP59P	8	156	0.0260	CP59	CP58	492.35	488.30	3	877	0.00	*1.25*	8.4
CP6P	8	335	0.0050	CP6	CP5	672.61	670.93	28	385	0.07	*1.44*	25.7
CP60P	8	660	0.0688	CP60	CP59	537.83	492.45	3	1,426	0.00	*1.75*	8.1
CP61P	8	306	0.0344	CP61	46803	388.50	377.96	2	1,009	0.00	*1.29*	9.5
CP62P	8	293	0.0377	CP62	CP61	399.76	388.70	2	1,056	0.00	*1.33*	9.4
CP63P	8	20	0.1985	CP63	CP62	403.90	399.93	2	2,422	0.00	2.36	6.5
CP64P	8	210	0.1512	CP64	CP63	435.76	404.00	2	2,116	0.00	2.15	7.0
CP65P	8	214	0.2332	CP65	CP64	485.77	435.86	2	2,625	0.00	2.50	6.5
CP66P	8	301	0.1903	CP66	CP65	543.14	485.87	2	2,373	0.00	2.33	5.6
CP67P	8	115	0.2382	CP67	CP66	570.63	543.24	2	2,655	0.00	2.52	9.7
CP68P	8	225	0.1206	CP68	CP67	602.40	575.26	2	1,888	0.00	*1.99*	8.6
CP69P	8	286	0.0050	CP69	CP68	603.93	602.50	2	385	0.01	*0.66*	15.0
CP7P	8	549	0.0050	CP7	CP6	675.46	672.71	12	385	0.03	*1.10*	7.4
CP70P	8	225	0.1108	CP70	73062-10	526.25	501.33	10	1,810	0.01	3.11	13.9
CP71P	8	105	0.7537	CP71	CP70	605.59	526.45	10	4,722	0.00	6.05	6.9
CP72P	8	140	0.0929	CP72	CP71	618.69	605.69	10	1,657	0.01	2.92	10.7
CP73P	8	209	0.1489	CP73	CP72	649.98	618.87	10	2,098	0.00	3.44	7.4
CP74P	8	37	0.0041	CP74	73062-10	501.48	501.33	26	346	0.08	*1.31*	9.8
CP75P	8	96	0.1004	CP75	CP74	511.22	501.58	26	1,723	0.02	4.02	8.5

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Italic = Velocity < 2 fps

Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
CP76P	8	141	0.1115	CP76	CP75	526.93	511.21	26	1,816	0.01	*0.17*	5.3
CP77P	8	1145	0.0776	CP77	CP76	615.83	527.03	26	1,514	0.02	3.67	8.0
CP78P	8	99	0.0918	CP78	X0046-S01	767.93	758.84	8	1,648	0.00	2.65	6.2
CP79P	8	300	0.0320	CP79	CP78	778.64	769.03	4	973	0.00	*1.54*	6.2
CP8P	8	263	0.1373	CP8	CP6	708.83	672.71	17	2,015	0.01	3.89	8.1
CP80P	8	179	0.0794	CP80	CP79	792.86	778.64	4	1,533	0.00	*0.03*	5.0
CP81P	8	300	0.0189	CP81	CP80	798.24	792.57	4	748	0.01	*0.03*	6.1
CP82P	8	151	0.0429	CP82	CP81	804.78	798.30	4	1,127	0.00	*1.70*	7.3
CP83P	8	251	0.0898	CP83	CP82	827.39	804.84	4	1,630	0.00	2.20	5.0
CP84P	8	70	0.3416	CP84	X0045-S08	725.42	701.51	8	3,178	0.00	4.30	3.7
CP85P	8	70	0.0119	CP85	CP84	726.35	725.52	8	592	0.01	*1.33*	4.2
CP86P	8	111	0.0317	CP86	CP85	729.97	726.45	8	968	0.01	*1.88*	6.8
CP87P	8	272	0.0467	CP87	CP86	742.78	730.07	6	1,175	0.01	*1.95*	4.2
CP88P	8	207	0.0104	CP88	CP87	745.00	742.85	6	554	0.01	*1.16*	5.0
CP9P	8	316	0.1658	CP9	CP8	761.33	708.93	17	2,214	0.01	4.16	8.1
CP90P	8	375	0.0080	CP90	X0045-S01	702.11	699.10	3	487	0.01	*0.86*	6.2
CP91P	8	201	0.0046	CP91	CP90	703.13	702.21	3	368	0.01	*0.71*	4.4
CP92P	8	31	0.1039	CP92	CP91	706.35	703.13	3	1,753	0.00	*0.02*	5.5
CP93P	8	20	0.3580	CP93	CP92	713.51	706.35	3	3,252	0.00	*0.02*	4.6
CP94P	8	69	0.2001	CP94	CP93	727.32	713.51	3	2,433	0.00	2.64	4.4
CP95P	8	168	0.1910	CP95	CP94	759.41	727.32	3	2,376	0.00	2.60	3.9
CP96P	8	30	0.1163	CP96	CP95	763.00	759.51	3	1,855	0.00	2.19	5.4
CP97P	8	186	0.0035	CP97	CP96	764.84	764.19	3	321	0.01	*0.65*	8.0
CP98P	8	187	0.1120	CP98	CP97	785.80	764.86	3	1,820	0.00	*1.84*	5.4
CP99P	8	175	0.1100	CP99	CP98	805.21	785.96	3	1,804	0.00	2.15	5.6
CSTLS_CST	12	20	0.0196	CSTLS	CST	0.89	0.50	1,330	2,247	0.59	6.64	14.2
CV1P	8	267	0.0042	CV1	STA62-S03	80.90	79.78	30	352	0.08	*1.37*	5.1
CV10P	8	171	0.0050	CV10	CV8	7.41	6.56	12	383	0.03	*1.11*	9.4
CV11P	8	348	0.0050	CV11	CV10	9.25	7.51	5	385	0.01	*0.86*	8.6
CV12P	8	164	0.0050	CV12	CV10	8.33	7.51	7	385	0.02	*0.94*	5.0
CV13P	8	159	0.0050	CV13	CV12	9.23	8.43	6	386	0.02	*0.90*	15.6
CV14P	8	222	0.1486	CV14	CV13	42.33	9.33	6	2,097	0.00	2.91	15.1
CV2P	8	50	0.0050	CV2	CUCKANUTVILLL	2.25	2.00	30	385	0.08	*1.46*	9.6
CV3P	8	234	0.0050	CV3	CV2	3.52	2.35	1	385	0.00	*0.59*	12.4
CV4P	8	475	0.0052	CV4	CV2	4.83	2.35	28	393	0.07	*1.46*	26.0
CV5P	8	245	0.0567	CV5	CV4	18.83	4.93	4	1,295	0.00	*1.87*	8.1
CV6P	8	654	0.1054	CV6	CV4	73.83	4.93	4	1,765	0.00	2.37	8.1
CV7P	8	119	0.0050	CV7	CV6	74.53	73.93	4	386	0.01	*0.82*	12.4
CV8P	8	305	0.0050	CV8	CV4	6.46	4.93	16	385	0.04	*1.21*	25.4
CV9P	8	333	0.0050	CV9	CV8	8.23	6.56	4	385	0.01	*0.79*	16.2
D1P	8	465	0.0357	D1	X0067-S07	243.83	227.25	17	1,027	0.02	2.46	8.0

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
D11P	8	181	0.0046	D11	X0060-S03	239.71	238.87	17	370	0.05	*1.19*	13.2
D12P	8	260	0.0494	D12	D11	252.76	239.91	17	1,209	0.01	2.73	9.9
D13P	8	209	0.0400	D13	D12	261.22	252.86	17	1,088	0.02	2.54	9.7
D14P	8	194	0.0406	D14	D13	269.20	261.32	17	1,096	0.02	2.55	11.3
83219	8	953	0.0050	D15	D4	147.18	142.41	58	385	0.15	*1.77*	9.6
D2P	8	309	0.0047	D2	83093-01	139.75	138.31	58	371	0.16	*1.68*	5.1
D3P	8	285	0.0038	D3	D2	140.93	139.85	58	335	0.17	*1.60*	4.3
D4P	8	340	0.0035	D4	D3	142.31	141.13	58	320	0.18	*1.55*	3.5
D5P	8	239	0.2656	D5	D15	210.83	147.28	58	2,802	0.02	6.75	8.0
D6P	8	1241	0.0579	D6	D5	282.83	210.93	35	1,309	0.03	3.62	8.0
D7P	8	1711	0.0426	D7	D5	283.83	210.93	16	1,122	0.01	2.54	8.0
83223	60	285	0.0004	JMMYTCONNE	T72013-01	39.51	39.40	45,016	23,027	1.95	5.08	0.3
E1P	8	284	0.0710	E1	32116	240.02	219.86	11	1,449	0.01	2.76	6.9
E10P	8	302	0.0050	E10	E9	253.44	251.93	6	385	0.02	*0.92*	81.4
E11P	8	140	0.1251	E11	49604	124.48	106.97	1	1,923	0.00	*1.79*	5.2
E12P	8	133	0.2959	E12	E11	163.84	124.48	1	2,959	0.00	*0.01*	4.0
E13P	8	296	0.1647	E13	E12	212.59	163.84	1	2,208	0.00	*1.97*	4.7
E14P	8	254	0.1207	E14	E13	243.25	212.59	1	1,889	0.00	*1.77*	3.6
E15P	8	175	0.1305	E15	E14	266.09	243.25	1	1,965	0.00	*0.01*	4.4
E16P	8	197	0.2509	E16	E15	316.33	266.90	1	2,722	0.00	2.28	8.1
E17P	8	233	0.0050	E17	E16	317.60	316.43	1	385	0.00	*0.59*	9.3
E2P	8	215	0.0244	E2	E1	245.36	240.12	11	849	0.01	*1.90*	4.0
E3P	8	248	0.0043	E3	E2	246.53	245.46	6	357	0.02	*0.87*	5.8
E4P	8	182	0.0050	E4	E3	247.54	246.63	6	385	0.02	*0.92*	4.8
E5P	8	242	0.0050	E5	E4	248.85	247.64	6	385	0.02	*0.92*	8.0
E6P	8	309	0.0050	E6	E5	250.50	248.95	6	385	0.02	*0.92*	8.4
E7P	8	60	0.0050	E7	E6	250.90	250.60	6	385	0.02	*0.92*	9.5
E9P	8	166	0.0050	E9	E7	251.83	251.00	6	385	0.02	*0.92*	5.0
EDGEMOORELS_EDGEMOOR	12	3	0.0400	EDGEMOORELS	EDGEMOORE	34.90	34.80	268	3,207	0.08	5.52	13.2
FIRLS_FIR	10	11	0.0484	FIRLS	FIR	318.55	318.00	95	2,169	0.04	4.43	4.6
FLYNNLS_FLYNN	10	8	0.0129	FLYNNLS	FLYNN	310.40	310.30	998	1,119	0.89	4.07	11.6
H1P	8	50	0.0050	H1	HANNEGANLS	185.25	185.00	66	385	0.17	*1.83*	11.5
H10P	8	931	0.0050	H10	H8	198.95	194.30	126	384	0.33	2.20	2.4
H11P	8	818	0.0050	H11	H12	203.75	199.66	19	385	0.05	*0.12*	13.1
H12P	8	50	0.0050	H12	HANNEGANLS2	199.81	199.56	96	385	0.25	2.04	6.9
H13P	8	213	0.0050	H13	H12	200.73	199.66	77	385	0.20	*0.49*	11.0
H14P	8	1150	0.0050	H14	H13	206.58	200.83	77	385	0.20	*1.92*	15.1
H15P	8	1263	0.0050	H15	H14	212.99	206.68	20	384	0.05	*1.30*	21.8
H2P	8	327	0.0050	H2	H1	186.99	185.35	66	385	0.17	*1.83*	9.8
H3P	8	364	0.0050	H3	H2	188.91	187.09	66	385	0.17	*1.83*	9.8
H4P	8	656	0.0302	H4	H3	208.83	189.01	13	945	0.01	*1.76*	8.0

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
H5P	8	461	0.0050	H5	H3	191.31	189.01	43	384	0.11	*1.62*	18.0
H6P	8	152	0.0050	H6	H5	192.17	191.41	43	385	0.11	*1.62*	18.6
H7P	8	1391	0.0050	H7	H6	199.23	192.27	24	385	0.06	*1.36*	20.1
H8P	8	795	0.0050	H8	U0018-S09	194.20	190.22	127	385	0.33	2.20	17.0
H9P	8	716	0.0050	H9	H8	197.88	194.30	-	384	0.00	0.00	15.6
HILTONLS_HILTON	15	26	0.0039	HILTONLS	HILTON	3.00	2.90	612	1,808	0.34	2.97	14.0
HORTONLS_HORTON	8	12	0.0168	HORTONLS	HORTON	143.70	143.50	1,305	704	1.85	8.32	10.8
JAMESLS_JAMES	24	7	0.0140	JAMESLS	JAMES	95.65	95.55	3,737	12,041	0.31	7.53	13.6
K1P	8	135	0.0050	K1	S0115-S04	221.86	221.18	74	386	0.19	*1.90*	14.9
K10P	8	579	0.0050	K10	K9	174.96	172.06	344	385	0.89	2.78	5.5
K11P	12	70	0.0099	K11	W0088-S12	235.29	234.60	27	1,592	0.02	*1.71*	7.5
K12P	8	161	0.0972	K12	23206	153.70	138.08	18	1,695	0.01	2.94	4.8
K13P	8	171	0.0621	K13	K12	164.40	153.80	18	1,355	0.01	3.03	5.3
K14P	8	320	0.0040	K14	K13	165.78	164.50	18	344	0.05	*1.16*	11.3
K15P	8	400	0.0040	K15	K14	167.48	165.88	18	344	0.05	*1.16*	5.4
K16P	8	393	0.0038	K16	K15	169.06	167.58	18	334	0.05	*1.14*	7.2
K17P	8	244	0.0050	K17	K16	170.38	169.16	18	385	0.05	*1.26*	4.6
K18P	8	300	0.0049	K18	K17	171.94	170.48	18	379	0.05	*1.24*	11.0
K19P	8	68	0.0144	K19	K18	172.92	171.94	18	653	0.03	*0.12*	10.0
K20P	8	150	0.0029	K20	K19	173.36	172.92	18	295	0.06	*1.04*	4.2
K21P	8	613	0.0050	K21	K20	176.53	173.46	18	385	0.05	*1.26*	15.3
K22P	8	308	0.0050	K22	K21	178.17	176.63	18	385	0.05	*1.26*	5.2
K23P	8	350	0.0050	K23	K22	180.02	178.27	18	385	0.05	*1.26*	7.3
K24P	8	290	0.0050	K24	K23	181.57	180.12	10	385	0.03	*1.06*	5.3
K3P	8	355	0.0266	K3	K1	231.42	221.96	74	888	0.08	3.44	12.4
K4P	8	424	0.0050	K4	K3	233.64	231.52	45	385	0.12	*1.64*	14.1
K5P	8	539	0.0050	K5	K4	236.33	233.64	45	384	0.12	*1.63*	7.9
K6P	8	31	0.0052	K6	STA85-S09	166.01	165.85	352	391	0.90	2.23	0.8
K7P	8	323	0.0050	K7	K6	167.73	166.11	352	385	0.91	2.64	6.4
K8P	8	616	0.0050	K8	K7	170.91	167.83	344	385	0.89	2.77	5.5
K9P	8	191	0.0050	K9	K8	171.96	171.01	344	384	0.90	2.77	7.0
KK1P	8	295	0.0481	KK1	KK2	206.60	192.42	21	1,192	0.02	*0.13*	6.8
KK10P	24	249	0.0014	KK10	KK9	179.18	178.83	894	3,817	0.23	2.21	12.2
KK11P	24	276	0.0014	KK11	KK10	179.66	179.28	894	3,778	0.24	2.19	13.7
KK12P	24	295	0.0014	KK12	KK11	180.17	179.76	894	3,795	0.24	2.20	11.8
KK13P	24	285	0.0014	KK13	KK12	180.67	180.27	894	3,814	0.23	2.21	11.2
KK14P	24	223	0.0017	KK14	KK13	181.15	180.77	855	4,203	0.20	2.34	11.4
KK15P	24	279	0.0017	KK15	KK14	181.72	181.25	855	4,179	0.20	2.33	11.8
KK16P	24	279	0.0017	KK16	KK15	182.30	181.82	855	4,223	0.20	2.35	12.1
KK17P	24	279	0.0017	KK17	KK16	182.87	182.40	855	4,179	0.20	2.33	12.0
KK18P	24	272	0.0018	KK18	KK17	183.46	182.97	855	4,321	0.20	2.39	11.4

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Italic = Velocity < 2 fps

Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
KK19P	24	292	0.0018	KK19	KK18	184.08	183.55	855	4,337	0.20	2.39	10.2
KK2P	8	62	0.0289	KK2	KK3	192.42	190.63	21	924	0.02	2.43	10.2
KK20P	24	256	0.0018	KK20	KK19	184.64	184.18	855	4,316	0.20	2.38	11.1
KK21P	24	279	0.0018	KK21	KK20	185.24	184.74	855	4,318	0.20	2.38	12.5
KK22P	8	1116	0.0381	KK22	KK8	221.93	179.42	27	1,061	0.03	2.90	7.9
KK23P	12	50	0.0050	KK23	KLINEKELLYLS	177.73	177.48	965	1,134	0.85	3.61	14.5
KK25P	8	802	0.0050	KK25	KK1	210.60	206.60	21	384	0.06	*1.31*	6.2
KK26P	8	930	0.0342	KK26	KK13	213.93	182.08	39	1,006	0.04	3.11	7.9
KK27P	8	800	0.0050	KK27	KK18	188.54	184.54	-	384	0.00	0.00	18.4
KK28P	24	279	0.0018	KK28	KK21	185.84	185.33	779	4,353	0.18	2.34	9.6
KK29P	24	262	0.0018	KK29	KK28	186.41	185.94	779	4,312	0.18	2.32	10.4
KK3P	12	184	0.0248	KK3	KK4	190.21	185.65	21	2,526	0.01	2.18	7.4
KK30P	24	262	0.0040	KK30	KK29	187.56	186.51	779	6,445	0.12	3.09	13.3
KK31P	24	295	0.0040	KK31	KK30	188.84	187.66	820	6,439	0.13	3.09	3.3
KK4P	12	279	0.0048	KK4	KK5	185.55	184.20	21	1,115	0.02	*1.23*	10.3
KK5P	12	295	0.0050	KK5	KK6	184.10	182.63	21	1,132	0.02	*1.24*	11.4
KK6P	12	279	0.0050	KK6	KK7	182.53	181.13	44	1,136	0.04	*1.55*	15.6
KK7P	12	282	0.0057	KK7	KK8	181.03	179.42	44	1,211	0.04	*1.62*	18.9
KK8P	24	191	0.0015	KK8	KK23	178.34	178.06	965	3,898	0.25	2.29	15.8
KK9P	24	210	0.0014	KK9	KK8	178.73	178.44	894	3,783	0.24	2.20	12.3
L1P	8	2361	0.0089	L1	PH19	100.83	79.85	75	513	0.15	*0.47*	7.9
L10P	8	904	0.0400	L10	L8	139.93	103.78	29	1,087	0.03	2.98	7.9
L11P	8	580	0.0144	L11	L10	148.36	140.03	18	652	0.03	*1.81*	18.5
L12P	8	120	0.0050	L12	L11	149.06	148.46	18	385	0.05	*1.25*	17.8
L13P	8	389	0.0050	L13	L12	151.10	149.16	18	384	0.05	*1.25*	12.7
L14P	8	526	0.0050	L14	L13	153.83	151.20	18	385	0.05	*1.26*	8.0
L15P	8	1975	0.0197	L15	L10	178.93	140.03	-	763	0.00	0.00	8.0
L2P	8	212	0.0755	L2	L1	116.93	100.93	19	1,494	0.01	2.95	9.9
L3P	8	636	0.0050	L3	L2	120.21	117.03	-	384	0.00	0.00	8.7
L4P	8	1025	0.0331	L4	L2	150.93	117.03	17	989	0.02	2.36	9.9
L5P	8	39	0.0051	L5	L4	151.23	151.03	14	389	0.04	*1.17*	10.6
L6P	8	308	0.0050	L6	L5	152.87	151.33	14	385	0.04	*1.16*	5.0
L7P	8	622	0.0050	L7	L6	156.08	152.97	14	385	0.04	*1.16*	5.8
L8P	8	550	0.0050	L8	L1	103.68	100.93	50	385	0.13	*1.69*	15.6
L9P	8	771	0.0625	L9	L8	151.93	103.78	9	1,359	0.01	2.25	8.0
LAKESIDELS_LAKESIDE	12	23	0.0218	LAKESIDELS	LAKESIDE	311.50	311.00	656	2,369	0.28	5.75	7.7
LAR1P	8	91	0.0049	LAR1	LAR13	176.68	176.23	-	382	0.00	0.00	18.3
LAR10P	18	295	0.0012	LAR10	LAR9	176.43	176.07	-	1,651	0.00	0.00	15.4
LAR11P	18	285	0.0012	LAR11	LAR10	176.87	176.53	-	1,633	0.00	0.00	13.0
LAR12P	18	190	0.0012	LAR12	LAR11	177.20	176.97	-	1,645	0.00	0.00	9.9
LAR13P	12	50	0.0050	LAR13	LARSONLS	165.98	165.73	779	1,134	0.69	3.47	19.4

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
LAR14P	12	154	0.0050	LAR14	LAR13	166.85	166.08	779	1,134	0.69	3.47	19.5
LAR15P	12	663	0.0050	LAR15	LAR16	173.33	170.02	756	1,133	0.67	3.44	0.0
26923	12	594	0.0050	LAR16	LAR14	169.92	166.95	779	1,134	0.69	3.47	19.4
LAR2P	21	177	0.0015	LAR2	LAR1	172.68	172.41	-	2,789	0.00	0.00	16.0
LAR3P	21	257	0.0015	LAR3	LAR2	173.16	172.78	-	2,740	0.00	0.00	15.4
LAR4P	21	197	0.0015	LAR4	LAR3	173.55	173.26	-	2,736	0.00	0.00	15.9
LAR5P	21	295	0.0012	LAR5	LAR4	174.01	173.65	-	2,491	0.00	0.00	19.1
LAR6P	21	295	0.0015	LAR6	LAR5	174.55	174.11	-	2,754	0.00	0.00	19.8
LAR7P	21	295	0.0012	LAR7	LAR6	175.00	174.65	-	2,456	0.00	0.00	20.2
LAR8P	18	148	0.0012	LAR8	LAR7	175.52	175.34	-	1,648	0.00	0.00	20.1
LAR9P	18	295	0.0012	LAR9	LAR8	175.98	175.62	-	1,651	0.00	0.00	19.3
MARTIN_FM_OUT1_50411	12	8	0.0381	ARTIN_FM_OU	50411	330.80	330.50	252	3,131	0.08	5.32	10.2
MARTINLS_MARTIN	12	8	0.0625	MARTINLS	MARTIN	305.00	304.50	252	4,009	0.06	*0.71*	17.7
MEADOWBROOKCTLS_MEAD	10	25	0.0202	ADOWBROOKC	MEADOWBROOI	126.50	126.00	168	1,400	0.12	3.84	17.0
MITCHELLLS_MITCHELL	12	32	0.0031	MITCHELLLS	MITCHELL	135.10	135.00	801	898	0.89	2.88	21.6
MITCHELLNORTHLS_MITC	8	64	0.0078	ITCHELLNORTH	MITCHELLN	126.50	126.00	669	479	1.40	4.27	14.8
NK1P	8	258	0.0050	NK1	NK22	177.05	175.76	236	385	0.61	2.43	7.5
NK10P	8	2038	0.0372	NK10	NK7	378.93	303.03	75	1,049	0.07	3.88	7.9
NK11P	8	1164	0.0408	NK11	K5	283.93	236.43	-	1,098	0.00	0.00	8.0
NK12P	8	813	0.0215	NK12	K5	253.93	236.43	28	798	0.04	2.39	7.9
NK13P	8	289	0.0546	NK13	NK2	193.83	178.05	236	1,271	0.19	4.64	7.9
NK14P	8	622	0.0729	NK14	NK13	224.93	179.60	90	1,468	0.06	*0.57*	7.9
NK15P	8	875	0.0645	NK15	NK14	281.43	225.03	15	1,381	0.01	2.92	8.0
NK16P	8	1290	0.0479	NK16	NK14	286.83	225.03	74	1,190	0.06	4.22	8.0
NK17P	8	159	0.0679	NK17	NK16	297.73	286.93	74	1,417	0.05	4.78	9.1
NK18P	8	220	0.0050	NK18	NK17	298.83	297.73	32	385	0.08	*1.48*	8.0
NK19P	8	273	0.0436	NK19	NK18	310.83	298.93	32	1,135	0.03	3.17	8.0
NK2P	8	160	0.0050	NK2	NK1	177.95	177.15	236	385	0.61	2.58	14.6
NK20P	8	291	0.0584	NK20	NK19	327.93	310.93	32	1,314	0.02	3.51	7.9
NK21P	8	579	0.0313	NK21	NK17	315.93	297.83	16	961	0.02	2.32	7.9
NK22P	8	120	0.0050	NK22	K10	175.66	175.06	344	385	0.89	2.78	12.8
NK23P	8	1528	0.0050	NK23	NK22	183.40	175.76	26	385	0.07	*0.17*	89.4
NK24P	8	25	0.0052	NK24	83074-01	177.86	177.73	12	392	0.03	*1.13*	7.0
NK25P	8	1100	0.0050	NK25	NK24	183.46	177.96	12	385	0.03	*1.12*	23.4
NK26P	8	439	0.0050	NK26	NK25	185.75	183.56	12	384	0.03	*1.12*	11.6
NK27P	8	647	0.0050	NK27	NK26	189.09	185.85	-	385	0.00	0.00	3.8
NK28P	12	327	0.0750	NK28	K11	259.88	235.38	27	4,391	0.01	3.46	11.5
NK29P	12	80	0.1153	NK29	NK28	269.26	260.00	-	5,444	0.00	0.00	6.3
NK3P	8	521	0.0050	NK3	NK13	196.54	193.93	131	385	0.34	2.22	7.1
NK30P	12	137	0.0644	NK30	NK29	278.20	269.36	-	4,069	0.00	0.00	7.3
NK31P	12	48	0.0232	NK31	NK30	279.52	278.40	-	2,441	0.00	0.00	5.5

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
NK32P	12	141	0.0894	NK32	NK31	292.20	279.62	-	4,794	0.00	0.00	6.6
NK33P	12	310	0.0355	NK33	NK32	303.32	292.30	-	3,023	0.00	0.00	10.4
NK34P	8	964	0.0606	NK34	W0088-S07	276.93	218.50	-	1,339	0.00	0.00	8.0
NK35P	8	622	0.0280	NK35	NK33	320.83	303.42	-	910	0.00	0.00	8.1
NK4P	8	313	0.0050	NK4	NK3	198.20	196.64	131	384	0.34	2.21	9.5
NK5P	8	218	0.0050	NK5	NK4	199.39	198.30	131	385	0.34	2.22	13.3
NK6P	8	520	0.0228	NK6	NK5	211.33	199.49	131	821	0.16	3.83	7.9
NK7P	8	1649	0.0555	NK7	NK6	302.93	211.43	94	1,281	0.07	4.78	7.9
NK8P	8	294	0.0711	NK8	NK7	323.93	303.03	-	1,450	0.00	0.00	8.0
NK9P	8	263	0.0050	NK9	NK8	325.35	324.03	-	385	0.00	0.00	11.6
NORTHERNMEADOWSL_NME	8	40	0.1060	THERNMEADO	NMEADOWS	152.23	148.00	107	1,771	0.06	6.23	3.7
NORTHSHORELS_NORTHSH	10	16	0.0557	NORTHSHORELS	NORTHSHORE	311.90	311.00	878	2,327	0.38	8.83	13.0
O1P	8	50	0.0050	O1	ORCHARDLS	130.25	130.00	26	385	0.07	*1.39*	12.6
O10P	12	126	0.0050	O10	U0043-S06	154.57	153.94	686	1,134	0.61	3.36	11.8
O11P	8	575	0.0050	O11	O10	157.55	154.67	9	385	0.02	*0.06*	14.3
O12P	8	43	0.0056	O12	83184-22	152.19	151.95	55	406	0.14	*1.44*	10.8
O13P	8	195	0.0040	O13	O12	153.17	152.39	55	344	0.16	*1.61*	7.8
O14P	8	159	0.0040	O14	O13	154.01	153.37	-	345	0.00	0.00	5.0
O15P	8	612	0.0050	O15	O13	156.33	153.27	55	385	0.14	*1.74*	7.4
O2P	8	189	0.0050	O2	O1	131.30	130.35	26	386	0.07	*1.40*	15.5
O3P	8	568	0.0483	O3	O2	158.83	131.40	20	1,195	0.02	2.86	8.0
O4P	8	1159	0.0050	O4	U0043-S08	155.49	149.69	82	385	0.21	*1.57*	2.2
O5P	8	50	0.0050	O5	ORCHARDLS2	122.25	122.00	44	385	0.11	*1.63*	4.5
O6P	8	56	0.0050	O6	O5	122.63	122.35	44	385	0.11	*1.63*	5.1
O7P	8	1524	0.0191	O7	O6	151.83	122.73	44	751	0.06	2.61	8.0
O8P	8	1682	0.0050	O8	X0034-S22	117.97	109.56	40	385	0.10	*1.58*	8.8
O9P	8	484	0.0050	O9	O8	120.49	118.07	40	385	0.10	*1.59*	16.3
P1P	8	50	0.0050	P1	PADDENLS	225.25	225.00	96	385	0.25	2.04	27.5
PH1P	8	50	0.0050	PH1	PACHWYNWLS	53.75	53.50	281	385	0.73	2.68	22.7
PH10P	8	143	0.0050	PH10	PH9	84.65	83.93	39	386	0.10	*1.57*	7.1
PH11P	8	3653	0.0129	PH11	PH10	131.93	84.75	24	618	0.04	*1.90*	7.9
PH12P	8	875	0.0371	PH12	PH13	133.83	101.35	15	1,048	0.01	*1.93*	8.0
PH13P	8	50	0.0050	PH13	PACHWYNWLS2	101.25	101.00	65	385	0.17	*1.82*	17.5
PH14P	8	2321	0.0232	PH14	PH18	163.33	109.57	35	828	0.04	*0.22*	8.0
PH15P	8	754	0.0288	PH15	PH16	160.83	139.10	84	923	0.09	3.53	8.0
PH16P	8	829	0.0050	PH16	PH17	139.00	134.85	75	385	0.20	*1.88*	0.8
PH17P	8	50	0.0050	PH17	PACHWYNWLS3	134.75	134.50	185	385	0.48	2.30	0.0
PH18P	8	1644	0.0050	PH18	PH13	109.57	101.35	50	385	0.13	*1.69*	12.2
PH19P	8	1311	0.0050	PH19	PH3	79.85	73.29	110	385	0.28	2.11	11.8
PH2P	8	1589	0.0050	PH2	PH1	61.80	53.85	237	385	0.62	2.58	14.7
PH3P	8	2258	0.0050	PH3	PH2	73.19	61.90	192	385	0.50	2.45	13.9

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PH4P	8	1359	0.0232	PH4	PH3	104.81	73.29	41	828	0.05	*0.26*	17.5
PH5P	8	1324	0.0050	PH5	PH4	111.43	104.81	27	385	0.07	*1.41*	7.9
PH6P	8	1624	0.0050	PH6	PH4	113.03	104.91	14	385	0.04	*1.15*	3.8
PH7P	8	1610	0.0145	PH7	PH1	77.15	53.85	45	654	0.07	*0.28*	19.7
PH8P	8	625	0.0050	PH8	PH7	80.38	77.25	42	385	0.11	*1.61*	13.9
PH9P	8	671	0.0050	PH9	PH8	83.83	80.48	39	384	0.10	*1.56*	8.0
PINELS_PINE	12	1	0.0610	PINELS	PINE	9.00	8.95	154	3,959	0.04	*0.44*	3.6
QM1P	8	316	0.0050	QM1	S0152-S02	198.84	197.27	83	384	0.22	*1.93*	6.6
QM10P	8	51	0.0290	QM10	QM9	186.93	185.45	10	926	0.01	*1.92*	6.4
QM11P	8	112	0.0225	QM11	QM10	189.55	187.03	10	816	0.01	*1.76*	6.2
QM12P	8	129	0.0389	QM12	QM11	194.57	189.55	10	1,073	0.01	*0.06*	6.4
QM13P	8	135	0.0168	QM13	QM12	196.84	194.57	10	705	0.01	*1.59*	6.2
QM14P	8	132	0.0479	QM14	QM13	203.31	196.99	10	1,190	0.01	2.29	6.1
QM15P	8	58	0.0050	QM15	QM14	203.70	203.41	10	385	0.03	*1.04*	12.2
QM16P	8	126	0.0050	QM16	QM15	204.43	203.80	10	385	0.03	*1.04*	18.9
QM17P	8	718	0.0687	QM17	QM16	253.83	204.53	10	1,425	0.01	2.60	8.1
QM2P	8	365	0.0039	QM2	QM1	200.28	198.84	82	342	0.24	*1.79*	5.1
QM3P	8	108	0.0056	QM3	QM2	200.88	200.28	82	406	0.20	2.02	12.1
QM4	8	217	0.0045	QM4	QM3	201.86	200.88	82	366	0.23	*1.88*	11.8
QM5P	8	219	0.0047	QM5	QM4	202.88	201.86	82	371	0.22	*1.89*	4.0
QM6P	8	1008	0.0050	QM6	QM5	207.92	202.88	17	385	0.04	*0.11*	20.9
QM7P	8	469	0.0050	QM7	H4	211.28	208.93	13	385	0.03	*1.15*	16.6
QM8P	8	194	0.0100	QM8	X0020-S03	180.38	178.45	10	543	0.02	*1.32*	7.6
QM9P	8	125	0.0390	QM9	QM8	185.35	180.48	10	1,073	0.01	2.13	6.5
R83294-02_4003	8	97	0.0036	R83294-02	4003	62.72	62.37	303	327	0.93	2.37	8.5
R83294-03_R83294-02	12	151	0.0028	R83294-03	R83294-02	63.25	62.82	303	855	0.35	2.17	10.5
ROEDERLS_ROEDER	36	49	0.0020	ROEDERLS	ROEDER	-0.05	-0.15	12,376	13,570	0.91	4.85	12.7
S0044-S01_53902	8	225	0.0049	S0044-S01	53902	171.03	169.93	102	380	0.27	*1.61*	7.8
S0044-S02_S0044-S04	8	137	0.0104	S0044-S02	S0044-S04	173.48	172.06	83	554	0.15	2.50	6.3
S0044-S04_S0044-S01	8	158	0.0053	S0044-S04	S0044-S01	171.96	171.13	101	395	0.26	2.08	7.6
S0063-S01_34204	8	26	0.0191	S0063-S01	34204	400.10	399.60	78	751	0.10	3.09	9.8
S0063-S02_S0063-S01	8	72	0.4242	S0063-S02	S0063-S01	430.70	400.20	77	3,542	0.02	9.17	6.9
S0063-S03_S0063-S02	8	125	0.0650	S0063-S03	S0063-S02	438.90	430.80	76	1,387	0.05	4.74	5.8
S0063-S04_S0063-S03	8	67	0.0951	S0063-S04	S0063-S03	445.35	439.00	76	1,677	0.05	5.41	2.1
S0063-S05_S0063-S04	8	101	0.1452	S0063-S05	S0063-S04	460.15	445.45	74	2,072	0.04	6.23	5.3
S0063-S06_S0063-S05	8	289	0.1175	S0063-S06	S0063-S05	494.15	460.25	72	1,864	0.04	5.73	2.8
S0063-S07_S0063-S06	8	171	0.1810	S0063-S07	S0063-S06	525.19	494.25	69	2,314	0.03	6.58	2.2
S0075-S01_X0089-S11	8	59	0.0237	S0075-S01	X0089-S11	172.00	170.60	83	837	0.10	3.39	15.2
S0075-S02_S0075-S01	8	318	0.0719	S0075-S02	S0075-S01	195.00	172.10	83	1,459	0.06	5.04	5.7
S0115-S01_STA85-S09	12	335	0.0121	S0115-S01	STA85-S09	169.90	165.85	230	1,764	0.13	*0.65*	8.9
S0115-S02_S0115-S01	12	303	0.0251	S0115-S02	S0115-S01	177.60	170.00	186	2,541	0.07	4.20	12.0

Bold cells = pipe at capacity / manholes surcharged within 2' of rim.
If a mh is surcharged and the pipe is not at capacity, this is a result of the model recognizing a downstream problem.
Italic = Velocity < 2 fps

Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
S0115-S03_S0115-S02	12	399	0.0893	S0115-S03	S0115-S02	213.29	177.70	145	4,791	0.03	6.08	9.3
S0115-S04_S0115-S03	12	146	0.0527	S0115-S04	S0115-S03	221.08	213.39	145	3,680	0.04	5.06	12.9
S0115-S05_S0115-S04	12	91	0.0050	S0115-S05	S0115-S04	221.63	221.18	70	1,128	0.06	*1.78*	13.7
S0115-S06_S0115-S05	12	145	0.0051	S0115-S06	S0115-S05	222.47	221.73	70	1,145	0.06	*1.79*	15.2
S0115-S07_S0115-S06	12	96	0.0177	S0115-S07	S0115-S06	224.26	222.57	70	2,131	0.03	2.77	11.4
S0117-S01_72011-06	18	169	0.0098	S0117-S01	72011-06	252.11	250.45	366	4,678	0.08	3.51	20.7
S0117-S02_S0117-S01	18	289	0.0022	S0117-S02	S0117-S01	252.85	252.21	366	2,241	0.16	2.08	29.3
S0117-S03_S0117-S02	18	183	0.0401	S0117-S03	S0117-S02	270.28	262.95	366	9,461	0.04	5.76	17.0
S0123-S01_83224-01	10	79	0.0937	S0123-S01	83224-01	387.50	380.13	526	3,018	0.17	8.89	9.7
S0147-S01_43302	18	136	0.0072	S0147-S01	43302	104.80	103.82	2,584	4,010	0.64	3.25	1.1
S0147-S02_S0147-S01	8	102	0.0139	S0147-S02	S0147-S01	106.32	104.90	44	642	0.07	*0.28*	7.2
S0147-S03_S0147-S02	8	209	0.1311	S0147-S03	S0147-S02	133.86	106.42	41	1,969	0.02	5.03	8.1
S0152-S01_S0075-S02	8	22	0.0374	S0152-S01	S0075-S02	195.94	195.10	83	1,052	0.08	4.00	11.3
S0152-S02_S0152-S01	8	318	0.0039	S0152-S02	S0152-S01	197.27	196.04	83	338	0.24	*1.78*	21.0
S0175-S01_S0117-S03	18	202	0.1057	S0175-S01	S0117-S03	291.74	270.38	366	15,370	0.02	8.09	5.1
S0175-S02_S0175-S01	18	401	0.0035	S0175-S02	S0175-S01	293.24	291.84	366	2,792	0.13	2.43	15.0
S0190-S01_X0033-S05	8	165	0.1182	S0190-S01	X0033-S05	436.33	416.85	130	1,869	0.07	6.85	5.3
S0190-S02_S0190-S01	8	160	0.0998	S0190-S02	S0190-S01	452.42	436.43	28	1,718	0.02	4.07	2.8
S0253-S01_83163-06	12	252	0.0004	S0253-S01	83163-06	236.53	236.43	1,221	319	3.82	3.45	8.6
S0271-S03_53802	8	104	0.0033	S0271-S03	53802	177.39	177.05	545	311	1.75	3.46	2.2
S1P	8	90	0.0450	S1	73074-10	150.00	145.95	56	1,154	0.05	3.81	7.5
S10P	8	117	0.1556	S10	S9	139.63	121.42	8	2,145	0.00	3.25	8.1
S11P	8	335	0.0869	S11	S10	168.83	139.73	8	1,603	0.00	2.66	8.1
S12P	8	178	0.0550	S12	S8	119.73	109.94	8	1,275	0.01	2.27	9.0
S13P	8	335	0.0484	S13	STA84-S02	159.00	142.78	7	1,197	0.01	2.10	7.0
S14P	8	327	0.0369	S14	73074-07	142.90	130.85	9	1,044	0.01	2.04	12.1
S15P	8	138	0.0971	S15	S14	156.40	143.00	9	1,695	0.01	2.86	1.9
S16P	8	101	0.0057	S16	73074-08	106.72	106.14	15	412	0.04	*1.24*	8.2
S17P	8	400	0.0050	S17	S16	108.72	106.72	15	385	0.04	*1.18*	5.7
S18P	8	162	0.0393	S18	73074-08	112.50	106.14	4	1,077	0.00	*1.62*	5.5
S19P	8	145	0.0827	S19	S18	124.71	112.70	4	1,564	0.00	2.16	8.7
S2P	8	611	0.0050	S2	S25	213.61	210.56	40	384	0.10	*1.59*	25.7
S20P	8	132	0.0560	S20	S19	132.18	124.81	4	1,287	0.00	*1.88*	4.5
S21P	8	98	0.0221	S21	S20	134.44	132.28	4	808	0.01	*1.36*	4.1
S22P	8	113	0.1687	S22	S21	153.80	134.74	4	2,234	0.00	2.76	4.6
S23P	8	11	0.0455	S23	S22	155.43	154.93	4	1,159	0.00	*1.75*	3.5
S24P	8	81	0.0715	S24	S23	161.32	155.53	4	1,454	0.00	2.05	5.1
S25P	8	660	0.0402	S25	S26	210.46	183.93	49	1,090	0.05	3.52	16.4
S26P	8	741	0.0455	S26	S1	183.83	150.10	56	1,160	0.05	3.83	8.0
S27P	30	118	0.0168	S27	29305	97.10	95.12	2,984	23,917	0.12	*1.35*	12.0
S28P	8	193	0.0050	S28	S6	220.40	219.43	10	386	0.02	*1.04*	6.5

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Italic = Velocity < 2 fps

Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
S3P	8	1033	0.0456	S3	S2	260.83	213.71	8	1,161	0.01	2.08	13.1
S4P	8	668	0.0050	S4	S2	217.05	213.71	26	385	0.07	*1.39*	10.8
S5P	8	807	0.0050	S5	S4	221.19	217.15	16	385	0.04	*1.21*	15.6
S6P	8	436	0.0050	S6	S4	219.33	217.15	10	385	0.02	*1.04*	5.0
S7P	8	342	0.0050	S7	S28	222.21	220.50	10	385	0.02	*1.04*	11.6
S8P	8	228	0.1408	S8	STA62-S01	109.84	77.74	8	2,040	0.00	3.14	10.2
S9P	8	49	0.0304	S9	S12	121.32	119.83	8	948	0.01	*1.84*	10.3
SD413-S01_83334-09	8	96	0.0039	SD413-S01	83334-09	347.09	346.72	52	338	0.15	*1.57*	9.7
SD415-S01_SE654-S03	8	237	0.0005	SD415-S01	SE654-S03	395.37	395.26	39	120	0.32	*0.68*	5.9
SD415-S02_SD415-S01	8	93	0.2002	SD415-S02	SD415-S01	414.09	395.47	31	2,433	0.01	3.46	9.2
SD415-S03_SD415-S02	8	132	0.0061	SD415-S03	SD415-S02	415.00	414.19	20	426	0.05	*1.39*	7.4
SD415-S04_SD415-S03	8	204	0.0054	SD415-S04	SD415-S03	416.21	415.10	20	401	0.05	*1.33*	11.2
SD415-S05_SD415-S04	8	208	0.0049	SD415-S05	SD415-S04	417.32	416.31	14	379	0.04	*1.15*	10.1
SD415-S06_SD415-S05	8	152	0.0559	SD415-S06	SD415-S05	425.91	417.42	11	1,286	0.01	2.54	3.9
SD415-S07_SD415-S06	8	282	0.0242	SD415-S07	SD415-S06	432.83	426.01	8	846	0.01	*1.71*	4.0
SD416-S03_SD416-S04	8	80	0.0516	SD416-S03	SD416-S04	268.38	264.25	6	1,236	0.00	*1.99*	9.1
SD416-S04_SD416-S05	8	324	0.0370	SD416-S04	SD416-S05	264.15	252.17	23	1,046	0.02	2.73	9.4
SD416-S05_SD416-S06	8	138	0.0455	SD416-S05	SD416-S06	252.07	245.80	30	1,160	0.03	3.16	5.4
SD416-S06_SD416-S07	8	76	0.0686	SD416-S06	SD416-S07	245.70	240.50	32	1,425	0.02	3.74	6.7
SD416-S07_SD416-S08	8	130	0.0411	SD416-S07	SD416-S08	240.40	235.07	34	1,103	0.03	3.12	7.6
SD416-S08_SD416-S09	8	126	0.0020	SD416-S08	SD416-S09	234.97	234.72	40	242	0.17	*1.15*	7.4
SD416-S09_SD416-S11	8	54	0.0081	SD416-S09	SD416-S11	234.62	234.18	42	490	0.08	*1.91*	7.5
SD416-S11_SD416-S12	8	117	0.0052	SD416-S11	SD416-S12	234.08	233.47	44	393	0.11	*1.66*	7.2
SD416-S12_SD416-S13	8	96	0.0015	SD416-S12	SD416-S13	233.37	233.23	45	208	0.22	*1.06*	8.9
SD416-S13_35711	10	103	0.0156	SD416-S13	35711	233.13	231.53	46	1,232	0.04	2.40	4.6
SD417-S01_73094-01	8	165	0.0854	SD417-S01	73094-01	618.02	603.91	3	1,590	0.00	2.03	4.0
SD417-S02_SD417-S01	8	171	0.0376	SD417-S02	SD417-S01	624.55	618.12	3	1,054	0.00	*1.44*	6.0
SD417-S10_73081-09	12	213	0.0090	SD417-S10	73081-09	557.95	556.03	128	1,520	0.08	2.61	10.7
SD419-S01_83162-61	8	108	0.1382	SD419-S01	83162-61	482.05	467.13	37	2,021	0.02	4.98	5.5
SD419-S03_SD419-S01	8	41	0.1329	SD419-S03	SD419-S01	487.54	482.15	35	1,982	0.02	4.81	5.4
SD419-S04_SD419-S03	8	138	0.1566	SD419-S04	SD419-S03	509.33	487.64	30	2,152	0.01	4.86	4.6
SD421-S02_83204-18	8	127	0.0220	SD421-S02	83204-18	188.19	185.41	35	806	0.04	2.56	3.7
SD421-S03_SD421-S02	8	157	0.0141	SD421-S03	SD421-S02	190.49	188.29	30	645	0.05	2.09	4.3
SD421-S04_SD421-S03	8	105	0.0086	SD421-S04	SD421-S03	191.49	190.59	27	504	0.05	*1.70*	6.4
SD423-S01_SD423-S02	8	272	0.0063	SD423-S01	SD423-S02	194.00	192.30	2	430	0.00	*0.68*	9.1
SD423-S01_SD423-S06	8	143	0.0066	SD423-S01	SD423-S06	194.00	193.05	2	443	0.00	*0.70*	9.1
SD423-S02_SD421-S04	8	320	0.0019	SD423-S02	SD421-S04	192.20	191.59	8	237	0.04	*0.71*	7.7
SD423-S04_SD421-S04	8	220	0.0009	SD423-S04	SD421-S04	191.79	191.60	15	162	0.09	*0.64*	7.4
SD423-S05_SD423-S04	8	111	0.0043	SD423-S05	SD423-S04	192.37	191.89	7	357	0.02	*0.88*	10.1
SD423-S06_SD423-S05	8	78	0.0061	SD423-S06	SD423-S05	192.95	192.47	5	425	0.01	*0.90*	16.4
SD425-S04_73084-11	8	228	0.0813	SD425-S04	73084-11	628.66	610.10	11	1,550	0.01	2.88	9.9

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
SD425-S06_SD425-S04	8	169	0.1098	SD425-S06	SD425-S04	647.35	628.76	9	1,802	0.01	3.03	11.8
SD425-S09_SD425-S06	8	137	0.0574	SD425-S09	SD425-S06	655.34	647.45	8	1,303	0.01	2.29	17.1
SD425-S20_SD425-S22	8	121	0.1583	SD425-S20	SD425-S22	689.80	670.60	7	2,164	0.00	3.11	10.8
SD425-S22_SD425-S23	8	257	0.1353	SD425-S22	SD425-S23	670.50	635.76	10	2,000	0.01	3.32	8.6
SD425-S23_73081-07	8	42	0.1090	SD425-S23	73081-07	635.66	631.04	11	1,795	0.01	3.16	10.1
SD426-S01_STA95-S01	8	187	0.0403	SD426-S01	STA95-S01	450.89	443.34	7	1,092	0.01	*1.97*	8.5
SD427-S02_SD417-S10	8	377	0.0353	SD427-S02	SD417-S10	571.37	558.05	126	1,022	0.12	4.43	7.4
SD429-S07_SD419-S04	8	137	0.0995	SD429-S07	SD419-S04	523.10	509.43	23	1,715	0.01	3.85	2.8
SD429-S08_SD429-S07	8	141	0.0078	SD429-S08	SD429-S07	524.30	523.20	15	480	0.03	*1.40*	10.6
SD430-S04_STA85-S07	10	108	0.0023	SD430-S04	STA85-S07	165.05	164.80	610	474	1.29	2.47	0.0
SE654-S01_SE662-S04	8	300	0.0370	SE654-S01	SE662-S04	392.93	381.82	50	1,047	0.05	3.43	4.9
SE654-S02_SE654-S01	8	351	0.0037	SE654-S02	SE654-S01	394.33	393.03	44	331	0.13	*1.46*	8.2
SE654-S03_SE654-S02	8	194	0.0037	SE654-S03	SE654-S02	395.16	394.43	39	333	0.12	*1.42*	10.1
SE662-S01_25202	8	238	0.0499	SE662-S01	25202	368.43	356.54	63	1,215	0.05	4.09	13.0
SE662-S02_SE662-S01	8	269	0.0425	SE662-S02	SE662-S01	379.97	368.53	60	1,121	0.05	3.81	14.4
SE662-S03_SE662-S02	8	151	0.0056	SE662-S03	SE662-S02	380.91	380.07	58	406	0.14	*1.84*	4.2
SE662-S04_SE662-S03	8	99	0.0072	SE662-S04	SE662-S03	381.72	381.01	57	460	0.12	*1.99*	3.2
SE678-S01_82012-06	8	81	0.0037	SE678-S01	82012-06	155.15	154.85	293	331	0.89	2.38	20.9
SE678-S02_SE678-S01	8	176	0.0063	SE678-S02	SE678-S01	156.35	155.25	293	431	0.68	2.95	16.1
SE678-S03_SE678-S02	8	165	0.0187	SE678-S03	SE678-S02	159.55	156.45	293	745	0.39	4.14	14.2
SE678-S04_SE678-S03	8	163	0.0608	SE678-S04	SE678-S03	169.57	159.65	293	1,341	0.22	6.83	19.1
SE678-S05_SE678-S04	8	398	0.0040	SE678-S05	SE678-S04	171.27	169.67	292	345	0.85	2.47	22.0
SE678-S06_SE678-S05	8	395	0.0042	SE678-S06	SE678-S05	173.05	171.37	252	354	0.71	2.45	14.3
SE678-S07_SE678-S06	8	319	0.0043	SE678-S07	SE678-S06	174.53	173.15	252	357	0.70	2.47	16.3
SE678-S08_SE678-S07	8	399	0.0040	SE678-S08	SE678-S07	176.22	174.63	252	343	0.73	2.39	20.8
SE680-S01_26923	15	100	0.0063	SE680-S01	26923	25.18	24.55	189	2,305	0.08	2.52	10.8
SE680-S02_SE680-S01	15	83	0.0120	SE680-S02	SE680-S01	26.28	25.28	189	3,188	0.06	3.17	18.5
SE680-S03_SE680-S02	15	90	0.0152	SE680-S03	SE680-S02	27.75	26.38	158	3,584	0.04	3.26	14.6
SE686-S01_5012	28	138	0.0007	SE686-S01	5012	55.00	54.90	5,128	4,133	1.24	2.63	4.6
SE686-S02_SE686-S01	21	471	0.0199	SE686-S02	SE686-S01	64.45	55.10	2,429	10,051	0.24	2.24	6.4
SE686-S03_SE686-S02	21	458	0.0029	SE686-S03	SE686-S02	65.90	64.55	2,398	3,873	0.62	3.66	5.9
SE686-S04_SE686-S03	21	463	0.0028	SE686-S04	SE686-S03	67.29	66.00	2,365	3,757	0.63	3.57	5.4
SE686-S05_SE686-S04	21	490	0.0025	SE686-S05	SE686-S04	68.60	67.39	2,334	3,552	0.66	3.42	4.8
SE686-S06_SE686-S05	21	112	0.0016	SE686-S06	SE686-S05	68.88	68.70	2,312	2,821	0.82	2.89	4.7
SE686-S08_26922	15	243	0.0185	SE686-S08	26922	55.05	50.57	179	3,949	0.05	3.63	7.6
SE686-S09_SE686-S08	8	279	0.0086	SE686-S09	SE686-S08	57.55	55.15	12	504	0.02	*1.25*	7.4
SE701-S01_82012-08	8	305	0.0048	SE701-S01	82012-08	154.80	153.34	-	376	0.00	0.00	5.9
SHOREWOOD_FM_OUT_351	4	431	0.0043	REWOOD_FM_	35107	78.74	76.87	83	56	1.46	2.11	3.8
SHOREWOODLS_SHOREWOO	8	7	0.0142	SHOREWOODLS	SHOREWOOD	62.75	62.65	82	648	0.13	2.84	14.5
ST778-S02_ST778-S03	8	319	0.0162	ST778-S02	ST778-S03	343.15	338.00	211	691	0.30	3.81	8.9
ST778-S03_X0033-S07	8	154	0.0124	ST778-S03	X0033-S07	337.95	336.04	249	606	0.41	3.68	6.8

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Italic = Velocity < 2 fps

Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
ST879-C13_83184-11	8	26	0.0177	ST879-C13	83184-11	147.54	147.09	5	724	0.01	*0.79*	11.0
ST929-S01_13823	8	257	0.0317	ST929-S01	13823	129.45	121.30	93	969	0.10	3.90	6.1
ST929-S02_ST929-S01	8	289	0.0325	ST929-S02	ST929-S01	138.95	129.55	92	981	0.09	3.93	7.3
ST929-S03_ST929-S02	8	269	0.0582	ST929-S03	ST929-S02	154.71	139.05	92	1,311	0.07	4.82	8.8
STA62-S01_45602	8	168	0.0387	STA62-S01	45602	77.64	71.16	174	1,069	0.16	5.02	9.4
STA62-S02_STA62-S01	8	140	0.0049	STA62-S02	STA62-S01	78.43	77.74	166	382	0.43	2.35	9.5
STA62-S03_STA62-S02	8	226	0.0047	STA62-S03	STA62-S02	79.58	78.53	144	371	0.39	2.22	6.1
STA71-S01_26103	8	113	0.0343	STA71-S01	26103	277.47	273.59	207	1,007	0.21	5.06	4.8
STA74-S01_31920	8	109	0.0805	STA74-S01	31920	111.02	102.22	531	1,543	0.34	8.93	7.6
STA76-S01_21705	18	137	0.0007	STA76-S01	21705	315.44	315.34	317	1,277	0.25	*1.16*	3.6
STA84-S01_STA84-S02	15	173	0.0026	STA84-S01	STA84-S02	136.98	136.54	1,200	1,475	0.81	2.98	6.7
STA84-S02_STA84-S03	15	187	0.0047	STA84-S02	STA84-S03	136.54	135.66	1,209	1,995	0.61	3.79	10.6
STA84-S03_STA84-S04	15	176	0.0082	STA84-S03	STA84-S04	135.56	134.10	1,211	2,640	0.46	4.69	11.3
STA84-S04_29908	15	15	0.0623	STA84-S04	29908	134.00	133.05	1,211	7,255	0.17	8.32	5.6
STA85-S01_83073-14	10	114	0.0562	STA85-S01	83073-14	160.45	154.02	714	2,338	0.31	2.88	12.0
STA85-S02_STA85-S01	10	148	0.0037	STA85-S02	STA85-S01	161.10	160.55	704	602	1.17	2.84	14.6
STA85-S03_STA85-S02	10	226	0.0024	STA85-S03	STA85-S02	161.75	161.20	695	486	1.43	2.80	16.2
STA85-S04_STA85-S03	10	262	0.0029	STA85-S04	STA85-S03	162.60	161.85	656	527	1.24	2.64	14.6
STA85-S05_STA85-S04	10	193	0.0041	STA85-S05	BV23	163.50	162.70	633	634	1.00	2.55	13.0
STA85-S06_STA85-S05	10	130	0.0031	STA85-S06	STA85-S05	164.00	163.60	633	548	1.16	2.55	12.9
STA85-S07_STA85-S06	10	209	0.0029	STA85-S07	STA85-S06	164.70	164.10	624	529	1.18	2.52	2.9
STA85-S08_SD430-S04	10	122	0.0020	STA85-S08	SD430-S04	165.40	165.15	608	446	1.36	2.46	4.5
STA85-S09_STA85-S08	10	136	0.0018	STA85-S09	STA85-S08	165.75	165.50	605	422	1.43	2.45	1.7
STA91-S01_83323-23	8	130	0.0998	STA91-S01	83323-23	284.50	271.50	165	1,718	0.10	6.93	3.5
STA91-S02_STA91-S01	8	404	0.0572	STA91-S02	STA91-S01	307.71	284.60	64	1,300	0.05	4.31	4.7
STA91-S03_STA91-S02	8	231	0.0393	STA91-S03	STA91-S02	316.90	307.81	54	1,079	0.05	3.60	5.6
STA91-S04_STA91-S03	8	34	0.0449	STA91-S04	STA91-S03	318.53	317.00	46	1,152	0.04	3.59	5.5
STA95-S01_83162-58	8	299	0.0241	STA95-S01	83162-58	443.24	436.05	11	843	0.01	*1.87*	8.1
STB15-S01_82013-22	12	366	0.0044	STB15-S01	82013-22	154.05	152.46	436	1,058	0.41	2.34	14.9
STB15-S02_STB15-S01	12	400	0.0037	STB15-S02	STB15-S01	155.63	154.15	435	975	0.45	2.67	10.8
STB22-S01_43301	18	144	0.0007	STB22-S01	43301	103.02	102.92	2,603	1,247	2.09	3.28	3.4
SY1P	8	159	0.0037	SY1	73081-02	588.66	588.07	13	331	0.04	*0.08*	9.3
SY10P	8	428	0.0050	SY10	SY8	544.49	542.35	91	385	0.24	2.01	12.7
SY11P	8	1362	0.1038	SY11	34706	618.83	477.52	46	1,752	0.03	*0.29*	8.0
SY12P	8	121	0.0785	SY12	34707	496.50	487.00	6	1,524	0.00	2.38	4.0
SY13P	8	39	0.0769	SY13	SY12	501.00	498.00	6	1,508	0.00	2.36	4.0
SY14P	8	731	0.0854	SY14	U0019-S08	763.33	700.90	15	1,589	0.01	3.19	8.1
SY15P	8	2628	0.0246	SY15	SY10	609.33	544.59	91	854	0.11	3.54	8.0
SY16P	10	219	0.0161	SY16	73094-12	545.12	541.59	70	1,252	0.06	2.75	8.7
SY17PA	8	786	0.0478	SY17	SY7	653.97	616.43	70	1,188	0.06	4.14	10.2
SY18P	8	132	0.0436	SY18	SY17	659.82	654.07	66	1,135	0.06	3.94	10.9

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
SY19P	8	204	0.0436	SY19	SY18	668.81	659.92	66	1,135	0.06	3.94	10.0
SY2P	8	167	0.1222	SY2	SY1	610.00	589.60	13	1,901	0.01	3.48	4.5
SY20P	8	200	0.0288	SY20	SY19	674.67	668.91	66	923	0.07	3.41	9.9
SY21P	8	201	0.0305	SY21	SY20	680.90	674.77	66	950	0.07	3.48	8.3
SY22P	8	1299	0.0398	SY22	SY21	732.83	681.10	66	1,085	0.06	3.82	8.0
SY23P	8	278	0.0050	SY23	SY22	734.32	732.93	23	385	0.06	*1.35*	17.5
SY24P	8	367	0.0050	SY24	SY23	736.26	734.42	23	385	0.06	*1.35*	24.1
SY3P	8	233	0.0050	SY3	SY16	546.39	545.22	70	385	0.18	*1.86*	5.3
SY4P	8	265	0.0050	SY4	SY3	547.81	546.49	70	384	0.18	*1.86*	12.9
SY5P	8	311	0.0866	SY5	SY4	574.83	547.91	70	1,600	0.04	5.10	8.0
SY6P	8	746	0.0050	SY6	SY5	578.64	574.91	70	385	0.18	*1.86*	15.6
SY7P	8	987	0.0381	SY7	SY6	616.33	578.74	70	1,061	0.07	3.82	8.0
SY8P	8	50	0.0050	SY8	SOUTHYEWLS	542.25	542.00	91	385	0.24	2.01	8.0
83209	12	398	0.0029	SY9	73093-11	538.75	537.58	298	869	0.34	2.23	2.1
T72013-01_T72013-02	60	48	0.0041	T72013-01	T72013-02	39.30	39.10	45,138	75,383	0.60	5.10	12.3
T72013-02_26910	60	564	0.0009	T72013-02	26910	39.00	38.50	45,238	34,913	1.30	5.11	13.6
T72014-01_T72014-35	60	461	0.0010	T72014-01	T72014-35	67.18	66.71	44,304	37,262	1.19	5.02	15.0
T72014-35_27204	60	48	0.0315	T72014-35	27204	66.61	65.10	44,419	208,171	0.21	5.03	12.8
T72022-01_928	60	611	0.0011	T72022-01	928	30.77	30.10	52,279	38,825	1.35	5.91	0.6
T82254-15_82254-11	12	169	0.0006	T82254-15	82254-11	2.70	2.60	-	390	0.00	0.00	7.7
T82362-01_27707	48	148	0.0030	T82362-01	27707	71.84	71.39	43,951	35,252	1.25	7.79	4.2
T82362-47_27302	60	1034	0.0010	T82362-47	27302	69.11	68.07	43,957	37,084	1.19	4.99	4.6
T82363-02_T72014-01	60	441	0.0010	T82363-02	T72014-01	67.72	67.28	44,248	37,042	1.19	5.02	9.3
T83172-08_11201	15	159	0.0112	T83172-08	11201	183.00	181.22	1,549	3,081	0.50	2.80	5.0
T83172-09_83172-02	12	133	0.0275	T83172-09	83172-02	204.00	200.34	1,464	2,659	0.55	7.00	7.6
T83204-01_7803	8	453	0.0412	T83204-01	7803	167.45	148.76	146	1,104	0.13	4.88	9.9
T83293-01_T83294-01	18	355	0.0001	T83293-01	T83294-01	45.42	45.37	4,136	561	7.38	5.18	19.5
T83294-01_3409	42.35	95	0.0013	T83294-01	3409	45.27	45.15	18,802	16,479	1.14	4.28	9.2
T83301-01_3313	42.35	140	0.0032	T83301-01	3313	43.56	43.11	19,185	26,289	0.73	4.97	13.0
T83302-01_2407	53	380	0.0129	T83302-01	2407	36.95	32.05	30,028	95,569	0.31	11.83	29.2
T83302-03_83302-22	42.35	215	0.0007	T83302-03	83302-22	40.24	40.10	22,106	11,812	1.87	4.97	6.6
T83302-51_2304	42.35	252	0.0014	T83302-51	2304	38.96	38.61	28,232	17,254	1.64	6.38	15.4
T83302-52_3301	42.35	87	0.0014	T83302-52	3301	40.64	40.52	22,103	17,215	1.28	4.98	4.1
T83302-54_2305	42.35	23	0.0022	T83302-54	2305	39.43	39.38	25,313	21,639	1.17	5.71	18.1
T83302-55_T83302-54	42.35	206	0.0005	T83302-55	T83302-54	39.63	39.53	25,312	10,189	2.48	5.71	14.9
T83302-56_2311	8	424	0.0523	T83302-56	2311	99.58	77.37	1,033	1,244	0.83	8.88	7.1
T83302-57_1803	8	312	0.0507	T83302-57	1803	118.01	102.17	791	1,225	0.65	7.80	8.8
T83303-01_2619	8	57	0.1546	T83303-01	2619	38.00	29.22	1,614	2,138	0.75	15.00	8.3
T83303-11_83303-03	60	126	0.0010	T83303-11	83303-03	5.90	5.78	41,369	36,240	1.14	4.69	6.3
T83304-02_2912	42	331	0.0198	T83304-02	2912	43.33	36.77	1,265	63,707	0.02	5.83	5.3
T83311-01_T83311-02	10	352	0.0455	T83311-01	T83311-02	154.00	137.98	386	2,103	0.18	6.04	6.3

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
T83311-02_1720	10	129	0.0486	T83311-02	1720	137.88	131.63	735	2,174	0.34	6.99	4.2
T83314-01_1614	8	43	0.0329	T83314-01	1614	164.46	163.05	154	986	0.16	4.58	2.9
U0005-S01_22605	10	145	0.1027	U0005-S01	22605	500.00	485.10	1,386	3,160	0.44	9.91	10.0
U0005-S02_U0005-S01	8	255	0.1205	U0005-S02	U0005-S01	530.79	500.10	1,381	1,887	0.73	13.15	5.8
U0005-S03_U0005-S02	8	377	0.0838	U0005-S03	U0005-S02	562.47	530.89	803	1,574	0.51	8.14	14.8
U0005-S04_U0005-S03	8	210	0.1332	U0005-S04	U0005-S03	590.57	562.57	790	1,984	0.40	11.13	5.9
U0005-S05_U0005-S04	8	322	0.0506	U0005-S05	U0005-S04	607.00	590.67	777	1,224	0.64	8.27	10.9
U0005-S06_U0005-S05	8	336	0.0473	U0005-S06	U0005-S05	623.00	607.10	764	1,183	0.65	8.02	19.0
U0005-S07_U0005-S06	8	334	0.0596	U0005-S07	U0005-S06	643.00	623.10	755	1,328	0.57	8.50	17.0
U0005-S08_U0005-S07	8	253	0.0800	U0005-S08	U0005-S07	663.37	643.10	749	1,538	0.49	9.48	8.7
U0005-S09_U0005-S08	8	398	0.0239	U0005-S09	U0005-S08	673.00	663.47	743	842	0.88	6.06	12.3
U0005-S10_U0005-S09	8	323	0.0311	U0005-S10	U0005-S09	683.16	673.10	735	959	0.77	6.48	7.5
U0005-S11_U0005-S10	8	320	0.0117	U0005-S11	U0005-S10	687.00	683.26	729	588	1.24	4.65	7.0
U0005-S12_U0005-S11	8	264	0.0110	U0005-S12	U0005-S11	690.00	687.10	722	570	1.27	4.61	8.0
U0005-S13_U0005-S12	8	304	0.0147	U0005-S13	U0005-S12	694.55	690.10	712	658	1.08	4.67	2.7
U0010-S01_2502	8	31	0.0647	U0010-S01	2502	61.00	58.97	116	1,383	0.08	5.36	7.4
U0018-S01_83093-01	8	140	0.0336	U0018-S01	83093-01	143.03	138.32	160	997	0.16	4.37	4.5
U0018-S02_U0018-S01	8	154	0.0070	U0018-S02	U0018-S01	144.20	143.13	160	453	0.35	2.64	3.7
U0018-S03_U0018-S02	8	174	0.0081	U0018-S03	U0018-S02	145.71	144.30	160	488	0.33	2.79	2.0
U0018-S04_U0018-S03	8	175	0.0251	U0018-S04	U0018-S03	150.20	145.81	160	861	0.19	4.20	2.4
U0018-S05_U0018-S04	8	202	0.0775	U0018-S05	U0018-S04	165.96	150.30	160	1,514	0.11	6.28	5.9
U0018-S06_U0018-S05	8	120	0.0435	U0018-S06	U0018-S05	171.29	166.06	160	1,134	0.14	5.11	3.8
U0018-S07_U0018-S06	8	341	0.0390	U0018-S07	U0018-S06	184.72	171.39	160	1,075	0.15	4.92	4.4
U0018-S08_U0018-S07	8	292	0.0149	U0018-S08	U0018-S07	189.18	184.82	159	664	0.24	3.48	5.3
U0018-S09_U0018-S08	8	76	0.0111	U0018-S09	U0018-S08	190.12	189.28	126	573	0.22	2.94	6.1
U0019-S01_X18-S05	8	169	0.0538	U0019-S01	X18-S05	621.65	612.58	121	1,262	0.10	5.08	4.9
U0019-S02_U0019-S01	8	267	0.0163	U0019-S02	U0019-S01	626.11	621.75	121	695	0.17	3.32	8.2
U0019-S03_U0019-S02	8	169	0.0657	U0019-S03	U0019-S02	637.29	626.21	120	1,394	0.09	5.43	5.4
U0019-S04_U0019-S03	8	233	0.1028	U0019-S04	U0019-S03	661.34	637.39	31	1,744	0.02	4.26	6.0
U0019-S05_U0019-S04	8	105	0.0761	U0019-S05	U0019-S04	669.45	661.44	31	1,500	0.02	3.84	5.0
U0019-S06_U0019-S05	8	178	0.0062	U0019-S06	U0019-S05	670.65	669.55	31	428	0.07	*1.59*	8.3
U0019-S07_U0019-S06	8	62	0.1879	U0019-S07	U0019-S06	682.39	670.75	31	2,357	0.01	5.26	5.0
U0019-S08_U0019-S07	8	256	0.0715	U0019-S08	U0019-S07	700.80	682.49	31	1,454	0.02	3.76	6.9
U0023-S02_U0023-S03	15	293	0.0024	U0023-S02	U0023-S03	71.00	70.28	133	1,438	0.09	*1.50*	6.7
U0023-S03_U0023-S04	15	127	0.0030	U0023-S03	U0023-S04	70.18	69.80	180	1,598	0.11	*0.33*	5.5
U0023-S04_SE686-S06	21	328	0.0024	U0023-S04	SE686-S06	69.70	68.93	2,181	3,467	0.63	2.02	6.4
U0023-S05_U0023-S04	18	146	0.0001	U0023-S05	U0023-S04	69.82	69.80	2,001	510	3.93	2.52	6.0
U0023-S06_U0023-S05	18	278	0.0008	U0023-S06	U0023-S05	70.14	69.92	1,964	1,342	1.46	2.47	10.4
U0023-S07_U0023-S06	18	312	0.0005	U0023-S07	U0023-S06	70.39	70.24	1,932	1,037	1.86	2.43	7.4
U0023-S08_U0023-S07	18	99	0.0195	U0023-S08	U0023-S07	72.42	70.49	1,921	6,605	0.29	2.42	7.0
U0023-S09_U0023-S08	18	374	0.0034	U0023-S09	U0023-S08	73.80	72.52	1,895	2,761	0.69	3.75	5.3

Bold cells = pipe at capacity / manholes surcharged within 2' of rim.
If a mh is surcharged and the pipe is not at capacity, this is a result of the model recognizing a downstream problem.
Italic = Velocity < 2 fps

Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
U0023-S10_U0023-S09	15	160	0.0026	U0023-S10	U0023-S09	74.20	73.79	1,543	1,469	1.05	3.04	4.5
U0023-S11_U0023-S10	15	159	0.0028	U0023-S11	U0023-S10	74.80	74.35	1,427	1,546	0.92	3.16	4.2
U0023-S12_U0023-S11	15	276	0.0005	U0023-S12	U0023-S11	75.05	74.90	1,411	678	2.08	2.56	3.2
U0023-S13_U0023-S12	15	276	0.0039	U0023-S13	U0023-S12	76.22	75.15	1,113	1,811	0.61	2.02	7.3
U0023-S13_U0023-S13	8	276	0.0034	U0023-S14	U0023-S13	77.25	76.32	347	316	1.10	2.22	8.7
U0023-S14_08502	8	276	0.0034	U0023-S14	U0023-S13	77.25	76.32	347	316	1.10	2.22	8.7
U0023-S15_83193-03	8	532	0.0039	U0023-S15	83193-03	81.28	79.20	161	340	0.47	*1.71*	7.9
U0023-S16_U0023-S13	8	456	0.0044	U0023-S16	U0023-S13	78.33	76.32	300	361	0.83	*1.91*	3.7
U0023-S17_U0023-S14	8	456	0.0003	U0023-S17	U0023-S14	77.49	77.35	503	95	5.28	3.21	2.8
U0033-S01_4919	30	256	0.0014	U0033-S01	4919	53.12	52.77	14,115	6,819	2.07	6.35	1.4
U0033-S02_U0033-S01	24	10	0.0183	U0033-S02	U0033-S01	53.68	53.49	8,666	13,756	0.63	6.11	5.4
U0033-S03_U0033-S02	24	320	0.0193	U0033-S03	U0033-S02	59.97	53.78	8,625	14,159	0.61	7.50	10.0
U0033-S04_U0033-S03	24	399	0.0131	U0033-S04	U0033-S03	65.29	60.07	8,549	11,641	0.73	8.77	2.6
U0033-S05_U0033-S04	24	386	0.0045	U0033-S05	U0033-S04	67.11	65.39	7,835	6,793	1.15	5.53	0.1
U0033-S06_U0033-S05	24	398	0.0058	U0033-S06	U0033-S05	69.52	67.21	7,835	7,760	1.01	5.53	2.7
U0033-S07_U0033-S06	24	393	0.0056	U0033-S07	U0033-S06	71.81	69.62	7,713	7,610	1.01	6.13	2.5
U0033-S08_U0033-S07	24	404	0.0224	U0033-S08	U0033-S07	80.94	71.91	7,582	15,223	0.50	5.36	5.5
U0033-S09_U0033-S08	24	197	0.0150	U0033-S09	U0033-S08	84.00	81.04	7,476	12,467	0.60	9.23	2.3
U0033-S10_U0033-S09	24	296	0.0073	U0033-S10	U0033-S09	86.27	84.10	7,395	8,700	0.85	6.92	7.2
U0033-S11_U0033-S10	24	203	0.0069	U0033-S11	U0033-S10	87.76	86.37	7,321	8,442	0.87	6.74	5.7
U0033-S12_U0033-S11	24	469	0.0093	U0033-S12	U0033-S11	92.20	87.86	7,218	9,796	0.74	6.40	13.9
U0035-S01_U0019-S03	8	67	0.0487	U0035-S01	U0019-S03	640.66	637.39	88	1,200	0.07	4.46	4.7
U0035-S02_U0035-S01	8	318	0.0032	U0035-S02	U0035-S01	641.77	640.76	74	306	0.24	*1.60*	2.3
U0035-S03_U0035-S02	8	139	0.0050	U0035-S03	U0035-S02	642.57	641.87	72	385	0.19	*1.88*	4.7
U0035-S04_U0035-S03	8	83	0.0076	U0035-S04	U0035-S03	643.30	642.67	72	475	0.15	2.18	9.5
U0035-S05_U0035-S04	8	66	0.1701	U0035-S05	U0035-S04	654.63	643.40	72	2,243	0.03	6.53	4.7
U0035-S06_U0035-S05	8	55	0.2031	U0035-S06	U0035-S05	665.87	654.73	72	2,451	0.03	6.95	9.3
U0037-S01_S0044-S02	8	117	0.0121	U0037-S01	S0044-S02	175.00	173.58	13	598	0.02	*1.49*	9.6
U0037-S02_U0037-S01	8	274	0.0039	U0037-S02	U0037-S01	176.16	175.10	13	339	0.04	*1.03*	8.8
U0037-S02_U0037-S03	8	364	0.0045	U0037-S03	U0037-S02	177.90	176.26	0	365	0.00	*0.32*	14.6
U0039-S01_U0039-S02	12	234	0.0004	U0039-S01	U0039-S02	2.30	2.20	147	332	0.44	*0.42*	7.7
U0039-S02_24403	15	204	0.0005	U0039-S02	24403	2.10	2.00	176	644	0.27	*0.32*	7.7
U0043-S01_U0043-S02	12	348	0.0096	U0043-S01	U0043-S02	167.42	164.09	645	1,568	0.41	4.22	7.1
U0043-S02_U0043-S03	12	189	0.0072	U0043-S02	U0043-S03	163.99	162.63	663	1,362	0.49	3.83	10.5
U0043-S03_U0043-S04	12	122	0.0457	U0043-S03	U0043-S04	162.53	156.97	664	3,426	0.19	4.28	14.7
U0043-S04_U0043-S05	12	400	0.0039	U0043-S04	U0043-S05	156.87	155.33	664	995	0.67	2.86	10.2
U0043-S05_U0043-S06	12	274	0.0024	U0043-S05	O10	155.23	154.57	677	788	0.86	2.51	4.0
U0043-S06_U0043-S07	12	408	0.0034	U0043-S06	U0043-S07	153.84	152.45	687	936	0.73	2.89	13.0
U0043-S07_U0043-S08	12	110	0.0242	U0043-S07	U0043-S08	152.35	149.69	687	2,494	0.28	3.32	11.5
U0043-S08_U0043-S09	12	320	0.0035	U0043-S08	U0043-S09	149.59	148.46	769	952	0.81	3.00	14.6
U0043-S09_X0034-S20	12	318	0.0039	U0043-S09	X0034-S20	148.36	147.11	787	1,005	0.78	3.15	4.9

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Italic = Velocity < 2 fps

Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
U0047-C03_U0047-S18	8	28	0.0442	U0047-C03	U0047-S18	100.00	98.76	-	1,143	0.00	0.00	15.0
U0047-C05_U0047-S23	8	12	0.0120	U0047-C05	U0047-S23	74.00	73.85	0	596	0.00	0.00	8.5
U0047-S11_U0047-S12	18	302	0.0044	U0047-S11	U0047-S12	108.50	107.16	414	3,146	0.13	2.17	18.6
U0047-S12_U0047-S13	18	319	0.0011	U0047-S12	U0047-S13	107.06	106.71	414	1,574	0.26	*1.67*	12.4
U0047-S13_U0047-S14	18	144	0.0149	U0047-S13	U0047-S14	106.61	104.46	414	5,778	0.07	4.08	16.5
U0047-S14_U0047-S15	18	472	0.0040	U0047-S14	U0047-S15	104.36	102.46	416	2,999	0.14	2.66	12.8
U0047-S15_U0047-S16	18	499	0.0041	U0047-S15	U0047-S16	102.36	100.32	467	3,021	0.15	2.76	13.4
U0047-S16_U0047-S17	18	8	0.0038	U0047-S16	U0047-S17	100.22	100.19	467	2,911	0.16	2.69	12.3
U0047-S17_U0047-S18	18	237	0.0056	U0047-S17	U0047-S18	100.09	98.76	467	3,544	0.13	3.09	11.9
U0047-S18_U0047-S19	18	215	0.0115	U0047-S18	U0047-S19	98.66	96.19	468	5,062	0.09	3.98	16.0
U0047-S19_U0047-S20	18	331	0.0107	U0047-S19	U0047-S20	96.09	92.53	469	4,900	0.10	3.90	13.0
U0047-S20_U0047-S21	18	333	0.0267	U0047-S20	U0047-S21	92.43	83.52	476	7,731	0.06	5.40	7.3
U0047-S21_U0047-S22	18	291	0.0197	U0047-S21	U0047-S22	83.42	77.69	476	6,629	0.07	4.84	8.1
U0047-S22_U0047-S23	18	506	0.0074	U0047-S22	U0047-S23	77.59	73.85	478	4,065	0.12	3.43	7.1
U0047-S23_U0047-S24	18	401	0.0078	U0047-S23	U0047-S24	73.75	70.63	478	4,172	0.11	3.49	8.3
U0047-S24_U0047-S25	18	447	0.0063	U0047-S24	U0047-S25	70.53	67.71	479	3,756	0.13	3.25	11.2
U0047-S25_82234-03	18	21	0.0096	U0047-S25	82234-03	67.61	67.41	558	4,624	0.12	2.85	12.0
U0052-S01_BRITTONLOO	8	45	0.2047	U0052-S01	BRITTONLOOPLS	286.84	277.60	134	2,460	0.05	8.29	12.5
U0052-S02_U0052-S01	8	146	0.0450	U0052-S02	U0052-S01	293.50	286.94	132	1,153	0.11	4.89	11.9
U0052-S03_U0052-S02	8	142	0.0407	U0052-S03	U0052-S02	299.40	293.60	128	1,098	0.12	4.68	11.7
U0052-S04_U0052-S03	8	202	0.0403	U0052-S04	U0052-S03	307.63	299.50	125	1,092	0.11	4.63	12.3
U0052-S05_U0052-S04	8	187	0.0617	U0052-S05	U0052-S04	319.29	307.73	120	1,351	0.09	5.31	13.1
U0052-S06_U0052-S05	12	189	0.0061	U0052-S06	U0052-S05	320.53	319.39	117	1,247	0.09	2.22	11.8
U0052-S07_U0052-S06	8	189	0.0459	U0052-S07	U0052-S06	329.31	320.63	112	1,165	0.10	4.69	13.0
U0052-S08_U0052-S07	8	133	0.0690	U0052-S08	U0052-S07	338.56	329.41	108	1,429	0.08	5.37	14.6
U0052-S12_U0052-S08	12	187	0.0083	U0052-S12	U0052-S08	340.21	338.66	105	1,462	0.07	2.40	19.4
U0052-S13_U0052-S12	12	164	0.0060	U0052-S13	U0052-S12	341.29	340.31	101	1,238	0.08	2.11	21.5
U0058-S01_82134-06	10	108	0.0524	U0058-S01	82134-06	154.37	148.73	1,772	2,257	0.79	8.31	3.7
U0058-S05_U0058-S01	8	21	0.0162	U0058-S05	U0058-S01	154.99	154.65	15	693	0.02	*1.27*	2.7
U0069-S01_U0047-S11	8	370	0.0367	U0069-S01	U0047-S11	122.16	108.60	108	1,041	0.10	3.02	9.5
U0069-S02_U0069-S01	8	410	0.0092	U0069-S02	U0069-S01	126.01	122.26	107	520	0.21	2.61	10.7
U0069-S03_U0069-S02	8	284	0.0283	U0069-S03	U0069-S02	134.15	126.11	107	914	0.12	3.91	9.8
U0069-S04_U0069-S03	8	279	0.0171	U0069-S04	U0069-S03	139.01	134.25	107	710	0.15	3.26	14.8
U0069-S05_U0069-S09	8	165	0.0030	U0069-S05	U0069-S09	141.96	141.46	102	299	0.34	*1.73*	12.8
U0069-S06_U0069-S05	8	66	0.0039	U0069-S06	U0069-S05	142.32	142.06	102	340	0.30	*1.90*	12.4
U0069-S09_U0069-S04	8	137	0.0164	U0069-S09	U0069-S04	141.36	139.11	107	696	0.15	3.22	13.6
U0071-S02_924	8	84	0.0087	U0071-S02	924	168.04	167.31	241	506	0.48	3.19	9.1
U0071-S03_804	8	311	0.0534	U0071-S03	804	185.20	168.59	203	1,257	0.16	3.22	5.8
U0072-S01_U0072-S02	8	363	0.0045	U0072-S01	U0072-S02	139.99	138.37	1	363	0.00	*0.43*	12.9
U0072-S02_U0072-S03	8	296	0.0045	U0072-S02	U0072-S03	138.27	136.95	14	363	0.04	*1.11*	14.1
U0072-S03_U0072-S04	8	297	0.0039	U0072-S03	U0072-S04	136.85	135.70	14	339	0.04	*1.07*	25.6

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Italic = Velocity < 2 fps

Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
U0072-S04_U0072-S05	8	362	0.0036	U0072-S04	U0072-S05	135.60	134.31	18	325	0.06	*1.11*	11.2
U0072-S05_U0072-S06	8	214	0.0042	U0072-S05	U0072-S06	134.21	133.32	19	351	0.05	*1.20*	3.2
U0072-S06_U0072-S08	8	311	0.0045	U0072-S06	U0072-S08	133.22	131.81	20	366	0.06	*0.13*	11.7
U0072-S07_MITCHELLNO	8	20	0.2508	U0072-S07	ITCHELLNORTH	131.63	126.60	211	2,723	0.08	7.14	10.0
U0072-S08_U0072-S07	8	39	0.0006	U0072-S08	U0072-S07	131.75	131.73	155	129	1.20	*0.99*	15.3
U0073-S01_28820	8	137	0.1065	U0073-S01	28820	374.00	359.41	17	1,775	0.01	3.60	2.3
U0074-S01_U0074-S02	8	219	0.0037	U0074-S01	U0074-S02	169.94	169.12	93	331	0.28	*1.61*	4.2
U0074-S02_82112-09	8	77	0.0035	U0074-S02	82112-09	169.02	168.75	119	323	0.37	*1.35*	6.0
U0074-S04_U0074-S01	8	291	0.0036	U0074-S04	U0074-S01	171.08	170.04	93	326	0.29	*1.79*	6.7
U0074-S05_U0074-S04	8	294	0.0059	U0074-S05	U0074-S04	172.92	171.18	93	418	0.22	2.15	13.8
U0076-S01_83323-27	8	12	0.0699	U0076-S01	83323-27	465.07	464.22	12	1,438	0.01	2.79	4.0
U0077-S01_20903	8	58	0.0155	U0077-S01	20903	397.37	396.47	113	677	0.17	*1.65*	0.0
U0077-S02_U0077-S01	8	398	0.0029	U0077-S02	U0077-S01	398.62	397.47	108	292	0.37	*1.40*	0.0
U0077-S03_U0077-S02	8	219	0.0296	U0077-S03	U0077-S02	405.19	398.72	73	935	0.08	2.83	6.7
U0077-S04_U0077-S10	8	116	0.0357	U0077-S04	U0077-S10	410.65	406.50	73	1,027	0.07	3.79	3.5
U0077-S05_U0077-S04	8	212	0.0972	U0077-S05	U0077-S04	431.34	410.75	73	1,695	0.04	5.39	3.7
U0077-S06_U0077-S05	8	166	0.1014	U0077-S06	U0077-S05	448.25	431.44	72	1,732	0.04	5.46	3.6
U0077-S07_U0077-S06	8	111	0.0653	U0077-S07	U0077-S06	455.57	448.35	72	1,390	0.05	4.67	6.0
U0077-S08_U0077-S07	8	137	0.0139	U0077-S08	U0077-S07	457.57	455.67	72	641	0.11	2.70	13.5
U0077-S09_U0077-S08	8	108	0.0169	U0077-S09	U0077-S08	459.50	457.67	71	708	0.10	2.90	14.6
U0077-S10_U0077-S03	8	42	0.0263	U0077-S10	U0077-S03	406.40	405.29	73	882	0.08	3.41	5.3
U0078-S01_82134-22	8	51	0.0566	U0078-S01	82134-22	163.51	160.60	470	1,294	0.36	4.12	8.2
U0078-S02_U0078-S01	10	250	0.0028	U0078-S02	U0078-S01	164.31	163.61	470	520	0.90	2.40	17.1
U0078-S03_U0078-S02	10	166	0.0026	U0078-S03	U0078-S02	164.85	164.41	470	507	0.93	2.35	11.6
U0078-S04_U0078-S03	10	57	0.0017	U0078-S04	U0078-S03	165.04	164.95	470	401	1.17	*1.92*	13.0
U0078-S05_U0078-S04	10	140	0.0028	U0078-S05	U0078-S04	165.54	165.14	470	523	0.90	2.22	10.3
U0078-S06_U0078-S05	10	60	0.0036	U0078-S06	U0078-S05	165.85	165.64	469	588	0.80	2.67	8.5
U0078-S07_U0078-S06	10	347	0.0029	U0078-S07	U0078-S06	166.95	165.95	442	528	0.84	2.42	16.3
U0081-S03_U0033-S12	21	105	0.0168	U0081-S03	U0033-S12	94.06	92.30	6,724	9,236	0.73	7.78	7.2
U0081-S04_U0081-S03	21	229	0.0163	U0081-S04	U0081-S03	97.90	94.16	6,697	9,115	0.73	8.89	9.5
U0081-S05_U0081-S04	21	91	0.0077	U0081-S05	U0081-S04	98.70	98.00	6,661	6,255	1.06	6.60	11.9
U0081-S08_U0081-S05	21	88	0.0030	U0081-S08	U0081-S05	99.07	98.80	6,641	3,910	1.70	6.15	12.3
U0081-S09_U0081-S08	21	194	0.0331	U0081-S09	U0081-S08	105.59	99.17	6,600	12,974	0.51	6.11	10.9
U0081-S10_U0081-S09	21	190	0.0272	U0081-S10	U0081-S09	110.85	105.69	6,556	11,762	0.56	11.19	14.3
U0081-S11_U0081-S10	21	23	0.2080	U0081-S11	U0081-S10	115.67	110.95	914	32,517	0.03	*0.85*	10.7
U0081-S12_U0081-S10	21	55	0.0339	U0081-S12	U0081-S10	112.80	110.95	2,850	13,136	0.22	2.64	13.1
U0081-S12_S10	21	55	0.0358	U0081-S12	U0081-S10	112.80	110.85	2,926	13,486	0.22	2.71	13.1
U0093-S01_U0093-Y01	48	243	0.0002	U0093-S01	U0093-Y01	92.05	92.00	43,901	9,280	4.73	7.78	3.9
U0093-Y01_27401	48	480	0.0260	U0093-Y01	27401	91.90	79.43	43,927	104,177	0.42	12.28	4.1
U0099-S03_83082-01	8	294	0.0018	U0099-S03	83082-01	179.62	179.10	465	229	2.03	2.96	0.0
U0100-S01_U0023-S17	8	140	0.0004	U0100-S01	U0023-S17	77.65	77.59	456	112	4.06	2.90	2.2

Bold cells = pipe at capacity / manholes surcharged within 2' of rim.
If a mh is surcharged and the pipe is not at capacity, this is a result of the model recognizing a downstream problem.
Italic = Velocity < 2 fps

Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
U0100-S02_U0100-S01	8	144	0.0003	U0100-S02	U0100-S01	77.79	77.75	341	90	3.77	2.16	1.9
U0100-S03_U0100-S02	8	296	0.0048	U0100-S03	U0100-S02	80.36	78.95	264	375	0.70	2.16	0.6
U0100-S04_U0100-S03	8	147	0.0096	U0100-S04	U0100-S03	80.36	78.95	214	533	0.40	*1.35*	0.7
U0102-S03_MITCHELLLS	8	108	0.0771	U0102-S03	MITCHELLLS	143.53	135.20	94	1,510	0.06	*0.60*	9.4
V0010-S03_53201	10	26	0.0068	V0010-S03	53201	166.80	166.62	115	814	0.14	2.35	8.0
V0025-S01_29922	18	44	0.0071	V0025-S01	29922	120.01	119.70	1,747	3,979	0.44	4.85	6.6
V0025-S02_V0025-S01	18	77	0.0134	V0025-S02	V0025-S01	121.14	120.11	1,746	5,466	0.32	5.55	4.3
W0027-S01_83174-11	8	20	0.0343	W0027-S01	83174-11	166.65	165.95	107	1,006	0.11	4.00	3.2
W0027-S02_NORTHERNME	8	39	0.0026	W0027-S02	RTHERNMEADO	152.43	152.33	107	276	0.39	*1.65*	9.4
W0027-S03_W0027-S02	8	49	0.0949	W0027-S03	W0027-S02	157.15	152.53	59	1,676	0.04	3.59	5.3
W0027-S06_W0027-S03	8	154	0.0198	W0027-S06	W0027-S03	160.29	157.25	59	765	0.08	2.89	14.4
W0027-S08_W0027-S12	8	160	0.0044	W0027-S08	W0027-S12	163.18	162.48	36	360	0.10	*1.47*	14.2
W0027-S12_W0027-S06	8	142	0.0141	W0027-S12	W0027-S06	162.38	160.39	59	645	0.09	2.56	15.0
W0033-S01_83292-17	30	381	0.0048	W0033-S01	83292-17	61.64	59.80	7,983	12,834	0.62	6.13	4.2
W0073-S03_JAMESLS	18	28	0.0905	W0073-S03	JAMESLS	98.24	95.75	3,610	14,224	0.25	4.55	11.2
W0088-C03_W0088-S12	12	110	0.0100	W0088-C03	K11	236.47	235.37	0	1,600	0.00	0.00	9.5
W0088-S02_83072-01	12	168	0.0098	W0088-S02	83072-01	173.03	171.39	532	1,584	0.34	4.05	4.1
W0088-S03_W0088-S02	12	295	0.0095	W0088-S03	W0088-S02	175.93	173.13	532	1,562	0.34	4.01	5.3
W0088-S04_W0088-S03	12	364	0.0158	W0088-S04	W0088-S03	181.80	176.03	510	2,018	0.25	4.77	8.2
W0088-S05_W0088-S04	12	402	0.0437	W0088-S05	W0088-S04	199.48	181.90	510	3,352	0.15	6.86	10.2
W0088-S07_W0088-S05	12	315	0.0597	W0088-S07	W0088-S05	218.40	199.58	499	3,919	0.13	7.63	10.1
W0088-S08_W0088-S07	12	209	0.0261	W0088-S08	W0088-S07	223.97	218.50	58	2,591	0.02	2.77	11.5
W0088-S09_W0088-S08	12	390	0.0233	W0088-S09	W0088-S08	233.15	224.07	42	2,448	0.02	2.62	9.3
W0088-S10_W0088-S09	12	45	0.0049	W0088-S10	W0088-S09	233.47	233.25	41	1,126	0.04	*1.52*	9.3
W0088-S11_W0088-S10	12	131	0.0037	W0088-S11	W0088-S10	234.06	233.57	41	981	0.04	*1.38*	13.4
W0088-S12_W0088-S11	12	96	0.0035	W0088-S12	W0088-S11	234.50	234.16	38	953	0.04	*1.32*	4.7
W0117-S01_82013-27	8	74	0.0027	W0117-S01	82013-27	135.68	135.48	34	283	0.12	*1.21*	9.1
W0117-S02_W0117-S01	8	169	0.0048	W0117-S02	W0117-S01	136.59	135.78	34	377	0.09	*1.48*	2.8
WA536-S01_82013-01	8	47	0.0016	WA536-S01	82013-01	146.55	146.48	0	217	0.00	*0.21*	13.1
WA536-S02_WA536-S01	8	115	0.0178	WA536-S02	WA536-S01	148.70	146.65	0	725	0.00	*0.48*	11.3
WA539-S01_STB15-S02	8	281	0.0210	WA539-S01	STB15-S02	161.78	155.88	38	788	0.05	2.19	10.1
WA543-S01_82251-09	8	37	0.0040	WA543-S01	82251-09	9.30	9.15	251	344	0.73	*1.81*	7.8
WESTBAKERVIEWLS_WBAK	10	13	0.0238	ESTBAKERVIEW	WBAKERVIEW	168.30	168.00	1,191	1,520	0.78	6.86	6.7
WILLOWLS_WILLOW	8	8	0.0480	WILLOWLS	WILLOW	33.39	33.00	583	1,192	0.49	7.56	12.5
WMAPLEWOODLS_WMAPLEW	12	4	0.0262	WMAPLEWOOD	WMAPLEWOOD	156.45	156.35	895	2,597	0.34	6.67	13.3
X0007-S01_17502	8	131	0.0298	X0007-S01	17502	215.21	211.31	63	939	0.07	3.41	6.7
X0007-S02_X0007-S01	8	46	0.0970	X0007-S02	X0007-S01	219.77	215.31	57	1,693	0.03	5.01	4.0
X0007-S03_X0007-S02	8	86	0.0186	X0007-S03	X0007-S02	221.47	219.87	53	741	0.07	2.74	4.0
X0007-S05_X0007-S03	8	271	0.0141	X0007-S05	X0007-S03	225.40	221.57	45	646	0.07	2.37	10.6
X0007-S06_X0007-S05	8	149	0.0924	X0007-S06	X0007-S05	239.23	225.50	20	1,653	0.01	3.56	7.4
X0020-S01_S0044-S02	8	170	0.0066	X0020-S01	S0044-S02	174.70	173.58	63	441	0.14	2.00	7.6

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
X0020-S02_X0020-S01	8	240	0.0046	X0020-S02	X0020-S01	175.90	174.80	60	368	0.16	*1.73*	8.3
X0020-S03_X0020-S02	8	193	0.0122	X0020-S03	X0020-S02	178.35	176.00	52	600	0.09	2.35	8.8
X0020-S04_X0020-S03	8	102	0.0034	X0020-S04	X0020-S03	178.80	178.45	36	319	0.11	*1.35*	15.6
X0020-S05_X0020-S04	8	84	0.0057	X0020-S05	X0020-S04	179.38	178.90	28	412	0.07	*1.51*	8.6
X0020-S06_X0020-S05	8	41	0.0041	X0020-S06	X0020-S05	179.65	179.48	28	350	0.08	*1.33*	7.4
X0027-S01_7702	8	186	0.0467	X0027-S01	7702	141.91	133.22	15	1,175	0.01	2.61	10.4
X0027-S04_X0027-S01	8	99	0.0227	X0027-S04	X0027-S01	144.27	142.01	3	820	0.00	*1.20*	8.7
X0031-S01_U0035-S06	8	116	0.0071	X0031-S01	U0035-S06	666.79	665.97	71	458	0.16	2.12	10.5
X0031-S02_X0031-S01	8	131	0.0047	X0031-S02	X0031-S01	667.51	666.89	71	375	0.19	*1.83*	9.2
X0031-S03_X0031-S02	8	190	0.0041	X0031-S03	X0031-S02	668.39	667.61	70	349	0.20	*1.73*	6.4
X0032-S01_S0063-S07	8	43	0.1089	X0032-S01	S0063-S07	529.92	525.29	69	1,794	0.04	5.51	2.5
X0032-S02_X0032-S01	8	92	0.4535	X0032-S02	X0032-S01	571.74	530.02	66	3,662	0.02	8.97	4.4
X0032-S03_X0032-S02	8	57	0.1268	X0032-S03	X0032-S02	579.06	571.84	66	1,936	0.03	5.75	3.3
X0032-S04_X0032-S03	8	60	0.0071	X0032-S04	X0032-S03	579.58	579.16	66	459	0.14	2.08	5.2
X0032-S05_X0032-S04	8	200	0.0777	X0032-S05	X0032-S04	595.19	579.68	66	1,516	0.04	4.84	7.3
X0032-S06_X0032-S05	8	65	0.0994	X0032-S06	X0032-S05	601.71	595.29	66	1,715	0.04	5.26	5.6
X0032-S12_X0032-S06	8	216	0.0581	X0032-S12	X0032-S06	614.35	601.81	65	1,311	0.05	4.34	7.9
X0032-S13_X0032-S12	8	224	0.0557	X0032-S13	X0032-S12	626.95	614.45	63	1,283	0.05	4.25	9.4
X0032-S14_X0032-S13	8	276	0.1285	X0032-S14	X0032-S13	662.50	627.05	62	1,949	0.03	5.65	6.0
X0032-S15_X0032-S14	8	196	0.1201	X0032-S15	X0032-S14	686.08	662.60	40	1,884	0.02	4.86	6.4
X0032-S16_X0032-S14	8	68	0.0399	X0032-S16	X0032-S14	665.30	662.60	16	1,086	0.01	2.50	7.1
X0032-S17_X0032-S16	8	114	0.1523	X0032-S17	X0032-S16	682.82	665.40	16	2,122	0.01	3.99	3.4
X0032-S18_X0032-S17	8	125	0.0955	X0032-S18	X0032-S17	694.85	682.92	16	1,680	0.01	3.39	2.5
X0032-S20_X0032-S15	8	166	0.1365	X0032-S20	X0032-S15	708.87	686.18	36	2,009	0.02	4.93	8.1
X0032-S21_X0032-S20	8	290	0.1037	X0032-S21	X0032-S20	739.09	708.97	30	1,751	0.02	4.24	8.3
X0033-S01_ST778-S02	8	374	0.0465	X0033-S01	ST778-S02	360.63	343.25	200	1,172	0.17	5.58	12.0
X0033-S02_X0033-S14	8	201	0.0465	X0033-S02	X0033-S14	374.95	365.58	187	1,173	0.16	5.48	2.4
X0033-S03_X0033-S02	8	180	0.0499	X0033-S03	CP21	391.85	382.87	168	1,215	0.14	*1.07*	6.2
X0033-S04_X0033-S03	8	165	0.0496	X0033-S04	X0033-S03	400.16	391.95	153	1,211	0.13	5.29	6.9
X0033-S05_X0033-S04	8	165	0.0999	X0033-S05	X0033-S04	416.75	400.26	141	1,719	0.08	6.62	5.2
X0033-S07_73061-14	8	190	0.0515	X0033-S07	73061-14	335.94	326.17	258	1,234	0.21	6.22	7.3
X0033-S08_ST778-S03	8	103	0.0055	X0033-S08	ST778-S03	338.61	338.05	33	402	0.08	*1.38*	6.3
X0033-S09_X0033-S08	8	244	0.0067	X0033-S09	X0033-S08	340.34	338.71	19	444	0.04	*1.40*	2.0
X0033-S14_X0033-S01	8	126	0.0378	X0033-S14	X0033-S01	365.48	360.73	191	1,057	0.18	5.12	6.8
X0034-S01_52702	8	82	0.0156	X0034-S01	52702	107.17	105.89	48	679	0.07	*0.31*	7.7
X0034-S02_X0034-S01	8	297	0.0882	X0034-S02	X0034-S01	133.45	107.27	48	1,615	0.03	4.60	10.3
X0034-S03_X0034-S02	8	250	0.0103	X0034-S03	X0034-S02	136.13	133.55	46	552	0.08	2.13	12.7
X0034-S04_X0034-S03	8	239	0.0098	X0034-S04	X0034-S03	138.58	136.23	39	539	0.07	*1.99*	13.6
X0034-S05_X0034-S04	8	194	0.0099	X0034-S05	X0034-S04	140.60	138.68	30	542	0.05	*1.84*	14.3
X0034-S06_X0034-S05	8	91	0.0839	X0034-S06	X0034-S05	148.31	140.70	18	1,575	0.01	3.34	6.6
X0034-S07_X0034-S06	8	170	0.0354	X0034-S07	X0034-S06	154.43	148.41	15	1,023	0.01	2.35	8.1

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Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
X0034-S08_X0034-S07	8	206	0.0072	X0034-S08	X0034-S07	156.01	154.53	11	461	0.02	*1.24*	11.4
X0034-S13_54502	8	119	0.0044	X0034-S13	54502	148.35	147.82	235	362	0.65	2.46	16.3
X0034-S20_X0034-S21	12	228	0.0378	X0034-S20	X0034-S21	147.01	138.41	850	3,117	0.27	7.51	9.1
X0034-S21_X0034-S22	12	402	0.0715	X0034-S21	X0034-S22	138.31	109.56	880	4,286	0.21	9.54	7.0
X0034-S22_42803	12	60	0.1340	X0034-S22	42803	109.46	101.36	1,021	5,869	0.17	3.48	9.9
X0035-S10_X0035-S12	8	206	0.0138	X0035-S10	X0035-S12	449.41	446.57	100	638	0.16	2.96	6.9
X0035-S11_X0035-S10	8	162	0.0120	X0035-S11	X0035-S10	451.46	449.51	85	596	0.14	2.69	17.8
X0035-S12_X0035-S13	8	161	0.0083	X0035-S12	X0035-S13	446.47	445.13	104	496	0.21	2.51	6.0
X0035-S13_X0035-S14	8	149	0.0625	X0035-S13	X0035-S14	445.03	435.70	106	1,360	0.08	5.16	6.8
X0035-S14_83224-45	8	130	0.0558	X0035-S14	83224-45	435.60	428.33	108	1,284	0.08	4.98	7.2
X0036-S01_83201-58	8	43	0.0071	X0036-S01	83201-58	194.07	193.77	14	457	0.03	*1.31*	10.9
X0036-S02_X0036-S01	8	175	0.0044	X0036-S02	X0036-S01	194.93	194.17	12	359	0.03	*1.07*	10.0
X0036-S03_X0036-S02	8	185	0.0053	X0036-S03	X0036-S02	196.01	195.03	7	396	0.02	*0.94*	5.6
X0039-S01_X0031-S03	8	208	0.0040	X0039-S01	X0031-S03	669.32	668.49	68	344	0.20	*1.71*	8.4
X0039-S02_X0039-S01	8	92	0.1174	X0039-S02	X0039-S01	680.26	669.42	67	1,863	0.04	5.17	6.0
X0039-S03_X0039-S02	8	141	0.0051	X0039-S03	X0039-S02	681.08	680.36	61	389	0.16	*1.81*	5.3
X0039-S04_X0039-S03	8	33	0.0132	X0039-S04	X0039-S03	681.62	681.18	15	626	0.02	*1.66*	9.8
X0040-S01_73084-16	8	297	0.0874	X0040-S01	73084-16	548.97	523.01	18	1,608	0.01	3.42	4.2
X0040-S02_X0040-S01	8	120	0.1244	X0040-S02	X0040-S01	563.98	549.07	17	1,918	0.01	3.76	7.2
X0040-S04_X0040-S02	8	162	0.0994	X0040-S04	X0040-S02	580.17	564.08	16	1,715	0.01	3.43	7.1
X0040-S05_X0040-S04	8	205	0.1462	X0040-S05	X0040-S04	610.31	580.27	15	2,079	0.01	3.88	6.1
X0040-S06_X0040-S05	8	275	0.1184	X0040-S06	X0040-S05	642.99	610.41	14	1,871	0.01	3.49	7.2
X0040-S07_X0040-S06	8	230	0.1110	X0040-S07	X0040-S06	668.64	643.09	11	1,812	0.01	3.23	3.5
X0040-S08_X0040-S07	8	95	0.0910	X0040-S08	X0040-S07	677.37	668.74	10	1,640	0.01	2.87	6.7
X0040-S09_X0040-S08	8	101	0.0991	X0040-S09	X0040-S08	687.51	677.47	9	1,712	0.01	2.86	9.3
X0042-S01_MEADOWBROO	8	167	0.0227	X0042-S01	ADOWBROOKC	130.38	126.60	134	819	0.16	3.84	14.4
X0042-S02_X0042-S01	8	95	0.0041	X0042-S02	X0042-S01	130.87	130.48	129	348	0.37	2.05	11.0
X0042-S05_X0042-S02	8	287	0.0046	X0042-S05	X0042-S02	132.28	130.97	121	367	0.33	2.09	8.7
X0042-S07_X0042-S05	8	222	0.0044	X0042-S07	X0042-S05	133.36	132.38	111	361	0.31	2.03	9.6
X0042-S09_X0042-S07	8	264	0.0116	X0042-S09	X0042-S07	136.52	133.46	104	585	0.18	2.81	5.7
X0042-S10_X0042-S09	8	77	0.0638	X0042-S10	X0042-S09	141.52	136.62	100	1,373	0.07	5.10	4.8
X0042-S11_X0042-S10	8	183	0.0444	X0042-S11	X0042-S10	149.73	141.62	96	1,145	0.08	4.44	5.8
X0042-S12_X0042-S11	8	123	0.0226	X0042-S12	X0042-S11	152.61	149.83	63	817	0.08	3.08	6.2
X0042-S16_X0042-S12	8	246	0.0041	X0042-S16	X0042-S12	153.72	152.71	60	348	0.17	*1.66*	10.4
X0045-S01_X0032-S18	8	141	0.0287	X0045-S01	X0032-S18	699.00	694.95	16	922	0.02	2.23	5.4
X0045-S08_X0045-S01	8	24	0.0962	X0045-S08	X0045-S01	701.41	699.10	8	1,687	0.00	2.77	6.7
X0046-S01_X0032-S21	8	126	0.1559	X0046-S01	X0032-S21	758.84	739.13	8	2,147	0.00	3.19	4.3
X0047-S01_82112-08	8	29	0.0122	X0047-S01	82112-08	170.66	170.31	1,058	600	1.76	6.75	7.1
X0047-S02_X0047-S01	8	25	0.0474	X0047-S02	X0047-S01	171.95	170.76	1,058	1,184	0.89	6.75	0.0
X0047-S03_X0047-S02	8	368	0.0231	X0047-S03	X0047-S02	180.55	172.05	1,058	826	1.28	6.75	0.0
X0047-S04_X0047-S03	8	272	0.0107	X0047-S04	X0047-S03	183.57	180.65	1,055	564	1.87	6.74	6.7

Bold cells = pipe at capacity / manholes surcharged within 2' of rim.
If a mh is surcharged and the pipe is not at capacity, this is a result of the model recognizing a downstream problem.
Italic = Velocity < 2 fps

Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
X0047-S05_X0047-S04	8	100	0.0106	X0047-S05	X0047-S04	184.73	183.67	1,054	559	1.89	6.72	2.1
X0049-S01_U0052-S13	12	121	0.0049	X0049-S01	U0052-S13	341.98	341.39	97	1,121	0.09	*1.95*	28.2
X0049-S02_X0049-S01	8	288	0.0032	X0049-S02	X0049-S01	343.00	342.08	89	308	0.29	*1.70*	19.4
X0049-S03_X0049-S02	8	76	0.0046	X0049-S03	X0049-S02	343.45	343.10	84	369	0.23	*1.91*	14.6
X0049-S04_X0049-S03	8	166	0.0413	X0049-S04	X0049-S03	350.40	343.55	80	1,105	0.07	4.10	7.0
X0049-S05_X0049-S04	8	110	0.0498	X0049-S05	X0049-S04	356.00	350.50	74	1,214	0.06	4.28	3.9
X0053-S01_X0033-S09	8	134	0.0225	X0053-S01	X0033-S09	343.45	340.44	19	816	0.02	2.15	5.6
X0053-S02_X0053-S01	8	90	0.0458	X0053-S02	X0053-S01	347.68	343.55	19	1,164	0.02	2.75	12.1
X0054-S01_SD415-S02	8	122	0.0757	X0054-S01	SD415-S02	423.42	414.16	11	1,497	0.01	2.78	4.5
X0054-S02_X0054-S01	8	292	0.0787	X0054-S02	X0054-S01	446.55	423.52	8	1,526	0.01	2.55	5.3
X0054-S03_X0054-S02	8	251	0.0315	X0054-S03	X0054-S02	454.55	446.65	1	964	0.00	*0.80*	7.0
X0056-S01_X0056-S12	8	49	0.0077	X0056-S01	X0056-S12	142.60	142.22	36	478	0.08	*1.80*	8.3
X0056-S02_X0056-S01	8	82	0.0251	X0056-S02	X0056-S01	144.77	142.70	35	862	0.04	2.68	7.6
X0056-S03_X0056-S02	8	149	0.0439	X0056-S03	X0056-S02	151.41	144.87	31	1,139	0.03	3.15	8.9
X0056-S04_X0056-S03	8	380	0.0043	X0056-S04	X0056-S03	153.14	151.51	24	356	0.07	*1.29*	7.6
X0056-S12_S0147-S03	8	131	0.0624	X0056-S12	S0147-S03	142.12	133.96	38	1,358	0.03	3.80	7.8
X0057-S08_7606	8	113	0.0040	X0057-S08	7606	136.47	136.02	28	342	0.08	*0.18*	7.0
X0060-S02_X0067-S06	8	284	0.0152	X0060-S02	X0067-S06	234.31	230.00	129	670	0.19	3.30	13.3
X0060-S03_X0060-S02	8	200	0.0213	X0060-S03	X0060-S02	238.67	234.41	77	794	0.10	3.21	11.8
X0061-S03_X0061-S04	8	149	0.0365	X0061-S03	X0061-S04	504.90	499.45	14	1,038	0.01	2.35	7.5
X0061-S04_X0061-S05	8	50	0.0219	X0061-S04	X0061-S05	499.35	498.25	18	805	0.02	2.12	7.6
X0061-S05_X0061-S06	8	245	0.0547	X0061-S05	X0061-S06	498.15	484.75	28	1,272	0.02	3.29	5.7
X0061-S06_X0061-S12	8	191	0.1277	X0061-S06	X0061-S12	484.65	460.30	38	1,943	0.02	4.88	4.8
X0061-S12_U0077-S09	8	121	0.0050	X0061-S12	U0077-S09	460.20	459.60	50	383	0.13	*1.69*	3.2
X0063-S14_X0063-S15	8	143	0.0031	X0063-S14	X0063-S15	230.38	229.93	25	305	0.08	*1.18*	9.5
X0063-S15_X0063-S16	8	172	0.0045	X0063-S15	X0063-S16	229.83	229.06	30	364	0.08	*1.41*	10.0
X0063-S16_X0063-S17	8	154	0.0053	X0063-S16	X0063-S17	228.96	228.15	42	396	0.11	*1.64*	10.9
X0063-S17_X0063-S18	8	154	0.0047	X0063-S17	X0063-S18	228.05	227.32	45	374	0.12	*1.61*	11.8
X0063-S18_X0063-S19	8	126	0.0061	X0063-S18	X0063-S19	227.22	226.45	47	425	0.11	*1.78*	9.8
X0063-S19_S0115-S07	8	231	0.0086	X0063-S19	S0115-S07	226.35	224.36	69	505	0.14	2.26	7.6
X0063-S20_W0088-S08	12	179	0.0533	X0063-S20	W0088-S08	233.61	224.07	16	3,700	0.00	2.60	10.0
X0066-S03_X0066-S04	8	41	0.0087	X0066-S03	X0066-S04	167.79	167.43	434	507	0.86	3.25	9.1
X0066-S04_U0078-S07	8	64	0.0045	X0066-S04	U0078-S07	167.33	167.05	442	364	1.21	2.82	10.9
X0067-S06_X0067-S07	8	383	0.0045	X0067-S06	X0067-S07	228.99	227.25	129	366	0.35	2.13	16.2
X0067-S07_X0067-S16	8	46	0.3093	X0067-S07	X0067-S16	227.15	212.84	181	3,024	0.06	10.60	10.2
X0067-S08_X0067-S09	8	170	0.0464	X0067-S08	X0067-S09	151.08	143.20	261	1,171	0.22	6.01	10.0
X0067-S09_X0067-S10	8	150	0.0351	X0067-S09	X0067-S10	143.10	137.85	261	1,019	0.26	5.37	7.3
X0067-S10_X0067-S11	8	365	0.0104	X0067-S10	X0067-S11	137.75	133.97	261	553	0.47	3.31	4.4
X0067-S11_X0067-S12	8	361	0.0041	X0067-S11	X0067-S12	133.87	132.39	261	348	0.75	2.44	6.7
X0067-S12_X0067-S13	8	107	0.0041	X0067-S12	X0067-S13	132.29	131.85	261	349	0.75	2.44	7.3
X0067-S13_X0067-S14	8	467	0.0041	X0067-S13	X0067-S14	131.75	129.85	262	347	0.75	2.42	7.8

Bold cells = pipe at capacity / manholes surcharged within 2' of rim.
If a mh is surcharged and the pipe is not at capacity, this is a result of the model recognizing a downstream problem.
Italic = Velocity < 2 fps

Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
X0067-S14_X0067-S15	8	68	0.0029	X0067-S14	X0067-S15	129.75	129.55	262	295	0.89	2.02	12.0
X0067-S15_83164-05	8	47	0.0040	X0067-S15	83164-05	129.45	129.26	262	344	0.76	*1.93*	15.9
X0067-S16_X0067-S08	8	141	0.4353	X0067-S16	X0067-S08	212.74	151.18	181	3,588	0.05	11.11	5.7
X0068-S02_19806	8	205	0.0288	X0068-S02	19806	405.04	399.15	47	923	0.05	3.09	6.9
X0069-S01_X0069-S15	8	188	0.0357	X0069-S01	X0069-S15	166.11	159.40	90	1,027	0.09	3.83	12.1
X0069-S02_X0069-S01	8	311	0.0079	X0069-S02	X0069-S01	168.66	166.21	90	482	0.19	2.35	13.6
X0069-S03_X0069-S02	8	405	0.0073	X0069-S03	X0069-S02	171.13	168.17	31	465	0.07	*0.20*	7.7
X0069-S11_X0069-S02	8	224	0.0021	X0069-S11	X0069-S02	169.22	168.76	54	248	0.22	*1.27*	10.1
X0069-S15_82134-24	8	63	0.0089	X0069-S15	82134-24	159.30	158.74	104	513	0.20	*0.90*	12.7
X0070-S01_BRITTONLOO	8	212	0.0252	X0070-S01	BRITTONLOOPLS	282.95	277.60	48	863	0.06	2.93	12.3
X0070-S02_X0070-S15	8	204	0.0049	X0070-S02	X0070-S15	284.65	283.65	48	380	0.13	*1.66*	12.8
X0070-S03_X0070-S02	8	150	0.0077	X0070-S03	X0070-S02	285.90	284.75	48	476	0.10	*1.94*	19.9
X0070-S06_X0070-S03	8	92	0.1064	X0070-S06	X0070-S03	295.80	286.00	17	1,774	0.01	3.57	16.7
X0070-S09_X0070-S06	8	224	0.0465	X0070-S09	X0070-S06	306.29	295.90	13	1,172	0.01	2.48	11.8
X0070-S10_X0070-S09	8	168	0.0555	X0070-S10	X0070-S09	315.73	306.39	7	1,281	0.01	2.17	14.5
X0070-S15_X0070-S01	8	196	0.0025	X0070-S15	X0070-S01	283.55	283.05	48	275	0.17	*1.32*	12.7
X0072-S01_32201	8	60	0.0328	X0072-S01	32201	105.55	103.60	40	984	0.04	3.08	15.4
X0072-S02_X0072-S01	8	218	0.0053	X0072-S02	X0072-S01	106.80	105.65	0	395	0.00	0.00	5.4
X0072-S03_X0072-S02	8	220	0.0047	X0072-S03	X0072-S02	107.94	106.90	0	374	0.00	0.00	16.6
X0072-S04_X0072-S03	8	102	0.0058	X0072-S04	X0072-S03	108.63	108.04	0	414	0.00	0.00	4.0
X0072-S05_X0072-S04	8	122	0.0022	X0072-S05	X0072-S04	109.00	108.73	0	255	0.00	0.00	6.0
X0072-S06_X0072-S05	8	103	0.0331	X0072-S06	X0072-S05	112.51	109.10	-	990	0.00	0.00	2.9
X0074-S05_83162-06	8	48	0.2125	X0074-S05	83162-06	345.25	335.13	170	2,507	0.07	9.12	10.6
X0074-S06_X0074-S05	8	31	0.1029	X0074-S06	X0074-S05	348.50	345.35	170	1,744	0.10	7.06	14.8
X0074-S07_X0074-S06	8	32	0.3888	X0074-S07	X0074-S06	360.90	348.60	170	3,391	0.05	11.28	10.1
X0077-S01_X0077-S02	8	50	0.0869	X0077-S01	X0077-S02	607.92	603.56	5	1,603	0.00	2.31	4.4
X0077-S02_X0077-S03	8	93	0.0737	X0077-S02	X0077-S03	603.46	596.60	5	1,476	0.00	2.18	3.2
X0077-S03_X0077-S04	8	122	0.0125	X0077-S03	X0077-S04	596.50	594.98	5	608	0.01	*1.18*	4.8
X0077-S04_X0077-S05	8	200	0.0311	X0077-S04	X0077-S05	594.88	588.67	5	958	0.01	*1.62*	8.1
X0077-S05_X0077-S10	8	179	0.1198	X0077-S05	X0077-S10	588.57	567.10	12	1,883	0.01	3.34	5.1
X0077-S07_X0077-S08	8	143	0.0412	X0077-S07	X0077-S08	583.00	577.10	7	1,104	0.01	2.00	28.7
X0077-S08_X0077-S09	8	298	0.0064	X0077-S08	X0077-S09	577.00	575.10	7	434	0.02	*1.04*	14.9
X0077-S09_X0077-S10	8	218	0.0362	X0077-S09	X0077-S10	575.00	567.10	23	1,035	0.02	2.71	6.5
X0077-S10_X0077-S11	8	347	0.0040	X0077-S10	X0077-S11	567.00	565.63	42	342	0.12	*1.48*	6.6
X0077-S11_X0077-S12	8	90	0.0355	X0077-S11	X0077-S12	565.53	562.35	120	1,025	0.12	4.38	14.6
X0077-S12_73053-07	8	133	0.0751	X0077-S12	73053-07	562.25	552.28	123	1,490	0.08	5.75	8.2
X0077-S13_X0077-S11	8	190	0.1192	X0077-S13	X0077-S11	588.27	565.63	69	1,877	0.04	5.69	9.8
X0077-S14_X0077-S13	8	158	0.1012	X0077-S14	X0077-S13	604.36	588.37	69	1,730	0.04	5.38	7.5
X0077-S15_X0077-S14	8	57	0.0631	X0077-S15	X0077-S14	608.08	604.46	46	1,366	0.03	4.04	8.8
X0078-S09_83162-28	8	195	0.0937	X0078-S09	83162-28	326.47	308.25	180	1,664	0.11	6.94	5.8
X0079-S01_SD413-S01	8	251	0.0072	X0079-S01	SD413-S01	349.00	347.19	1	462	0.00	*0.57*	12.8

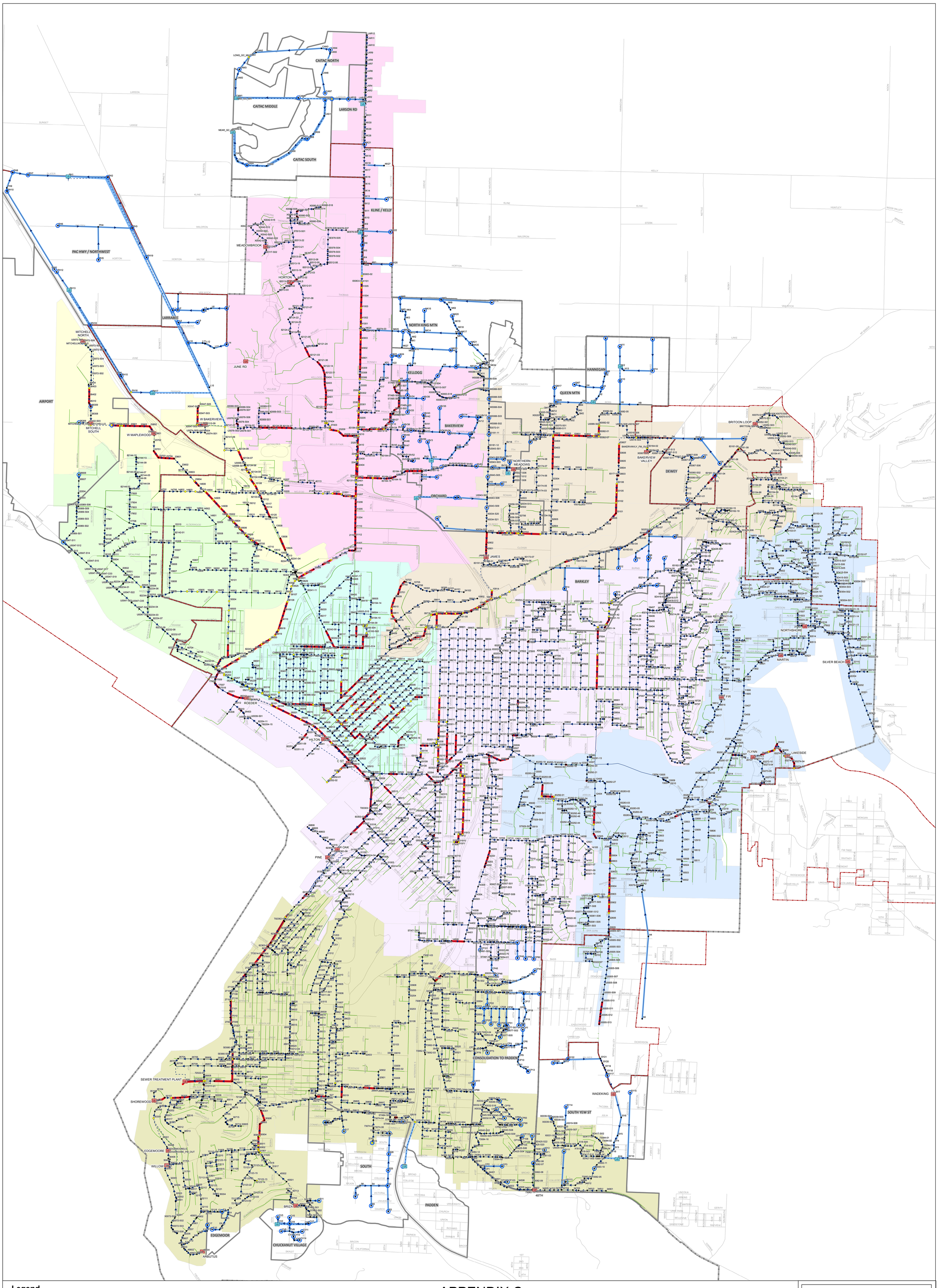
Bold cells = pipe at capacity / manholes surcharged within 2' of rim.
If a mh is surcharged and the pipe is not at capacity, this is a result of the model recognizing a downstream problem.
Italic = Velocity < 2 fps

Pipe ID	Diameter (in)	Length (ft)	Slope	Upstream Mh	Downstream MH	Upstream Invert (ft)	Downstream Invert (ft)	Maximum Flow (gpm)	Design Capacity (gpm)	Modeled Flow to Design Flow Ratio	Maximum Velocity (ft/s)	Depth from Max Surcharge Level to Rim of Upstream MH (ft)
X0079-S02_X0079-S01	8	188	0.0048	X0079-S02	X0079-S01	350.00	349.10	0	376	0.00	*0.38*	16.4
X0080-S01_STB15-S02	12	135	0.0057	X0080-S01	STB15-S02	156.50	155.73	398	1,210	0.33	3.07	5.6
X0080-S02_X0080-S01	12	154	0.0068	X0080-S02	X0080-S01	157.65	156.60	68	1,326	0.05	*1.27*	7.7
X0080-S03_X0080-S02	12	272	0.0025	X0080-S03	X0080-S02	158.42	157.75	-	795	0.00	0.00	6.6
X0080-S04_X0080-S01	8	289	0.0138	X0080-S04	X0080-S01	160.61	156.60	316	640	0.49	4.07	10.4
X0080-S05_X0080-S04	8	105	0.0054	X0080-S05	X0080-S04	161.27	160.71	316	400	0.79	2.83	7.4
X0080-S06_X0080-S05	8	48	0.0010	X0080-S06	X0080-S05	161.42	161.37	316	175	1.80	2.01	6.3
X0080-S07_X0080-S06	8	194	0.0040	X0080-S07	X0080-S06	162.30	161.52	316	345	0.92	2.01	5.6
X0080-S08_X0080-S07	8	52	0.0025	X0080-S08	X0080-S07	162.53	162.40	316	271	1.17	2.01	5.7
X0080-S09_X0080-S08	8	170	0.0135	X0080-S09	X0080-S08	164.92	162.63	316	631	0.50	2.90	7.9
X0080-S10_X0080-S09	8	273	0.0070	X0080-S10	X0080-S09	166.93	165.02	316	455	0.69	3.13	5.3
X0080-S14_X0080-S10	8	184	0.0161	X0080-S14	X0080-S10	170.00	167.03	316	691	0.46	4.23	2.6
X0080-S17_X0080-S14	8	148	0.0045	X0080-S17	X0080-S14	170.76	170.10	316	363	0.87	2.61	6.0
X0080-S18_X0080-S17	8	168	0.0079	X0080-S18	X0080-S17	172.19	170.86	315	485	0.65	3.25	5.8
X0080-S25_WA539-S01	8	95	0.0281	X0080-S25	WA539-S01	164.56	161.88	37	912	0.04	2.86	8.6
X0080-S26_X0080-S25	8	348	0.0149	X0080-S26	X0080-S25	169.86	164.66	1	665	0.00	*0.64*	8.1
X0089-S10_X0089-S11	8	136	0.0103	X0089-S10	X0089-S11	172.00	170.60	0	550	0.00	*0.32*	11.8
X0089-S11_53902	8	254	0.0022	X0089-S11	53902	170.50	169.93	83	257	0.32	*1.46*	13.4
X18-S01_SD427-S02	8	171	0.0304	X18-S01	SD427-S02	576.68	571.47	125	948	0.13	4.19	3.2
X18-S02_X18-S01	8	79	0.0265	X18-S02	X18-S01	578.86	576.78	125	885	0.14	3.98	3.5
X18-S03_X18-S02	8	125	0.0529	X18-S03	X18-S02	585.60	578.96	125	1,251	0.10	5.09	6.5
X18-S05_X18-S03	8	251	0.1066	X18-S05	X18-S03	612.48	585.70	124	1,775	0.07	6.50	2.6

Bold cells = pipe at capacity / manholes surcharged within 2' of rim.
If a mh is surcharged and the pipe is not at capacity, this is a result of the model recognizing a downstream problem.
Italic = Velocity < 2 fps

APPENDIX C

MODEL RESULTS (MAP)



Legend

- Proposed Lift Station
- Existing Lift Station
- Sewer MH (Surcharged w/in 2' of Rim)
- Sewer MH (Modeled)
- UGA Flow Input MH
- Sewer Pipe (Modeled)
- Sewer Pipe (Surcharged)
- Force Main (Modeled)
- Proposed Infrastructure
- Sewer Pipe (Existing)
- UGA Boundary
- City Limits
- UGA Area

Sewer Basins

- Birchwood
- Broadway
- Central
- Cordata/Meridian
- Lake Whatcom
- Northwest
- Southside
- Sunset/MT.Baker

APPENDIX C

N

0 550 1,100 2,200 3,300 4,400 Feet

CITY OF BELLINGHAM

WASTEWATER CONVEYANCE PLAN
MODEL RESULTS

Gray & Osborne, Inc.

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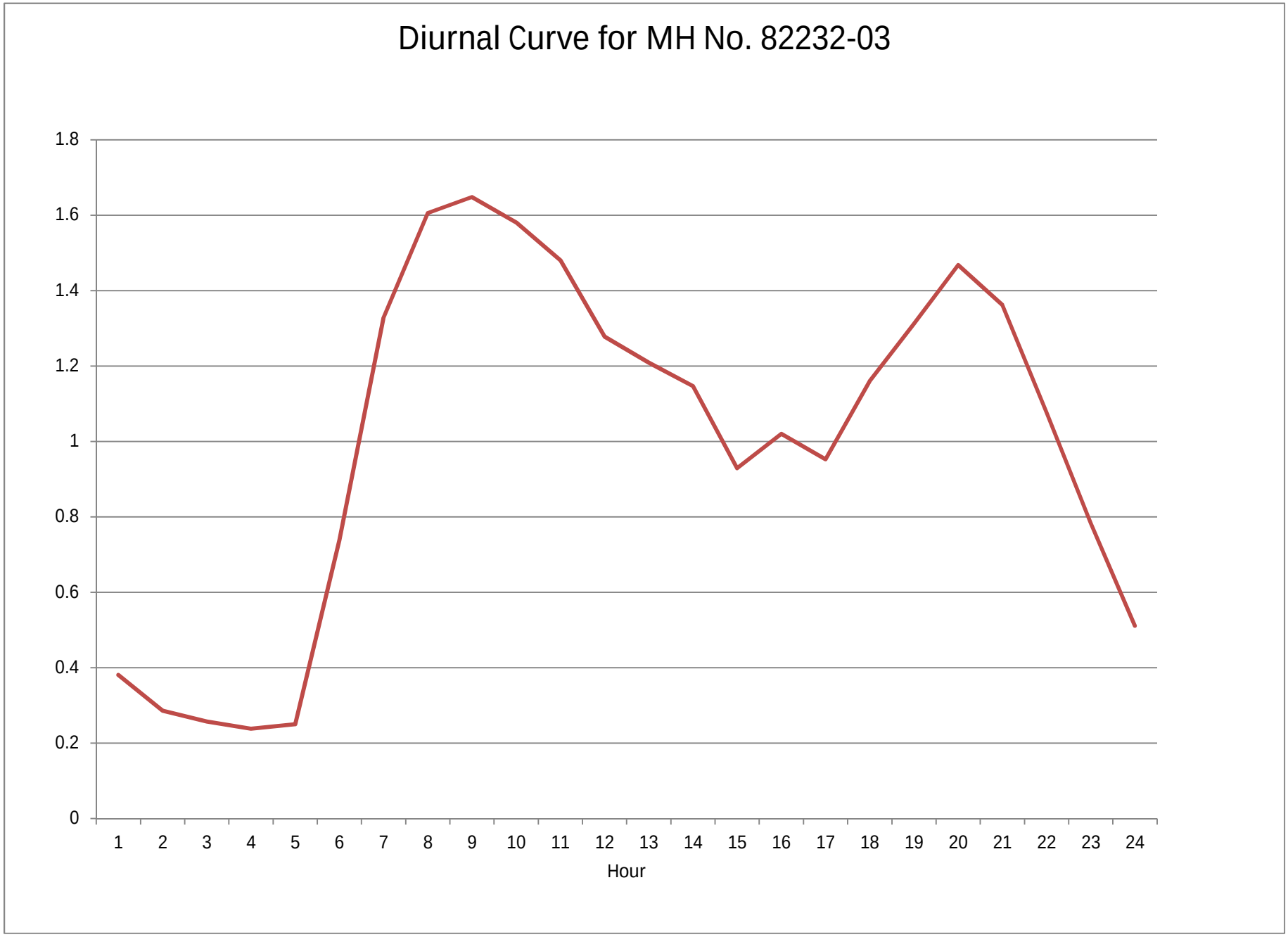
APPENDIX D

DIURNAL CURVES


Diurnal Curve for MH No. 82232-03
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
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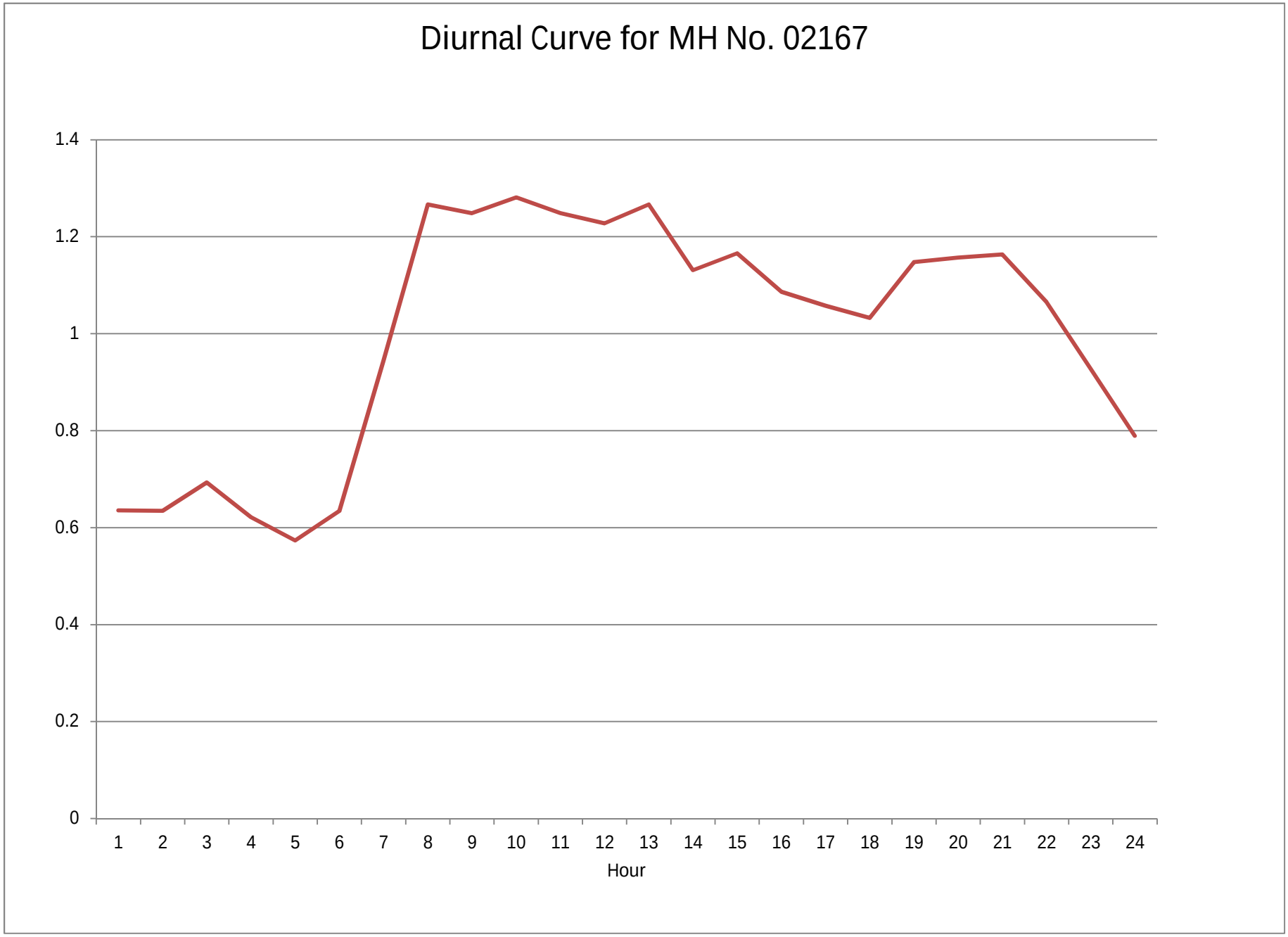
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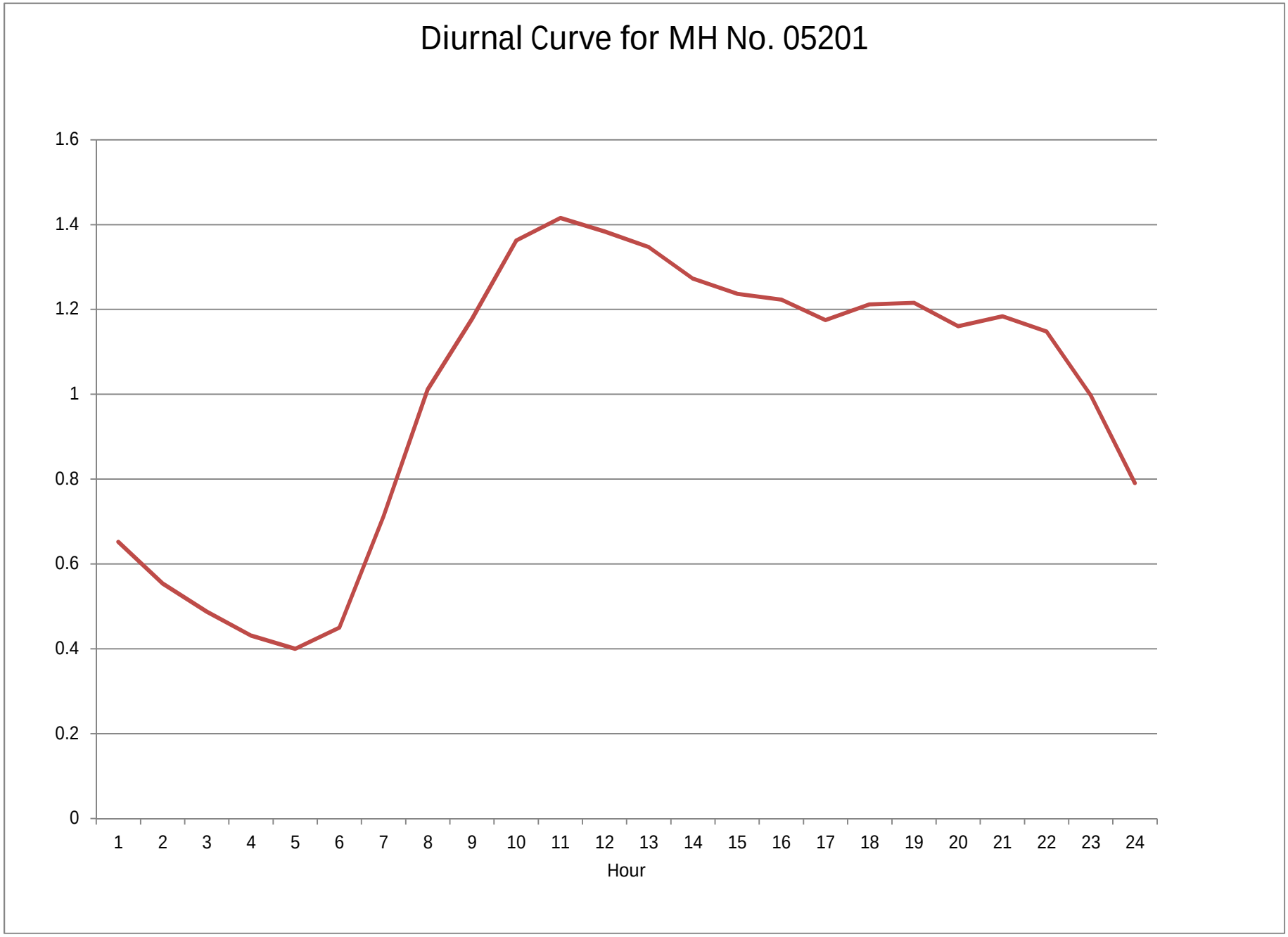
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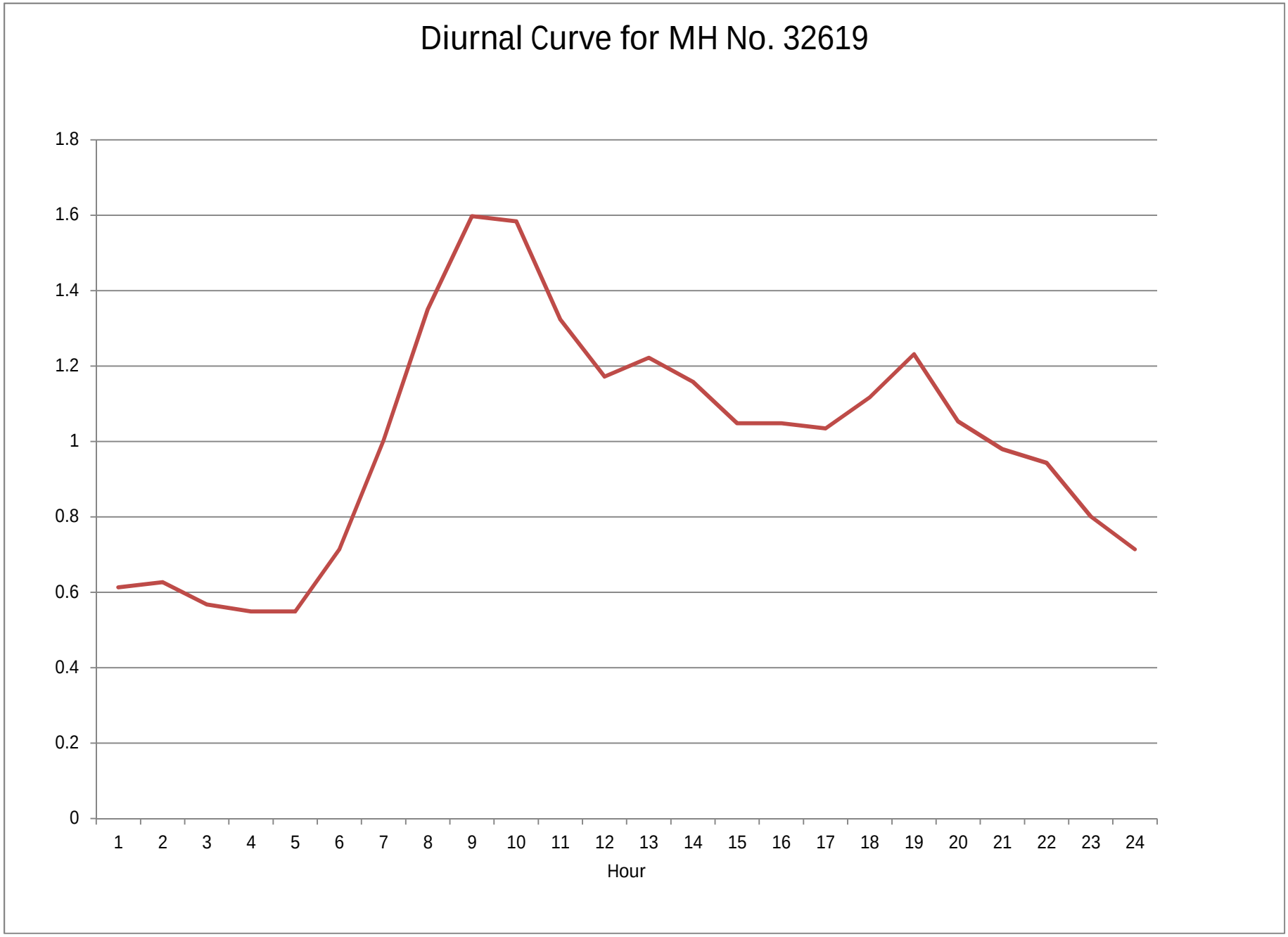
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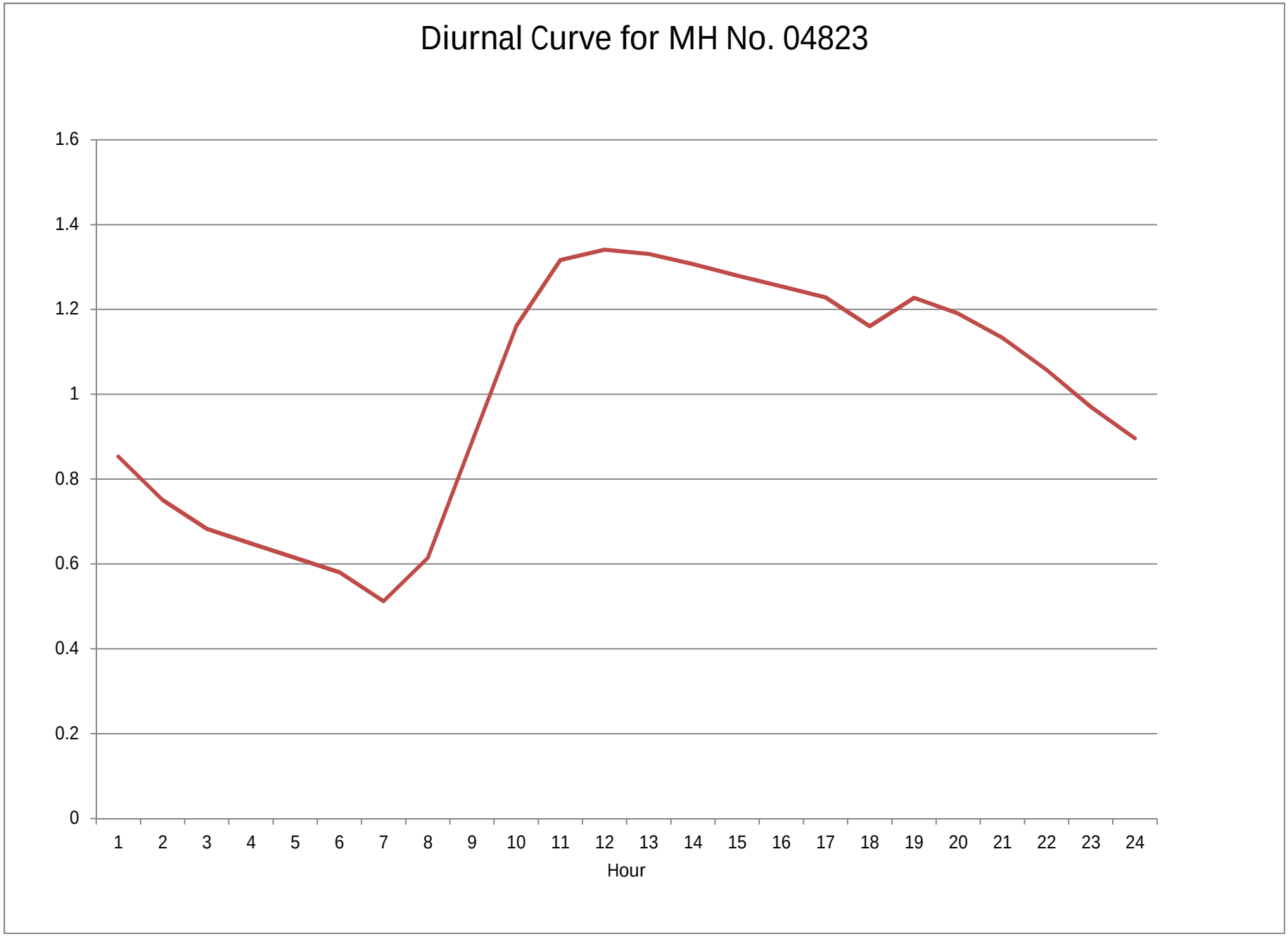
Hour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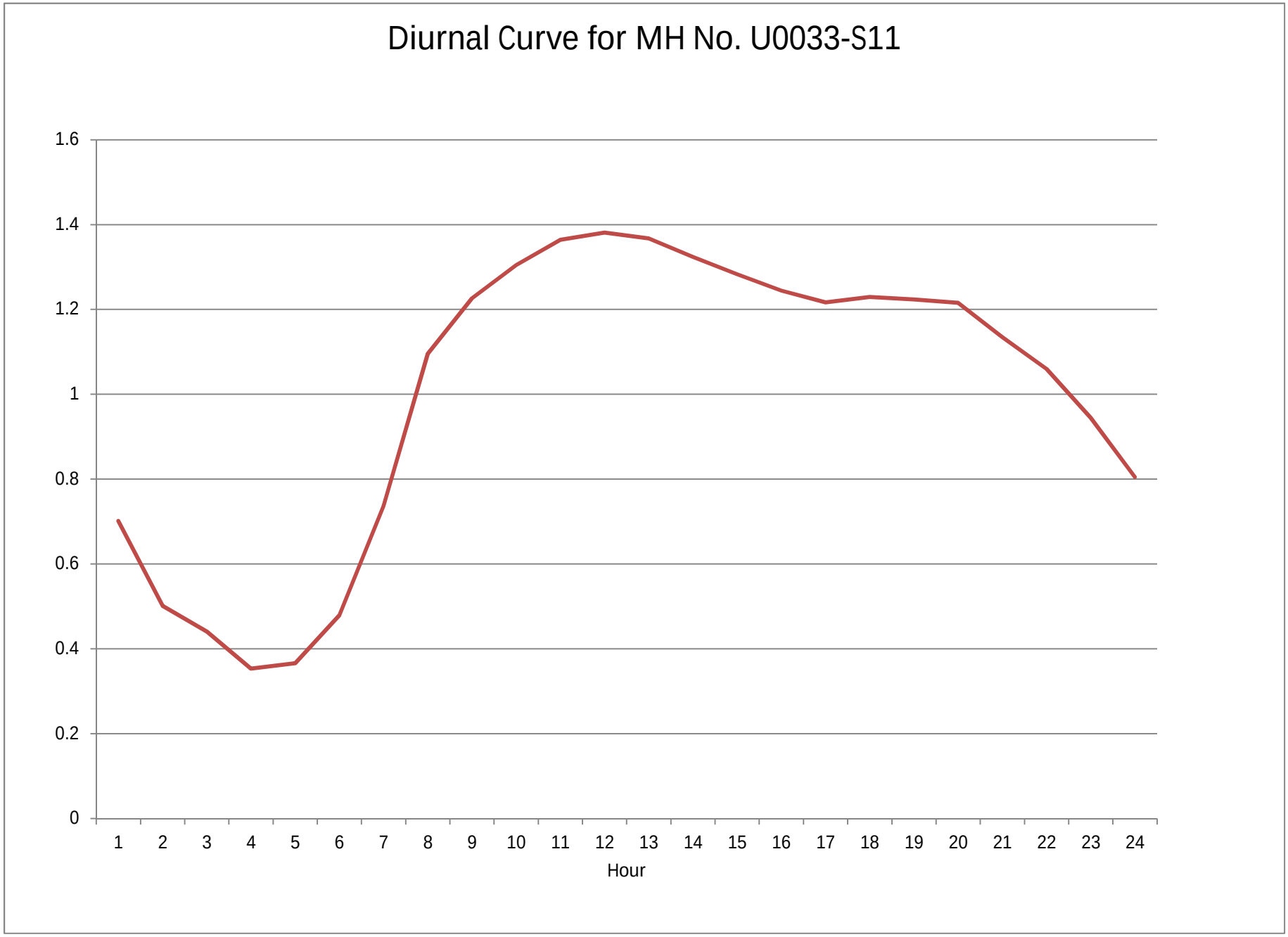
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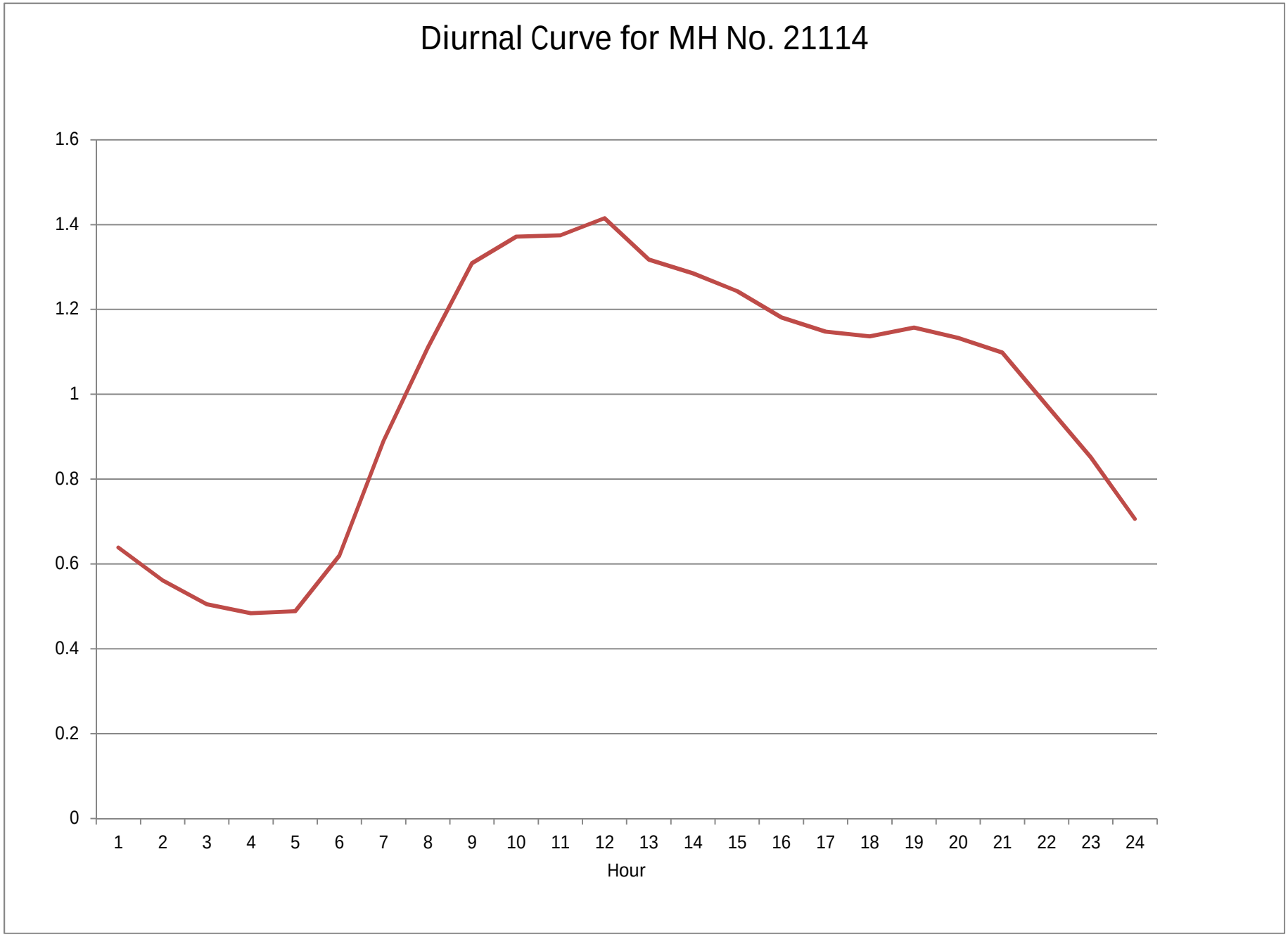
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Hour

APPENDIX E

2013 PARAMETRIX LIFT STATION EVALUATION

Parametrix ENGINEERING . PLANNING . ENVIRONMENTAL SCIENCES

1019 39TH AVE SE, SUITE 100
PUYALLUP, WA 98374
T. 253.604.6600 F. 253.604.6799
www.parametrix.com

TECHNICAL MEMORANDUM

JOEL STEPHEN LINKE
STATE OF WASHINGTON
48954
REGISTERED
PROFESSIONAL ENGINEER
12-12-2013

Date:	December 12, 2013
To:	Rob Johnson and Randy Bolgen; City of Bellingham
From:	Joel Linke, P.E.; and Ray Nickel, P.E.; Parametrix
Subject:	Bellingham Sewage Pump Station Evaluation
Project Number:	216-2480-012 (Phase 05)
Project Name:	Bellingham On-call Services – Pump Station Evaluation

PURPOSE OF WORK

The City of Bellingham (City) operates and maintains many sewage pump stations around the City (See Figure 5.2 in Appendix A). Each station has unique operating characteristics that the City would like reviewed, to possibly increase the capacity if needed in the future and to increase the reliability of the station.

This technical memorandum reviews each pump station for its characteristics and specific capacity or reliability issues and provides a recommendation related to each issue identified. The "Summary of Findings" section reviews each station and its issues and recommendations individually. Many of the stations share the same issues. The list of issues reviewed at each station that were common to more than one station included the following:

- Stations at or nearing capacity
- Stations at or nearing design life
- Cycling volume in wet well
- Dry well floor rust
- Long residence time of sewage in force main
- Low force main velocity
- High force main velocity
- High pump run times
- Ragging of pumps or wet well
- Other issues

A single-page summary table at the end of the memorandum provides a list of each pump station reviewed and which issues apply to each station from the list above. The issues are not listed in order of importance or being critical in nature. However, from the information provided, the most critical issue found during this evaluation was stations that were at or near pumping capacities. The pumping capacities at these stations should be verified with the procedure in Appendix B and compared to the station capacity (inflow) established in this technical memorandum. The pump stations at or near pumping capacities are:

- Bakerview Valley
- Fir Street
- Horton
- James
- Meadowbrook
- Mitchell Way
- Northshore
- Roeder Avenue
- Shorewood
- Willow

APPROACH

Source of Data

Twenty-six pump stations were evaluated based on the information provided by the City in the Comprehensive Sewer Plan dated June 2009 and the spreadsheets titled "Waste Water Pumping Station Evaluation 03 Nov 09 RWJ.xlsx," "Pump Run Hours Data 2009.xlsx," "Pump Run Hours Data 2010.xlsx," "Pump Run Hours Data 2011.xlsx," "Pump Run Hours Data 2012.xlsx" and "Generator Deployment 10 Dec 10 RWJ.xlsx."

Some of the recommendations in the findings below are based on notes provided in one of the spreadsheets listed above. If available, each note referenced below includes the year it was added into the spreadsheet by the City.

The data for each station was found in either the spreadsheets listed above or it was calculated from the data provided. The steps for the data that was calculated are explained below.

Definitions and Use of Terms

Response Time: The Response Time for each station was calculated from the number of minutes in a day divided by average starts per day at the station. The average starts per day were only taken from the 2010 and 2011 Pump Run Hours spreadsheets, because 2009 and 2012 did not have data for the entire year. The Response Time is the average time between Lead Pump starts. It is not the time to overflow. This time will vary based on time of day and amount of recent precipitation.

Firm Capacity: The firm capacity is the station's capacity with its largest pump off-line.

Peak Hourly Inflow Range: The peak hourly inflow range was calculated from the original design capacity and the average field tested capacity multiplied by the pump run hours. A peaking factor of 4 was used for stations in separated sewer areas, and a peaking factor of 6 was used for stations inside the combined sewer area which is shown in Figure 6.9 of the June 2009 *Comprehensive Sewer Plan* (Appendix A).

Station Capacity (flow): The station's original design capacity was subtracted from the peak hourly inflow range to determine the amount of inflow each station can still accommodate. Numbers provided in parentheses are negative numbers.

Station Capacity (residential capita): The June 2009 *Comprehensive Sewer Plan* estimated the residential per capita flow as 77 gallons per capita per day (gpcd) on page 4-6. The inflow still available at each station was divided by this value and the peaking factor to determine the approximate increase in capita each station can still accommodate. Numbers provided in parentheses are negative numbers.

Force Main Velocity: The force main velocity was calculated from either the original design capacity or field test capacities, whichever was the worst case. Each station that had a force main velocity less than 3 feet per second or greater than 8 feet per second was commented on and a recommendation was added. The 3-feet-per-second velocity is necessary for flushing solids with intermittent operation (2 feet per second is acceptable for continuous operation). The 8-feet-per-second velocity is Washington State Department of Ecology's (Ecology's) recommended maximum velocity for a sewage force main. This is primarily due to wear. Ecology states that facilities with velocities above 4 feet per second should be checked for water hammer.

Pump Run Times: The pump run times were calculated from the pump run hour spreadsheets. These hours were averaged to give an approximate station run time. Any station that ran less than 5 percent of the time was noted for checking the sewage residence time in the force main. A couple stations with pump run times between 5 and 8 percent of the time were also included if they also had force main velocities of less than 3 feet per second.

Pump Cycling: The available volume for pump cycling was calculated by multiplying the cross-sectional area of the wet well by the Lead Pump operating range and is converted from cubic feet to gallons. This value was compared to the volume needed to satisfy National Electrical Manufacturers Association (NEMA) motor standards for allowable starts per hour. The shortest time between starts (worst case scenario) occurs when inflow equals half of pump capacity. Thus the calculation for needed volume is the pump capacity multiplied by the maximum number of motor starts recommended in NEMA standards and divided by four for the worst-case scenario. The pump starts more than NEMA recommends if the needed volume is greater than the available volume. This tends to cause excessive heat in the motor windings and thereby shortens the life of the motor.

Station Age: Stations that are more than 20 years old and have not received an upgrade, excluding controls upgrades, were noted as nearing or at typical design life and should be more thoroughly evaluated.

SUMMARY OF FINDINGS

The “Summary of Findings” section reviews each station individually and provides issues and recommendations specific to each station.

STATION: 48TH STREET			
Location: Separated Sewer Area			
Standby Power: 75 kW generator		**Response Time**: 16 minutes	
Pumps:	**Number:** 2	**hp**: 15	**Installed**: 1973
Firm Capacity:	**Original Design**: 600 gallons per minute (gpm)		**Field Tested**: 606 gpm
Force Main Diameter: 8 inches		**Length**: 1,207 feet	

Issues and Recommendations

- **Drywell Floor Rust**
  - *Comments*: Notes from 1998 and 2010 state the drywell floor is rusting.
  - *Recommendation*: Remove rust and repaint drywell. Also check for airspace under drywell floor. Underside of floor could be filled with grout if the rust has caused structural issues with the floor. Consider adding a dehumidifier in the dry well to help prevent interior corrosion. For exterior corrosion, consider adding cathodic protection to the drywell along with a test station.
- **Force Main Residence Time**
  - *Comments*: The station's pump run times are very low which increases the residence time of sewage in the force main. This can cause odor and corrosion issues in the downstream collection system.
  - *Recommendation*: The residence time during average flow periods is approximately 10 hours. Long residence times tend to produce odor and corrosion issues. The downstream gravity sewer system force main should be evaluated for evidence of corrosion. It would be recommended to limit the residence time to 8 hours; however, there is not a feasible option to reduce residence time.
- **Pump Capacities**
  - *Comments*: The pump capacity field tests completed in 1998 and 2010 showed that the pumps are operating at about 107 percent of original design capacity.
  - *Recommendation*: Confirm capacities of the pumps with drawdown test (see procedure in Appendix B). Confirm if the increased capacity is a result of lower system head than anticipated for in design or from refurbishment of the pump.
- **Station Capacity**
  - *Comments*: The station has a peak hourly inflow range of 186 to 270 gpm. This station is able to receive approximately 330 to 414 gpm more inflow before reaching its original design capacity, which is an increase of approximately 1,550 to 1,950 residential capita.
  - *Recommendation*: Confirm pump capacities, because of the age of the pumps, with drawdown test (see procedure in Appendix B). The pumps appear to be operating at original design capacity, and the station's inflow is still well below its original design capacity. This station's capacity most likely does not need to be increased in the near future.
- **Station Age**
  - *Comments*: This station is near or past the typical design life for this type of station.
  - *Recommendation*: This station should be given a thorough evaluation to determine its condition and what equipment requires repair or replacement.

STATION: ARBUTAS			
Location: Separated Sewer Area			
Standby Power: 35 kW generator		**Response Time**: 18 minutes	
Pumps:	**Number:** 2	**hp**: 15	**Installed**: 1981
Firm Capacity:	**Original Design**: 75 gpm		**Field Tested**: 94 gpm
Force Main Diameter: 4 inches		**Length**: 2,587 feet	

Issues and Recommendations

- **Potential Site Flooding**
  - *Comments*: Notes from the June 2009 Comprehensive Plan states that the site should be replaced due to flooding potential with a suggested incorporation in 2009.
  - *Recommendation*: Review the potential for flooding and possible impacts.
- **Force Main Residence Time**
  - *Comments*: The station's pump run times are very low which increases the residence time of sewage in the force main. This can cause corrosion issues in the force main and the downstream collection system.
  - *Recommendation*: The residence time during average flow periods is approximately 40 hours. Long residence times tend to produce odor and corrosion issues. The downstream gravity sewer system force main should be evaluated for evidence of corrosion. It would be recommended to limit the residence time to 8 hours; however, there is not a feasible option to reduce residence time. It is recommended to increase the velocity in the force main to help reduce the amount of solids that settle in the force main. Also see comments on velocity.
- **Low Force Main Velocity**
  - *Comments*: The original design capacity and the 4-inch force main produces a velocity lower than the recommended 3 feet per second (fps). Low velocities allow solids to settle out, which reduces pump capacity and increases odor and corrosion in the downstream gravity system.
  - *Recommendation*: Confirm capacities of the pumps with drawdown test (see procedure in Appendix B). The minimum recommended flow for a 4-inch force main is 120 gpm. The downstream gravity system should be evaluated for evidence of corrosion.
- **Pump Capacities**
  - *Comments*: The pump capacity field tests completed in 1998 and 2010 showed that the pumps are operating at about 129 percent of original design capacity.
  - *Recommendation*: Confirm capacities of the pumps with drawdown test (see procedure in Appendix B). Confirm if the increased capacity is a result of lower system head than anticipated for in design or from refurbishment of the pump.
- **Station Capacity**
  - *Comments*: The station has a peak hourly inflow range of 22 to 38 gpm. This station is able to receive approximately 37 to 53 gpm more inflow before reaching its original design capacity, which is an increase of approximately 175 to 245 residential capita.
  - *Recommendation*: Confirm pump capacities, because of the age of the pumps, with drawdown test (see procedure in Appendix B). The pumps appear to be operating above original design capacity, and the station is still below original design capacity. This station's capacity most likely does not need to be increased in the near future.

- **Station Age**
  - *Comments*: This station is near or past the typical design life for this type of station.
  - *Recommendation*: This station should be given a thorough evaluation to determine its condition and what equipment requires repair or replacement.

STATION: BAKERVIEW VALLEY			
Location: Separated Sewer Area			
Standby Power: None on site, requires 35 kW gen set			**Response Time**: 16 minutes
Pumps:	**Number:** 2	**hp**: 10	**Installed**: 1996
Firm Capacity:	**Original Design**: 260 gpm		**Field Tested**: 137 gpm
Force Main Diameter: 4 inches		**Length**: 1,906 feet	

Issues and Recommendations:

- **Pump Capacities**
  - *Comments*: The pump capacity field tests completed in 1998 and 2010 produced similar results. The pumps are operating at about 55 percent of original design capacity and this station's inflow is near the capacity of the field tests.
  - *Recommendation*: Confirm capacities of the pumps with drawdown test (see procedure in Appendix B). Confirm if the reduced capacity is a result of pump wear or a higher system head than anticipated for in design. If pump wear is causing the reduced capacity, then replace the pump components when more capacity is needed or replace the entire pump in kind.
- **Station Capacity**
  - *Comments*: The station has a peak hourly inflow range of 96 to 217 gpm. This station is able to receive approximately 43 to 164 gpm more inflow before reaching its original design capacity, which is an increase of approximately 200 to 770 residential capita.
  - *Recommendation*: Confirm pump capacities with drawdown test (see procedure in Appendix B). The pumps appear to be operating well below original design capacity, and the station's inflow appears to be at or above its field tested capacities. According to the data provided, the capacity of this station may need to be increased immediately.

STATION: BRITTON LOOP			
Location: Separated Sewer Area			
Standby Power: None on site, requires 35 kW gen set			**Response Time**: 18 minutes
Pumps:	**Number:** 2	**hp**: 5	**Installed**: 2001
Firm Capacity:	**Original Design**: 450 gpm		**Field Tested**: 407 gpm
Force Main Diameter: 8 inches		**Length**: 1,181 feet	

Issues and Recommendations:

- **Low Force Main Velocity**
  - *Comments*: The original design capacity and the 8-inch force main produces a velocity lower than the recommended 3 fps. Low velocities allow solids to settle out, which reduces pump capacity and increases odor and corrosion in the downstream gravity sewer system.
  - *Recommendation*: Confirm capacities of the pumps with drawdown test (see procedure in Appendix B). The minimum recommended flow for an 8-inch force main is 470 gpm. The downstream gravity sewer system should be evaluated for evidence of corrosion.
- **Force Main Residence Time**
  - *Comments*: The station's pump run times are very low which increases the residence time of sewage in the force main. This can cause odor and corrosion issues in the downstream collection system.
  - *Recommendation*: The residence time during average flow periods is approximately 18 hours. Long residence times tend to produce odor and corrosion issues. The downstream gravity sewer system force main should be evaluated for evidence of corrosion. It would be recommended to limit the residence time to 8 hours; however, there is not a feasible option to reduce residence time. It is recommended to increase the velocity in the force main to help reduce the amount of solids that settle in the force main. Also see comments on velocity.
- **Pump Capacities**
  - *Comments*: The pump capacity field tests completed in 2010 showed that the pumps are operating at about 93 percent of original design capacity; however, this station's inflow is still well below its design capacity.
  - *Recommendation*: Confirm capacities of the pumps with drawdown test (see procedure in Appendix B). Confirm if the reduced capacity is a result of pump wear or a higher system head than anticipated for in design. If pump wear is causing the reduced capacity, then replace the pump components when more capacity is needed or replace the entire pump in kind.
- **Station Capacity**
  - *Comments*: The station has a peak hourly inflow range of 98 to 133 gpm. This station is able to receive approximately 317 to 352 gpm more inflow before reaching its original design capacity, which is an increase of approximately 1,480 to 1,640 residential capita.
  - *Recommendation*: Confirm pump capacities with drawdown test (see procedure in Appendix B). The pumps appear to be operating below original design capacity, but the station's inflow is still well below its original design capacity. This station's capacity most likely does not need to be increased in the near future.

STATION: BRIZA			
Location: Separated Sewer Area			
Standby Power: None on site, requires 165 kW gen set			**Response Time**: 288 minutes
Pumps:	**Number:** 2	**hp**: 88	**Installed**: 1986
Firm Capacity:	**Original Design**: 600 gpm		**Field Tested**: 711 gpm
Force Main Diameter: 8 inches		**Length**: 1,244 feet	

Issues and Recommendations:

- **Force Main Residence Time**
  - *Comments*: The station's pump run times are very low which increases the residence time of sewage in the force main. This can cause odor and corrosion issues in the downstream collection system.
  - *Recommendation*: The residence time during average flow periods is approximately 70 hours. Long residence times tend to produce odor and corrosion issues. The downstream gravity sewer system force main should be evaluated for evidence of corrosion. It would be recommended to limit the residence time to 8 hours; however, there is not a feasible option to reduce residence time.
- **Pump Capacities**
  - *Comments*: The pump capacity field tests completed in 1998 and 2010 produced similar results. The pumps are operating at about 120 percent of original design capacity.
  - *Recommendation*: Confirm capacities of the pumps with drawdown test (see procedure in Appendix B). Confirm if the increased capacity is a result of lower system head than anticipated for in design or from refurbishment of the pump.
- **Station Capacity**
  - *Comments*: The station has a peak hourly inflow range of 25 to 38 gpm. This station is able to receive approximately 560 to 575 gpm more inflow before reaching its original design capacity, which is an increase of approximately 2,625 to 2,690 residential capita.
  - *Recommendation*: Confirm pump capacities with drawdown test (see procedure in Appendix B). The pumps appear to be operating above original design capacity and the station's inflow is still significantly below its original design capacity. This station's capacity most likely does not need to be increased in the near future.
- **Station Age**
  - *Comments*: This station is near or past the typical design life for this type of station.
  - *Recommendation*: This station should be given a thorough evaluation to determine its condition and what equipment requires repair or replacement.

STATION: C STREET			
Location: Combined Sewer Area			
Standby Power: None on site, requires 35 kW gen set			**Response Time**: 120 minutes
Pumps:	**Number:** 2	**hp**: 5	**Installed**: 1973
Firm Capacity:	**Original Design**: 500 gpm		**Field Tested**: 372 gpm
Force Main Diameter: 6 inches		**Length**: 100 feet	

Issues and Recommendations:

- **Drywell Floor Rust**
  - *Comments*: Notes from 1998 state the drywell floor is rusting. Notes from 2010 state that the drywell condition is good.
  - *Recommendation*: Check for airspace under drywell floor. Underside of floor could be filled with grout if rust has caused structural issues with the floor. Consider adding a dehumidifier in the dry well to help prevent interior corrosion if rust problems continue. For exterior corrosion, consider adding cathodic protection to the drywell along with a test station.
- **Pump Capacities**
  - *Comments*: The pump capacity field tests completed in 1998 and 2010 showed that the pumps are operating at about 77 percent of original design capacity; however, this station's inflow is still well below its design capacity.
  - *Recommendation*: Confirm capacities of the pumps with drawdown test (see procedure in Appendix B). Confirm if the reduced capacity is a result of pump wear or a higher system head than anticipated for in design. If pump wear is causing the reduced capacity, then replace the pump components when more capacity is needed or replace the entire pump in kind.
- **Station Capacity**
  - *Comments*: The station has a peak hourly inflow range of 31 to 52 gpm. This station is able to receive approximately 448 to 469 gpm more inflow before reaching its original design capacity, which is an increase of approximately 1400 to 1460 residential capita.
  - *Recommendation*: Confirm pump capacities, because of the age of the pumps, with drawdown test (see procedure in Appendix B). The pumps appear to be operating well below original design capacity, but the station is still receiving inflow well below its original design capacity. This station's capacity most likely does not need to be increased in the near future.
- **Station Age**
  - *Comments*: This station is near or past the typical design life for this type of station.
  - *Recommendation*: This station should be given a thorough evaluation to determine its condition and what equipment requires repair or replacement.

STATION: FIR STREET			
Location: Separated Sewer Area			
Standby Power: 58 kW generator	**Response Time**: 39 minutes		
Pumps:	**Number:** 2	**hp**: 7.5	**Installed**: 1977
Firm Capacity:	**Original Design**: 150 gpm		**Field Tested**: 143 gpm
Force Main Diameter: 4 inches	**Length**: 695 feet		

Issues and Recommendations:

- **Drywell Floor Rust**
  - *Comments*: Notes from 1998 state the drywell floor is rusting. Notes from 2010 state that the drywell rust on the floor was painted.
  - *Recommendation*: Check for airspace under drywell floor. Underside of floor could be filled with grout if the rust has caused structural issues with the floor. Consider adding a dehumidifier in the dry well to help prevent interior corrosion. For exterior corrosion, consider adding cathodic protection to the drywell along with a test station.
- **Pump Capacities**
  - *Comments*: The pump capacity field tests completed in 1998 and 2010 showed that the pumps are operating at about 100 percent of original design capacity and this station's inflow is nearing its design capacity.
  - *Recommendation*: Confirm capacities of the pumps with drawdown test (see procedure in Appendix B).
- **Station Capacity**
  - *Comments*: The station has a peak hourly inflow range of 83 to 110 gpm. This station is able to receive approximately 40 to 67 gpm more inflow before reaching its original design capacity, which is an increase of approximately 190 to 310 residential capita.
  - *Recommendation*: Confirm pump capacities, because of the age of the pumps, with drawdown test (see procedure in Appendix B). The pumps appear to be operating at or near original design capacity, but the station's inflow is nearing its original design capacity. According to the data provided, this station's capacity may need to be increased immediately.
- **Station Age**
  - *Comments*: This station is near or past the typical design life for this type of station.
  - *Recommendation*: This station should be given a thorough evaluation to determine its condition and what equipment requires repair or replacement.

STATION: FLYNN STREET			
Location: Separated Sewer Area			
Standby Power: 59 kW generator		**Response Time**: 16 minutes	
Pumps:	**Number:** 2	**hp**: 20	**Installed**: 1966
Firm Capacity:	**Original Design**: 500 gpm		**Field Tested**: 521 gpm
Force Main Diameter: 6 inches		**Length**: 314 feet	

Issues and Recommendations:

- **Link to Lakeside Pump Station**
  - *Comments*: Notes from June 2009 Comprehensive Sewer Plan state that this station is to have a link to the Lakeside Pump Station in the future.
  - *Recommendation*: Install the link between the stations.
- **Wet Well Size/Pump Cycling**
  - *Comments*: The volume cycled between the Lead Pump On-Off range needs to be increased to prevent the pump from cycling more than the manufacturer recommends, which shortens the life of the motor.
  - *Recommendation*: Increase the Lead Pump On-Off range to 3.7 feet.
- **Pump Capacities**
  - *Comments*: The pump capacity field tests completed in 1998 and 2010 showed that the pumps are operating at about 105 percent of original design capacity.
  - *Recommendation*: Confirm capacities of the pumps with drawdown test (see procedure in Appendix B). Confirm if the increased capacity is a result of lower system head than anticipated for in design or from refurbishment of the pump.
- **Station Capacity**
  - *Comments*: The station has a peak hourly inflow range of 235 to 310 gpm. This station is able to receive approximately 190 to 265 gpm more inflow before reaching its original design capacity, which is an increase of approximately 890 to 1,240 residential capita.
  - *Recommendation*: Confirm pump capacities, because of the age of the pumps, with drawdown test (see procedure in Appendix B). The pumps appear to be operating at original design capacity and the station's inflow is still below its original design capacity. This station's capacity most likely does not need to be increased in the near future.
- **Station Age**
  - *Comments*: This station is near or past the typical design life for this type of station.
  - *Recommendation*: This station should be given a thorough evaluation to determine its condition and what equipment requires repair or replacement.

STATION: HILTON			
Location: Combined Sewer Area			
Standby Power: None on site, requires 35 kW gen set			**Response Time**: 19 minutes
Pumps:	**Number:** 2	**hp**: 15	**Installed**: 1973
Firm Capacity:	**Original Design**: 900 gpm		**Field Tested**: 920 gpm
Force Main Diameter: 8 inches		**Length**: 115 feet	

Issues and Recommendations:

- **Wet Well Size/Pump Cycling**
  - *Comments*: The volume cycled between the Lead Pump On-Off range needs to be increased to prevent the pump from cycling more than the manufacturer recommends, which shortens the life of the motor. A note for this station on its data spreadsheet states that the effective pumping range is limited to approximately 2 vertical feet, but the range for notes taken in 2010 indicate the vertical range is set at 2.7 feet.
  - *Recommendation*: Increase the Lead Pump On-Off range to 3.5 feet if possible.
- **Pump Capacities**
  - *Comments*: The pump capacity field tests completed in 1998 and 2010 are significantly different. Only the values shown for 2010 were used because this test was done over a larger vertical range, which increases accuracy. The field tests from 2010 showed that the pumps are operating at about 103 percent of original design capacity.
  - *Recommendation*: Confirm capacities of the pumps with drawdown test (see procedure in Appendix B). Confirm if the increased capacity is a result of lower system head than anticipated for in design or from refurbishment of the pump.
- **Station Capacity**
  - *Comments*: The station has a peak hourly inflow range of 392 to 505 gpm. This station is able to receive approximately 390 to 510 gpm more inflow before reaching its original design capacity, which is an increase of approximately 1,230 to 1,580 residential capita.
  - *Recommendation*: Confirm pump capacities, because of the age of the pumps, with drawdown test (see procedure in Appendix B). The pumps appear to be operating above original design capacity and the station's inflow is still well below its original design capacity. This station's capacity most likely does not need to be increased in the near future.
- **Station Age**
  - *Comments*: This station is near or past the typical design life for this type of station.
  - *Recommendation*: This station should be given a thorough evaluation to determine its condition and what equipment requires repair or replacement.

STATION: HORTON		
Location: Separated Sewer Area		
Standby Power: None on site, requires 165 kW gen set		**Response Time**: 14 minutes
Pumps: Number: 2 (Third pump installed in 2013)	**hp**: 20	**Installed**: 1988
Firm Capacity: **Original Design**: 600 gpm		**Field Tested**: 638 gpm
Force Main Diameter: 8 inches	**Length**: 2,401 feet	

Issues and Recommendations:

- **Pump Capacities**
  - *Comments*: The pump capacity field tests completed in 1998 and 2010 are significantly different. Only the values shown for 2010 were used because this test was conducted over a larger vertical range, which increases accuracy. The field tests from 2010 showed that the pumps are operating at about 112 percent of original design capacity; however, this station's inflow is at or above its design capacity.
  - *Recommendation*: Confirm capacities of the pumps with drawdown test (see procedure in Appendix B). Confirm if the increased capacity is a result of lower system head than anticipated for in design or from refurbishment of the pump.
- **Station Capacity**
  - *Comments*: The station has a peak hourly inflow range of 505 to 704 gpm. This station is able to receive approximately (104) to 95 gpm more inflow before reaching its original design capacity, which is approximately (487) to 443 residential capita.
  - *Recommendation*: Confirm pump capacities, because of the age of the pumps, with drawdown test (see procedure in Appendix B). The pumps appear to be operating above original design capacity, but the station's inflow is at or above its original design capacity. According to the data provided, this station's capacity may need to be increased immediately.
- **Station Age**
  - *Comments*: This station is near or past the typical design life for this type of station.
  - *Recommendation*: This station should be given a thorough evaluation to determine its condition and what equipment requires repair or replacement.

STATION: JAMES			
Location: Separated Sewer Area			
Standby Power: 225 kW generator			**Response Time**: 14 minutes
Pumps:	**Number:** 2	**hp**: 88	**Installed**: 1985
Firm Capacity:	**Original Design**: 1,200 gpm		**Field Tested**: 1,728 gpm
Force Main Diameter: 10 inches		**Length**: 1,547 feet	

Issues and Recommendations:

- **Wet Well Size/Pump Cycling**
  - *Comments*: The volume cycled between the Lead Pump On-Off range needs to be increased to prevent the pump from cycling more than the manufacturer recommends, which shortens the life of the motor.
  - *Recommendation*: Use variable frequency drives (VFDs) to start pumps with a minimum ramp up time of 3 seconds. This reduces the amperage rush to the motor at pump start-up and increases the life of the motor.
- **Ragging Issues**
  - *Comments*: Notes from a conference call with the City indicated that Flygt N impellers were installed at this station to reduce ragging issues but were not successful.
  - *Recommendation*: The City may want to determine if they are open to looking into other options to reduce ragging such as the installation of pumps with screw centrifugal impellers.
- **Pump Capacities**
  - *Comments*: The pump capacity field tests completed in 1998 and 2010 showed that the pumps are operating at about 146 percent of original design capacity; however, this station's inflow is at or nearing its design capacity.
  - *Recommendation*: Confirm capacities of the pumps with drawdown test (see procedure in Appendix B). Confirm if the increased capacity is a result of lower system head than anticipated for in design or from refurbishment of the pump.
- **Station Capacity**
  - *Comments*: The station has a peak hourly inflow range of 722 to 1367 gpm. This station is able to receive approximately (167) to 478 gpm more inflow before reaching its original design capacity, which is an increase of approximately (490) to 440 residential capita.
  - *Recommendation*: Confirm pump capacities, because of the age of the pumps, with drawdown test (see procedure in Appendix B). The pumps appear to be operating above original design capacity, but the station's inflow is at or nearing its original design capacity. According to the data provided, this station's capacity may need to be increased immediately.
- **Station Age**
  - *Comments*: This station is near or past the typical design life for this type of station.
  - *Recommendation*: This station should be given a thorough evaluation to determine its condition and what equipment requires repair or replacement.

STATION: JUNE ROAD			
Location: Separated Sewer Area			
Standby Power: 35 kW generator		**Response Time**: 1,309 minutes	
Pumps:	**Number:** 2	**hp**: 7.5	**Installed**: 2010
Firm Capacity:	**Original Design**: 440 gpm		**Field Tested**: 238 gpm
Force Main Diameter: 6 inches		**Length**: 1,183 feet	

Issues and Recommendations:

- **Low Force Main Velocity**
  - *Comments*: The field tested capacity and the 6-inch force main produces a velocity lower than recommended. Low velocities allow solids to settle out which reduces pump capacity and can cause corrosion issues in the downstream gravity system.
  - *Recommendation*: Confirm capacities of the pumps with drawdown test (see procedure in Appendix B). The downstream gravity sewer system should be evaluated for evidence of corrosion. The minimum recommended flow for a 6-inch force main is 265 gpm.
- **Force Main Residence Time**
  - *Comments*: The station's pump run times are very low which increases the residence time of sewage in the force main. This can cause corrosion issues in the force main and downstream collection system.
  - *Recommendation*: The residence time during average flow periods is approximately 309 hours. It is recommended to limit the residence time to 8 hours; however, there is not a feasible option to reduce residence time. Long residence times tend to produce odor and corrosion issues. The downstream gravity sewer system force main should be evaluated for evidence of corrosion. It is also recommended to increase the velocity in the force main to help reduce the amount of solids that settle in the force main. Also see comments on velocity.
- **Pump Capacities**
  - *Comments*: The pump capacity field tests completed in 2010 showed that the pumps are operating at about 54 percent of original design.
  - *Recommendation*: Confirm capacities of the pumps with drawdown test (see procedure in Appendix B). Confirm if the reduced capacity is a result of pump wear or a higher system head than anticipated for in design. If pump wear is causing the reduced capacity, then replace the pump components when more capacity is needed or replace the entire pump in kind.
- **Station Capacity**
  - *Comments*: The station has a peak hourly inflow range of 3 to 4 gpm. This station is able to receive approximately 230 gpm more inflow before reaching its field tested capacity, which is an increase of approximately 915 to 925 residential capita.
  - *Recommendation*: Confirm pump capacities with drawdown test (see procedure in Appendix B). The pumps appear to be operating well below original design capacity, but the station's inflow is still well below its original design capacity. This station's capacity most likely does not need to be increased in the near future.

STATION: LAKESIDE			
Location: Separated Sewer Area			
Standby Power: 20 kW generator		**Response Time**: 63 minutes	
Pumps:	**Number:** 2	**hp**: 5	**Installed**: 1968, upgraded 2006
Firm Capacity:	**Original Design**: 137 gpm		**Field Tested**: 88 gpm
Force Main Diameter: 4 inches		**Length**: 320 feet	

Issues and Recommendations:

- **Low Force Main Velocity**
  - *Comments*: The original design capacity and the 4-inch force main produces a velocity lower than recommended. Low velocities allow solids to settle out which reduces pump capacity and can cause corrosion issues in the force main.
  - *Recommendation*: Confirm capacities of the pumps with drawdown test (see procedure in Appendix B). The force main should be evaluated for evidence of corrosion. The minimum recommended flow for a 4-inch force main is 120 gpm.
- **Pump Capacities**
  - *Comments*: The pump capacity field tests completed in 2010 showed that the pumps are operating at about 77 percent of original design capacity.
  - *Recommendation*: Confirm capacities of the pumps with drawdown test (see procedure in Appendix B). Confirm if the reduced capacity is a result of pump wear or a higher system head than anticipated for in design. If pump wear is causing the reduced capacity, then replace the pump components when more capacity is needed or replace the entire pump in kind.
- **Station Capacity**
  - *Comments*: The station has a peak hourly inflow range of 34 to 56 gpm. This station is able to receive approximately 81 to 103 gpm more inflow before reaching its original design capacity, which is an increase of approximately 375 to 480 residential capita.
  - *Recommendation*: Confirm pump capacities with drawdown test (see procedure in Appendix B). The pumps appear to be operating below original design capacity, but the station's inflow is still below its original design capacity. This station's capacity most likely does not need to be increased in the near future.

STATION: MARTIN STREET			
Location: Separated Sewer Area			
Standby Power: None on site, requires 35 kW gen set			**Response Time**: 65 minutes
Pumps:	**Number:** 2	**hp**: 10	**Installed**: 1973
Firm Capacity:	**Original Design**: 700 gpm		**Field Tested**: 615 gpm
Force Main Diameter: 10 inches		**Length**: 32 feet	

Issues and Recommendations:

- **Low Force Main Velocity**
  - *Comments*: The original design capacity and the 10-inch force main produces a velocity lower than recommended. Low velocities allow solids to settle out which reduces pump capacity and can cause corrosion issues in the force main.
  - *Recommendation*: Confirm capacities of the pumps with drawdown test (see procedure in Appendix B). The force main should be evaluated for evidence of corrosion. The minimum recommended flow for a 10-inch force main is 750 gpm.
- **Drywell Floor Rust**
  - *Comments*: Notes from 2010 state the drywell floor is rusting.
  - *Recommendation*: Remove rust and repaint drywell. Also check for airspace under drywell floor that could be filled with concrete to reinforce the floor if necessary. Consider adding a dehumidifier in the dry well to help prevent interior corrosion. Consider adding cathodic protection for exterior corrosion, along with a test station.
- **Pump Capacities**
  - Comments: The pump capacity field tests completed in 1998 and 2010 are significantly different. Only the values shown for 2010 were used because the test was conducted over a larger vertical range, which increases accuracy. The pump capacity field tests completed in 2010 showed that the pumps are operating at about 96 percent of original design capacity.
  - *Recommendation*: Confirm capacities of the pumps with drawdown test (see procedure in Appendix B). Confirm if the reduced capacity is a result of pump wear or a higher system head than anticipated for in design. If pump wear is causing the reduced capacity, then replace the pump components when more capacity is needed or replace the entire pump in kind.
- **Station Capacity**
  - *Comments*: The station has a peak hourly inflow range of 87 to 114 gpm. This station is able to receive approximately 586 to 613 gpm more inflow before reaching its original design capacity, which is an increase of approximately 2,740 to 2,860 residential capita.
  - *Recommendation*: Confirm pump capacities with drawdown test (see procedure in Appendix B). The pumps appear to be operating below original design capacity, but the station's inflow is still well below its original design capacity. This station's capacity most likely does not need to be increased in the near future.
- **Station Age**
  - *Comments*: This station is near or past the typical design life for this type of station.
  - *Recommendation*: This station should be given a thorough evaluation to determine its condition and what equipment requires repair or replacement.

STATION: MEADOWBROOK			
Location: Separated Sewer Area			
Standby Power: None on site, requires 35 kW gen set		**Response Time**: 50 minutes	
Pumps:	**Number:** 2	**hp**: 7.5	**Installed**: 1997
Firm Capacity:	**Original Design**: 150 gpm	**Field Tested**: 198 gpm	
Force Main Diameter: 4 inches	**Length**: 361 feet		

Issues and Recommendations:

- **Valve Vault Repair**
  - *Comments*: Notes from 2010 indicate that valve vault grouting needs repair.
  - *Recommendation*: Determine cause of grouting deterioration and fix grouting.
- **Wet Well Fouling**
  - *Comments*: Notes from 2010 indicate there is frequent and heavy fouling in the wet well.
  - *Recommendation*: Recommendation needs more information on condition.
- **Pump Capacities**
  - *Comments*: The pump capacity field tests completed in 1998 and 2010 showed that the pumps are operating at about 141 percent of original design capacity.
  - *Recommendation*: Confirm capacities of the pumps with drawdown test (see procedure in Appendix B). Confirm if the increased capacity is a result of lower system head than anticipated for in design or from refurbishment of the pump.
- **Station Capacity**
  - *Comments*: The station has a peak hourly inflow range of 71 to 126 gpm. This station is able to receive approximately 24 to 79 gpm more inflow before reaching its original design capacity, which is an increase of approximately 110 to 370 residential capita.
  - *Recommendation*: Confirm pump capacities with drawdown test (see procedure in Appendix B). The pumps appear to be operating above original design capacity, but the station's inflow is near or at its original design capacity. This station's capacity may need to be increased in the near future.

STATION: MITCHELL WAY			
Location: Separated Sewer Area			
Standby Power: None on site, requires 35 kW gen set		**Response Time**: 192 minutes	
Pumps:	**Number:** 2	**hp**: 10	**Installed**: 2013
Firm Capacity:	**Original Design**: 350 gpm	**Field Tested**: 158 gpm	
Force Main Diameter: 4 inches	**Length**: 938 feet		

Issues and Recommendations:

- **High Force Main Velocity**
  - *Comments*: The original design capacity and the 4-inch force main produces a velocity higher than recommended. High velocities increase water hammer, abrasion, and wear in the force main.
  - *Recommendation*: Confirm the size of the force main. Conduct a water hammer analysis to confirm if current operation may be damaging the force main.
- **Aging Electrical Equipment**
  - *Comments*: Notes from 2010 indicate that the station's electrical equipment is aging.
  - *Recommendation*: Evaluate electrical equipment and prioritize equipment replacement based on function and necessity.
- **Force Main Residence Time**
  - *Comments*: The station's pump run times are very low which increases the residence time of sewage in the force main. This can cause odor and corrosion issues in the downstream collection system.
  - *Recommendation*: The residence time during average flow periods is approximately 9 hours. Long residence times tend to produce odor and corrosion issues. The downstream gravity sewer system force main should be evaluated for evidence of corrosion. It would be recommended to limit the residence time to 8 hours; however, there is not a feasible option to reduce residence time.
- **Pump Capacities**
  - *Comments*: The pump capacity field tests completed in 1998 and 2010 showed that the pumps are operating at about 49 percent of original design capacity.
  - *Recommendation*: Confirm capacities of the pumps with drawdown test (see procedure in Appendix B). Confirm if the reduced capacity is a result of pump wear or a higher system head than anticipated for in design. If pump wear is causing the reduced capacity, then replace the pump components when more capacity is needed or replace the entire pump in kind.
- **Station Capacity**
  - *Comments*: The station has a peak hourly inflow range of 39 to 100 gpm. This station is able to receive approximately 250 to 311 gpm more inflow before reaching its original design capacity, which is an increase of approximately 1,170 to 1,450 residential capita.
  - *Recommendation*: Confirm pump capacities with drawdown test (see procedure in Appendix B). The pumps appear to be operating well below original design capacity, and the station's inflow is nearing its field tested capacity. This station's capacity may need to be increased in the near future.

- **Station Age**
  - *Comments*: This station is near or past the typical design life for this type of station.
  - *Recommendation*: This station should be given a thorough evaluation to determine its condition and what equipment requires repair or replacement.

STATION: N. MEADOWS			
Location: Separated Sewer Area			
Standby Power: None on site, requires 35 kW gen set			**Response Time**: 240 minutes
Pumps:	**Number:** 2	**hp**: 3	**Installed**: 2000
Firm Capacity:	**Original Design**: 102 gpm		**Field Tested**: 94 gpm
Force Main Diameter: 4 inches		**Length**: 621 feet	

Issues and Recommendations:

- **Force Main Residence Time**
  - *Comments*: The station's pump run times are very low which increases the residence time of sewage in the force main. This can cause corrosion issues in the force main and downstream collection system.
  - *Recommendation*: The residence time during average flow periods is approximately 22 hours. Long residence times tend to produce odor and corrosion issues. The downstream gravity sewer system force main should be evaluated for evidence of corrosion. It would be recommended to limit the residence time to 8 hours; however, there is not a feasible option to reduce residence time. It is recommended to increase the velocity in the force main to help reduce the amount of solids that settle in the force main. Also see comments on velocity.
- **Low Force Main Velocity**
  - *Comments*: The original design capacity and the 4-inch force main produces a velocity lower than recommended. Low velocities allow solids to settle out which reduces pump capacity and can cause corrosion issues in the force main.
  - *Recommendation*: Confirm capacities of the pumps with drawdown test (see procedure in Appendix B). The force main should be evaluated for evidence of corrosion. The minimum recommended flow for a 4-inch force main is 120 gpm.
- **Pump Capacities**
  - *Comments*: The pump capacity field tests completed in 1998 and 2010 showed that the pumps are operating at about 93 percent of original design capacity.
  - *Recommendation*: Confirm capacities of the pumps with drawdown test (see procedure in Appendix B). Confirm if the reduced capacity is a result of pump wear or a higher system head than anticipated for in design. If pump wear is causing the reduced capacity, then replace the pump components when more capacity is needed or replace the entire pump in kind.
- **Station Capacity**
  - *Comments*: The station has a peak hourly inflow range of 10 to 14 gpm. This station is able to receive approximately 88 to 92 gpm more inflow before reaching its original design capacity, which is an increase of approximately 410 to 430 residential capita.
  - *Recommendation*: Confirm pump capacities with drawdown test (see procedure in Appendix B). The pumps appear to be operating below original design capacity, but the station's inflow is still well below its original design capacity. This station's capacity most likely does not need to be increased in the near future.

STATION: N. MITCHELL WAY			
Location: Separated Sewer Area			
Standby Power: None on site, requires 35 kW gen set			**Response Time**: 411 minutes
Pumps:	**Number:** 2	**hp**: 7.5	**Installed**: 2001
Firm Capacity:	**Original Design**: 525 gpm		**Field Tested**: 524 gpm
Force Main Diameter: 6 inches		**Length**: 1,928 feet	

Issues and Recommendations:

- **Force Main Residence Time**
  - *Comments*: The station's pump run times are very low which increases the residence time of sewage in the force main. This can cause corrosion issues in the force main and downstream collection system.
  - *Recommendation*: The residence time during average flow periods is approximately 419 hours. Long residence times tend to produce odor and corrosion issues. The downstream gravity sewer system force main should be evaluated for evidence of corrosion. It would be recommended to limit the residence time to 8 hours; however, there is not a feasible option to reduce residence time.
- **Pump Capacities**
  - *Comments*: The pump capacity field tests completed in 2010 showed that the two pumps have a significant difference in pumping capacity. Using the data provided, they are operating at about 105 percent of original design capacity.
  - *Recommendation*: Confirm capacities of the pumps with drawdown test (see procedure in Appendix B). Confirm if the increased capacity is a result of lower system head than anticipated for in design or from refurbishment of the pump.
- **Station Capacity**
  - *Comments*: The station has a peak hourly inflow range of 4 to 5 gpm. This station is able to receive approximately 520 to 521 gpm more inflow before reaching its original design capacity, which is an increase of approximately 2,430 to 2,435 residential capita.
  - *Recommendation*: Confirm pump capacities with drawdown test (see procedure in Appendix B). The pumps appear to be operating at or near original design capacity and the station's inflow is still well below its original design capacity. This station's capacity most likely does not need to be increased in the near future.

STATION: NORTHSHORE			
Location: Separated Sewer Area			
Standby Power: 125 kW generator		**Response Time**: 13 minutes	
Pumps:	**Number:** 2	**hp**: 75	**Installed**: 1980
Firm Capacity:	**Original Design**: 1,500 gpm		**Field Tested**: 1,580 gpm
Force Main Diameter: 10 inches		**Length**: 1,512 feet	

Issues and Recommendations:

- **Wet Well Size/Pump Cycling**
  - *Comments*: Notes for this station indicate that the diameter of the wet well is only 8 feet, but the inflow is very large and additional storage volume is needed. Calculations have confirmed that the volume cycled between the Lead Pump On-Off range needs to be increased to prevent the pump from cycling more than the manufacturer recommends, which shortens the life of the motor.
  - *Recommendation*: Increase the Lead Pump On-Off range to 11.0 feet if possible, add additional storage volume, or add variable frequency drives (VFDs) if increasing the Lead Pump On-Off range is not possible to reduce the amount of pump cycling.
- **Pump Capacities**
  - *Comments*: The pump capacity field tests completed in 1998 and 2010 showed that the pumps are operating at about 105 percent of original design capacity.
  - *Recommendation*: Confirm capacities of the pumps with drawdown test (see procedure in Appendix B). Confirm if the increased capacity is a result of lower system head than anticipated for in design or from refurbishment of the pump.
- **Station Capacity**
  - *Comments*: The station has a peak hourly inflow range of 889 to 1,215 gpm. This station is able to receive approximately 285 to 611 gpm more inflow before reaching its original design capacity, which is an increase of approximately 1,330 to 2,850 residential capita.
  - *Recommendation*: Confirm pump capacities with drawdown test (see procedure in Appendix B). The pumps appear to be operating at or near original design capacity, but the station's inflow is nearing its original design capacity. This station's capacity may need to be increased in the near future.
- **Station Age**
  - *Comments*: This station is near or past the typical design life for this type of station.
  - *Recommendation*: This station should be given a thorough evaluation to determine its condition and what equipment requires repair or replacement.

STATION: OAK STREET		
Location: Combined Sewer Area		
Standby Power: 2000/1500 kW Generator	**Response Time**: Unknown	
Pumps: **Number:** 5 **hp**: 300/600	**Installed**: 1973/Upgrade in 2004	
Firm Capacity: **Original Design**: 7,300/15,000 gpm	**Field Tested**: None	
Force Main Diameter: Dual 36 inch **Length**: 2,447/2,295 feet		

Issues and Recommendations:

- **Ragging Issues**
  - *Comments*: Notes indicate that the two smaller 300 horsepower pumps have ragging issues.
  - *Recommendation*: Consider replacing one or both of the 300 horsepower pumps with screw centrifugal pumps. Wemco Hidrostal provides a suitable hydraulic fit (motor would need to be replaced as well), or consider an early upgrade of the two 300 hp pumps to the 600 hp pumps (VFDs, electrical system, and generator sized for the ultimate 600 hp size).
- **Reduced Speed Operation**
  - *Comments*: This station runs for extended periods of time at reduced speed.
  - *Recommendation*: There is energy savings available if the minimum speeds of the pumps are increased to more efficient parts of their curves. This may also decrease ragging of the two smaller pumps (see "Ragging Issues" bullet).
- **Pump Capacities**
  - *Comments*: There have been no pump capacity field tests completed.
  - *Recommendation*: Confirm capacities of the pumps with drawdown test (see procedure in Appendix B).
- **Station Evaluation**
  - *Comments*: There was not enough data provided for this station to do an evaluation similar to the other stations.

STATION: ROEDER AVENUE			
Location: Combined Sewer Area			
Standby Power: 175 kW generator		**Response Time**: Unknown	
Pumps:	**Number:** 3	**hp**: 75/50	**Installed**: 1973/2 Pumps Upgraded in 2004
Firm Capacity:	**Original Design**: 3,100/4,000 gpm		**Field Tested**: None
Force Main Diameter: 18 inches		**Length**: 1,047 feet	

Issues and Recommendations:

- **Ragging Issues**
  - *Comments*: Notes indicate that the Variable Speed Pumps No. 1 and No. 3 have ragging issues and need to be unplugged about once a week.
  - *Recommendation*: Consider replacing one of the variable frequency drive (VFD) pumps with a screw centrifugal impeller pump or replace existing constant speed pump with screw centrifugal impeller pump and add a VFD.
- **Reduced Speed Operation**
  - *Comments*: This station runs for extended periods of time at reduced speed.
  - *Recommendation*: There is energy savings available at this station if the minimum speeds of the pumps are increased to more efficient parts of their curves. Increasing the minimum speed may also help reduce the amount of clogging that the pumps experience (see "Ragging Issues" bullet).
- **Pump Capacities**
  - *Comments*: There have been no pump capacity field tests completed.
  - *Recommendation*: Confirm capacities of the pumps with drawdown test (see procedure in Appendix B).
- **Station Capacity**
  - *Comments*: The station may be operating near its firm capacity based on a storm event from May 28 through May 30, 2010, that had two of the three pumps on multiple times. On May 29, 2010, two of the pumps each operated for the entire 24 hours that day.
  - *Recommendation*: Review operation and maintenance (O&M) records to determine if one of the pumps was partially clogged during that time period. Consider increasing the firm capacity of the station.
- **Station Evaluation**
  - *Comments*: There was not enough data provided for this station to do an evaluation similar to the other stations.

STATION: SHOREWOOD			
Location: Separated Sewer Area			
Standby Power: None on site, requires 12 kW gen set		**Response Time**: 51 minutes	
Pumps:	**Number:** 2	**hp**: 5	**Installed**: 1979/Upgrade in 2009
Firm Capacity:	**Original Design**: 340 gpm		**Field Tested**: 58 gpm
Force Main Diameter: 4 inches		**Length**: 548 feet	

Issues and Recommendations:

- **Low Force Main Velocity**
  - *Comments*: The field tested capacities and the 4-inch force main produce a velocity lower than recommended. Low velocities allow solids to settle out which reduces pump capacity and can cause corrosion issues in the force main.
  - *Recommendation*: Confirm capacities of the pumps with drawdown test (see procedure in Appendix B). The force main should be evaluated for evidence of corrosion. The minimum recommended flow for a 4-inch force main is 120 gpm.
- **High Force Main Velocity**
  - *Comments*: The original design capacity and the 4-inch force main produces a velocity higher than recommended. High velocities increase water hammer, abrasion, and wear in the force main.
  - *Recommendation*: Confirm capacities of the pumps with drawdown test (see procedure in Appendix B). Confirm the size of the force main. Conduct a water hammer analysis to confirm if current operation may be damaging the force main.
- **Force Main Residence Time**
  - *Comments*: The station's pump run times are very low which increases the residence time of sewage in the force main. This can cause corrosion issues in the force main.
  - *Recommendation*: The residence time during average flow periods is approximately 20 hours. Long residence times tend to produce odor and corrosion issues. The downstream gravity sewer system force main should be evaluated for evidence of corrosion. It would be recommended to limit the residence time to 8 hours; however, there is not a feasible option to reduce residence time. It is recommended to increase the velocity in the force main to help reduce the amount of solids that settle in the force main. Also see comments on velocity.
- **Pump Capacities**
  - *Comments*: The pump capacity field tests completed in 2010 showed that the pumps are operating at about 20 percent of original design capacity.
  - *Recommendation*: Confirm capacities of the pumps with drawdown test (see procedure in Appendix B). Confirm if the reduced capacity is a result of pump wear or a higher system head than anticipated for in design. If pump wear is causing the reduced capacity, then replace the pump components when more capacity is needed or replace the entire pump in kind.

- **Station Capacity**
  - *Comments*: The station has a peak hourly inflow range of 10 to 64 gpm. This station is able to receive approximately 276 to 330 gpm more inflow before reaching its original design capacity, which is an increase of approximately 1,290 to 1,540 residential capita.
  - *Recommendation*: Confirm pump capacities with drawdown test (see procedure in Appendix B). The pumps appear to be operating well below original design capacity and the station's inflow is near or at its field tested capacity. This station's capacity may need to be increased in the near future.

STATION: SILVERBEACH			
Location: Separated Sewer Area			
Standby Power: None on site, requires 35 kW gen set		**Response Time**: 21 minutes	
Pumps:	**Number:** 2	**hp**: 7.5	**Installed**: 1973
Firm Capacity:	**Original Design**: 800 gpm	**Field Tested**: 655 gpm	
Force Main Diameter: 8 inches	**Length**: 23 feet		

Issues and Recommendations:

- **Wet Well Access**
  - *Comments*: Notes from 2010 indicate the wet well is in a home's garden area and is overgrown and hard to access.
  - *Recommendation*: Meet with resident to discuss how access to pump station can be maintained.
- **Pump No. 2 Discharge Valve Frozen Open**
  - *Comments*: Notes from 2010 state that the discharge valve for Pump No. 2 is stuck in the open position.
  - *Recommendation*: Plan to replace the valve as soon as possible.
- **Pump Capacities**
  - *Comments*: The pump capacity field tests completed in 1998 and 2010 showed that the pumps are operating at about 82 percent of original design capacity.
  - *Recommendation*: Confirm capacities of the pumps with drawdown test (see procedure in Appendix B). Confirm if the reduced capacity is a result of pump wear or a higher system head than anticipated for in design. If pump wear is causing the reduced capacity, then replace the pump components when more capacity is needed or replace the entire pump in kind.
- **Station Capacity**
  - *Comments*: The station has a peak hourly inflow range of 214 to 326 gpm. This station is able to receive approximately 474 to 586 gpm more inflow before reaching its original design capacity, which is an increase of approximately 2,210 to 2,740 residential capita.
  - *Recommendation*: Confirm pump capacities with drawdown test (see procedure in Appendix B). The pumps appear to be operating well below original design capacity, but the station's inflow is below its original design capacity. This station's capacity most likely does not need to be increased in the near future.
- **Station Age**
  - *Comments*: This station is near or past the typical design life for this type of station.
  - *Recommendation*: This station should be given a thorough evaluation to determine its condition and what equipment requires repair or replacement.

STATION: W. BAKERVIEW			
Location: Separated Sewer Area			
Standby Power: None on site, requires 35 kW gen set		**Response Time**: 55 minutes	
Pumps:	**Number:** 2	**hp**: 10	**Installed**: 1998
Firm Capacity:	**Original Design**: 350 gpm	**Field Tested**: 244 gpm	
Force Main Diameter: 4 inches	**Length**: 831 feet		

Issues and Recommendations:

- **High Force Main Velocity**
  - *Comments*: The original design capacity and the 4-inch force main produces a velocity higher than recommended. High velocities increase water hammer, abrasion, and wear in the force main.
  - *Recommendation*: Confirm capacities of the pumps with drawdown test (see procedure in Appendix B). Confirm the size of the force main. Conduct a water hammer analysis to confirm if current operation may be damaging the force main.
- **Pump Capacities**
  - *Comments*: The pump capacity field tests completed in 1998 and 2010 showed that the pumps are operating at about 70 percent of original design capacity.
  - *Recommendation*: Confirm capacities of the pumps with drawdown test (see procedure in Appendix B). Confirm if the reduced capacity is a result of pump wear or a higher system head than anticipated for in design. If pump wear is causing the reduced capacity, then replace the pump components when more capacity is needed or replace the entire pump in kind.
- **Station Capacity**
  - *Comments*: The station has a peak hourly inflow range of 92 to 165 gpm. This station is able to receive approximately 185 to 258 gpm more inflow before reaching its original design capacity, which is an increase of approximately 870 to 1,200 residential capita.
  - *Recommendation*: Confirm pump capacities with drawdown test (see procedure in Appendix B). The pumps appear to be operating well below original design capacity, but the station's inflow is still below its original design capacity. This station's capacity most likely does not need to be increased in the near future.

STATION: W. MAPLEWOOD			
Location: Separated Sewer Area			
Standby Power: None on site, requires 35 kW gen set			**Response Time**: 24 minutes
Pumps:	**Number:** 2	**hp**: 5	**Installed**: 2013
Firm Capacity:	**Original Design**: 350 gpm		**Field Tested**: 441 gpm
Force Main Diameter: 8 inches		**Length**: 75 feet	

Issues and Recommendations:

- **Leaking Conduit**
  - *Comments*: Notes from 2010 indicate that there is a conduit leaking water into the PLC cabinet.
  - *Recommendation*: Repair the leaking conduit in the PLC cabinet.
- **Wet Well Fouling**
  - *Comments*: Notes from 2010 indicate there is frequent and heavy fouling in the wet well that requires vactoring.
  - *Recommendation*: Identify sources that may be causing fouling or include vactoring this station's wet well into a regular maintenance routine.
- **Low Force Main Velocity**
  - *Comments*: The field tested capacities and the 8-inch force main produce a velocity lower than recommended. Low velocities allow solids to settle out which reduces pump capacity and can cause corrosion issues in the force main.
  - *Recommendation*: Confirm capacities of the pumps with drawdown test (see procedure in Appendix B). The force main should be evaluated for evidence of corrosion. The minimum recommended flow for an 8-inch force main is 470 gpm.
- **Pump Capacities**
  - *Comments*: The pump capacity field tests completed in 1998 and 2010 were significantly different. By averaging the data provided, they are operating at about 126 percent of original design capacity.
  - *Recommendation*: Confirm capacities of the pumps with drawdown test (see procedure in Appendix B). Confirm if the increased capacity is a result of lower system head than anticipated for in design or from refurbishment of the pump.
- **Station Capacity**
  - *Comments*: The station has a peak hourly inflow range of 98 to 198 gpm. This station is able to receive approximately 152 to 252 gpm more inflow before reaching its original design capacity, which is an increase of approximately 710 to 1,180 residential capita.
  - *Recommendation*: Confirm pump capacities with drawdown test (see procedure in Appendix B). The pumps appear to be operating above original design capacity, and the station's inflow is still below its original design capacity. This station's capacity most likely does not need to be increased in the near future.
- **Station Age**
  - *Comments*: This station is near or past the typical design life for this type of station.
  - *Recommendation*: This station should be given a thorough evaluation to determine its condition and what equipment requires repair or replacement.

STATION: WILLOW			
Location: Separated Sewer Area			
Standby Power: 232 kW generator	**Response Time**: 28 minutes		
Pumps:	**Number:** 2	**hp**: 47	**Installed**: 1985
Firm Capacity:	**Original Design**: 500 gpm		**Field Tested**: 346 gpm
Force Main Diameter: 6 inches	**Length**: 2,556 feet		

Issues and Recommendations:

- **Electrical Shack**
  - *Comments*: Notes from 2010 indicate that the electrical shack is in very poor condition and needs rebuilding.
  - *Recommendation*: Rebuild the electrical shack.
- **Force Main Residence Time**
  - *Comments*: The station's pump run times are very low which increases the residence time of sewage in the force main. This can cause odor and corrosion issues in the downstream collection system.
  - *Recommendation*: The residence time during average flow periods is approximately 14 hours. Long residence times tend to produce odor and corrosion issues. The downstream gravity sewer system force main should be evaluated for evidence of corrosion. It would be recommended to limit the residence time to 8 hours; however, there is not a feasible option to reduce residence time.
- **Pump Capacities**
  - *Comments*: The pump capacity field tests completed in 1998 and 2010 showed that the pumps are operating at about 71 percent of original design capacity.
  - *Recommendation*: Confirm capacities of the pumps with drawdown test (see procedure in Appendix B). Confirm if the reduced capacity is a result of pump wear or a higher system head than anticipated for in design. If pump wear is causing the reduced capacity, then replace the pump components when more capacity is needed or replace the entire pump in kind.
- **Station Capacity**
  - *Comments*: The station has a peak hourly inflow range of 147 to 259 gpm. This station is able to receive approximately 241 to 353 gpm more inflow before reaching its original design capacity, which is an increase of approximately 1,130 to 1,650 residential capita.
  - *Recommendation*: Confirm pump capacities with drawdown test (see procedure in Appendix B). The pumps appear to be operating well below original design capacity and the station's inflow is near or at its field tested capacity. This station's capacity may need to be increased in the near future.
- **Station Age**
  - *Comments*: This station is near or past the typical design life for this type of station.
  - *Recommendation*: This station should be given a thorough evaluation to determine its condition and what equipment requires repair or replacement.

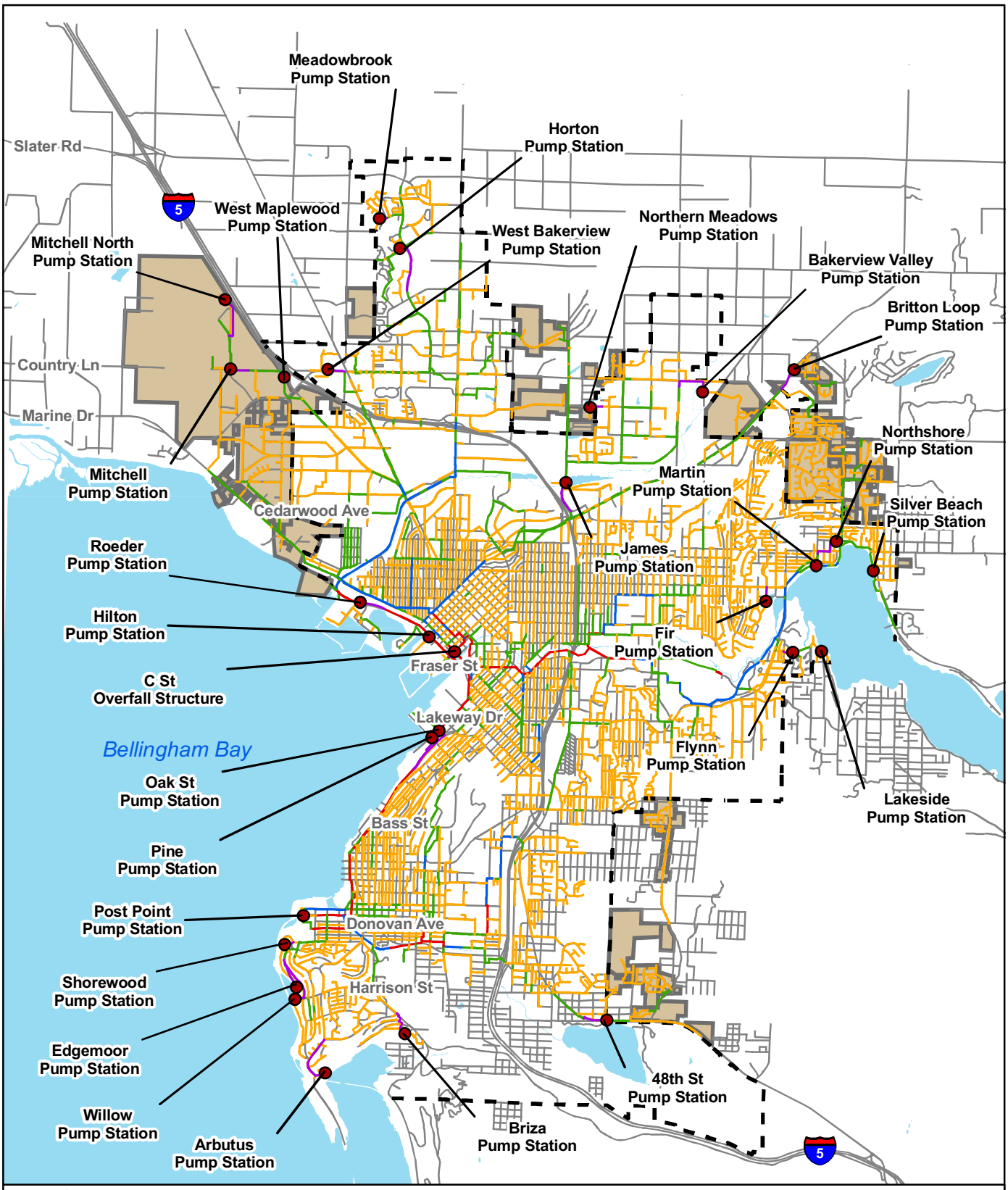
Pump Station Evaluation Summary Table

	Pump Station																									
Issue	**48th Street**	**Arbutas**	**Bakerview Valley**	**Britton Loop**	**Briza**	**C Street**	**Fir Street**	**Flynn Street**	**Hilton**	**Horton**	**James**	**June Road**	**Lakeside**	**Martin Street**	**Meadowbrook**	**Mitchell Way**	**N. Meadows**	**N. Mitchell Way**	**Northshore**	**Oak Street**	**Roeder Avenue**	**Shorewood**	**Silverbeach**	**W. Bakerview**	**W. Maplewood**	**Willow**
Station at or near original design capacity or field tested capacities			x				x			x	x				x	x			x		x	x				x
Station at or near typical design life	x	x			x	x	x	x	x	x	x			x		x			x				x		x	x
Cycling volume in wet well less than recommended for constant speed operation								x	x		x								x							
Drywell floor rust	x					x	x							x												
Long residence time of sewage in force main (low pump run times)	x	x		x	x							x				x	x	x				x				x
Force main velocity lower than recommended		x		x								x	x	x			x					x			x	
Force main velocity higher than recommended																x						x		x		
Very high pump run time due to running at reduced speed on VFDs.																				x	x					
Ragging of pump or wet well											x				x					x	x				x	
Other issues (see specific pump station reviews)		x						x							x	x							x		x	x

Note: This summary table is not intended to be inclusive of every issue discussed in the memo, but only repeated issues relevant to more than one station.

Appendix A

Combined and Separated Sewer Areas



Legend

- Lift Station
- Pipe Diameter
  - 4 - 8"
  - 10 - 18"
  - 20 - 28"
  - 30 - 60"
  - Force Main
- Streets
- City Limits
- Extended Sewer Service Zone

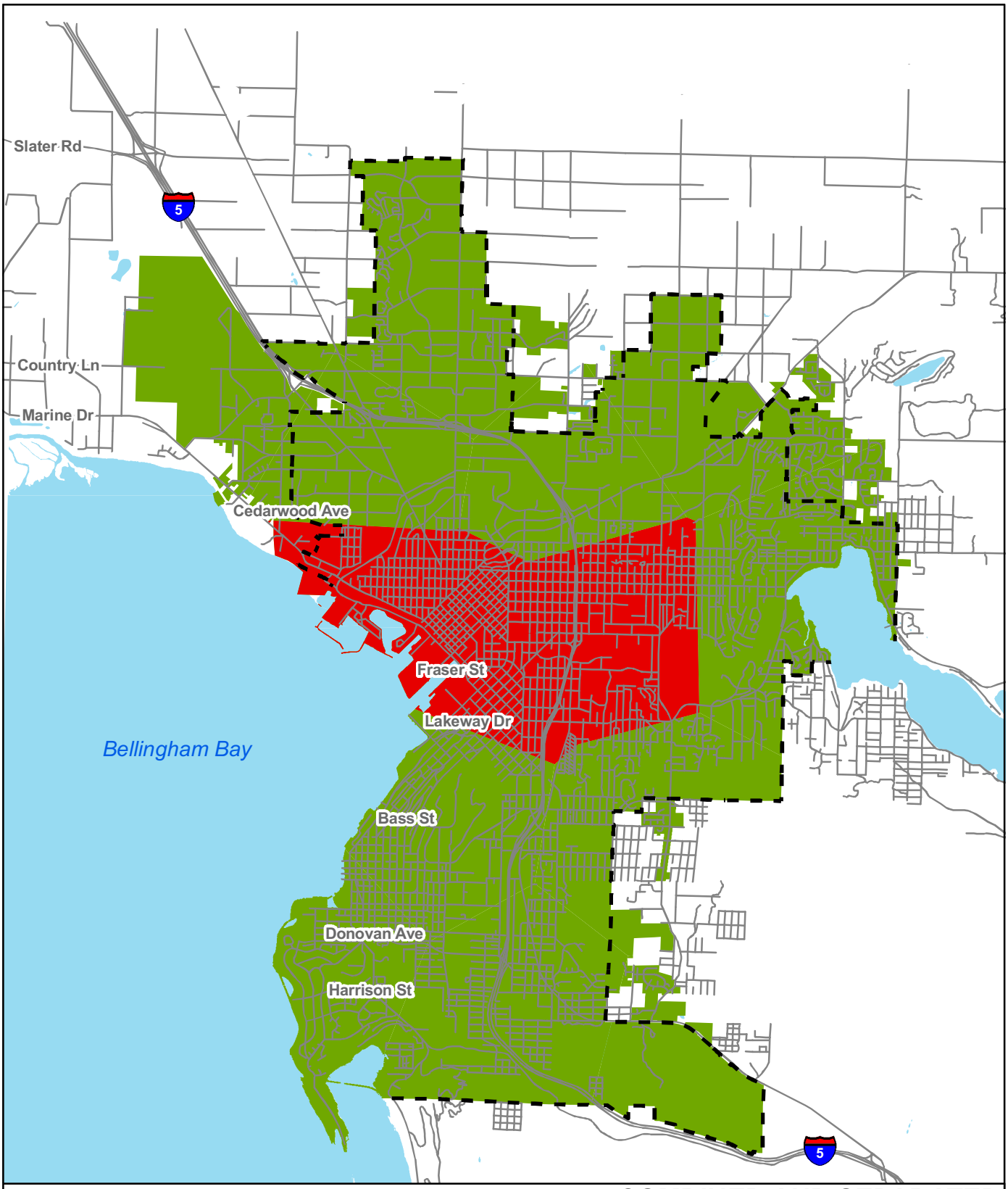
Miles
0 0.8 1.6

EXISTING SEWER SYSTEM

FIGURE 5.2

CITY OF BELLINGHAM
COMPREHENSIVE SEWER PLAN

carollo
Engineers...Working Wonders With Water™



Legend

- Streets
- City Limits
- Combined Sewer
- Separated Sewer

N

0 0.8 1.6 Miles

COMBINED AND SEPARATED SEWER AREAS

FIGURE 6.9

CITY OF BELLINGHAM
COMPREHENSIVE SEWER PLAN

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Appendix B

Pump Draw Down Testing Procedure

City of Bellingham - Pump Draw Down Testing Procedure

> The tabs on this spreadsheet are designed to calculate the flows currently available from each pump at any given pump station.
> It averages the inflow into the station before and after the draw down test to account for the flow coming into the station during the draw down test.
> To increase accuracy, it calculates the volume being pumped and subtracts the volume of items or equipment that may be present in the pumped volume.

Needed for test:

Wet well diameter or length and width (select the proper spreadsheet tab for the wet well type)
Approx. height and width of grout hopper in round wet well if it will be in the operating range (only in round wet well spreadsheet)
Approx. size (in cubic feet) of any equipment in the operating range
Stopwatch
A way to measure the change in water level (level transducer, rod stuck in wet well with tape spaced a set distance apart, tubing on a pump suction tap in dry well, etc.)
Manual operation of pumps

Instructions:

The stopwatch should run continuously through all pump tests at each station.
Only fill in the ORANGE and BLUE boxed and colored spreadsheets cells.
This spreadsheet could be populated during the actual pump test or the PRINTABLE tab could be printed and used during the pump test.
Familiarize yourself with the spreadsheet inputs before getting started.
Ideally, each pump should be run 3 times before moving on to the next pump, but if flow is low, fewer tests can be performed and the spreadsheet can be modified.
When the water depth reaches the influent pipe invert, the depth and time are recorded and the pump is started all at the same time.
Similarly, when the water depth reaches the desired depth, the depth and time are recorded and the pump is turned off all at the same time.
The inflow calculated at the end of each pump test will be used for the inflow at the beginning of the next pump test; the test runs continuously.

Step by Step Instructions (Print these instructions out):

1) Fill in Orange cells

2) Pump down wet well. After pump stops, immediately:
   a) Start stopwatch (Run stopwatch continuously through all tests)
   b) Record Depth (Row 14); wet well is filling
   c) Confirm Start Time is 0 Minutes and 0 Seconds (Rows 17 & 18)

3) When the water depth rises to the pipe invert:
   a) Record Depth (Row 15)
   b) Record Stop Time in Minutes and Seconds (Rows 19 & 20)

4) Turn on pump
   a) Depth and Start Time are already recorded from last step

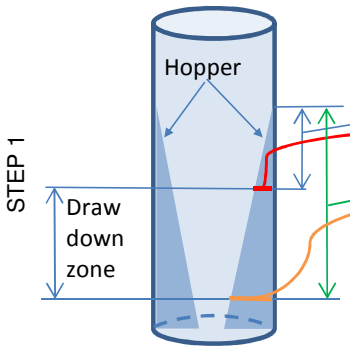
5) When water reaches desired depth:
   a) Turn off pump
   b) Record Depth (Row 25)
   c) Record Stop Time in Minutes and Seconds (Rows 28 & 29)

6) The Depth and Start Time are already recorded from the last step

7) When the water depth rises to the pipe invert:
   a) Record Depth (Row 33)
   b) Record Stop Time in Minutes and Seconds (Rows 37 & 38)

8) Repeat steps 4 through 7

City of Bellingham
Pump Test Spreadsheet for Round Wet Well



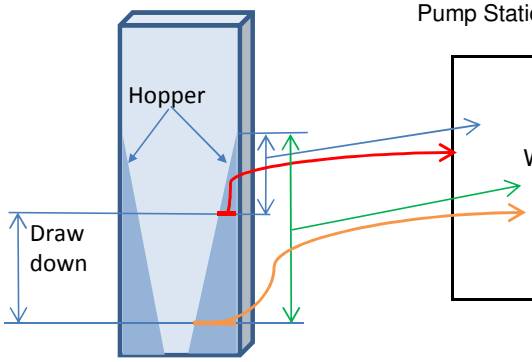
STEP 1

Test Date:		
Pump Station:		
Pump Station Wet Well Diameter =		ft
Height of grout hopper above draw down zone =		ft
Width of grout hopper at top of draw down zone =		ft
Height of draw down zone in grout hopper =		ft
Width of draw down zone in grout hopper =		ft
Appr. Vol. of any equipment in draw down =		ft^3
Wet Well Volume (gallons per foot depth) =	-	gallons

		PUMP NO _____					
		Test 1		Test 2		Test 3	
STEPS 2 & 3 Base Flow (inflow) before Pumping	Depth at beginning [after pump down] =		ft	-	ft	-	ft
	Depth at end of fill =		ft	-	ft	-	ft
	Volume of base flow entering station =	-	gal	-	gal	-	gal
	Start Time =	0	min	-	min	-	min
		0	sec	-	sec	-	sec
	Stop time =		min	-	min	-	min
			sec	-	sec	-	sec
	Time Elasped =	-	min	-	min	-	min
	Base flow before pump test =	#DIV/0!	gpm	#DIV/0!	gpm	#DIV/0!	gpm
STEPS 4, 5 & 6 Run Pump	Depth when pump starts =	-	ft	-	ft	-	ft
	Depth when pump stops =		ft		ft		ft
	Start Time =	-	min	-	min	-	min
		-	sec	-	sec	-	sec
	Stop time =		min		min		min
			sec		sec		sec
	Time Elasped =	-	min	-	min	-	min
STEP 7 Base Flow (inflow) after Pumping	Depth at beginning [after pump down] =	-	ft	-	ft	-	ft
	Depth at end of test =		ft		ft		ft
	Volume of base flow entering station =	-	gal	-	gal	-	gal
	Start Time =	-	min	-	min	-	min
		-	sec	-	sec	-	sec
	Stop time =		min		min		min
			sec		sec		sec
	Time Elasped =	-	min	-	min	-	min
	Base flow after pump test =	#DIV/0!	gpm	#DIV/0!	gpm	#DIV/0!	gpm
	Average inflow volume during pumping time =	#DIV/0!	gal	#DIV/0!	gal	#DIV/0!	gal
	Volume Pumped =	-	gal	-	gal	-	gal
	Pumping rate =	#DIV/0!	gpm	#DIV/0!	gpm	#DIV/0!	gpm
		average =		**#DIV/0!**	**gpm**		

City of Bellingham
Pump Test Spreadsheet for Rectangular Wet Well

STEP 1



Test Date:		
Pump Station:		
Pump Station Wet Well Length =		ft
Pump Station Wet Well Width =		ft
Height of grout hopper above draw down zone =		ft
Width of grout hopper at top of draw down zone =		ft
Height of draw down zone in grout hopper =		ft
Width of draw down zone in grout hopper =		ft
Appr. Vol. of any equipment in draw down =		ft^3
Wet Well Volume (gallons per foot depth) =	-	gallons

		PUMP NO ____					
		Test 1		Test 2		Test 3	
STEPS 2 & 3 Base Flow (inflow) before Pumping	Depth at beginning [after pump down] =		ft	-	ft	-	ft
	Depth at end of fill =		ft	-	ft	-	ft
	Volume of base flow entering station =	-	gal	-	gal	-	gal
	Start Time =	0	min	-	min	-	min
		0	sec	-	sec	-	sec
	Stop time =		min	-	min	-	min
			sec	-	sec	-	sec
	Time Elasped =	-	min	-	min	-	min
	Base flow before pump test =	#DIV/0!	gpm	#DIV/0!	gpm	#DIV/0!	gpm
STEPS 4, 5 & 6 Run Pump	Depth when pump starts =	-	ft	-	ft	-	ft
	Depth when pump stops =		ft		ft		ft
	Start Time =	-	min	-	min	-	min
		-	sec	-	sec	-	sec
	Stop time =		min		min		min
			sec		sec		sec
	Time Elasped =	-	min	-	min	-	min
STEP 7 Base Flow (inflow) after Pumping	Depth at beginning [after pump down] =	-	ft	-	ft	-	ft
	Depth at end of test =		ft		ft		ft
	Volume of base flow entering station =	-	gal	-	gal	-	gal
	Start Time =	-	min	-	min	-	min
		-	sec	-	sec	-	sec
	Stop time =		min		min		min
			sec		sec		sec
	Time Elasped =	-	min	-	min	-	min
	Base flow after pump test =	#DIV/0!	gpm	#DIV/0!	gpm	#DIV/0!	gpm
	Average inflow volume during pumping time =	#DIV/0!	gal	#DIV/0!	gal	#DIV/0!	gal
	Volume Pumped =	-	gal	-	gal	-	gal
	Pumping rate =	#DIV/0!	gpm	#DIV/0!	gpm	#DIV/0!	gpm
		average =		**#DIV/0!**	**gpm**		

5/15/2013

APPENDIX F

HYDRAULIC CALCULATIONS AND MANUFACTURER PUMP CURVES

Summary of Pump Stations Analyzed

		Existing Force Main								Existing Pumps					Flow				Existing Wet Well					
	Pump Stations Included in Analysis	Pipe Nominal Diameter	Pipe Material	Pipe Inside Diameter	Force Main Length	Pumps Off El.	Top El.	Static Head	Chezy C	Number	Make	Model	Horsepower	Impeller Dia. /Code	Existing PHF	Existing Capacity	Existing Design	Future PHF	Operating Depth (ft)	Diameter (ft)	Operating Volume (gallons)	Surface El.	Bottom El.	Wet Well Depth
1	Arbutus Lift Station	4	DI	3.98	2587	95	207.93	113	110	2	Smith & Loveless	S	10	NA	22 to 38	94	75	311	2.92	4	274	104.18	93	11.18
2	Bakerview Valley Lift Station	4	DI	3.98	1905	125.84	185	59	110	2	Flygt	CP3127	10	481*	96 to 217	137	260	596	3.1	8	1166	140.85	124.14	16.71
3	C' Street Lift Station	6	DI	6.04	100	-2.8	15.93	19	110	2	Smith & Loveless	483	5?	S4M32* - 11?	31 to 52	372	500	1329	3	8	1128	17	-5.88	22.88
4	Horton Lift Station	8	DI	8.15	2398	141.5	183.93	42	110	2	Flygt	3171.091	20	234	505 to 704	638	600	1305	3.6	8	1354	160.1	140.5	19.6
5	James St. Lift Station	10	CIPP	10	1547	93.3	163.93	71	120	2	Flygt	C3300	88	465*	772 to 1367	1728	1200	3737	3	10	1762	112	91.84	20.16
6	Mitchell Way Lift Station	4	DI	3.98	921	126.25	160.93	35	110	2	Myers?	4VC/4VCX	10	11?	39 to 100	158	350	801	6	8.5	2547	152	124	28
7	North Mitchell Way Lift Station	6	HDPE	6.085	1965	123	145	22	120	2	Flygt	CP3127	7.5	424*	4 to 5	264.5	525	668	2	8	752	139	121	18
8	Northshore Lift Station	10	DI	10.16	1512	305.2	386.93	82	110	2	Smith & Loveless	6D4C	75	12.5"	889 to 1215	1580	1500	878	3	8	1128		305	21.42
9	Edgemoor Lift Station	4	DI	3.98	1557	28.5	99.88	71	120	2	Smith & Loveless	4B2	15	9.5"	to	147	150	268	2	4	188	43	27	16
10	Pine St. Lift Station	8	DI	8.15	100	7.5	8.74	1	110	2	Flygt	CP3085	3	128mm	to			153	3.1	4	291	17	6.5	10.5
11	Roeder Lift Station	18	CON	18	1043	0.75	15.93	15	100	3	Yeomans	1215-4A	75	14.125"	to		4000	12507	SEE ROEDER TAB					
12	West Bakerview Lift Station	4	PVC	4.39	831	162.67	196.93	34	120	2	Meyers	4VH	10	8"	92 to 165	244	350	1190	3.6	8	1354	178.5	160	18.5
13	West Maplewood Lift Station	6	CI	6	97	154.26	167.93	14	NA	2	Smith & Loveless	4B2A	5	S42L23 - 7.5"?	98 to 198	441	350	895	3	8	1128	170.5	150	20.5

Arbutus Lift Station

Design Parameters

New Station or Replace Existing?	**REPLACE**

New Wet Well?	IF NEEDED
New Force Main?	IF NEEDED

Max. Current PHF Flow (gpm)	38
Future PHF Flow (gpm)	311
Tested Capacity (gpm)	94
Current Design Flow (gpm)	75

Existing Pump Station and Force Main Information

Wet Well

Operating Depth (ft)	2.92
Diameter (ft)	4
Operating Volume (gallons)	274.46964
Surface El @ Ex. Wet Well	104.18
Bottom El.	93
Wet Well Depth	11.18
Increased Depth (raise 10 inches)	3.7533333
Increased Volume	352.80002

Existing Force Main

Pipe Nominal Diameter	4
Pipe Material	DI
Pipe Inside Diameter	3.98
Force Main Length	2587
Equivalent Length	2632
Pumps Off El.	95
Top El.	207.93
Velocity @ Current Capacity	2.42
Static Head	112.93
Chezy C	110

Existing Pumps

Number	2
Make	Smith & Loveless
Model	S
Horsepower	10
Impeller Dia./Code	NA

**denotes code*

Local Losses in Existing System

Fitting	Count	Pipe Length	Equivalent
90 deg. Bend	0	20	0
45 deg bend	0	10.6	0
22.5 deg bend	0	10.6	0
Plug Valve	1	12	12
Check Valve	1	33	33
TOTAL			45

Pump and System Curve Data

System Curve

PS Pumping Capacity (gpm) (Q)	Velocity (fps) (V)	Unit Friction head loss	Friction Head Loss	TDH (ft)
0	0.00	0.000	0.0	113
50	1.29	0.003	7.7	121
75	1.93	0.006	16.3	129
79	2.04	0.007	18.0	131
94	2.42	0.009	24.8	138
144	3.71	0.021	54.5	167

Pump Curve

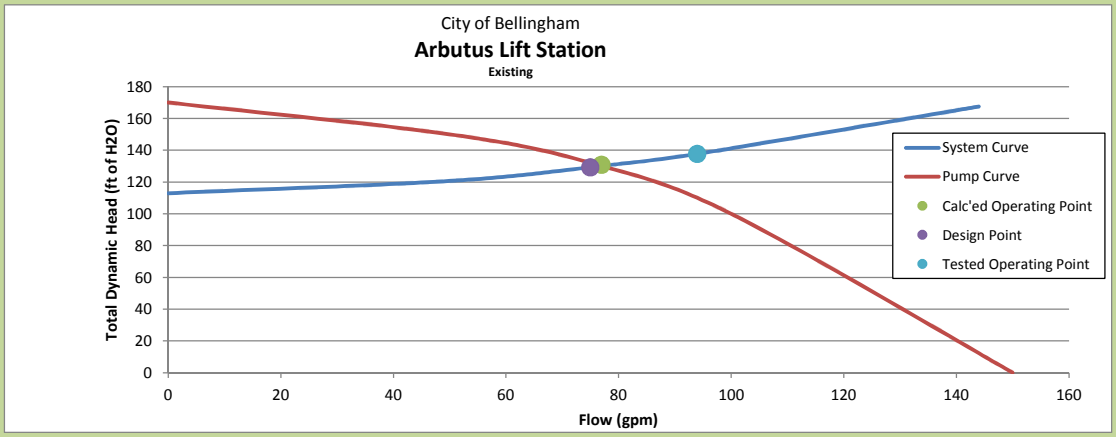
PS Pumping Capacity (gpm) (Q)	TDH (ft)
0	170
50	150
75	132
100	100
150	0

Pump and System Curves

Design Point	Flow (gpm)	Head (ft)
	75	129

Flow and head for operating point determined iteratively

Calculated Operating Point	Flow (gpm)	Head (ft)
	77	131



Arbutus Lift Station

Ex. System Analysis

Existing Force Main Analysis

Existing Force Main Evaluation

Design Flow (gpm)	311
Velocity in Ex. FM	8.02
TDH in Ex. FM	340
New FM?	YES

New force main considered if velocity exceeds 8 ft/s and/or TDH exceeds 200 ft H2O

Existing Wet Well Evaluation

3.7533333	Operating Volume (gallons)	274
311	Design Flow (gpm)	311
1242.9	Max Starts/hr (4V/Q)	17.0
	New Wet Well?	YES

New Wet Well considered if starts/hr > 12

Proposed System

New Force Main Sizing and Pump Selection

Solved by iteration for preferred head (generally less than 200 ft TDH) and velocity conditions (generally b/w 3 and 6 fps)

Material	HDPE
Class/ Thickness	17
Nominal Diameter	6
Inside DIameter	5.799
Chezy C	130
Velocity at Design Flow	3.8
TDH @ Design Flow	114

Proposed Wet Well Diameter

Starts/Hr	12
Op. Volume	388.75 gallons
Op. Depth	3.753333333 ft
Calced Dia.	4.20 ft
WW Dia.	6 ft.
Selected Dia.	6 ft.

Confirm WW is large enough for pumps

Proposed Pumps

Number	2
Make	Flygt
Model	NP3153SH
Horsepower	23
Impeller Dia./Code	274

**denotes code*

Pump and System Curve Data

System Curve

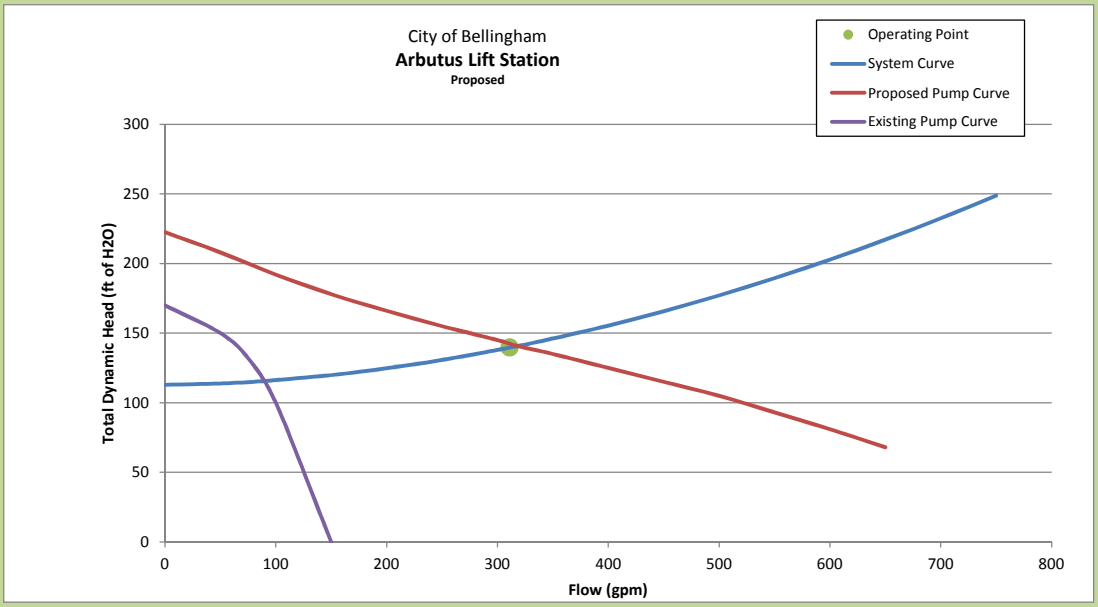
PS Pumping Capacity (gpm) (Q)	Velocity (fps) (V)	Unit Friction head loss	Friction Head Loss	TDH (ft)
0	0.00	0.0000	0.0	113
50	0.61	0.0003	0.9	114
90	1.09	0.0010	2.7	116
150	1.82	0.0026	6.9	120
200	2.43	0.0045	11.8	125
250	3.04	0.0068	17.8	131
311	3.78	0.0101	26.7	140
350	4.25	0.0126	33.2	146
400	4.86	0.0161	42.5	155
450	5.47	0.0201	52.8	166
500	6.07	0.0244	64.1	177
550	6.68	0.0291	76.5	189
600	7.29	0.0341	89.9	203
650	7.90	0.0396	104.2	217
700	8.50	0.0454	119.5	232
750	9.11	0.0516	135.8	249

Pump Curve

PS Pumping Capacity (gpm) (Q)	TDH (ft)
0	222.50
50	208.00
100	192.00
150	178.00
200	166.00
250	155.00
300	145.00
317	141.00
350	135.00
400	125.00
450	115.00
500	105.00
550	93.00
600	81.00
650	68.00
700	55.00

Pump and System Curves

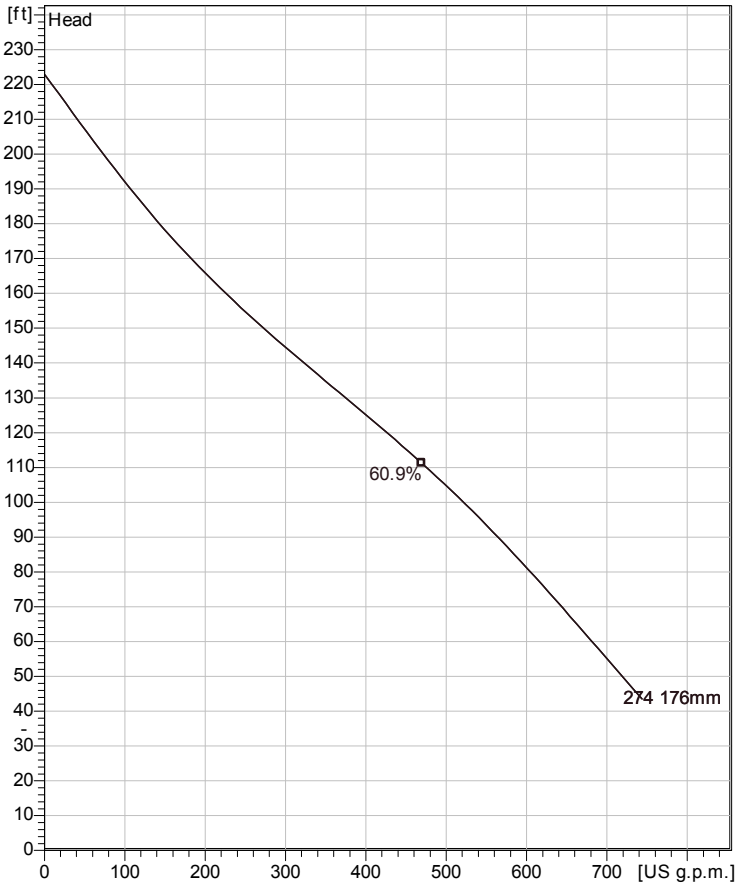
Operating Point	Flow (gpm)	Head (ft)
	311	140



Arbutus Alternative Nos. 1 and 3

NP 3153 SH 3~ 274

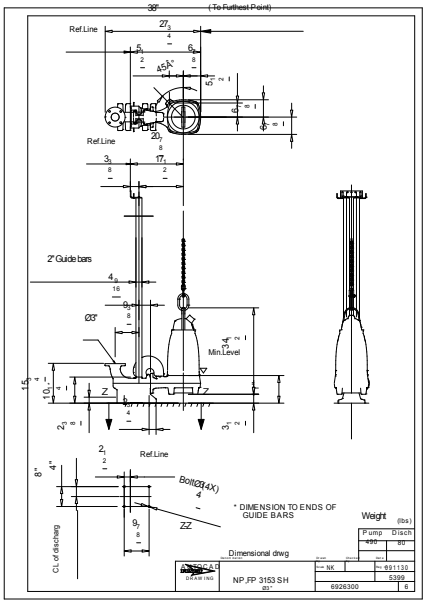
Technical specification



Water, pure *Curve ISO*

Note: Picture might not correspond to the current configuration.

Installation: P - Semi permanent, Wet



General

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Possible to be upgraded with Guide-pin® for even better clogging resistance. Modular based design with high adaptation grade.

Impeller

Impeller material	Grey cast iron
Discharge Flange Diameter	3 1/8 inch
Inlet diameter	80 mm
Impeller diameter	176 mm
Number of blades	2

Motor

Motor #	N3153.181 21-18-2BB-W 23hp
Stator variant	8
Frequency	60 Hz
Rated voltage	200 V
Number of poles	2
Phases	3~
Rated power	23 hp
Rated current	59 A
Starting current	460 A
Rated speed	3505 rpm
Power factor	
1/1 Load	0.92
3/4 Load	0.89
1/2 Load	0.82
Efficiency	
1/1 Load	90.5 %
3/4 Load	91.5 %
1/2 Load	91.5 %

Configuration

Project	Project ID	Created by	Created on	Last update
			2016-03-12 21:42:28	

NP 3153 SH 3~ 274

Performance curve

Pump

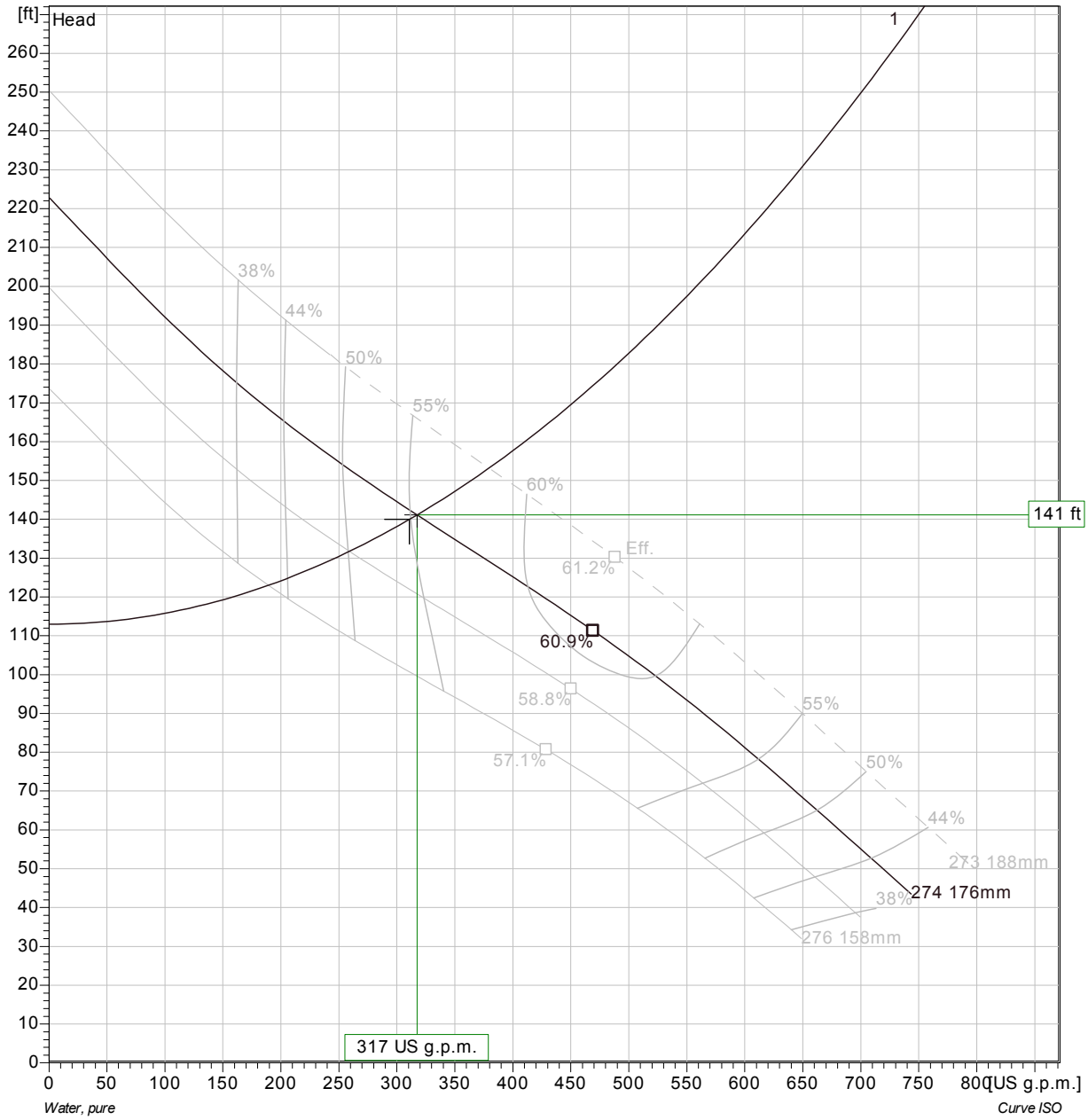
Discharge Flange Diameter	3 1/8 inch
Inlet diameter	80 mm
Impeller diameter	$6^{15}/_{16}$"
Number of blades	2

Motor

Motor #	N3153.181 21-18-2BB-W 23hp
Stator variant	8
Frequency	60 Hz
Rated voltage	200 V
Number of poles	2
Phases	3~
Rated power	23 hp
Rated current	59 A
Starting current	460 A
Rated speed	3505 rpm

Power factor	
1/1 Load	0.92
3/4 Load	0.89
1/2 Load	0.82

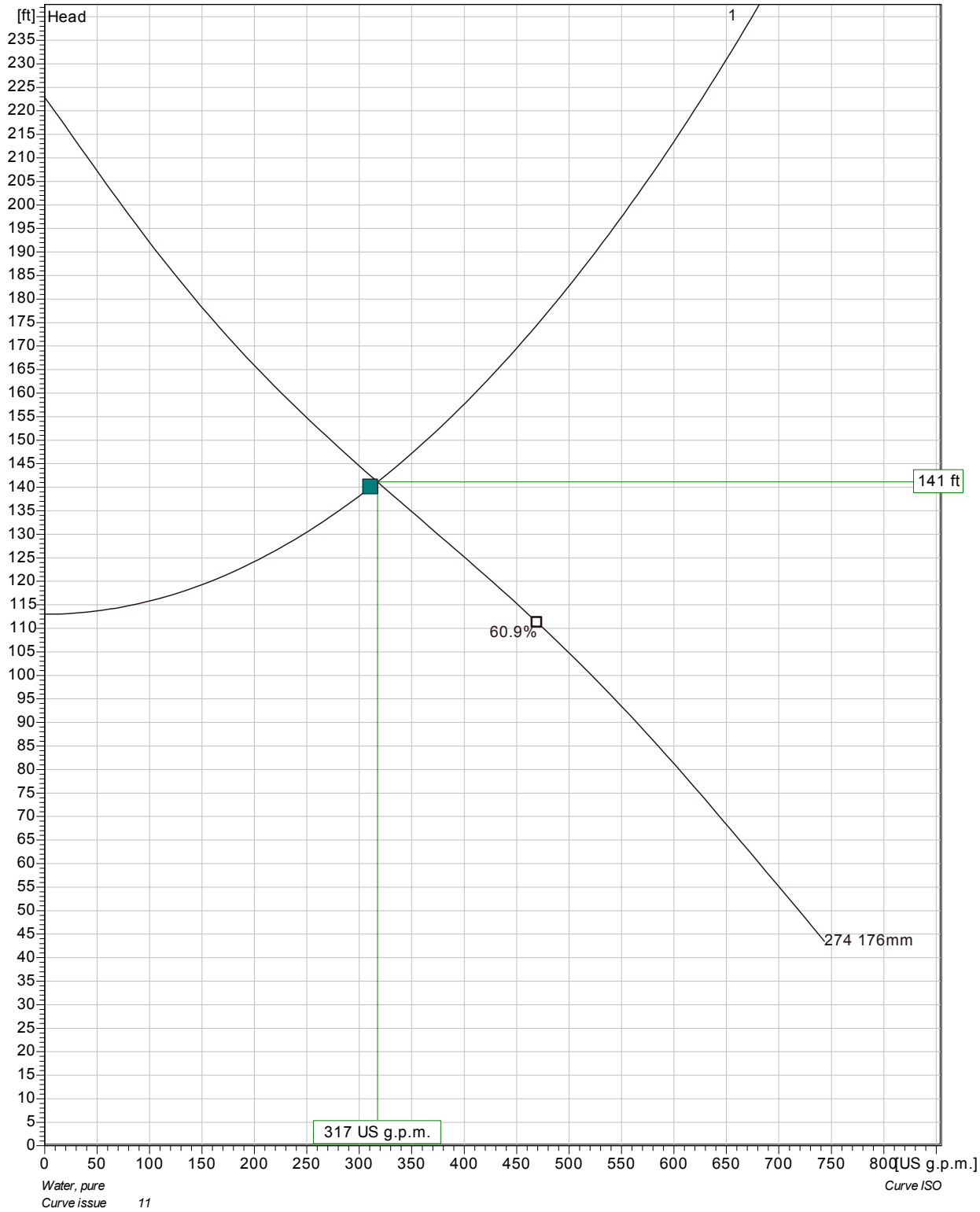
Efficiency	
1/1 Load	90.5 %
3/4 Load	91.5 %
1/2 Load	91.5 %



Project	Project ID	Created by	Created on	Last update
			2016-03-12 21:42:28	

NP 3153 SH 3~ 274

Duty Analysis

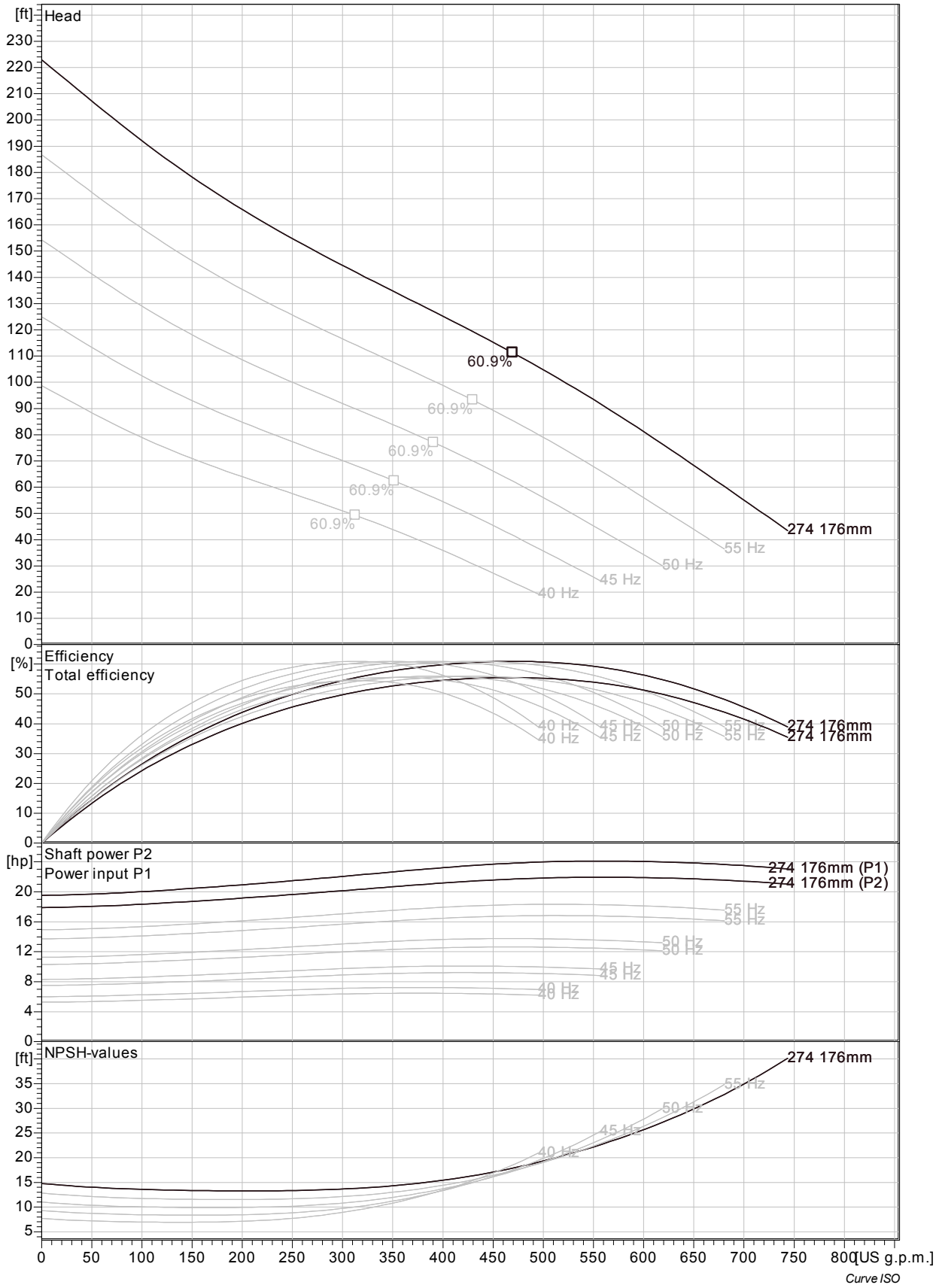


Pumps running /System	Individual pump Flow	Head	Shaft power	Total Flow	Head	Shaft power	Pump eff.	Specific energy	NPSHre
1	317 US g.p.m.	141 ft	20.3 hp	317 US g.p.m.	141 ft	20.3 hp	55.7 %	872 kWh/US MG	13.8 ft

Project	Project ID	Created by	Created on	Last update
			2016-03-12 21:42:28	

NP 3153 SH 3~ 274

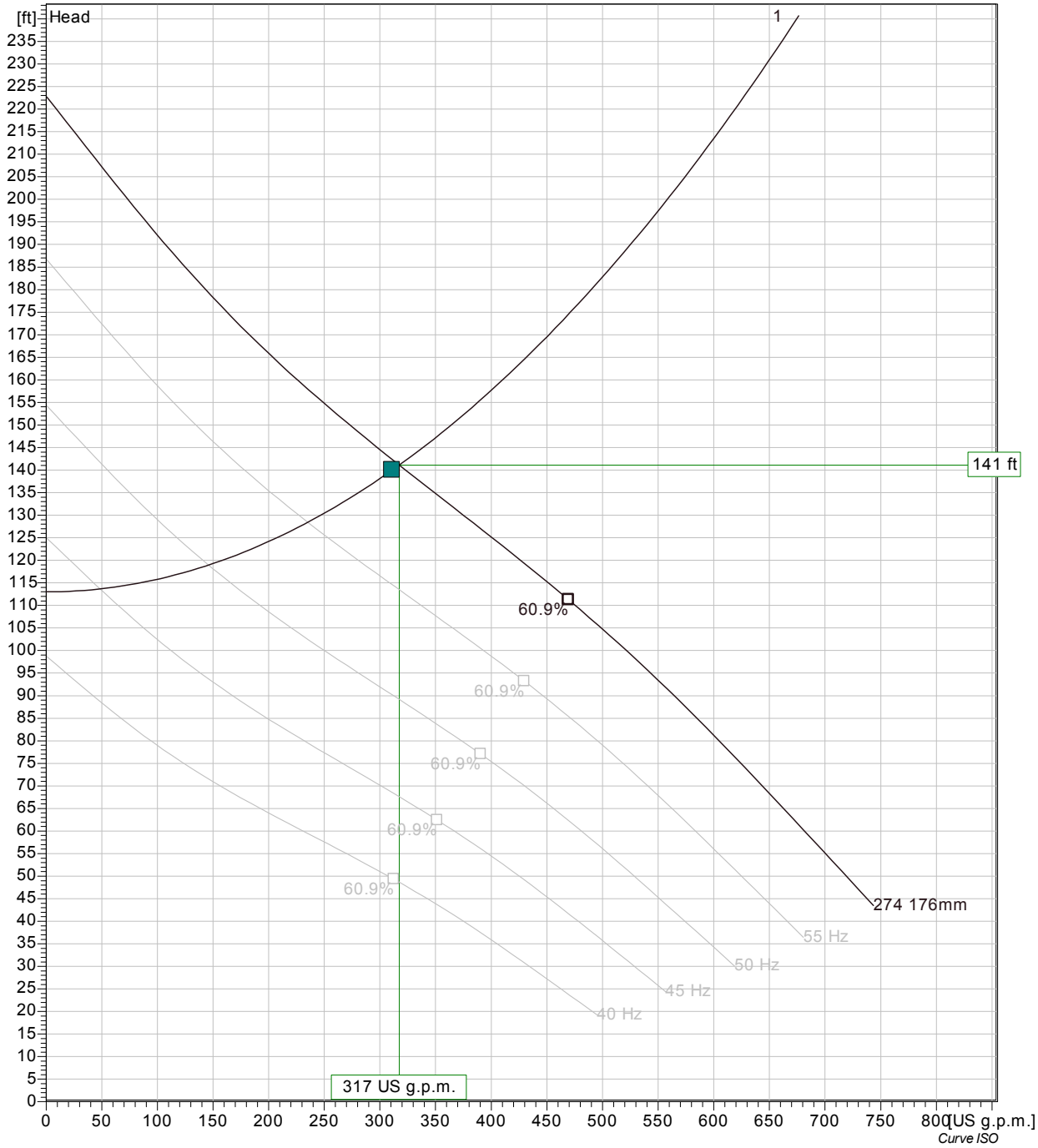
VFD Curve



Project	Project ID	Created by	Created on	Last update
			2016-03-12 21:42:28	

NP 3153 SH 3~ 274

VFD Analysis

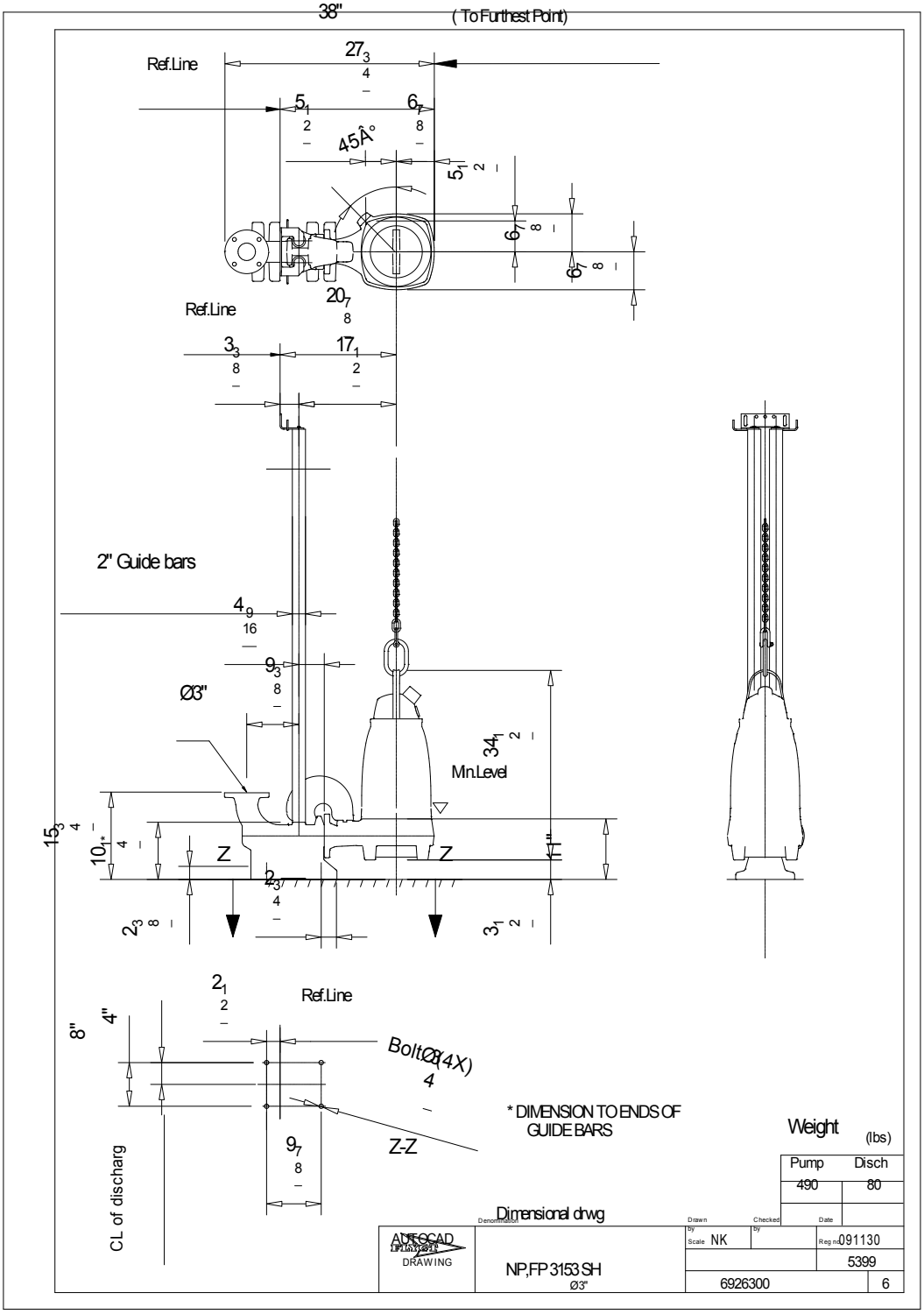


Pumps running /System	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hyd eff.	Specific energy	NPSHre
1	60 Hz	317 US g.p.m.	141 ft	20.3 hp	317 US g.p.m.	141 ft	20.3 hp	55.7 %	872 kWh/US MG	13.8 ft
1	55 Hz	235 US g.p.m.	128 ft	15.1 hp	235 US g.p.m.	128 ft	15.1 hp	50.6 %	869 kWh/US MG	11.6 ft
1	50 Hz	146 US g.p.m.	119 ft	10.9 hp	146 US g.p.m.	119 ft	10.9 hp	40.2 %	1010 kWh/US MG	9.91 ft
1	45 Hz	48.6 US g.p.m.	114 ft	7.61 hp	48.6 US g.p.m.	114 ft	7.61 hp	18.4 %	2150 kWh/US MG	8.73 ft
1	40 Hz									

Project	Project ID	Created by	Created on	Last update
			2016-03-12 21:42:28	

NP 3153 SH 3~ 274

Dimensional drawing



Project	Project ID	Created by	Created on	Last update
			2016-03-12 21:42:28	

Bakerview Valley Lift Station

Design Parameters

New Station or Replace Existing?	**REPLACE**

New Wet Well?	IF NEEDED
New Force Main?	IF NEEDED

Max. Current PHF Flow (gpm)	217
Future PHF Flow (gpm)	596
Tested Capacity (gpm)	137
Current Design Flow (gpm)	260

Existing Pump Station and Force Main Information

Wet Well

Operating Depth (ft)	3.1
Diameter (ft)	8
Operating Volume (gallons)	1165.556
Surface El @ Ex. Wet Well	140.85
Bottom El.	124.14
Wet Well Depth	16.71

Existing Force Main

Pipe Nominal Diameter	4
Pipe Material	DI
Pipe Inside Diameter	3.98
Force Main Length	1905
Equivalent Length	1950
Pumps Off El.	125.84
Top El.	184.93
Velocity @ Current Capacity	3.53
Static Head	59.09
Chezy C	110

Existing Pumps

Number	2
Make	Flygt
Model	CP3127
Horsepower	10
Impeller Dia./Code	481*

**denotes code*

Local Losses in Existing System

Fitting	Count	Pipe Length	Equivalent
90 deg. Bend	0	20	0
45 deg bend	0	10.6	0
22.5 deg bend	0	10.6	0
Plug Valve	1	12	12
Check Valve	1	33	33
TOTAL			45

Pump and System Curve Data

System Curve

PS Pumping Capacity (gpm) (Q)	Velocity (fps) (V)	Unit Friction head loss	Friction Head Loss	TDH (ft)
0	0.00	0.000	0.0	59
50	1.29	0.003	5.7	65
100	2.58	0.011	20.6	80
137	3.53	0.019	36.8	96
150	3.87	0.022	43.6	103
200	5.16	0.038	74.2	133
217	5.60	0.044	86.3	145
260	6.71	0.062	120.5	180
300	7.74	0.081	157.1	216
400	10.32	0.137	267.4	327
500	12.89	0.207	404.1	463

Pump Curve

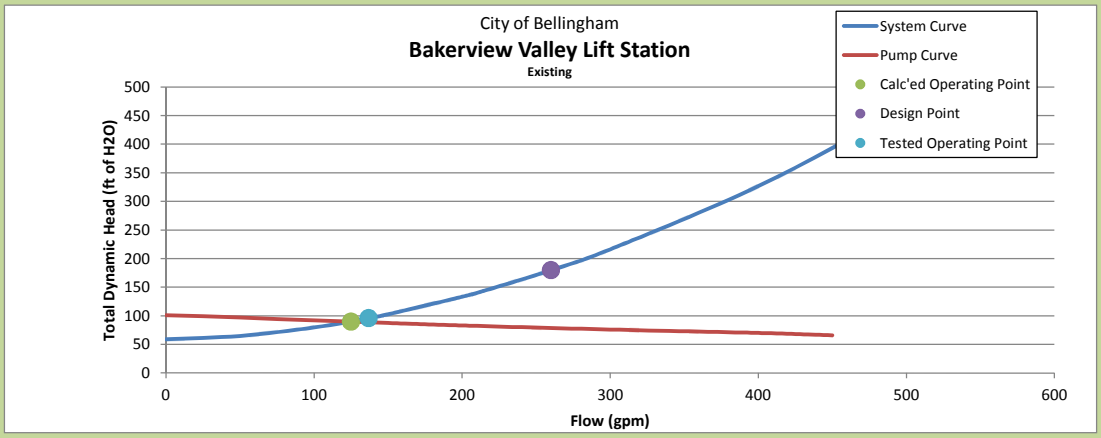
PS Pumping Capacity (gpm) (Q)	TDH (ft)
0	101
50	97
100	92
150	87.5
200	83
300	76
400	70
450	66

Pump and System Curves

Design Point	Flow (gpm)	Head (ft)
	260	180

Flow and head for operating point determined iteratively

Calculated Operating Point	Flow (gpm)	Head (ft)
	125	90



Bakerview Valley Lift Station

Ex. System Analysis

Existing Force Main Analysis

Existing Force Main Evaluation

Design Flow (gpm)	596
Velocity in Ex. FM	15.37
TDH in Ex. FM	618
New FM?	YES

New force main considered if velocity exceeds 8 ft/s and/or TDH exceeds 200 ft H2O

Existing Wet Well Evaluation

Operating Volume (gallons)	1166
Design Flow (gpm)	596
Max Starts/hr (4V/Q)	7.7
New Wet Well?	NO

New Wet Well considered if starts/hr > 12

Proposed System

New Force Main Sizing and Pump Selection

Solved by iteration for preferred head (generally less than 200 ft TDH) and velocity conditions (generally b/w 3 and 6 fps)

Material	HDPE
Class/ Thickness	17
Nominal Diameter	8
Inside DIameter	7.549
Chezy C	130
Velocity at Design Flow	4.3
TDH @ Design Flow	77

NOT USED

Proposed Wet Well Diameter

Starts/Hr	12
Op. Volume	745 gallons
Op. Depth	3.1 ft
Calced Dia.	6.40 ft
WW Dia.	8 ft.
Selected Dia.	8 ft.

Confirm WW is large enough for pumps

Proposed Pumps

Number	2
Make	Flygt
Model	NP3153HT
Horsepower	20
Impeller Dia./Code	261 mm

**denotes code*

Pump and System Curve Data

System Curve

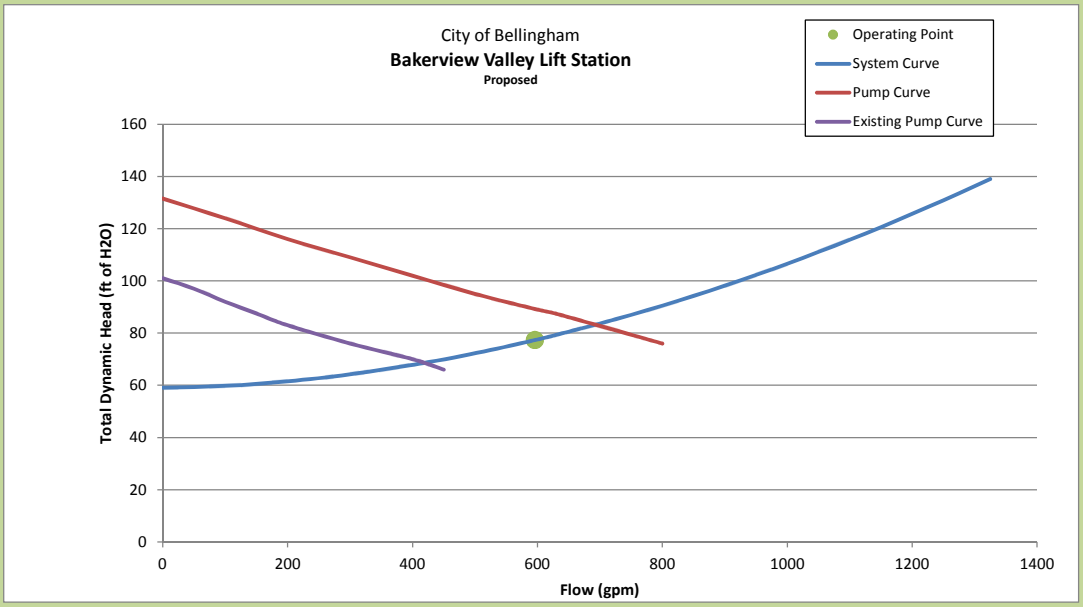
PS Pumping Capacity (gpm) (Q)	Velocity (fps) (V)	Unit Friction head loss	Friction Head Loss	TDH (ft)
0	0.00	0.0000	0.0	59
100	0.72	0.0003	0.7	60
200	1.43	0.0012	2.4	62
300	2.15	0.0026	5.1	64
425	3.05	0.0050	9.8	69
525	3.76	0.0074	14.4	74
596	4.27	0.0093	18.2	77
625	4.48	0.0102	19.9	79
725	5.20	0.0134	26.2	85
825	5.91	0.0171	33.3	92
925	6.63	0.0211	41.1	100
1025	7.35	0.0255	49.7	109
1125	8.06	0.0303	59.0	118
1225	8.78	0.0354	69.1	128
1325	9.50	0.0410	79.9	139

Pump Curve

PS Pumping Capacity (gpm) (Q)	TDH (ft)
0	131.50
100	124.00
200	116.00
300	109.00
400	102.00
500	95.00
600	89.00
633	87.20
800	76.00

Pump and System Curves

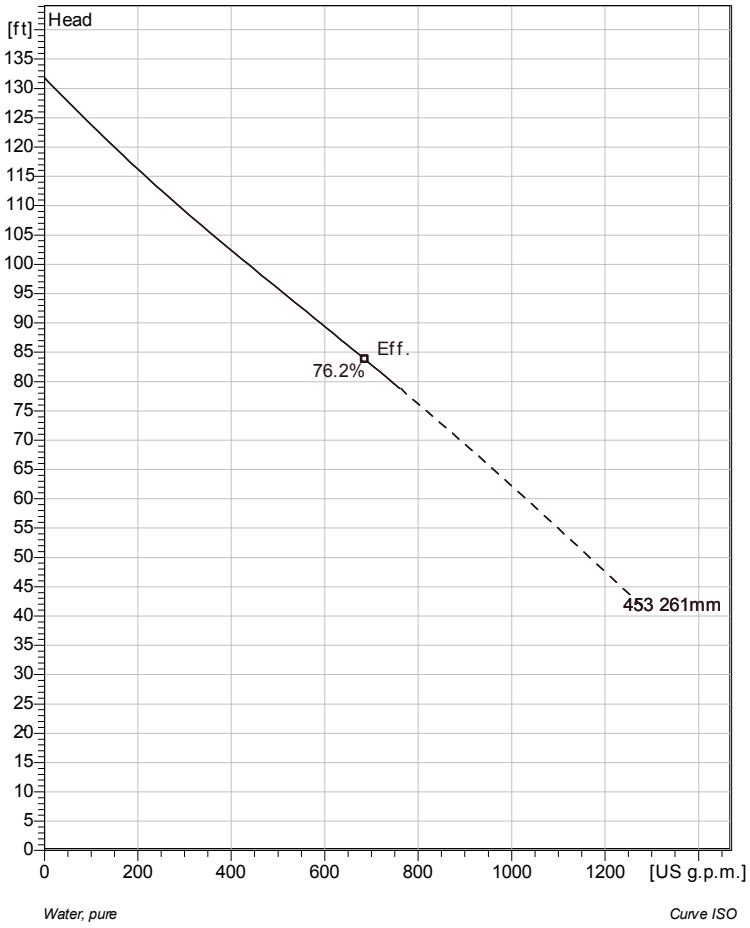
Operating Point	Flow (gpm)	Head (ft)
	596	77



Bakerview Alternative No. 1

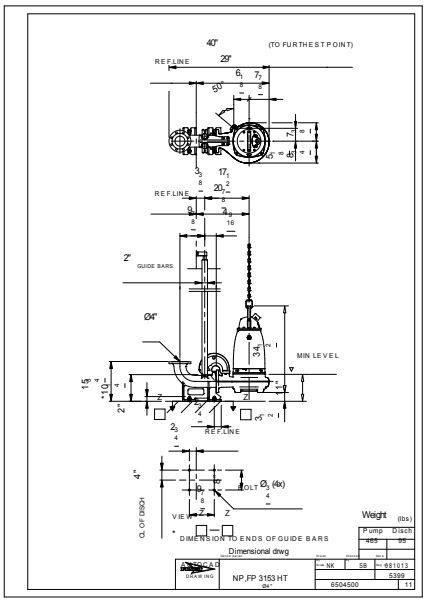
NP 3153 HT 3~ 453

Technical specification



Note: Picture might not correspond to the current configuration.

Installation: P - Semi permanent, Wet



General

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Possible to be upgraded with Guide-pin® for even better clogging resistance. Modular based design with high adaptation grade.

Impeller

Impeller material	Stainless steel
Discharge Flange Diameter	3 15/16 inch
Inlet diameter	3 15/16 inch
Impeller diameter	261 mm
Number of blades	2

Motor

Motor #	N3153.660 21-18-4AA-W 20hp
Stator variant	4
Frequency	60 Hz
Rated voltage	200 V
Number of poles	4
Phases	3~
Rated power	20 hp
Rated current	59 A
Starting current	330 A
Rated speed	1755 rpm
Power factor	
1/1 Load	0.84
3/4 Load	0.79
1/2 Load	0.68
Efficiency	
1/1 Load	87.7 %
3/4 Load	89.2 %
1/2 Load	89.5 %

Configuration

Project	Project ID	Created by	Created on	Last update
			2016-03-12 21:42:28	

NP 3153 HT 3~ 453

Performance curve

Pump

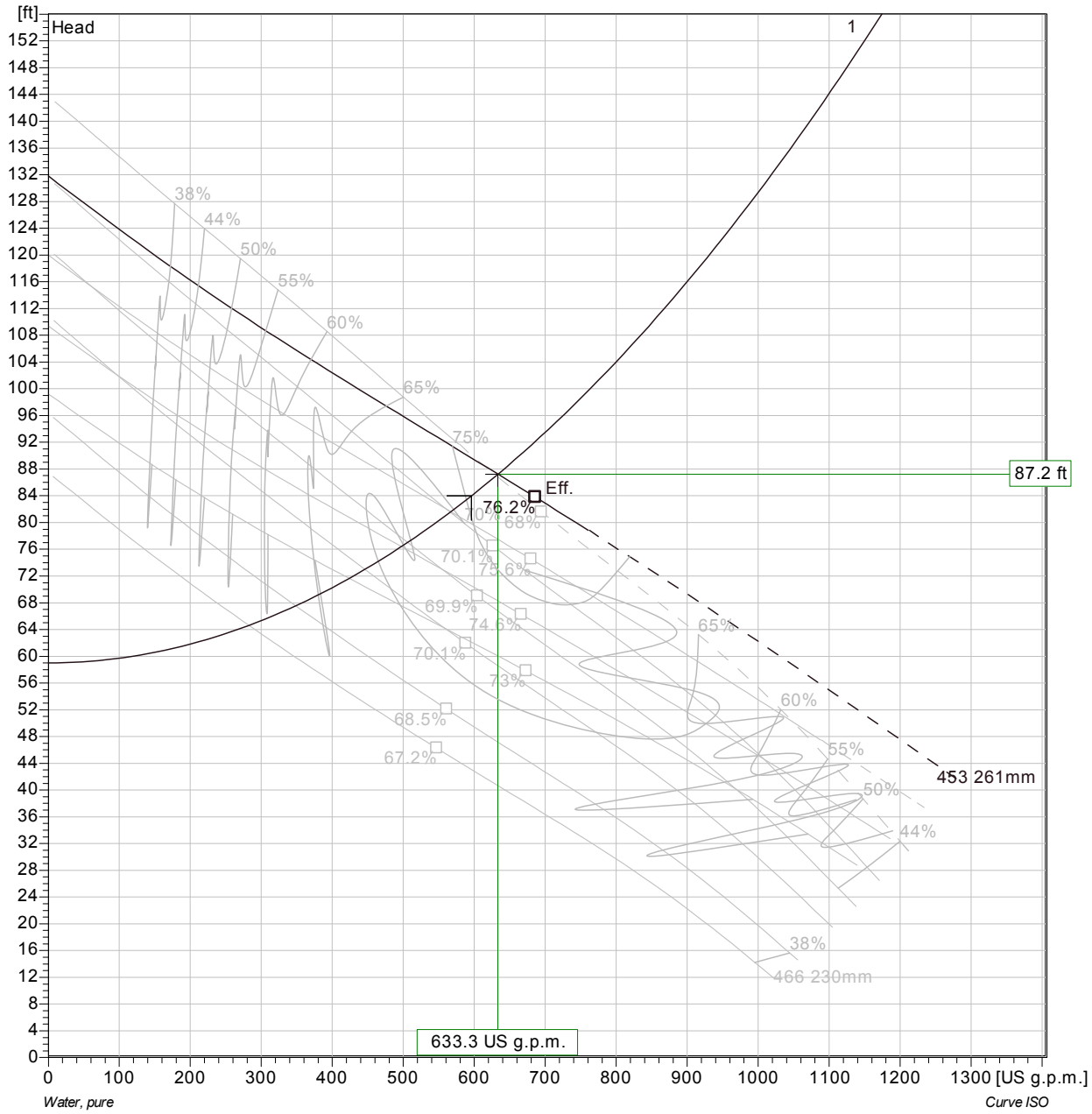
Discharge Flange Diameter	3 15/16 inch
Inlet diameter	100 mm
Impeller diameter	10¼"
Number of blades	2

Motor

Motor #	N3153.660 21-18-4AA-W 20hp
Stator variant	4
Frequency	60 Hz
Rated voltage	200 V
Number of poles	4
Phases	3~
Rated power	20 hp
Rated current	59 A
Starting current	330 A
Rated speed	1755 rpm

Power factor	
1/1 Load	0.84
3/4 Load	0.79
1/2 Load	0.68

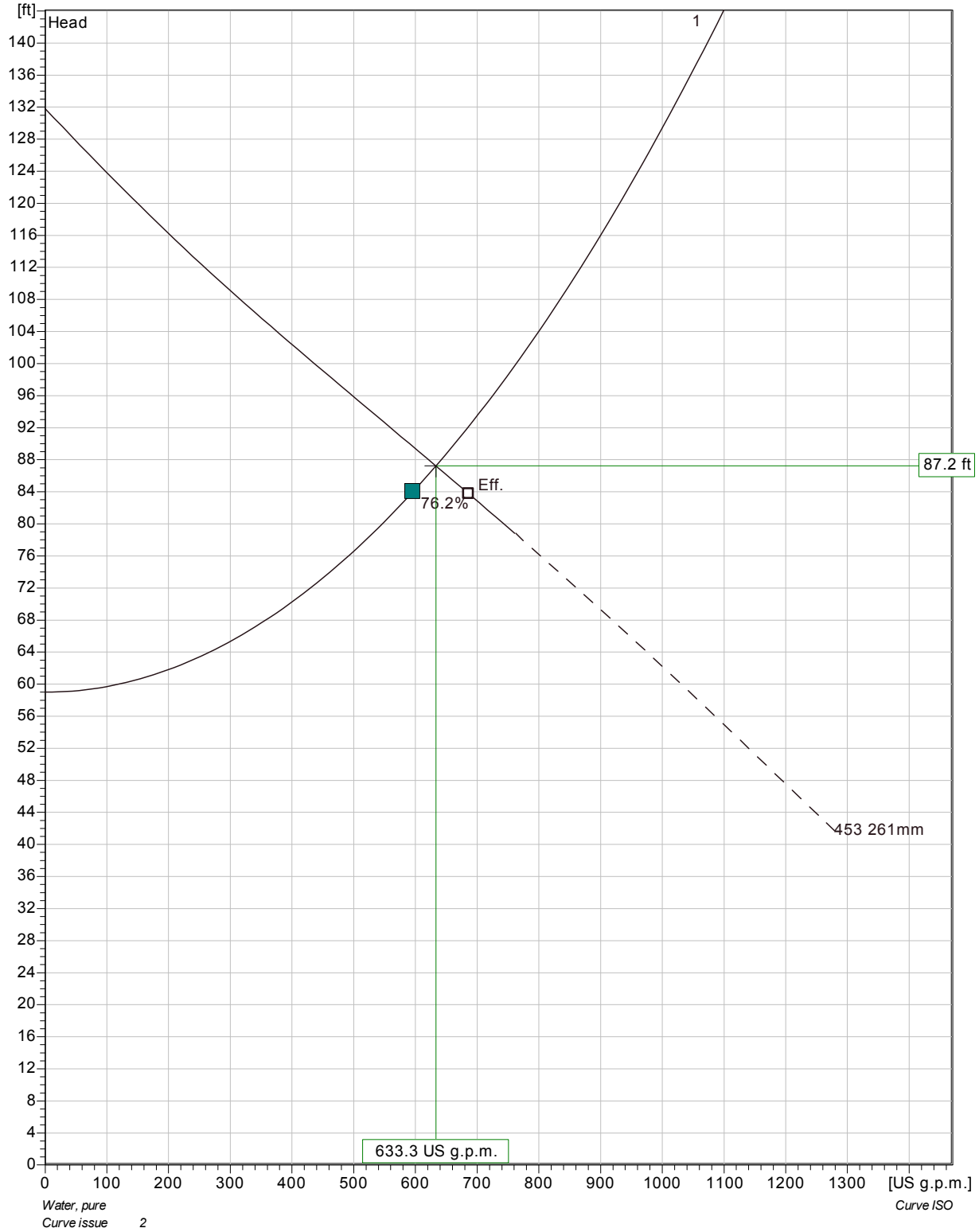
Efficiency	
1/1 Load	87.7 %
3/4 Load	89.2 %
1/2 Load	89.5 %



Project	Project ID	Created by	Created on	Last update
			2016-03-12 21:42:28	

NP 3153 HT 3~ 453

Duty Analysis

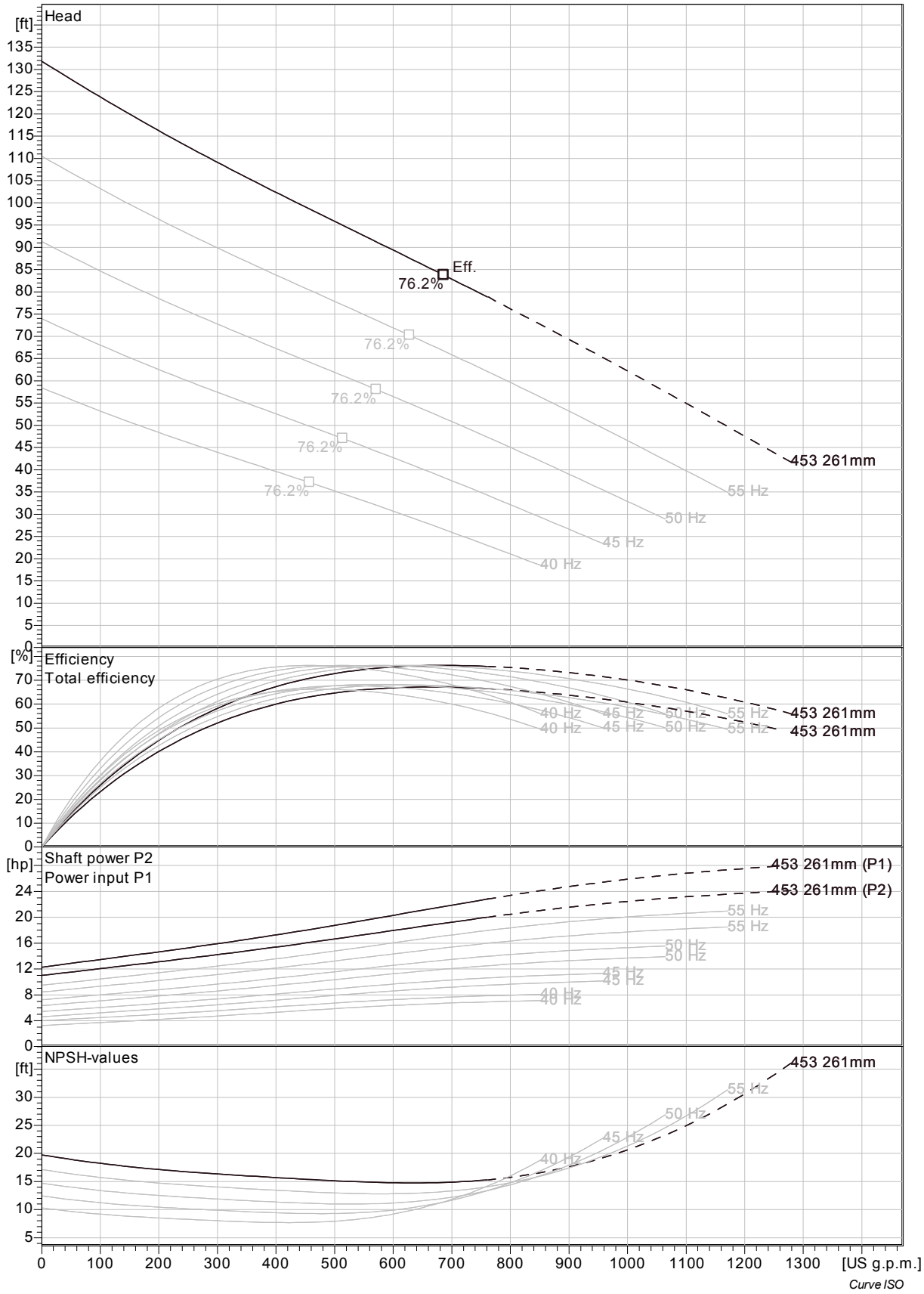


Pumps running /System	Individual pump Flow	Head	Shaft power	Total Flow	Head	Shaft power	Pump eff.	Specific energy	NPSHre
1	633 US g.p.m.	87.2 ft	18.4 hp	633 US g.p.m.	87.2 ft	18.4 hp	76 %	409 kWh/US MG	14.8 ft

Project	Project ID	Created by	Created on	Last update
			2016-03-12 21:42:28	

NP 3153 HT 3~ 453

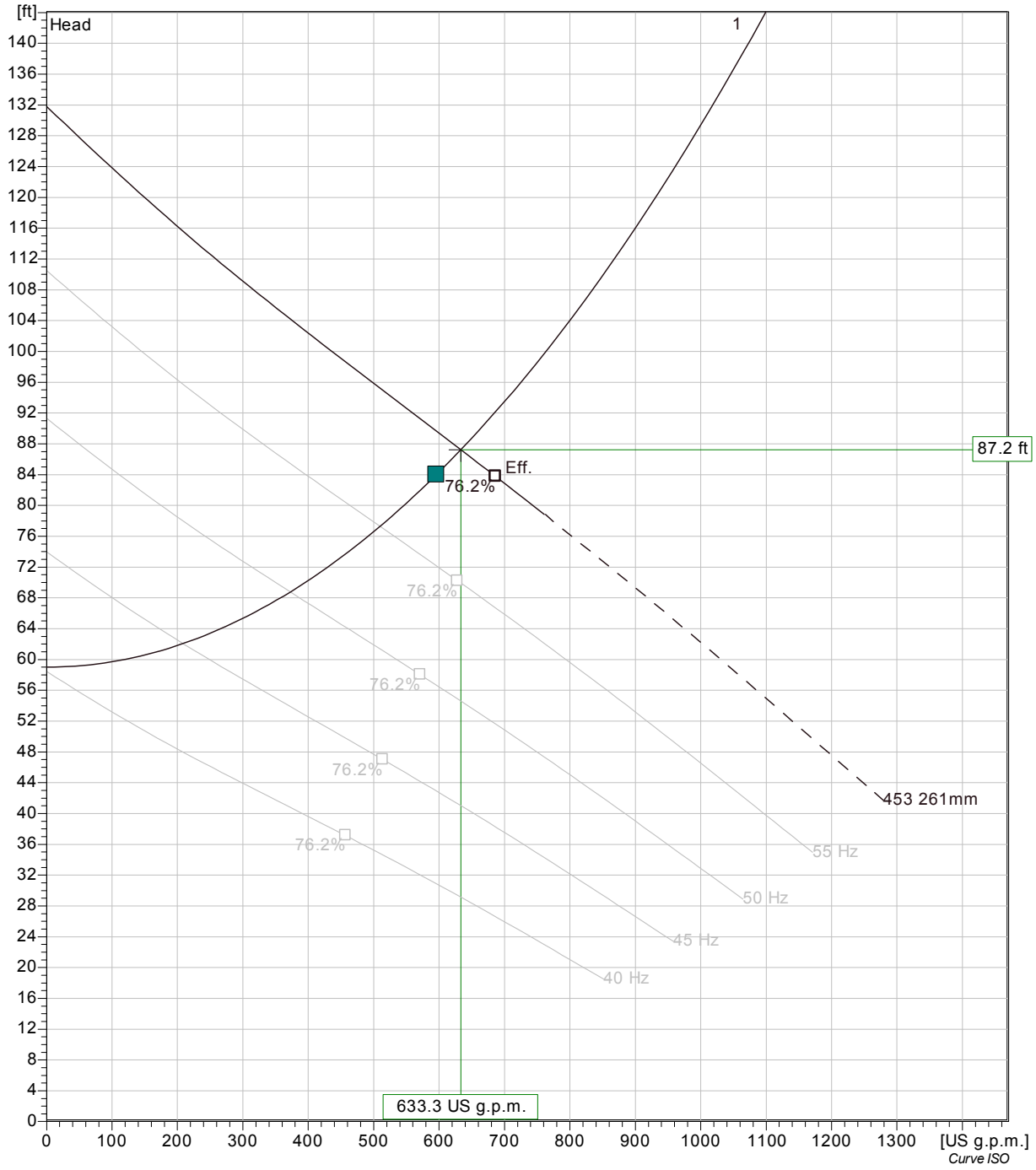
VFD Curve



Project	Project ID	Created by	Created on	Last update
			2016-03-12 21:42:28	

NP 3153 HT 3~ 453

VFD Analysis

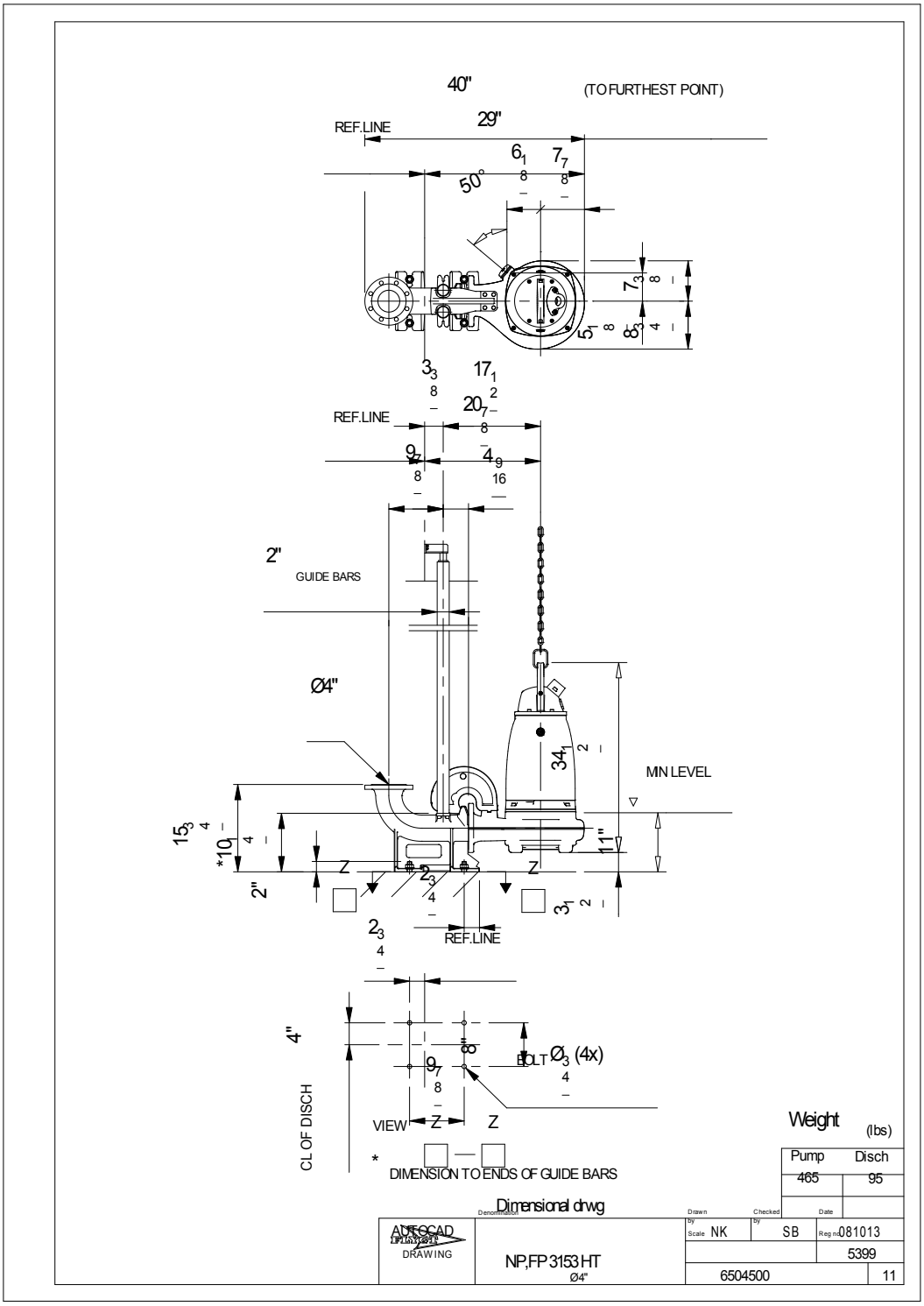


Pumps running /System	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hyd eff.	Specific energy	NPSHre
1	60 Hz	633 US g.p.m.	87.2 ft	18.4 hp	633 US g.p.m.	87.2 ft	18.4 hp	76 %	409 kWh/US MG	14.8 ft
1	55 Hz	510 US g.p.m.	77.3 ft	13.3 hp	510 US g.p.m.	77.3 ft	13.3 hp	74.7 %	363 kWh/US MG	12.9 ft
1	50 Hz	373 US g.p.m.	68.8 ft	9.21 hp	373 US g.p.m.	68.8 ft	9.21 hp	70.3 %	344 kWh/US MG	11.5 ft
1	45 Hz	209 US g.p.m.	62.1 ft	5.88 hp	209 US g.p.m.	62.1 ft	5.88 hp	55.8 %	401 kWh/US MG	10.4 ft
1	40 Hz									

Project	Project ID	Created by	Created on	Last update
			2016-03-12 21:42:28	

NP 3153 HT 3~ 453

Dimensional drawing



Project	Project ID	Created by	Created on	Last update
			2016-03-12 21:42:28	

C' Street Lift Station

Design Parameters

New Station or Replace Existing?	**REPLACE**

New Wet Well?	IF NEEDED
New Force Main?	IF NEEDED

Max. Current PHF Flow (gpm)	52
Future PHF Flow (gpm)	1329
Tested Capacity (gpm)	372
Current Design Flow (gpm)	500

Existing Pump Station and Force Main Information

Wet Well

Operating Depth (ft)	3
Diameter (ft)	8
Operating Volume (gallons)	1127.9574
Surface El @ Ex. Wet Well	17
Bottom El.	-5.88
Wet Well Depth	22.88

Existing Force Main

Pipe Nominal Diameter	6
Pipe Material	DI
Pipe Inside Diameter	6.04
Force Main Length	100
Equivalent Length	145
Pumps Off El.	-2.8
Top El.	15.93
Velocity @ Current Capacity	4.17
Static Head	18.73
Chezy C	110

Existing Pumps

Number	2
Make	Smith & Loveless
Model	483
Horsepower	5?
Impeller Dia./Code	S4M32* - 11?

**denotes code*

Local Losses in Existing System

Fitting	Count	Pipe Length	Equivalent
90 deg. Bend	0	20	0
45 deg bend	0	10.6	0
22.5 deg bend	0	10.6	0
Plug Valve	1	12	12
Check Valve	1	33	33
TOTAL			45

Pump and System Curve Data

System Curve

PS Pumping Capacity (gpm) (Q)	Velocity (fps) (V)	Unit Friction head loss	Friction Head Loss	TDH (ft)
0	0.00	0.000	0.0	19
100	1.12	0.001	0.2	19
200	2.24	0.005	0.7	19
300	3.36	0.011	1.5	20
372	4.17	0.016	2.3	21
475	5.32	0.025	3.6	22
500	5.60	0.027	3.9	23
600	6.72	0.038	5.5	24
700	7.84	0.051	7.4	26
800	8.96	0.065	9.4	28
900	10.08	0.081	11.7	30

Pump Curve

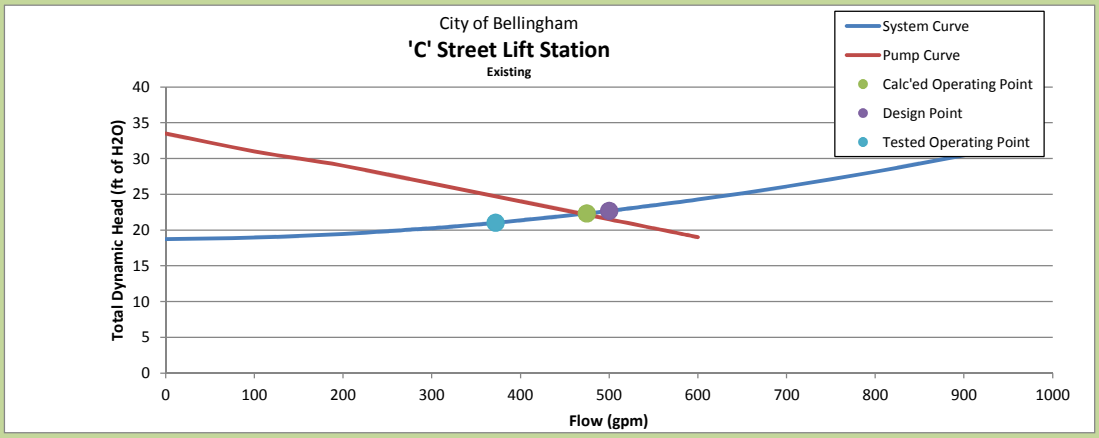
PS Pumping Capacity (gpm) (Q)	TDH (ft)
0	34
100	31
200	29
300	27
400	24
500	22
600	19

Pump and System Curves

Design Point	Flow (gpm)	Head (ft)
	500	23

Flow and head for operating point determined iteratively

Calculated Operating Point	Flow (gpm)	Head (ft)
	475	22



C' Street Lift Station

Ex. System Analysis

Existing Force Main Analysis

Existing Force Main Evaluation

Design Flow (gpm)	1329
Velocity in Ex. FM	14.88
TDH in Ex. FM	43
New FM?	YES

New force main considered if velocity exceeds 8 ft/s and/or TDH exceeds 200 ft H2O

Existing Wet Well Evaluation

Operating Volume (gallons)	1128
Design Flow (gpm)	1329
Max Starts/hr (4V/Q)	17.7
New Wet Well?	YES

New Wet Well considered if starts/hr > 12

Proposed System

New Force Main Sizing and Pump Selection

Solved by iteration for preferred head (generally less than 200 ft TDH) and velocity conditions (generally b/w 3 and 6 fps)

Material	HDPE
Class/ Thickness	17
Nominal Diameter	10
Inside DIameter	9.409
Chezy C	130
Velocity at Design Flow	6.1
TDH @ Design Flow	19

Proposed Wet Well Diameter

Starts/Hr	12
Op. Volume	1661.25 gallons
Op. Depth	3 ft
Calced Dia.	9.71 ft
WW Dia.	10 ft.
Selected Dia.	10 ft.

Confirm WW is large enough for pumps

Proposed Pumps

Number	2
Make	
Model	
Horsepower	
Impeller Dia./Code	

**denotes code*

Pump and System Curve Data

System Curve

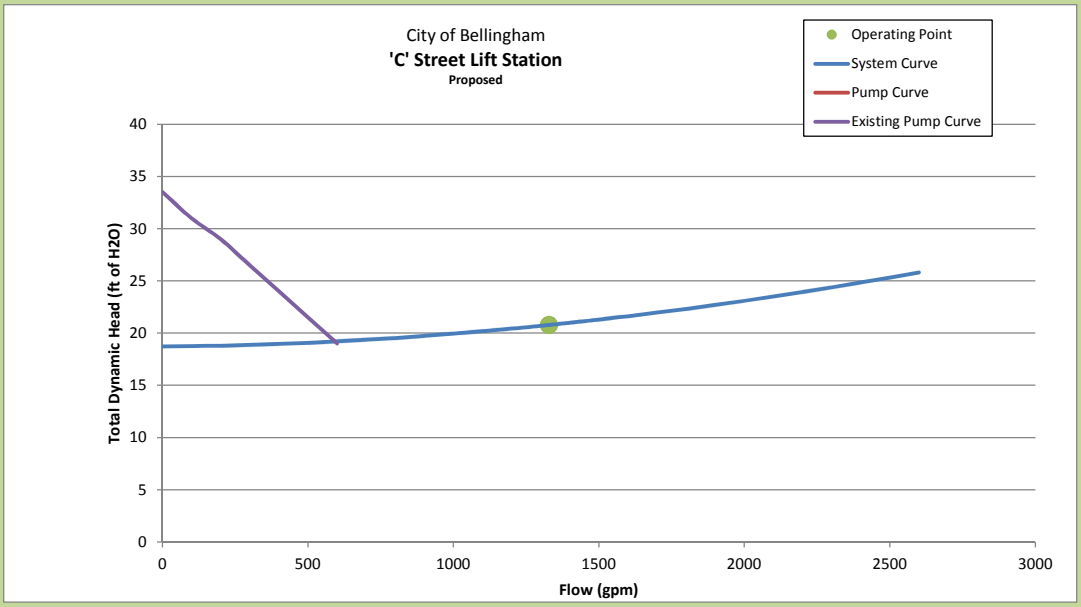
PS Pumping Capacity (gpm) (Q)	Velocity (fps) (V)	Unit Friction head loss	Friction Head Loss	TDH (ft)
0	0.00	0.0000	0.0	19
200	0.92	0.0004	0.1	19
400	1.85	0.0015	0.2	19
600	2.77	0.0032	0.5	19
800	3.69	0.0055	0.8	20
1000	4.61	0.0083	1.2	20
1200	5.54	0.0117	1.7	20
1329	6.13	0.0141	2.0	21
1400	6.46	0.0155	2.3	21
1600	7.38	0.0199	2.9	22
1800	8.31	0.0247	3.6	22
2000	9.23	0.0301	4.4	23
2200	10.15	0.0359	5.2	24
2400	11.07	0.0421	6.1	25
2600	12.00	0.0488	7.1	26
				19

Pump Curve

PS Pumping Capacity (gpm) (Q)	TDH (ft)
0	
200	
400	
600	
800	
1000	
1200	
1329	
1400	
1600	
1800	
2000	
2200	
2400	
2600	

Pump and System Curves

Operating Point	Flow (gpm)	Head (ft)
	1329	21



Horton Lift Station

Design Parameters

New Station or Replace Existing?	**REPLACE**

New Wet Well?	IF NEEDED
New Force Main?	IF NEEDED

Max. Current PHF Flow (gpm)	704
Future PHF Flow (gpm)	1305
Tested Capacity (gpm)	638
Current Design Flow (gpm)	600

Existing Pump Station and Force Main Information

Wet Well

Operating Depth (ft)	3.6
Diameter (ft)	8
Operating Volume (gallons)	1353.5489
Surface El @ Ex. Wet Well	160.1
Bottom El.	140.5
Wet Well Depth	19.6

Existing Force Main

Pipe Nominal Diameter	8
Pipe Material	DI
Pipe Inside Diameter	8.15
Force Main Length	2398
Equivalent Length	2443
Pumps Off El.	141.5
Top El.	183.93
Velocity @ Current Capacity	3.92
Static Head	42.43
Chezy C	110

Existing Pumps

Number	3
Make	Flygt
Model	3171.091
Horsepower	20
Impeller Dia./Code	234

**denotes code*

Existing Pump Station is set up for a third pump to be added.

Local Losses in Existing System

Fitting	Count	Equivalent	Total
90 deg. Bend	0	20	0
45 deg bend	0	10.6	0
22.5 deg bend	0	10.6	0
Plug Valve	1	12	12
Check Valve	1	33	33
TOTAL			45

Pump and System Curve Data

System Curve

PS Pumping Capacity (gpm) (Q)	Velocity (fps) (V)	Unit Friction head loss	Friction Head Loss	TDH (ft)
0	0.00	0.000	0.0	42
200	1.23	0.001	2.8	45
400	2.46	0.004	10.2	53
600	3.69	0.009	21.7	64
645	3.97	0.010	24.8	67
760	4.67	0.014	33.6	76
960	5.90	0.021	51.8	94
1305	8.03	0.037	91.3	134
1500	9.23	0.048	118.2	161
1700	10.46	0.061	149.0	191
2000	12.30	0.082	201.2	244

Pump Curve

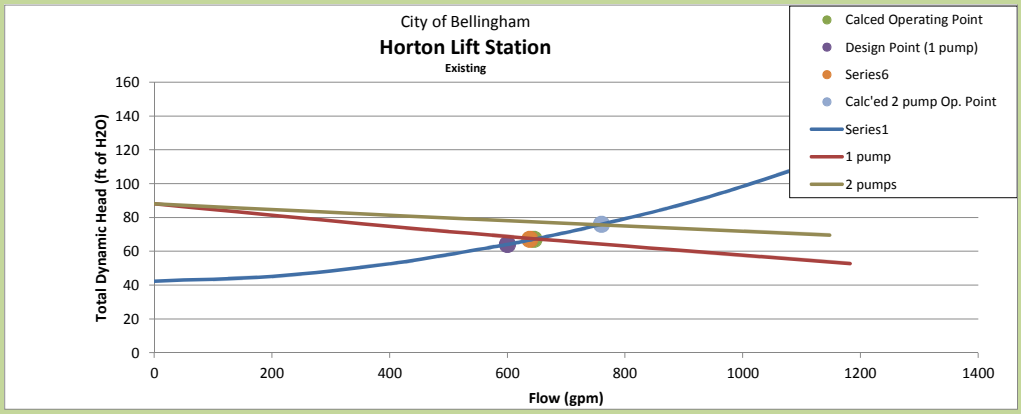
PS Pumping Capacity (gpm) (Q)		TDH (ft)
1 pump	2 pumps	
0	0	88
283.4	566.8	79
573.7	1147.4	70
877.9	1755.8	61
1182.1	2364.2	53
1459.6	2919.2	44
1755.8	3511.6	35

Pump and System Curves

Design Point	Flow (gpm)	Head (ft)
	600	64

Flow and head for operating point determined iteratively

Calculated 1-pump Operating Point	Flow (gpm)	Head (ft)
	645	67
2-pump Op. Point	760	76



Horton Lift Station

Ex. System Analysis

Existing Force Main Analysis

Existing Force Main Evaluation

Design Flow (gpm)	1305
Velocity in Ex. FM	8.03
TDH in Ex. FM	134
New FM?	YES

New force main considered if velocity exceeds 8 ft/s and/or TDH exceeds 200 ft H2O

Existing Wet Well Evaluation

Operating Volume (gallons)	1354
Design Flow (gpm)	1305
Max Starts/hr (4V/Q)	14.5
New Wet Well?	NO

New Wet Well considered if starts/hr > 12

Proposed System

New Force Main Sizing and Pump Selection

Solved by iteration for preferred head (generally less than 200 ft TDH) and velocity conditions (generally b/w 3 and 6 fps)

Material	HDPE	2 8-in FMs
Class/ Thickness	17	17
Nominal Diameter	12	8
Inside DIameter	11.16	7.549
Chezy C	130	130
Velocity at Design Flow	4.3	4.7
TDH @ Design Flow	43	44

NOT USED

Proposed Wet Well Diameter

Starts/Hr	12
Op. Volume	1631.25 gallons
Op. Depth	3.6 ft
Calced Dia.	8.78 ft
WW Dia.	10 ft.
Selected Dia.	10 ft.

Confirm WW is large enough for pumps

Proposed Pumps

Number	3
Make	Flygt
Model	NP3171HT
Horsepower	34
Impeller Dia./Code	303 mm

**denotes code*

Pump and System Curve Data

System Curve

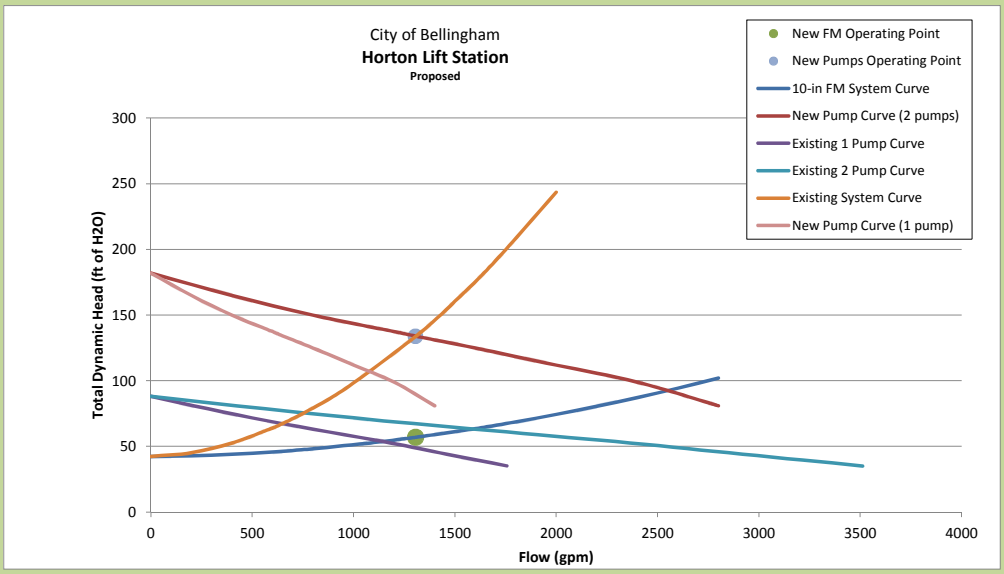
PS Pumping Capacity (gpm) (Q)	Velocity (fps) (V)	Unit Friction head loss	Friction Head Loss	TDH (ft)
0	0.00	0.0000	0.0	42
200	0.66	0.0002	0.5	43
400	1.31	0.0007	1.6	44
600	1.97	0.0014	3.5	46
800	2.62	0.0024	5.9	48
1100	3.61	0.0043	10.6	53
1300	4.26	0.0059	14.4	57
1305	4.28	0.0059	14.5	57
1600	5.25	0.0087	21.2	64
1800	5.90	0.0108	26.3	69
2000	6.56	0.0131	32.0	74
2200	7.22	0.0156	38.2	81
2400	7.87	0.0184	44.9	87
2600	8.53	0.0213	52.0	94
2800	9.18	0.0244	59.7	102

Pump Curve

two pump cap.	one pump capacity	TDH (ft)
0	0	182.00
400	200	165.00
800	400	150.00
1200	600	137.50
1308	654	134.00
1600	800	125.00
2000	1000	112.00
2400	1200	99.00
2800	1400	81.00

Pump and System Curves

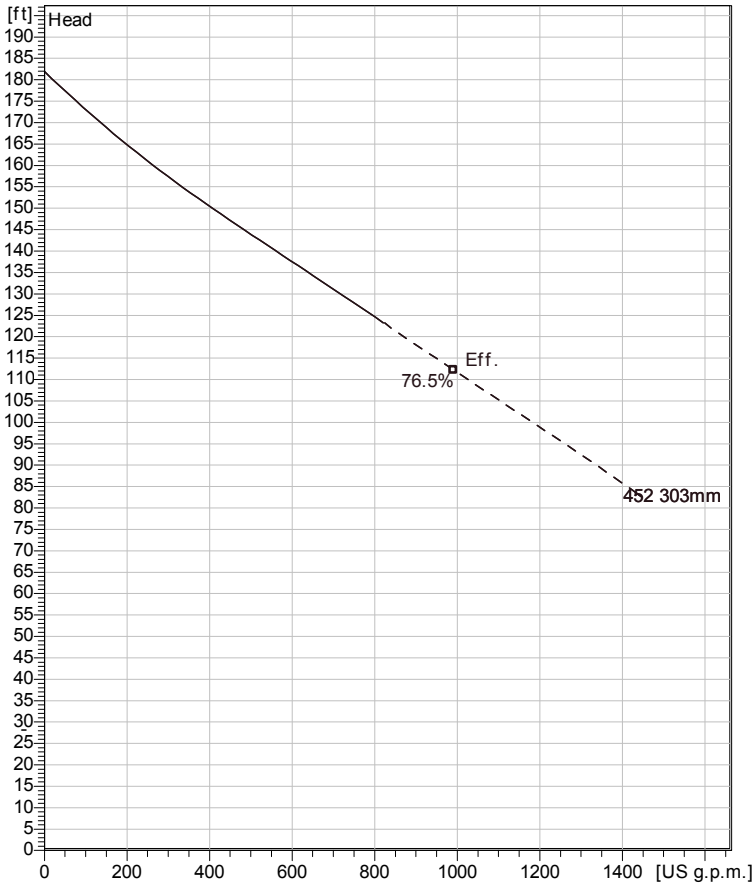
	Flow (gpm)	Head (ft)
Operating Point - New FM	1305	57
New Pumps, Existing FM	1305	134



Horton Alternative No. 2

NP 3171 HT 3~ 452

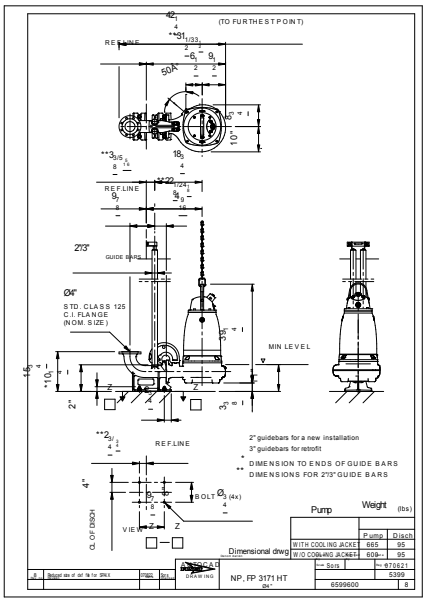
Technical specification



Water, pure *Curve ISO*

Note: Picture might not correspond to the current configuration.

Installation: P - Semi permanent, Wet



General

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Possible to be upgraded with Guide-pin® for even better clogging resistance. Modular based design with high adaptation grade.

Impeller

Impeller material	Grey cast iron
Discharge Flange Diameter	3 15/16 inch
Inlet diameter	3 15/16 inch
Impeller diameter	303 mm
Number of blades	2

Motor

Motor #	N3171.181 25-19-4AA-W 34hp
Stator variant	7
Frequency	60 Hz
Rated voltage	230 V
Number of poles	4
Phases	3~
Rated power	34 hp
Rated current	81 A
Starting current	560 A
Rated speed	1760 rpm
Power factor	
1/1 Load	0.87
3/4 Load	0.83
1/2 Load	0.74
Efficiency	
1/1 Load	90.0 %
3/4 Load	91.0 %
1/2 Load	91.0 %

Configuration

Project	Project ID	Created by	Created on	Last update
			2016-03-12 21:42:28	

NP 3171 HT 3~ 452

Performance curve

Pump

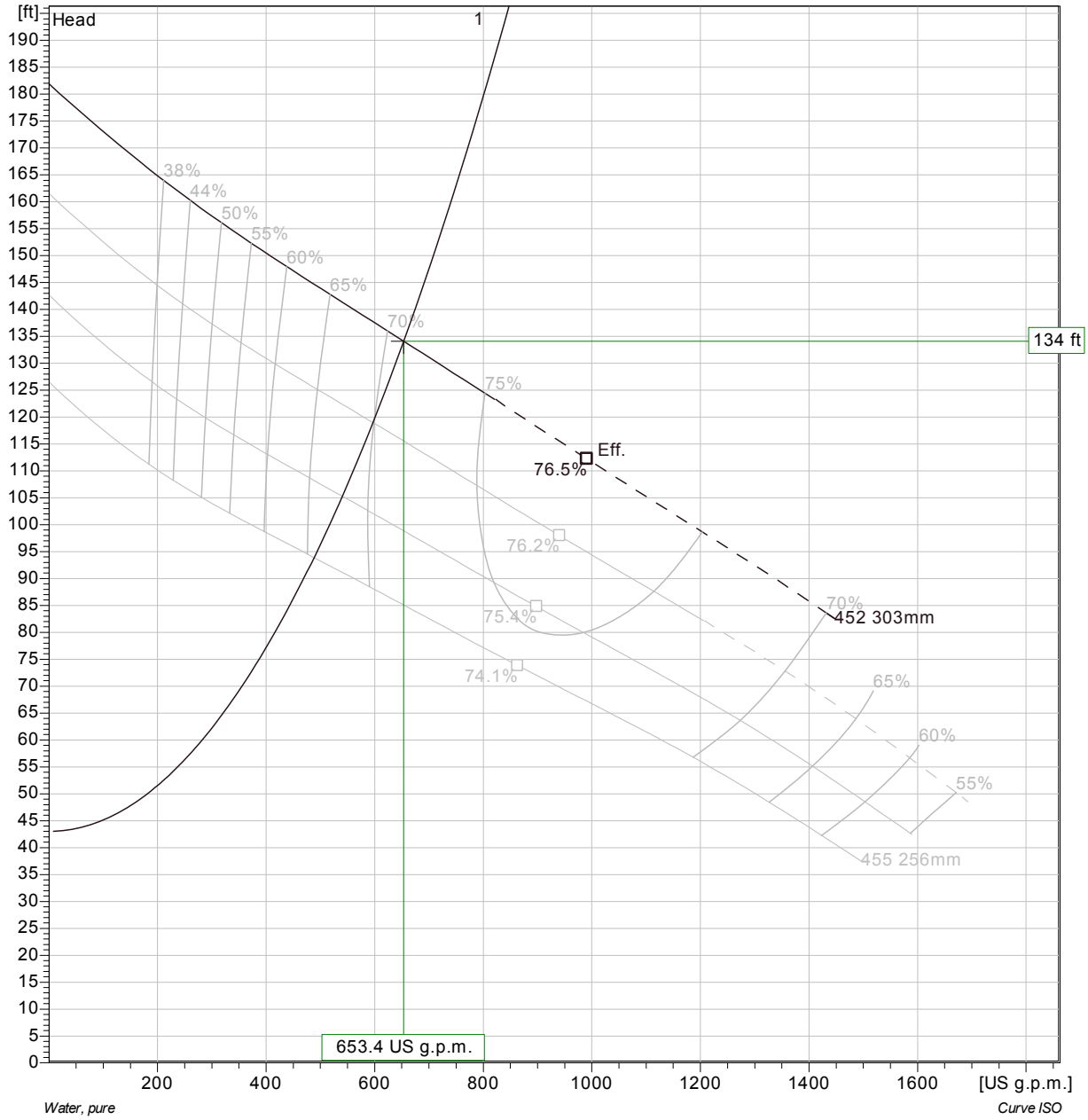
Discharge Flange Diameter	3 15/16 inch
Inlet diameter	100 mm
Impeller diameter	11 15/16"
Number of blades	2

Motor

Motor #	N3171.181 25-19-4AA-W 34hp
Stator variant	7
Frequency	60 Hz
Rated voltage	230 V
Number of poles	4
Phases	3~
Rated power	34 hp
Rated current	81 A
Starting current	560 A
Rated speed	1760 rpm

Power factor	
1/1 Load	0.87
3/4 Load	0.83
1/2 Load	0.74

Efficiency	
1/1 Load	90.0 %
3/4 Load	91.0 %
1/2 Load	91.0 %



Project	Project ID	Created by	Created on	Last update
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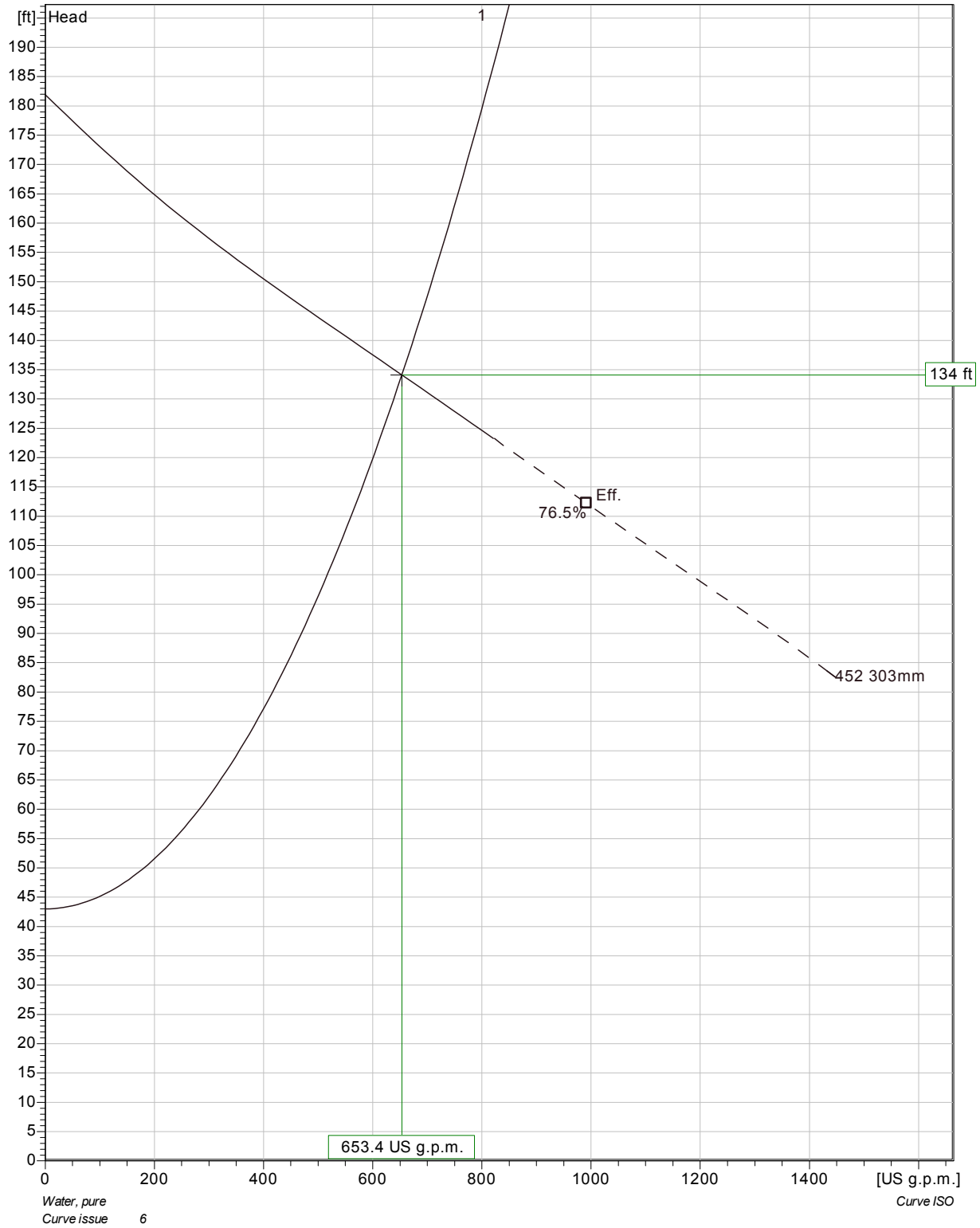
NP 3171 HT 3~ 452

Duty Analysis

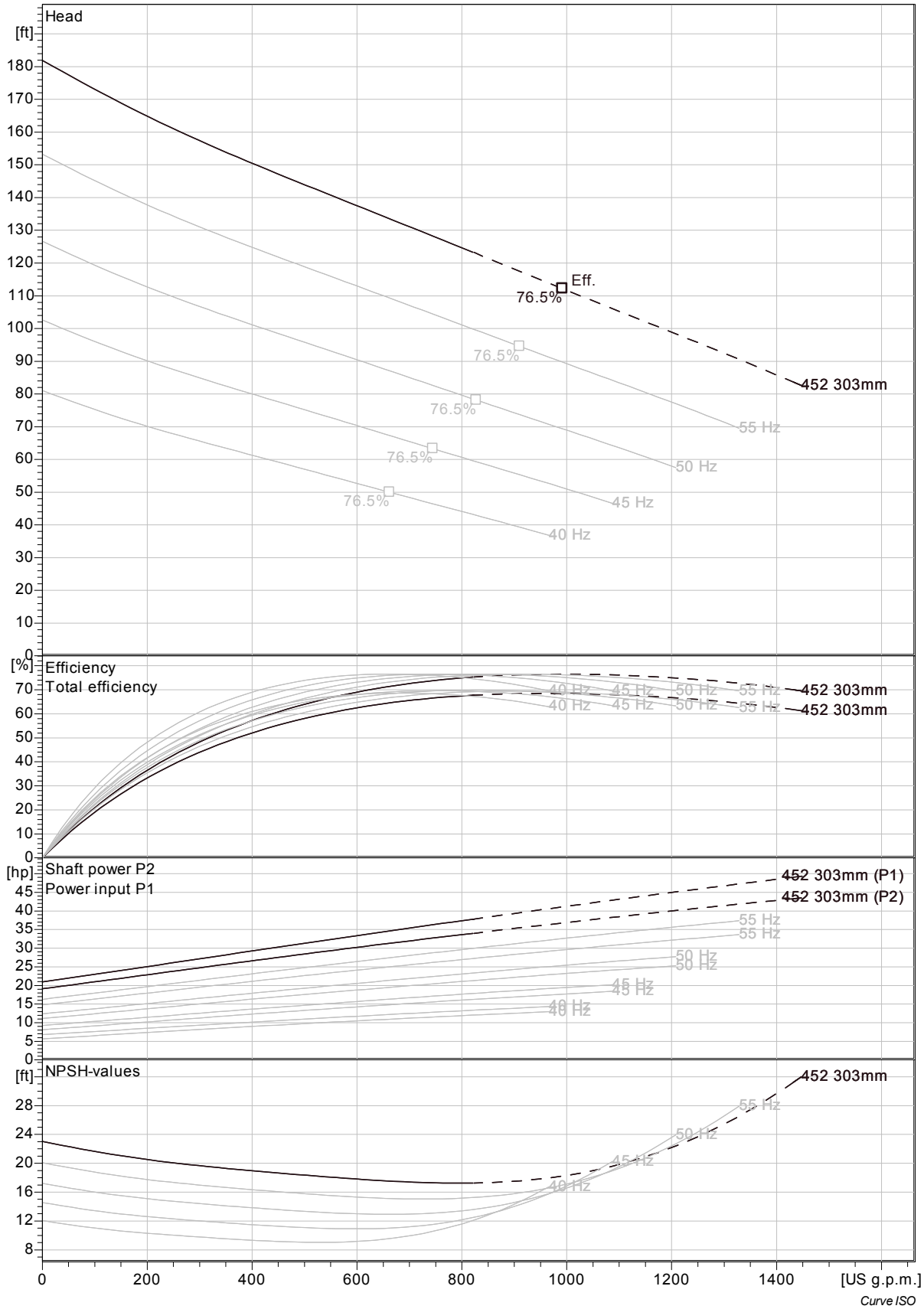


Pumps running /System	Individual pump Flow	Head	Shaft power	Total Flow	Head	Shaft power	Pump eff.	Specific energy	NPSHre
1 / 1	653 US g.p.m.	134 ft	31.2 hp	653 US g.p.m.	134 ft	31.2 hp	71.1 %	656 kWh/US MG	17.6 ft

Project	Project ID	Created by	Created on	Last update
			2016-03-12 21:42:28	

NP 3171 HT 3~ 452

VFD Curve



Project	Project ID	Created by	Created on	Last update
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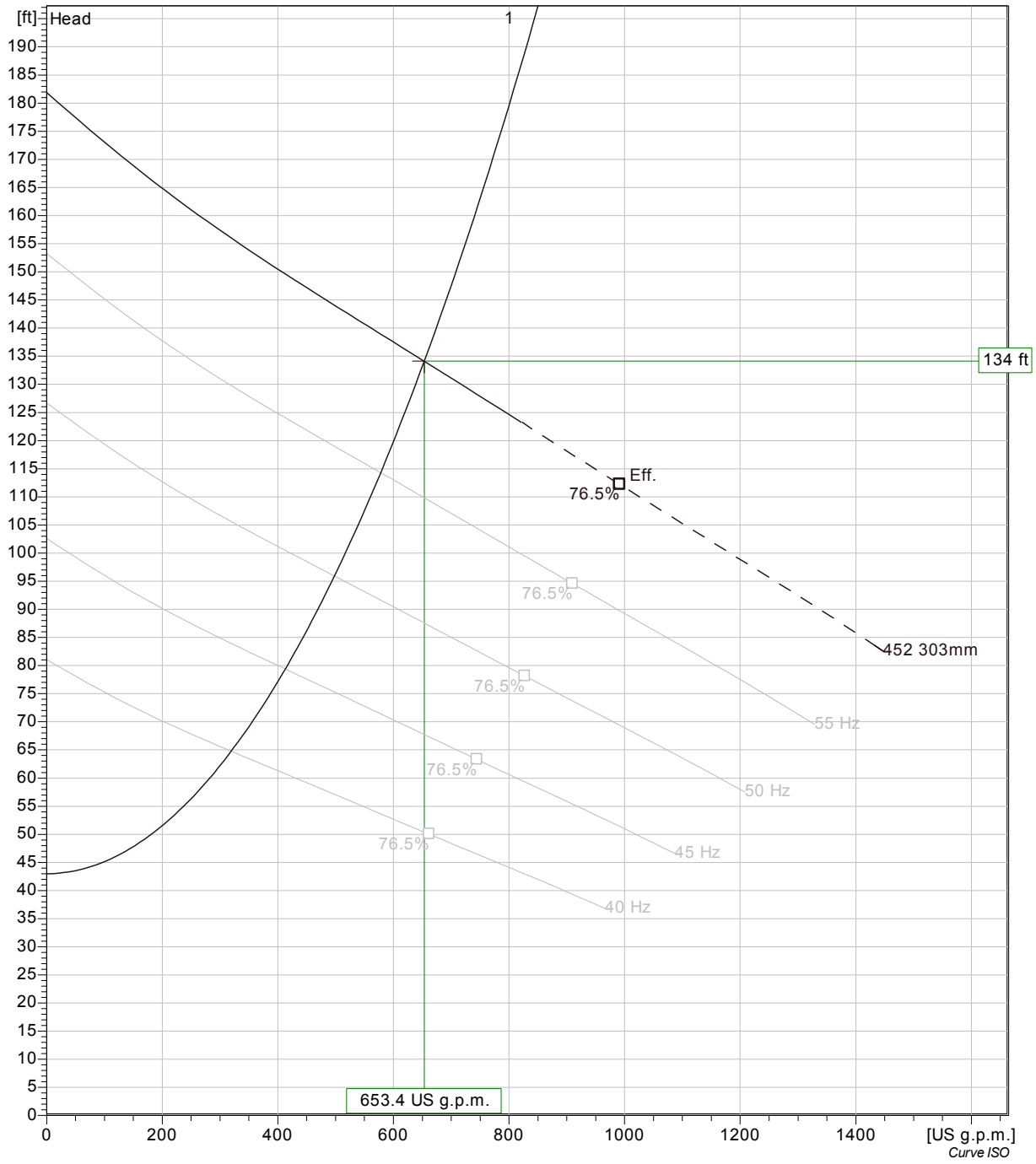
NP 3171 HT 3~ 452

VFD Analysis

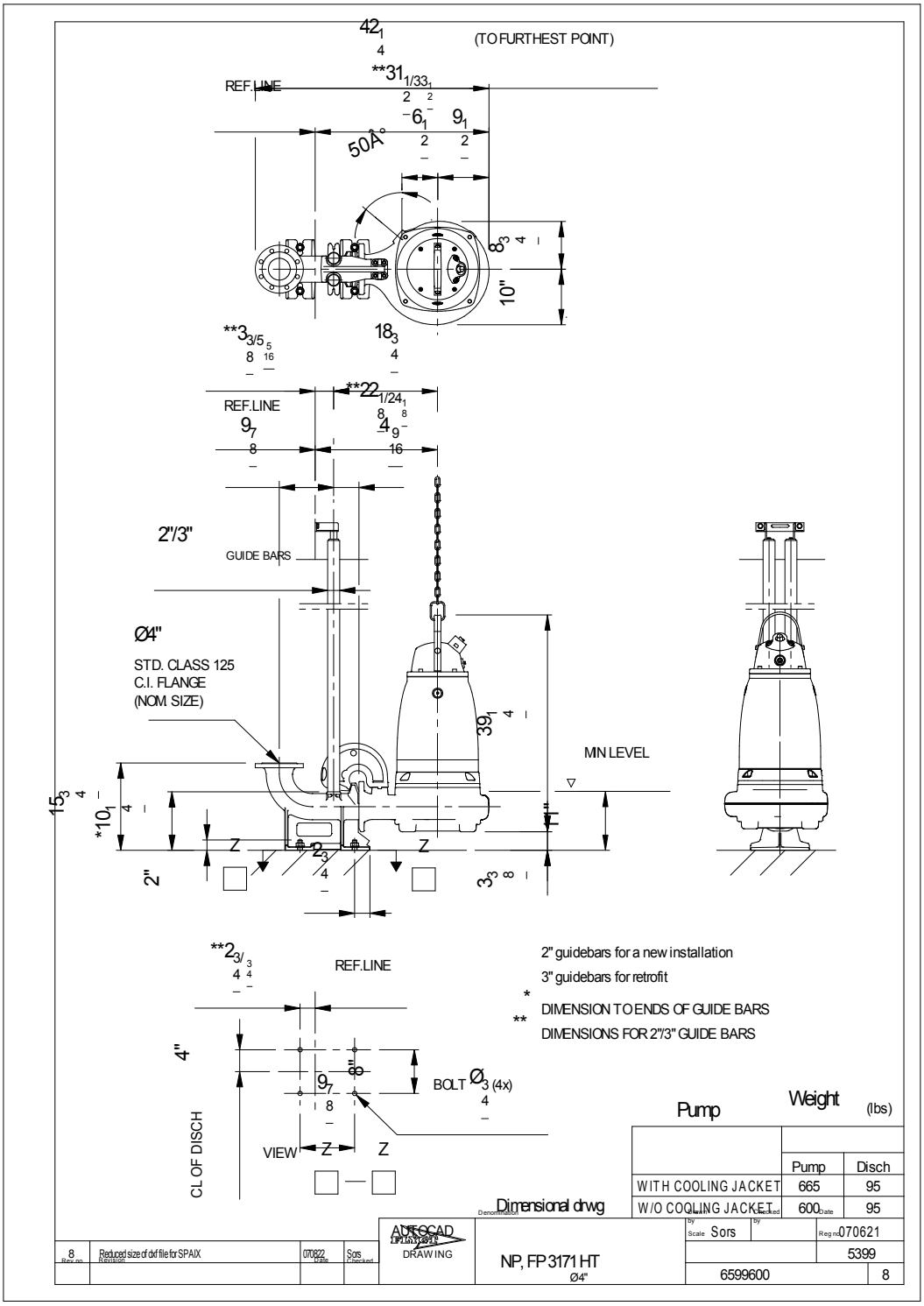


Pumps running /System	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hyd eff.	Specific energy	NPSHre
1 / 1	60 Hz	653 US g.p.m.	134 ft	31.2 hp	653 US g.p.m.	134 ft	31.2 hp	71.1 %	656 kWh/US MG	17.6 ft
1 / 1	55 Hz	578 US g.p.m.	114 ft	23.8 hp	578 US g.p.m.	114 ft	23.8 hp	70.2 %	561 kWh/US MG	15.4 ft
1 / 1	50 Hz	498 US g.p.m.	95.9 ft	17.5 hp	498 US g.p.m.	95.9 ft	17.5 hp	68.9 %	480 kWh/US MG	13.4 ft
1 / 1	45 Hz	413 US g.p.m.	79.4 ft	12.4 hp	413 US g.p.m.	79.4 ft	12.4 hp	66.7 %	415 kWh/US MG	11.4 ft
1 / 1	40 Hz	319 US g.p.m.	64.8 ft	8.35 hp	319 US g.p.m.	64.8 ft	8.35 hp	62.7 %	370 kWh/US MG	9.69 ft

Project	Project ID	Created by	Created on	Last update
			2016-03-12 21:42:28	

NP 3171 HT 3~ 452

Dimensional drawing



Project	Project ID	Created by	Created on	Last update
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James St. Lift Station

Design Parameters

New Station or Replace Existing?	**REPLACE**

New Wet Well?	IF NEEDED
New Force Main?	IF NEEDED

Max. Current PHF Flow (gpm)	1367
Future PHF Flow (gpm)	3737
Tested Capacity (gpm)	1728
Current Design Flow (gpm)	1200

Existing Pump Station and Force Main Information

Wet Well

Operating Depth (ft)	3
Diameter (ft)	10
Operating Volume (gallons)	1762.4335
Surface El @ Ex. Wet Well	112
Bottom El.	91.84
Wet Well Depth	20.16

Existing Force Main

Pipe Nominal Diameter	10
Pipe Material	CIPP
Pipe Inside Diameter	9.02
Force Main Length	1547
Equivalent Length	1592
Pumps Off El.	93.3
Top El.	163.93
Velocity @ Current Capacity	8.68
Static Head	70.63
Chezy C	120

Existing Pumps

Number	2
Make	Flygt
Model	C3300
Horsepower	88
Impeller Dia./Code	465*

**denotes code*

Local Losses in Existing System

Fitting	Count	Equivalent	Total
90 deg. Bend	0	20	0
45 deg bend	0	10.6	0
22.5 deg bend	0	10.6	0
Plug Valve	1	12	12
Check Valve	1	33	33
TOTAL			45

Pump and System Curve Data

System Curve

PS Pumping Capacity (gpm) (Q)	Velocity (fps) (V)	Unit Friction head loss	Friction Head Loss	TDH (ft)
0	0.00	0.000	0.0	71
250	1.26	0.001	1.5	72
500	2.51	0.003	5.2	76
750	3.77	0.007	11.1	82
1000	5.02	0.012	18.9	90
1200	6.03	0.017	26.5	97
1450	7.28	0.024	37.6	108
1728	8.68	0.033	52.0	123
1900	9.54	0.039	62.0	133
2000	10.04	0.043	68.2	139
2100	10.54	0.047	74.6	145

Pump Curve

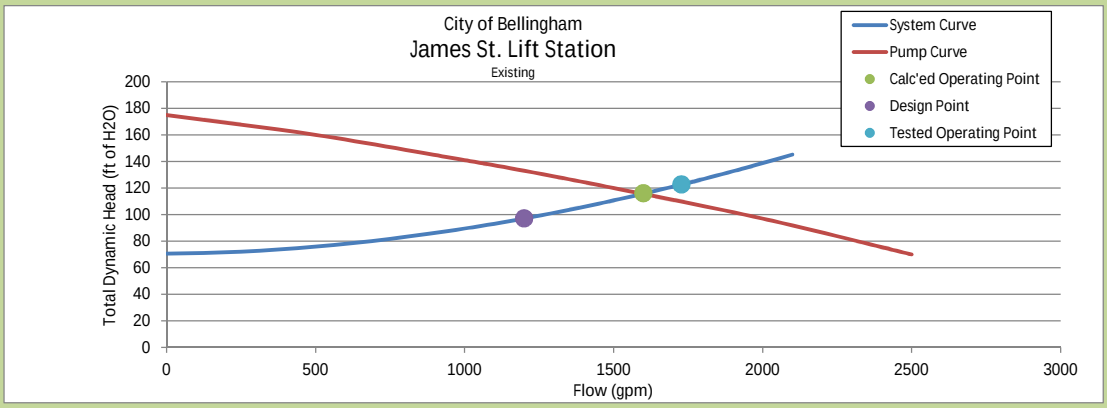
PS Pumping Capacity (gpm) (Q)	TDH (ft)
0	175
500	160
1000	141
1200	133
1500	120
2000	97
2500	70

Pump and System Curves

Design Point	Flow (gpm)	Head (ft)
	1200	97

Flow and head for operating point determined iteratively

Calculated Operating Point	Flow (gpm)	Head (ft)
	1600	116



James St. Lift Station

Ex. System Analysis

Existing Force Main Analysis

Existing Force Main Evaluation

Design Flow (gpm)	3737
Velocity in Ex. FM	18.76
TDH in Ex. FM	287
New FM?	YES

New force main considered if velocity exceeds 8 ft/s and/or TDH exceeds 200 ft H2O

Existing Wet Well Evaluation

Operating Volume (gallons)	1762
Design Flow (gpm)	3737
Max Starts/hr (4V/Q)	31.8
New Wet Well?	YES

New Wet Well considered if starts/hr > 12

Proposed System

New Force Main Sizing and Pump Selection

Solved by iteration for preferred head (generally less than 200 ft TDH) and velocity conditions (generally b/w 3 and 6 fps)

Material	DI
Class/ Thickness	52
Nominal Diameter	16
Inside DIameter	16.36
Chezy C	120
Velocity at Design Flow	5.7
TDH @ Design Flow	83

Proposed Wet Well Diameter

Starts/Hr	12	
Op. Volume	4671.25	gallons
Op. Depth	6	ft
Calced Dia.	11.51	ft
WW Dia.	12	ft.
Selected Dia.	12	ft.

Confirm WW is large enough for pumps

Proposed Pumps

Number	2
Make	Flygt
Model	NP3315LT
Horsepower	140
Impeller Dia./Code	408mm

**denotes code*

Proposed Pumps

Number	3
Make	Flygt
Model	NP3301
Horsepower	70
Impeller Dia./Code	15-1/8"

**denotes code*

Pump and System Curve Data

System Curve

PS Pumping Capacity (gpm) (Q)	Velocity (fps) (V)	Unit Friction head loss	Friction Head Loss	TDH (ft)
0	0.00	0.0000	0.0	71
400	0.61	0.0001	0.2	71
800	1.22	0.0004	0.7	71
1200	1.83	0.0009	1.5	72
1600	2.44	0.0016	2.5	73
2000	3.05	0.0024	3.8	74
2310	3.53	0.0031	4.9	76
2710	4.14	0.0041	6.6	77
3110	4.75	0.0053	8.5	79
3737	5.70	0.0075	12.0	83
4137	6.31	0.0091	14.4	85
4537	6.92	0.0108	17.1	88
4937	7.54	0.0126	20.0	91
5337	8.15	0.0145	23.1	94
5737	8.76	0.0166	26.4	97

Pump Curve

Duplex

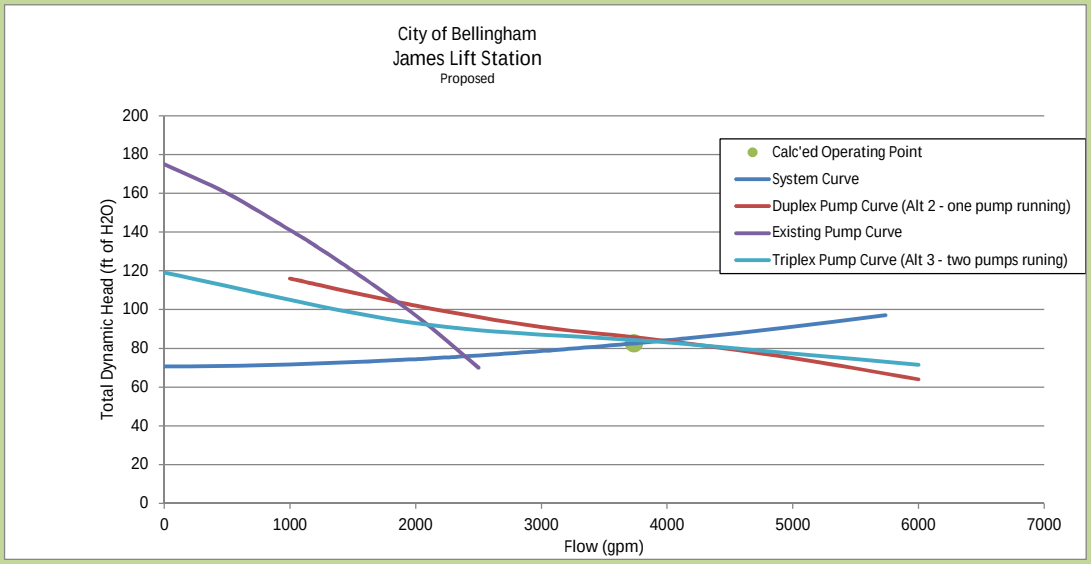
PS Pumping Capacity (gpm) (Q)	TDH (ft)
0	
1000	116.00
2000	102.00
3000	91.00
3937	84.30
5000	75.00
6000	64.00
7000	52.00
8000	39.00

Triplex

PS Pumping Capacity (gpm) (Q)	TDH (ft)
0	119.00
2000	93.00
4000	83.00
6000	71.50
8000	65.00

Pump and System Curves

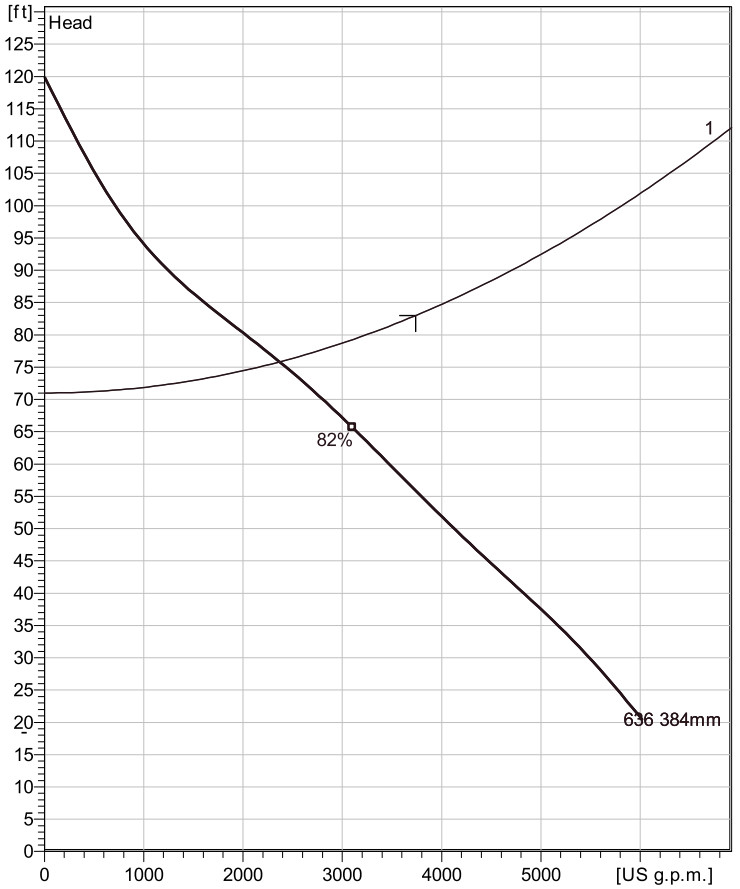
Operating Point	Flow (gpm)	Head (ft)
	3737	83



James St. Alternative No. 2

NP 3301 MT 3~ 636

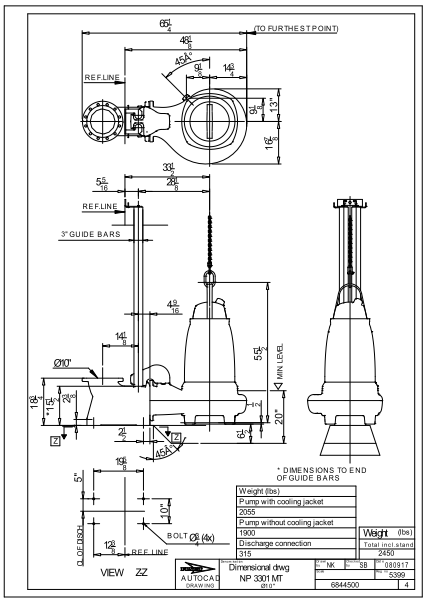
Technical specification



Water, pure *Curve ISO*

Note: Picture might not correspond to the current configuration.

Installation: P - Semi permanent, Wet



General

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Possible to be upgraded with Guide-pin® for even better clogging resistance. Modular based design with high adaptation grade.

Impeller

Impeller material	Grey cast iron
Discharge Flange Diameter	9 13/16 inch
Inlet diameter	9 13/16 inch
Impeller diameter	384 mm
Number of blades	2

Motor

Motor #	N3301.180 35-25-6AA-W 70hp
Stator variant	1
Frequency	60 Hz
Rated voltage	460 V
Number of poles	6
Phases	3~
Rated power	70 hp
Rated current	89 A
Starting current	560 A
Rated speed	1185 rpm
Power factor	
1/1 Load	0.80
3/4 Load	0.75
1/2 Load	0.64
Efficiency	
1/1 Load	91.0 %
3/4 Load	91.5 %
1/2 Load	91.5 %

Configuration

Project	Project ID	Created by	Created on	Last update
			2016-04-04	

NP 3301 MT 3~ 636

Performance curve

Pump

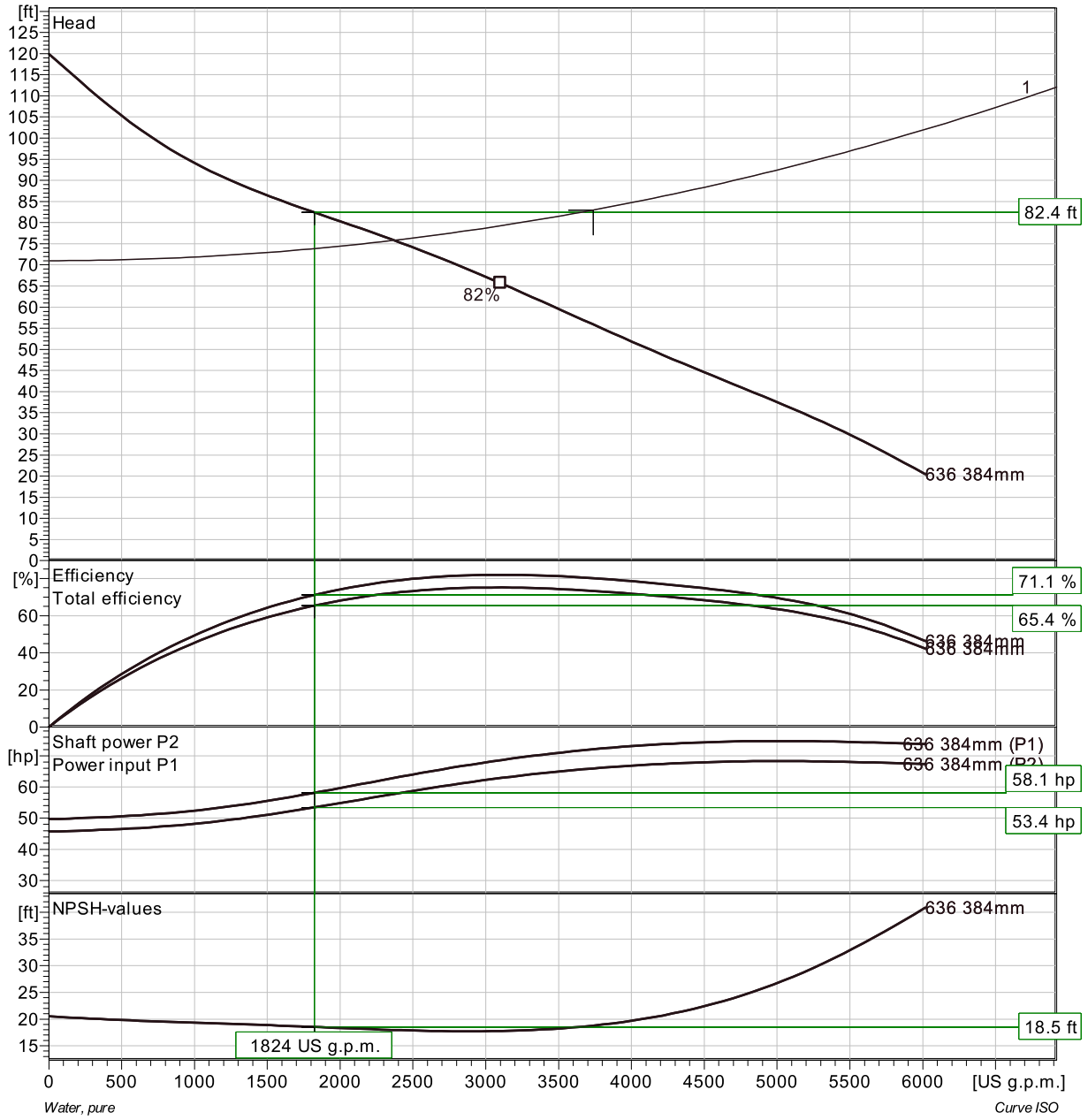
Discharge Flange Diameter	9 13/16 inch
Inlet diameter	250 mm
Impeller diameter	15 1/8"
Number of blades	2

Motor

Motor #	N3301.180 35-25-6AA-W 70hp
Stator variant	1
Frequency	60 Hz
Rated voltage	460 V
Number of poles	6
Phases	3~
Rated power	70 hp
Rated current	89 A
Starting current	560 A
Rated speed	1185 rpm

Power factor	
1/1 Load	0.80
3/4 Load	0.75
1/2 Load	0.64

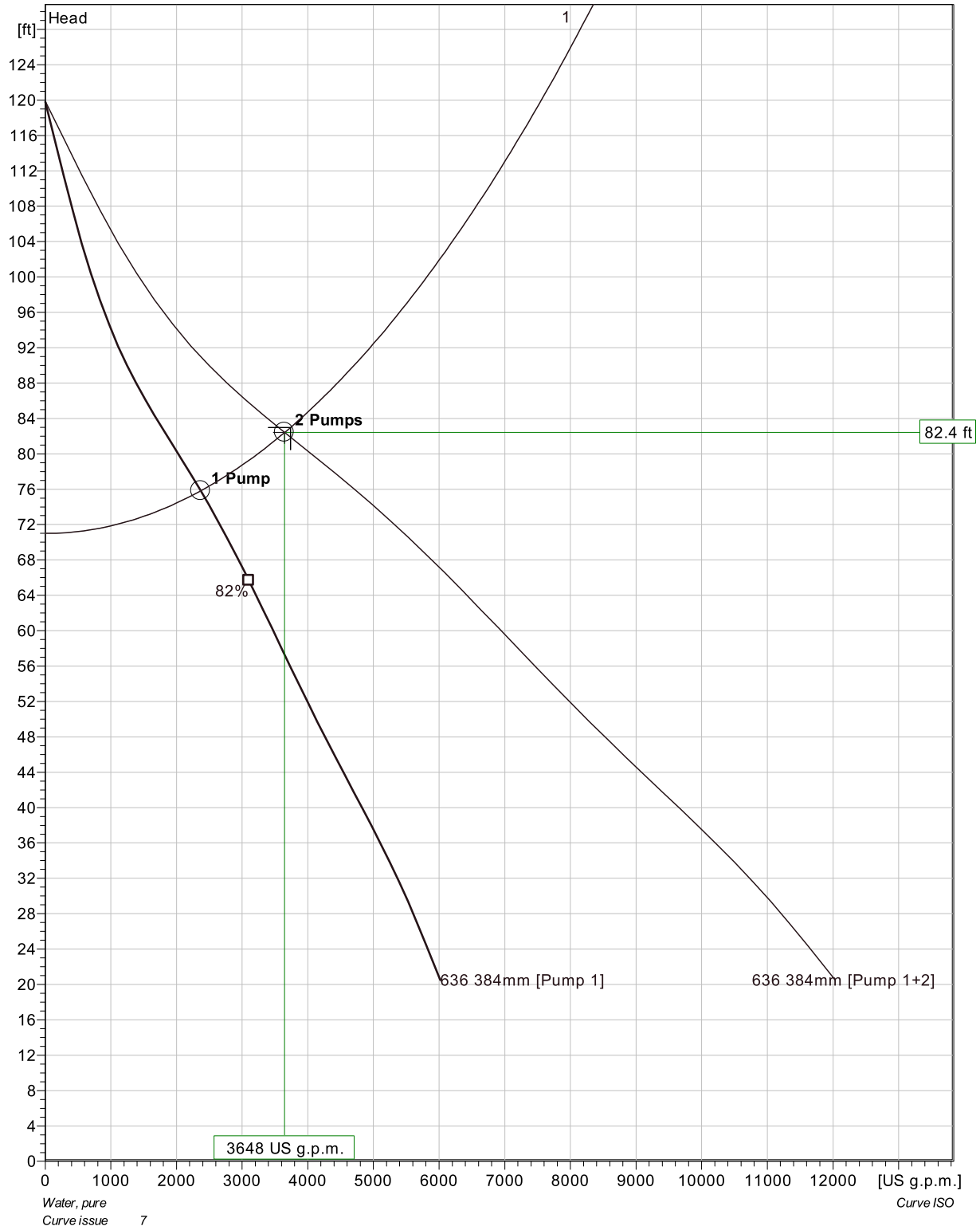
Efficiency	
1/1 Load	91.0 %
3/4 Load	91.5 %
1/2 Load	91.5 %



Project	Project ID	Created by	Created on	Last update
			2016-04-04	

NP 3301 MT 3~ 636

Duty Analysis

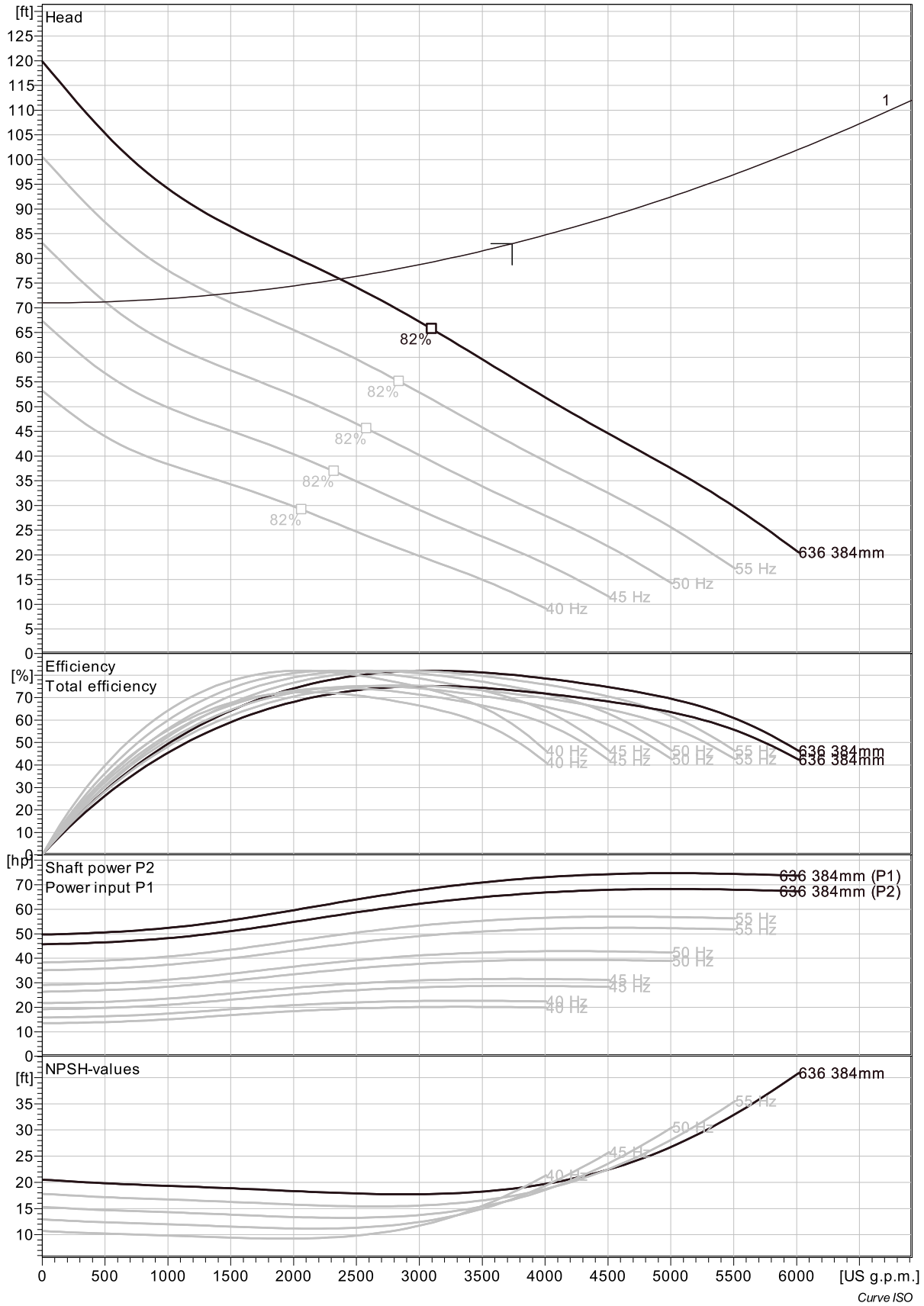


Pumps running /System	Individual pump Flow	Head	Shaft power	Total Flow	Head	Shaft power	Pump eff.	Specific energy	NPSHre
2 / 1	1820 US g.p.m.	82.4 ft	53.4 hp	3650 US g.p.m.	82.4 ft	107 hp	71.1 %	396 kWh/US MG	18.5 ft
1 / 1	2370 US g.p.m.	75.8 ft	57.7 hp	2370 US g.p.m.	75.8 ft	57.7 hp	78.7 %	329 kWh/US MG	18 ft

Project	Project ID	Created by	Created on	Last update
			2016-04-04	

NP 3301 MT 3~ 636

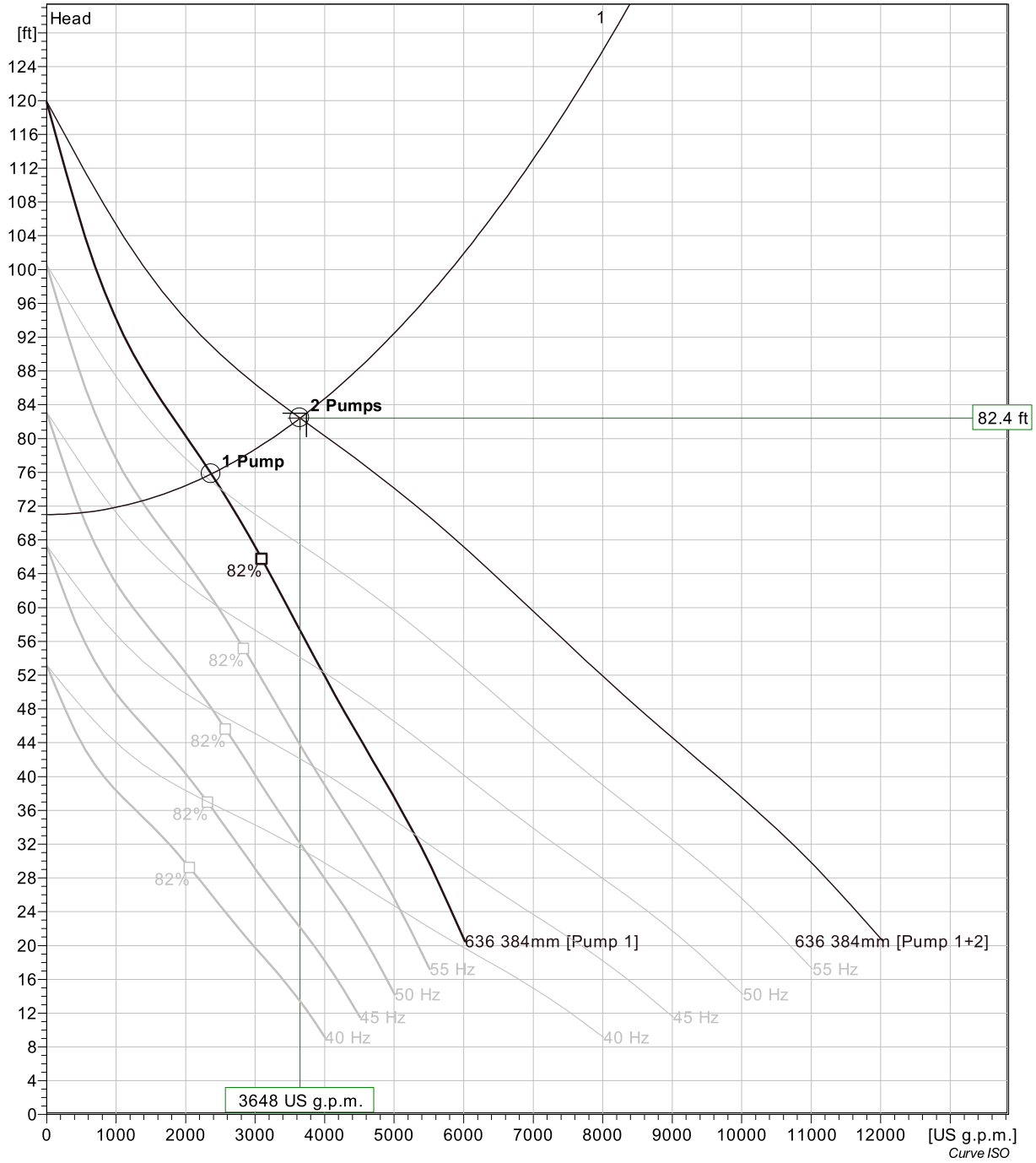
VFD Curve



Project	Project ID	Created by	Created on	Last update
			2016-04-04	

NP 3301 MT 3~ 636

VFD Analysis

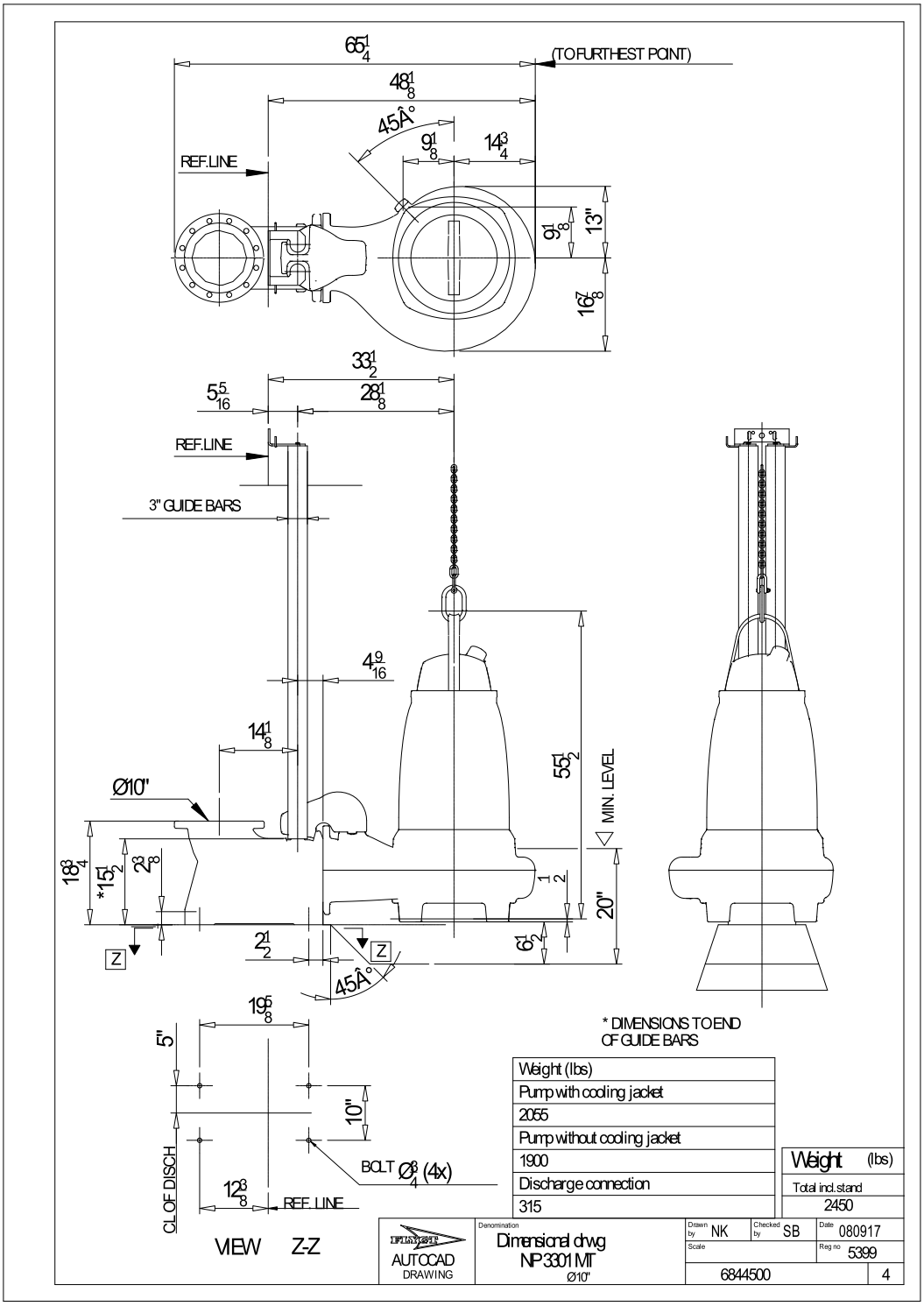


Pumps running /System	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hyd eff.	Specific energy	NPSHre
2 / 1	60 Hz	1820 US g.p.m.	82.4 ft	53.4 hp	3650 US g.p.m.	82.4 ft	107 hp	71.1 %	396 kWh/US MG	18.5 ft
2 / 1	55 Hz	1140 US g.p.m.	75.5 ft	38 hp	2290 US g.p.m.	75.5 ft	76 hp	57.4 %	450 kWh/US MG	16.6 ft
2 / 1	50 Hz	473 US g.p.m.	71.8 ft	26.9 hp	946 US g.p.m.	71.8 ft	53.9 hp	31.8 %	781 kWh/US MG	14.7 ft
2 / 1	45 Hz									
2 / 1	40 Hz									
1 / 1	60 Hz	2370 US g.p.m.	75.8 ft	57.7 hp	2370 US g.p.m.	75.8 ft	57.7 hp	78.7 %	329 kWh/US MG	18 ft
1 / 1	55 Hz	1370 US g.p.m.	72.6 ft	39.2 hp	1370 US g.p.m.	72.6 ft	39.2 hp	64 %	389 kWh/US MG	16.4 ft
1 / 1	50 Hz	500 US g.p.m.	71.2 ft	27 hp	500 US g.p.m.	71.2 ft	27 hp	33.3 %	741 kWh/US MG	14.7 ft
1 / 1	45 Hz									
1 / 1	40 Hz									

Project	Project ID	Created by	Created on	Last update
			2016-04-04	

NP 3301 MT 3~ 636

Dimensional drawing

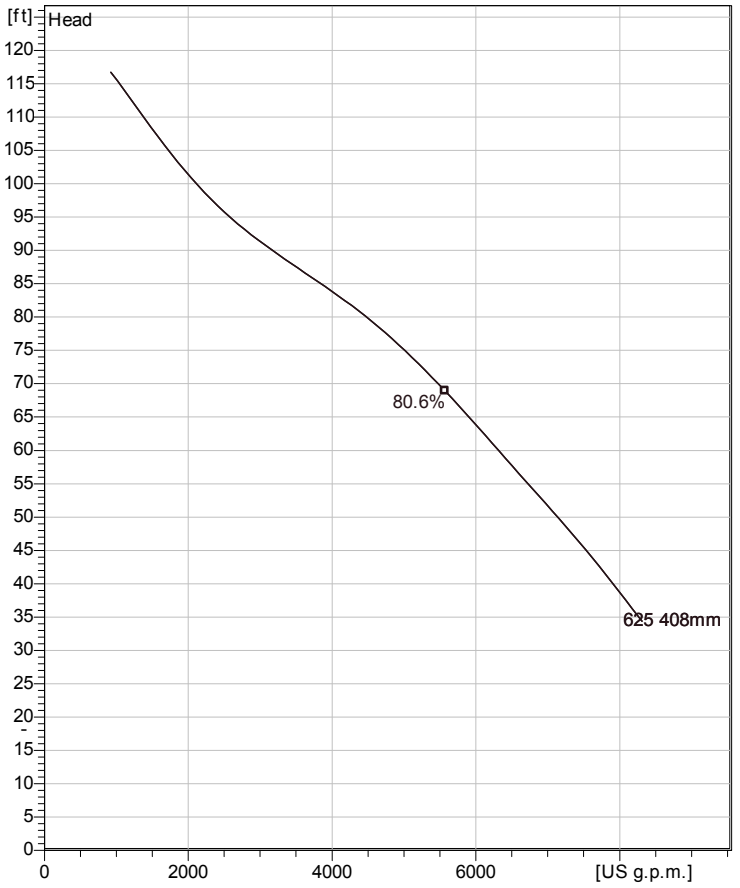


Project	Project ID	Created by	Created on	Last update
			2016-04-04	

James St. Alternative No. 3

NP 3315 LT 3~ 625

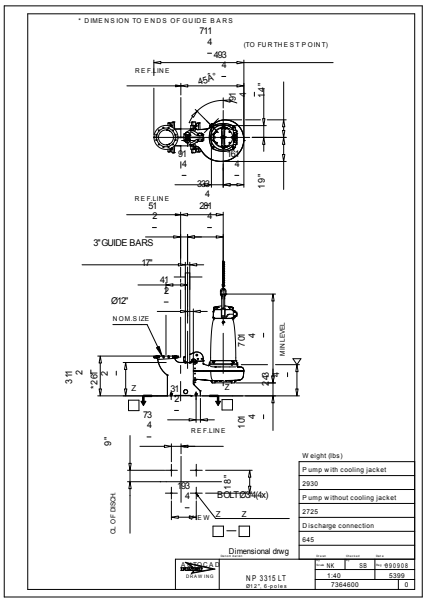
Technical specification



Water, pure *Curve ISO*

Note: Picture might not correspond to the current configuration.

Installation: P - Semi permanent, Wet



General

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Possible to be upgraded with Guide-pin® for even better clogging resistance. Modular based design with high adaptation grade.

Impeller

Impeller material	Grey cast iron
Discharge Flange Diameter	11 13/16 inch
Inlet diameter	11 13/16 inch
Impeller diameter	408 mm
Number of blades	3

Motor

Motor #	N3315.180 35-45-6AA-W 140hp
Stator variant	6
Frequency	60 Hz
Rated voltage	380 V
Number of poles	6
Phases	3~
Rated power	140 hp
Rated current	213 A
Starting current	1380 A
Rated speed	1185 rpm
Power factor	
1/1 Load	0.80
3/4 Load	0.76
1/2 Load	0.65
Efficiency	
1/1 Load	92.5 %
3/4 Load	93.0 %
1/2 Load	92.5 %

Configuration

Project	Project ID	Created by	Created on	Last update
			2016-03-16 23:24:28	

NP 3315 LT 3~ 625

Performance curve

Pump

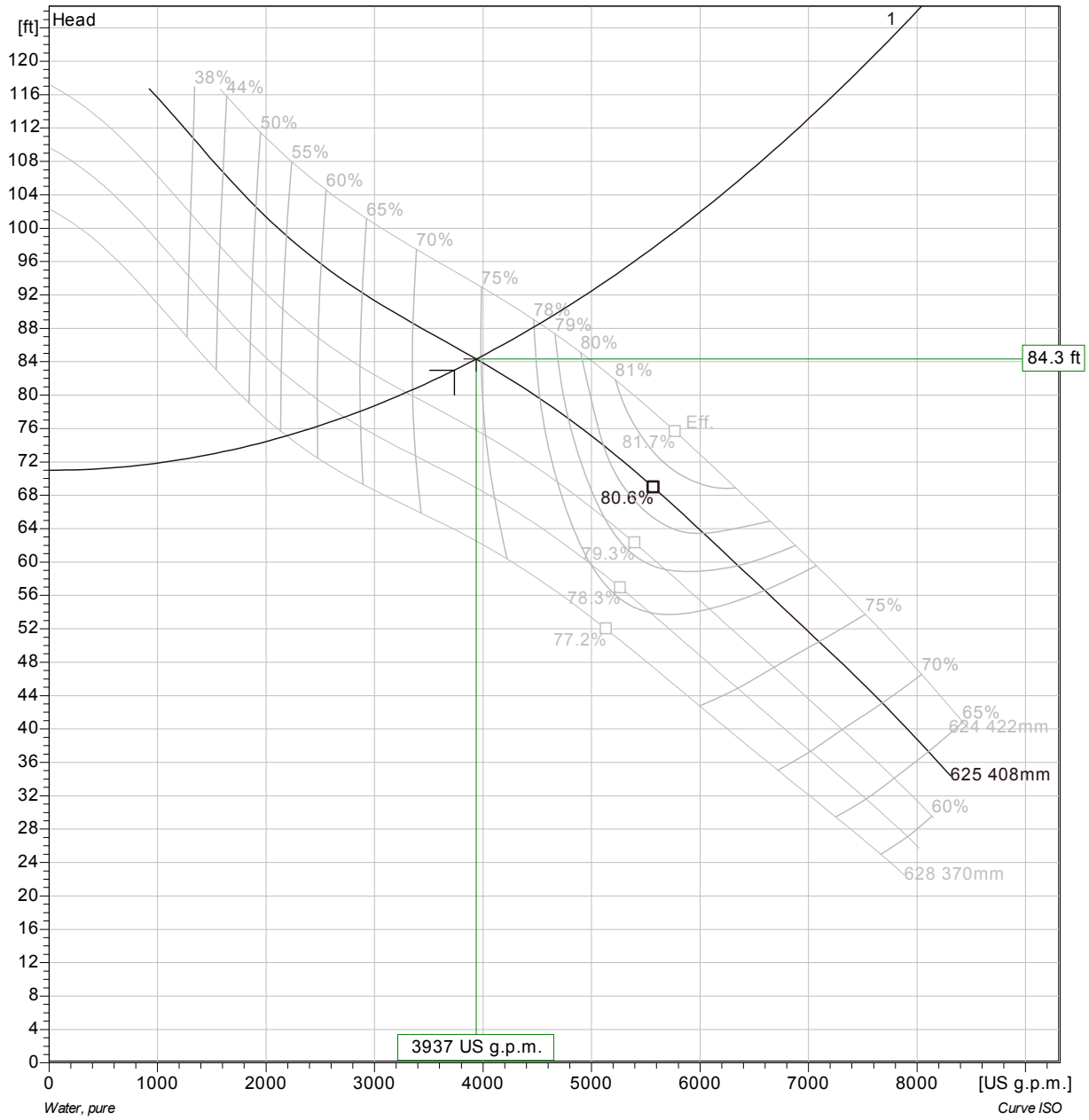
Discharge Flange Diameter	11 13/16 inch
Inlet diameter	300 mm
Impeller diameter	16 1/16"
Number of blades	3

Motor

Motor #	N3315.180 35-45-6AA-W 140hp
Stator variant	6
Frequency	60 Hz
Rated voltage	380 V
Number of poles	6
Phases	3~
Rated power	140 hp
Rated current	213 A
Starting current	1380 A
Rated speed	1185 rpm

Power factor	
1/1 Load	0.80
3/4 Load	0.76
1/2 Load	0.65

Efficiency	
1/1 Load	92.5 %
3/4 Load	93.0 %
1/2 Load	92.5 %



Project	Project ID	Created by	Created on	Last update
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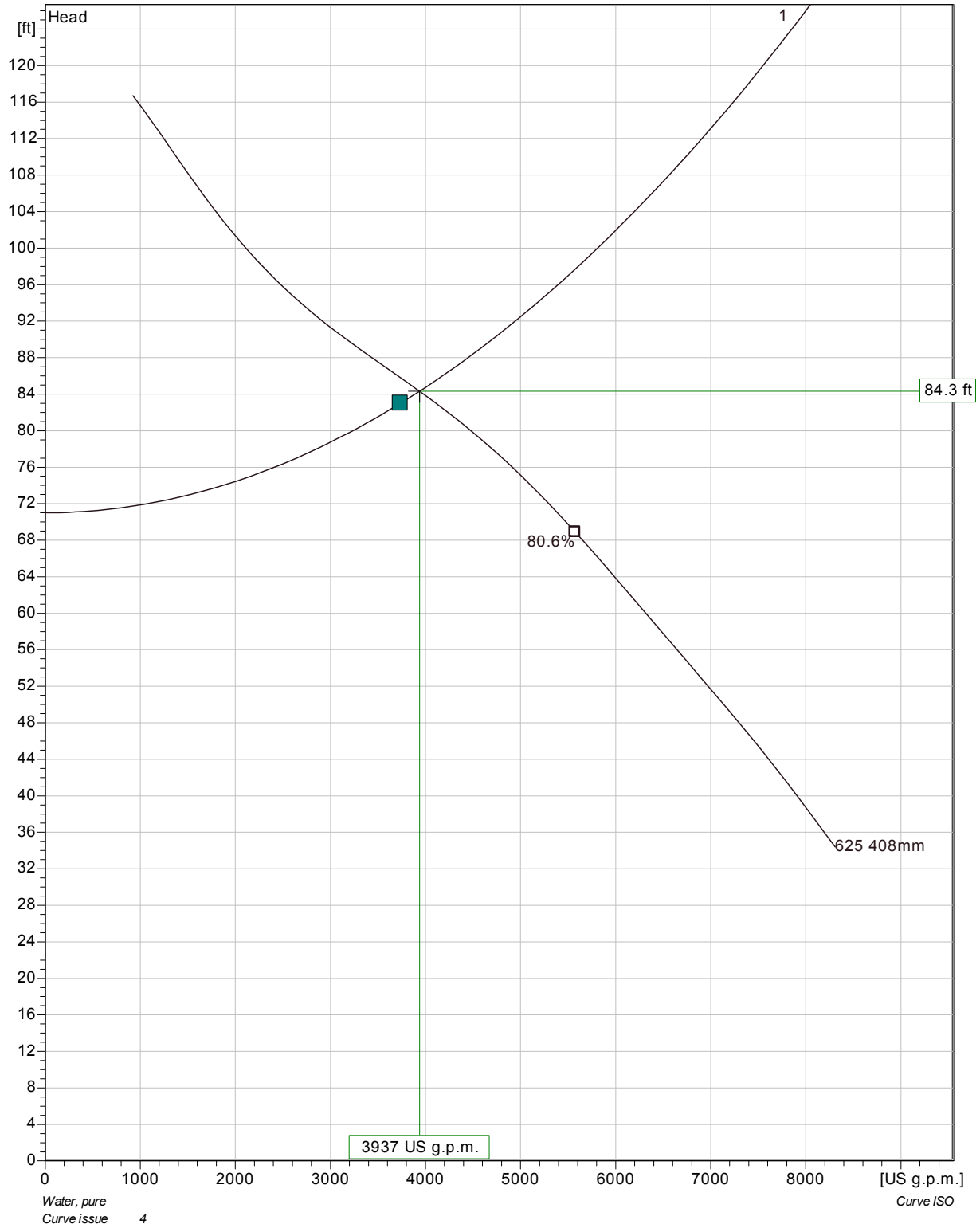
NP 3315 LT 3~ 625

Duty Analysis



Pumps running /System	Individual pump Flow	Head	Shaft power	Total Flow	Head	Shaft power	Pump eff.	Specific energy	NPSHre
1	3940 US g.p.m.	84.3 ft	112 hp	3940 US g.p.m.	84.3 ft	112 hp	74.8 %	381 kWh/US MG	15.8 ft

Project	Project ID	Created by	Created on	Last update
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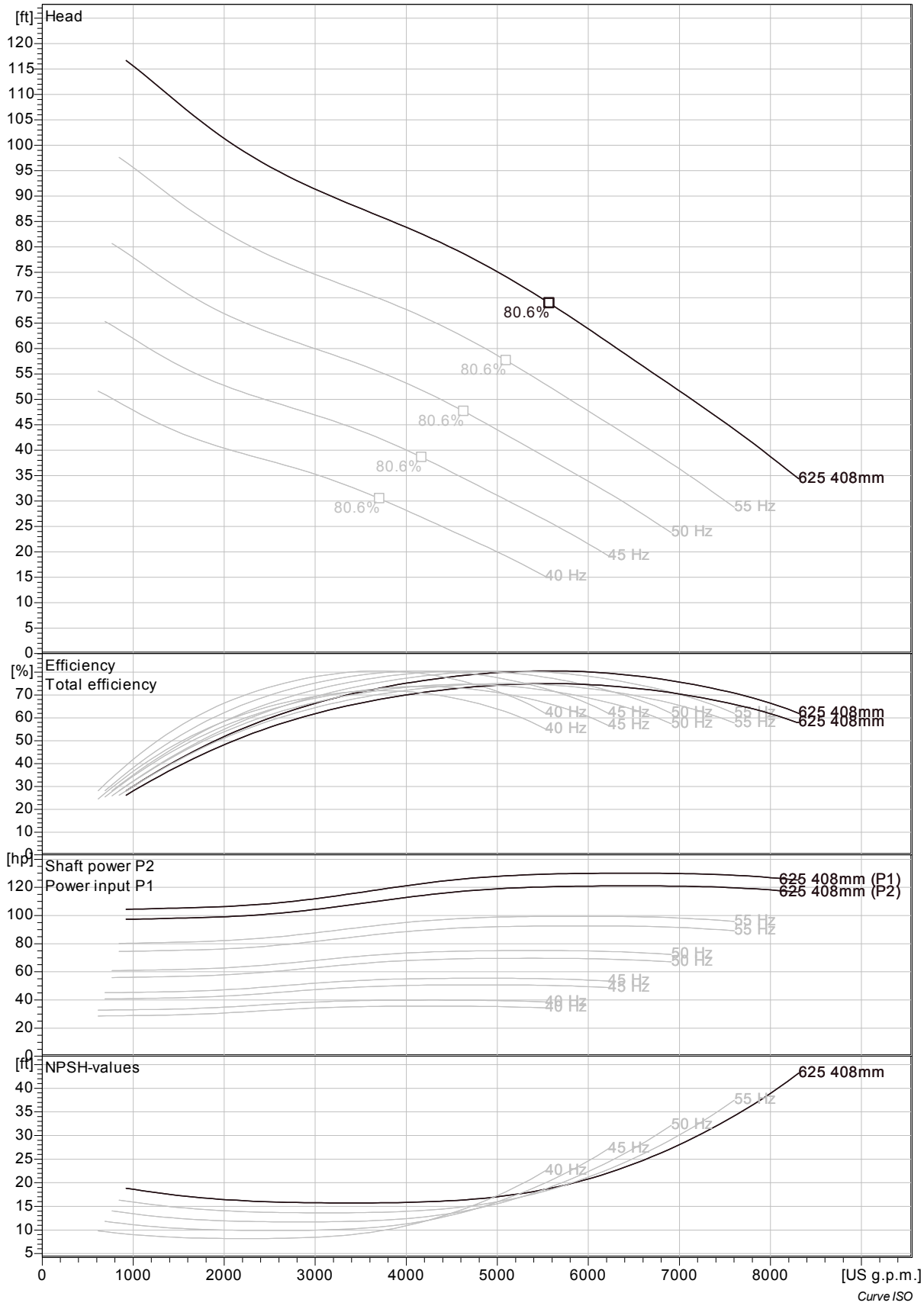
NP 3315 LT 3~ 625

VFD Curve



Project	Project ID	Created by	Created on	Last update
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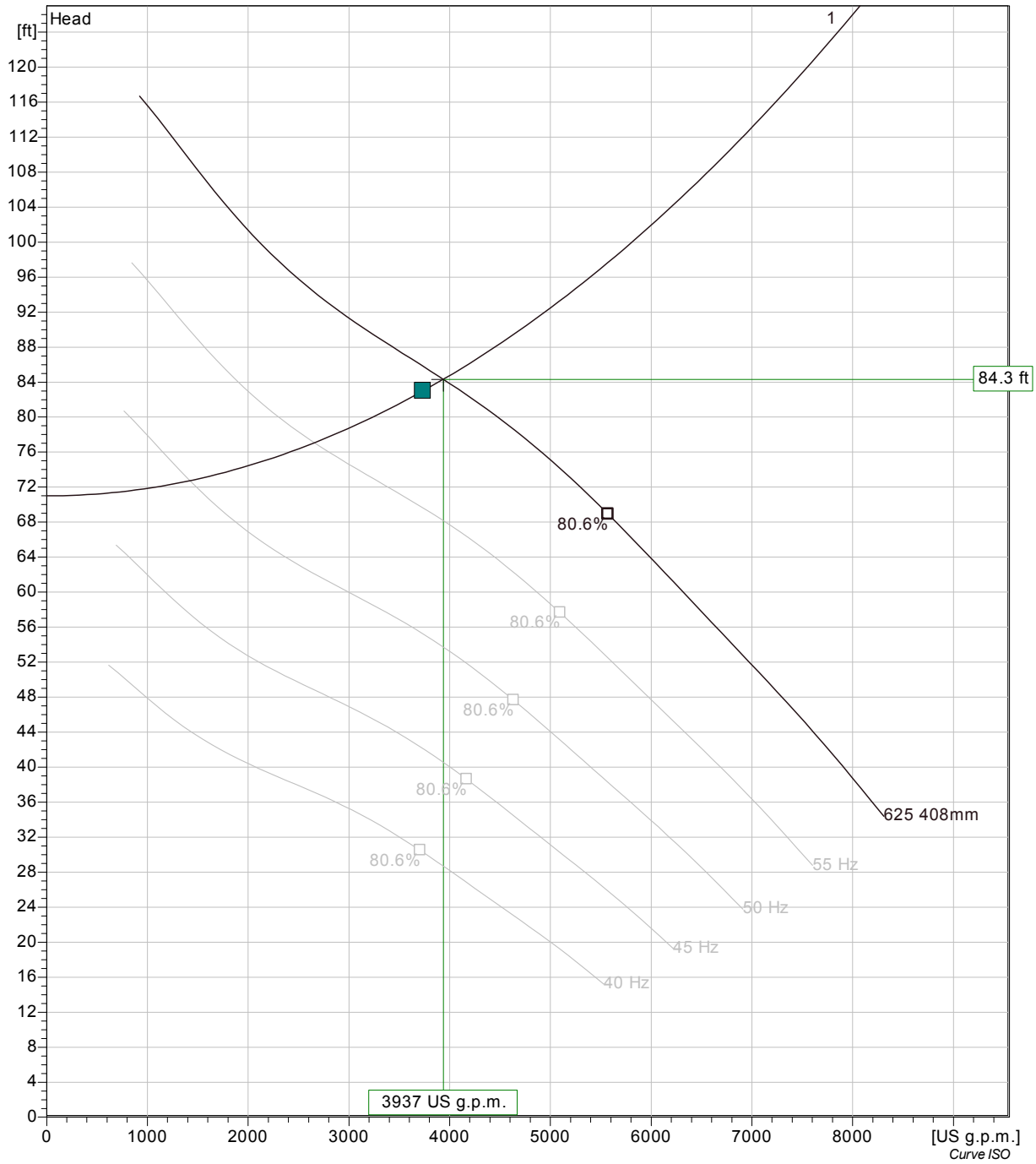
NP 3315 LT 3~ 625

VFD Analysis



Pumps running /System	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hyd eff.	Specific energy	NPSHre
1	60 Hz	3940 US g.p.m.	84.3 ft	112 hp	3940 US g.p.m.	84.3 ft	112 hp	74.8 %	381 kWh/US MG	15.8 ft
1	55 Hz	2660 US g.p.m.	77.1 ft	79.3 hp	2660 US g.p.m.	77.1 ft	79.3 hp	65.3 %	399 kWh/US MG	13.7 ft
1	50 Hz	1420 US g.p.m.	72.7 ft	56.6 hp	1420 US g.p.m.	72.7 ft	56.6 hp	46.2 %	538 kWh/US MG	12.6 ft
1	45 Hz									
1	40 Hz									

Project	Project ID	Created by	Created on	Last update
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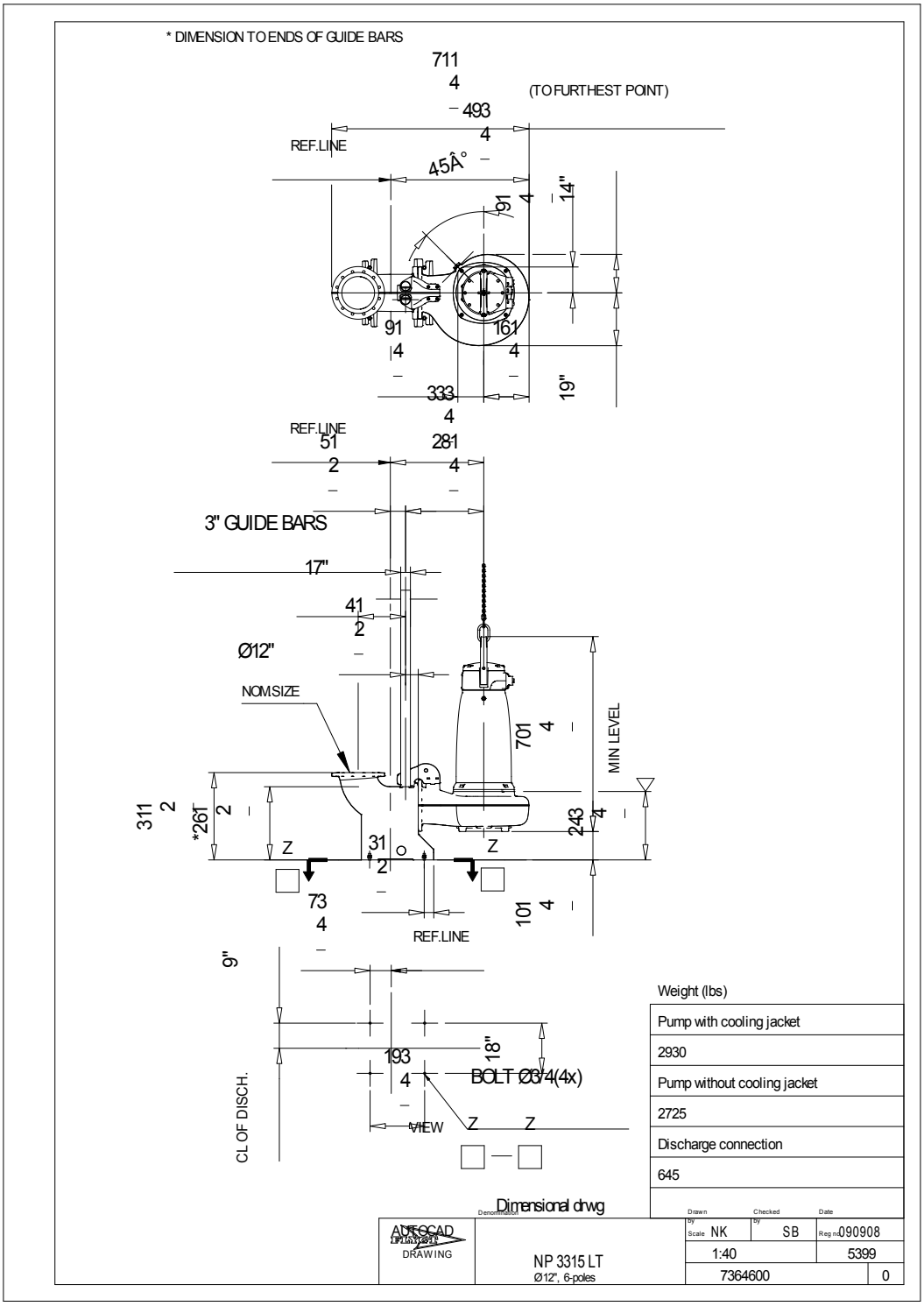
NP 3315 LT 3~ 625

Dimensional drawing



Project	Project ID	Created by	Created on	Last update
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Mitchell Way Lift Station

Design Parameters

New Station or Replace Existing?	**REPLACE**

New Wet Well?	IF NEEDED
New Force Main?	IF NEEDED

Max. Current PHF Flow (gpm)	100
Future PHF Flow (gpm)	801
Tested Capacity (gpm)	158
Current Design Flow (gpm)	350

Existing Pump Station and Force Main Information

Wet Well

Operating Depth (ft)	6
Diameter (ft)	8.5
Operating Volume (gallons)	2547
Surface El @ Ex. Wet Well	152
Bottom El.	124
Wet Well Depth	28

Existing Force Main

Pipe Nominal Diameter	4
Pipe Material	DI
Pipe Inside Diameter	3.98
Force Main Length	921
Equivalent Length	966
Pumps Off El.	126.25
Top El.	160.93
Velocity @ Current Capacity	4.07
Static Head	34.68
Chezy C	110

Existing Pumps

Number	2
Make	Myers?
Model	4VC/4VCX
Horsepower	10
Impeller Dia./Code	11?

**denotes code*

Local Losses in Existing System

Fitting	Count	Pipe Length	Equivalent
90 deg. Bend	0	20	0
45 deg bend	0	10.6	0
22.5 deg bend	0	10.6	0
Plug Valve	1	12	12
Check Valve	1	33	33
TOTAL			45

Pump and System Curve Data

System Curve

PS Pumping Capacity (gpm) (Q)	Velocity (fps) (V)	Unit Friction head loss	Friction Head Loss	TDH (ft)
0	0.00	0.000	0.0	35
50	1.29	0.003	2.8	38
158	4.07	0.025	23.8	58
240	6.19	0.053	51.5	86
350	9.03	0.107	103.5	138
400	10.32	0.137	132.5	167
480	12.38	0.192	185.6	220
560	14.44	0.256	246.9	282
640	16.50	0.327	316.1	351
720	18.57	0.407	393.0	428
800	20.63	0.494	477.6	512

Pump Curve

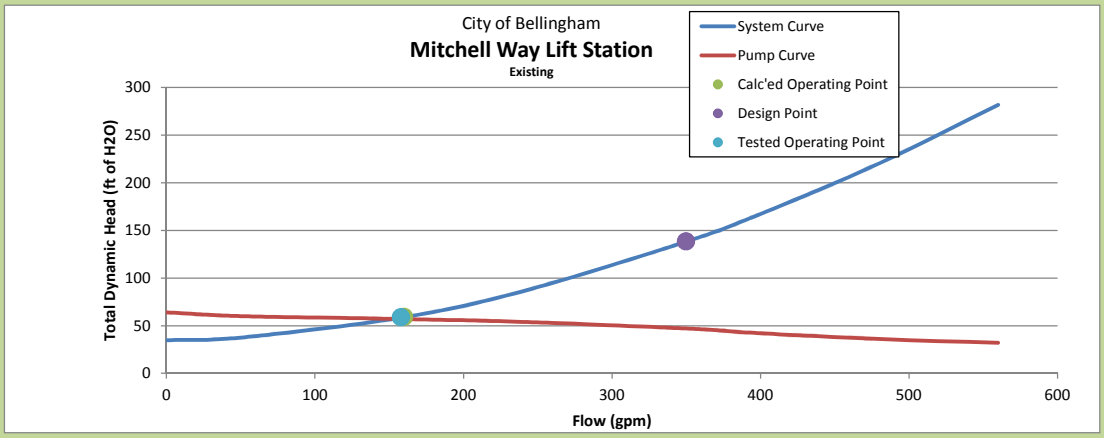
PS Pumping Capacity (gpm) (Q)	TDH (ft)
0	64
50	60
158	57
240	54
350	47
400	42
480	36
560	32
640	30
720	28
800	26

Pump and System Curves

Design Point	Flow (gpm)	Head (ft)
	350	138

Flow and head for operating point determined iteratively

Calculated Operating Point	Flow (gpm)	Head (ft)
	160	59



Mitchell Way Lift Station

Ex. System Analysis

Existing Force Main Analysis

Existing Force Main Evaluation

Design Flow (gpm)	801
Velocity in Ex. FM	20.66
TDH in Ex. FM	513
New FM?	YES

New force main considered if velocity exceeds 8 ft/s and/or TDH exceeds 200 ft H2O

Existing Wet Well Evaluation

Operating Volume (gallons)	2547
Design Flow (gpm)	801
Max Starts/hr (4V/Q)	4.7
New Wet Well?	NO

New Wet Well considered if starts/hr > 12

Proposed System

New Force Main Sizing and Pump Selection

Solved by iteration for preferred head (generally less than 200 ft TDH) and velocity conditions (generally b/w 3 and 6 fps)

Material	HDPE
Class/ Thickness	17
Nominal Diameter	8
Inside DIameter	7.549
Chezy C	130
Velocity at Design Flow	5.7
TDH @ Design Flow	50

NOT USED

Proposed Wet Well Diameter

Starts/Hr	12
Op. Volume	1001.25 gallons
Op. Depth	6 ft
Calced Dia.	5.33 ft
WW Dia.	6 ft.
Selected Dia.	6 ft.

Confirm WW is large enough for pumps

Proposed Pumps

Number	2
Make	Flygt
Model	NP3153HT
Horsepower	20
Impeller Dia./Code	229 mm

**denotes code*

Pump and System Curve Data

System Curve

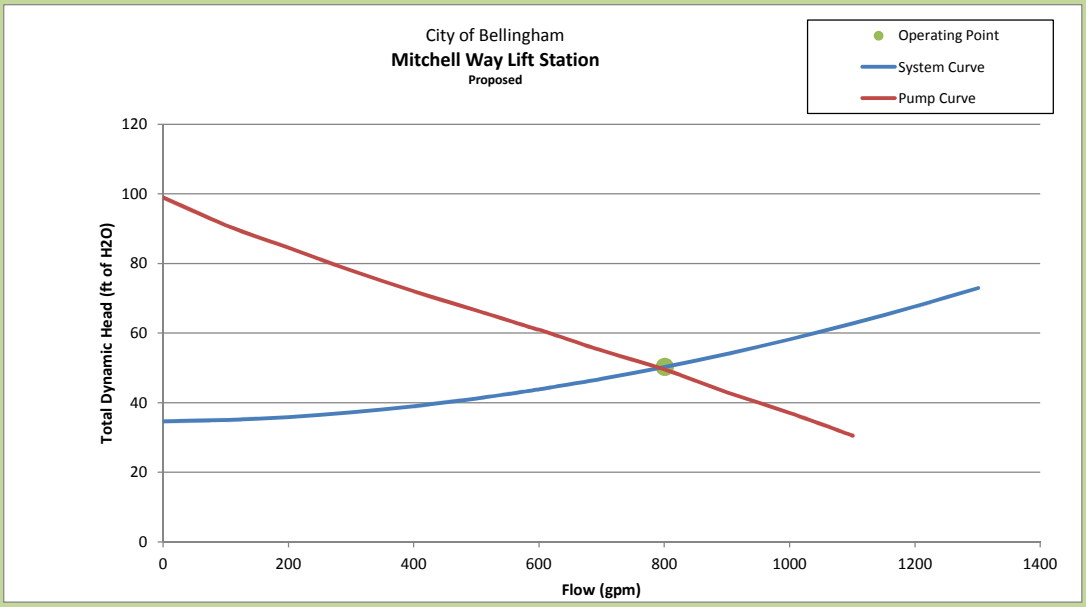
PS Pumping Capacity (gpm) (Q)	Velocity (fps) (V)	Unit Friction head loss	Friction Head Loss	TDH (ft)
0	0.00	0.0000	0.0	35
100	0.72	0.0003	0.3	35
200	1.43	0.0012	1.2	36
300	2.15	0.0026	2.5	37
400	2.87	0.0045	4.3	39
500	3.58	0.0068	6.5	41
596	4.27	0.0093	9.0	44
600	4.30	0.0095	9.1	44
700	5.02	0.0126	12.2	47
801	5.74	0.0162	15.6	50
901	6.46	0.0201	19.4	54
1001	7.18	0.0244	23.6	58
1101	7.89	0.0291	28.1	63
1201	8.61	0.0342	33.0	68
1301	9.33	0.0396	38.3	73

Pump Curve

PS Pumping Capacity (gpm) (Q)	TDH (ft)
0	99.00
100	91.00
200	84.50
300	78.00
400	72.00
500	66.50
596	61.10
600	61.00
700	55.00
801	49.50
900	43.00
1001	37.00
1101	30.50

Pump and System Curves

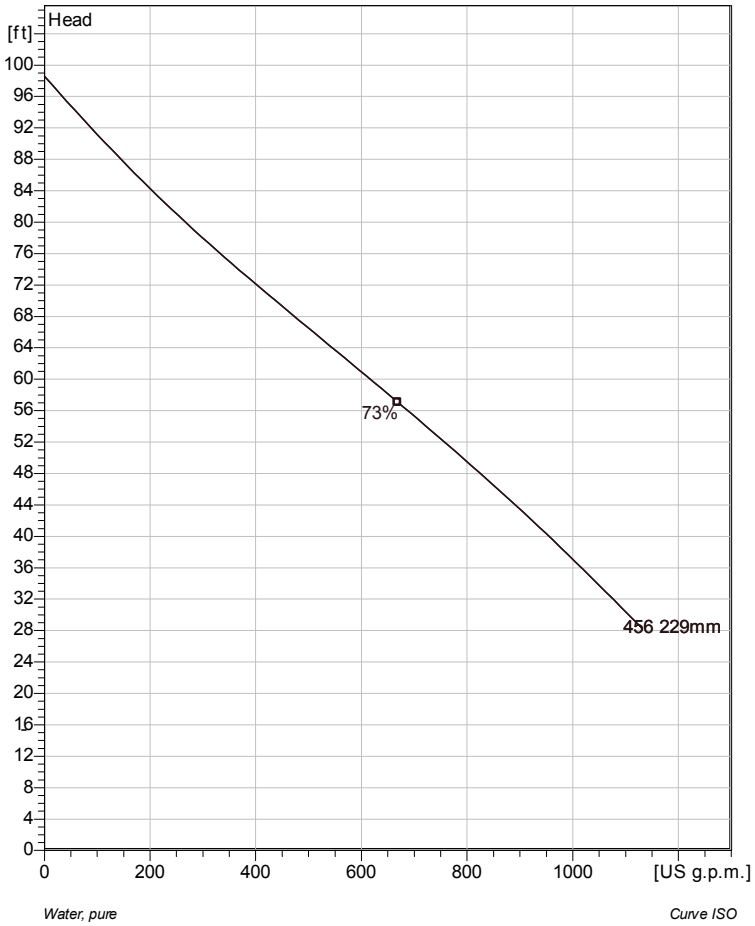
Operating Point	Flow (gpm)	Head (ft)
	801	50



Mitchell Way Alternative Nos. 1 and 2

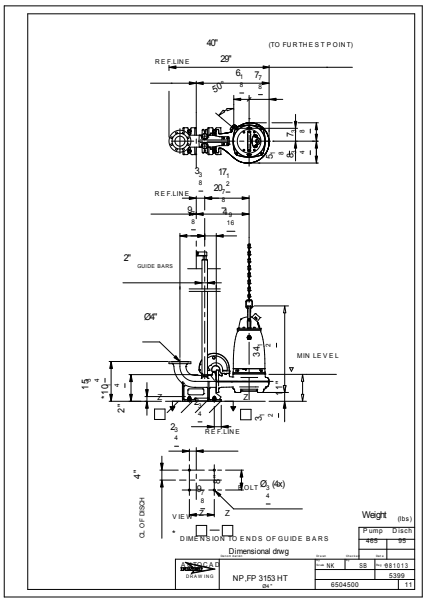
NP 3153 HT 3~ 456

Technical specification



Note: Picture might not correspond to the current configuration.

Installation: P - Semi permanent, Wet



General

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Possible to be upgraded with Guide-pin® for even better clogging resistance. Modular based design with high adaptation grade.

Impeller

Impeller material	Stainless steel
Discharge Flange Diameter	3 15/16 inch
Inlet diameter	3 15/16 inch
Impeller diameter	229 mm
Number of blades	2

Motor

Motor #	N3153.660 21-15-4AA-W 15hp
Stator variant	4
Frequency	60 Hz
Rated voltage	200 V
Number of poles	4
Phases	3~
Rated power	15 hp
Rated current	44 A
Starting current	246 A
Rated speed	1755 rpm
Power factor	
1/1 Load	0.85
3/4 Load	0.80
1/2 Load	0.70
Efficiency	
1/1 Load	87.2 %
3/4 Load	88.6 %
1/2 Load	88.6 %

Configuration

Project	Project ID	Created by	Created on	Last update
			2016-03-12 21:42:28	

NP 3153 HT 3~ 456

Performance curve

Pump

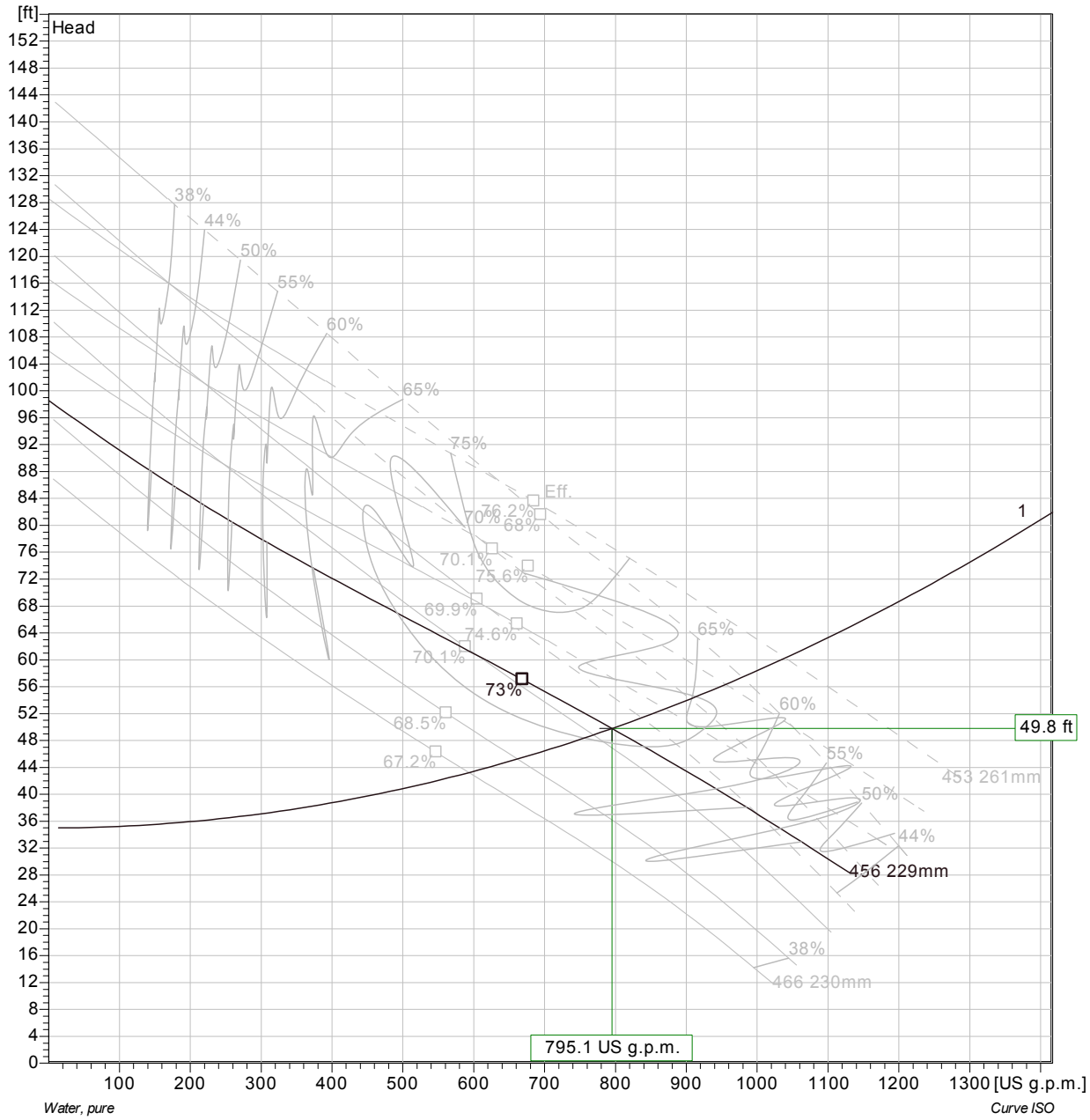
Discharge Flange Diameter	3 15/16 inch
Inlet diameter	100 mm
Impeller diameter	9"
Number of blades	2

Motor

Motor #	N3153.660 21-15-4AA-W 15hp
Stator variant	4
Frequency	60 Hz
Rated voltage	200 V
Number of poles	4
Phases	3~
Rated power	15 hp
Rated current	44 A
Starting current	246 A
Rated speed	1755 rpm

Power factor	
1/1 Load	0.85
3/4 Load	0.80
1/2 Load	0.70

Efficiency	
1/1 Load	87.2 %
3/4 Load	88.6 %
1/2 Load	88.6 %



Project	Project ID	Created by	Created on	Last update
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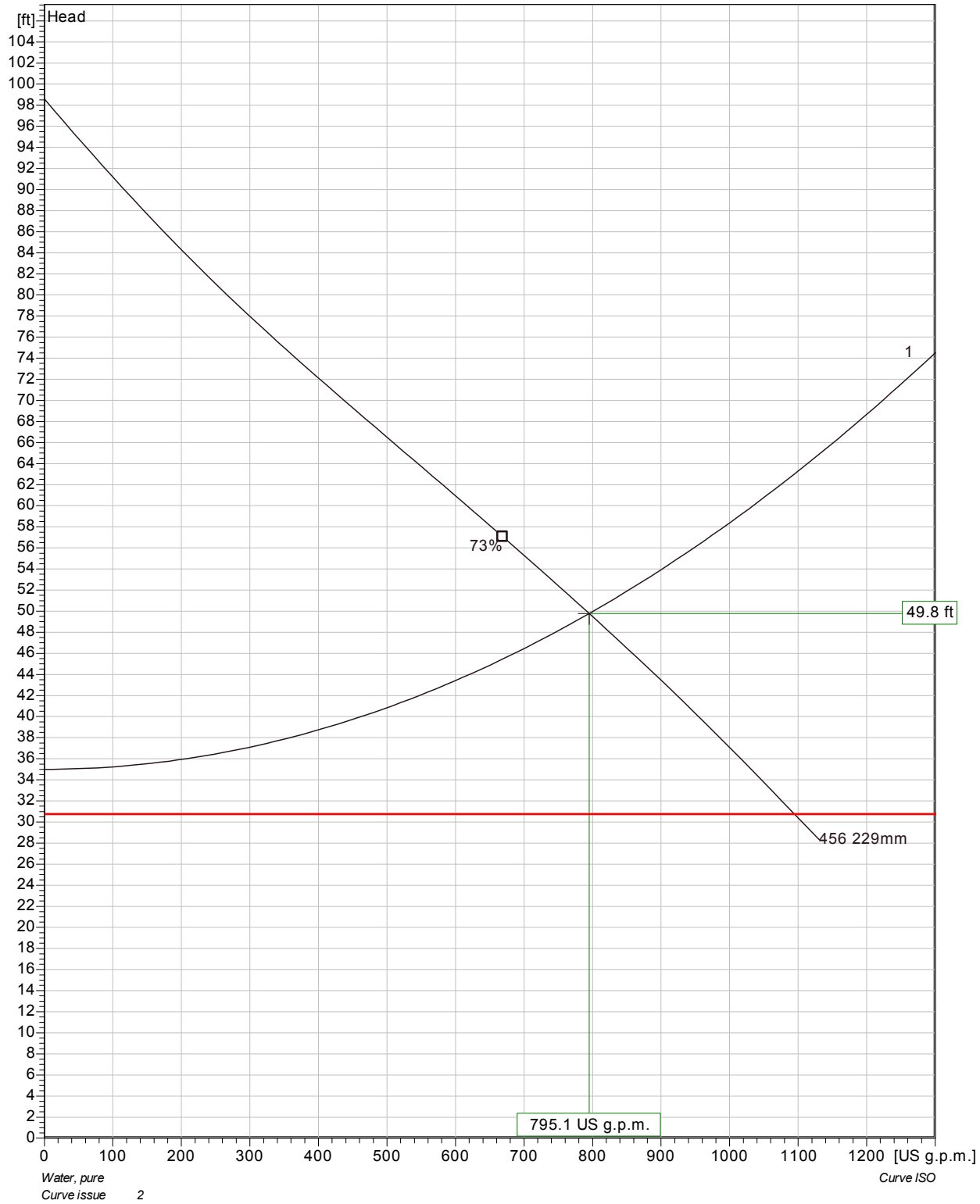
NP 3153 HT 3~ 456

Duty Analysis

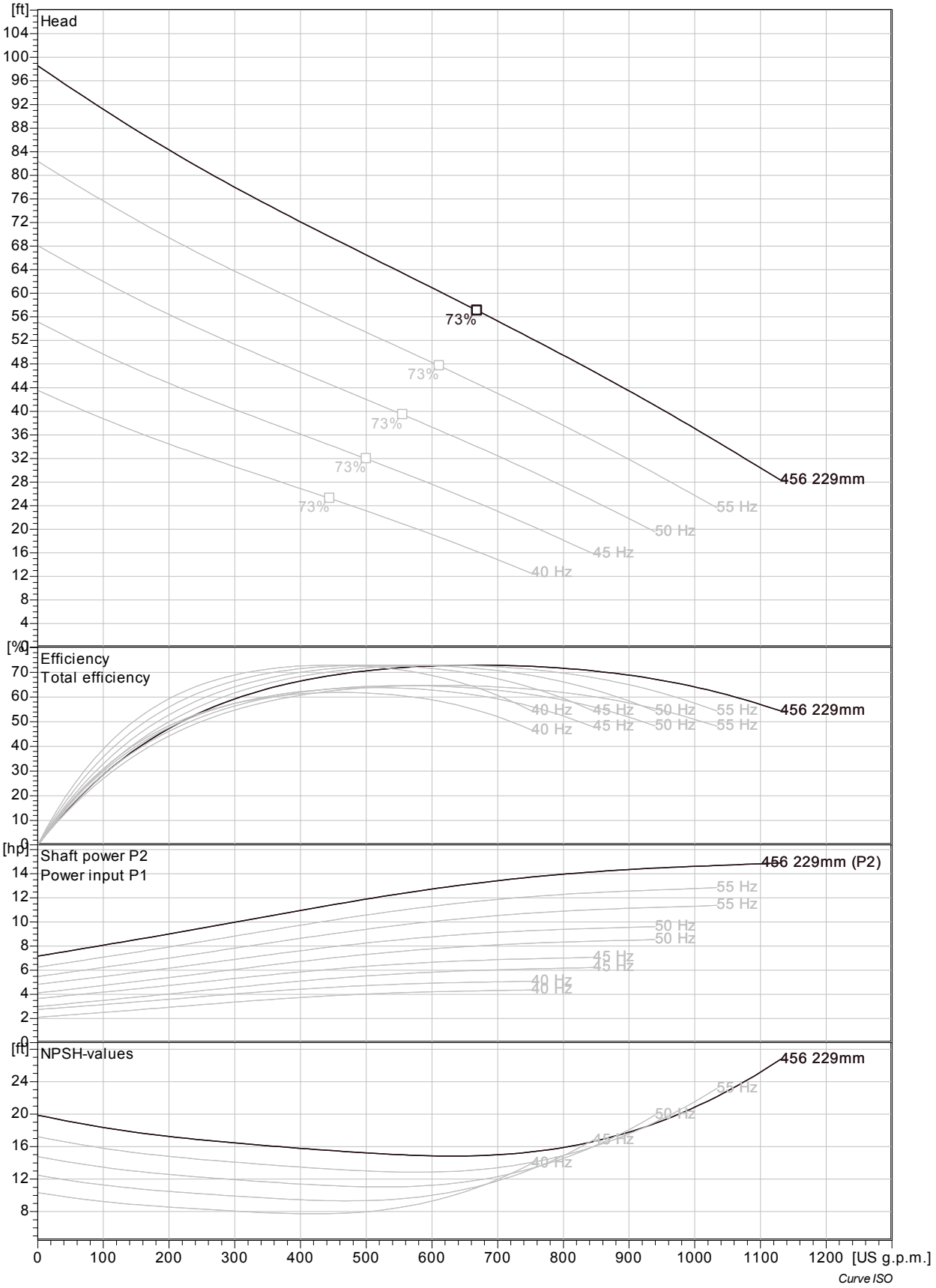


Pumps running /System	Individual pump Flow	Head	Shaft power	Total Flow	Head	Shaft power	Pump eff.	Specific energy	NPSHre
1	795 US g.p.m.	49.8 ft	13.9 hp	795 US g.p.m.	49.8 ft	13.9 hp	71.8 %	249 kWh/US MG	15.8 ft

Project	Project ID	Created by	Created on	Last update
			2016-03-12 21:42:28	

NP 3153 HT 3~ 456

VFD Curve



Project	Project ID	Created by	Created on	Last update
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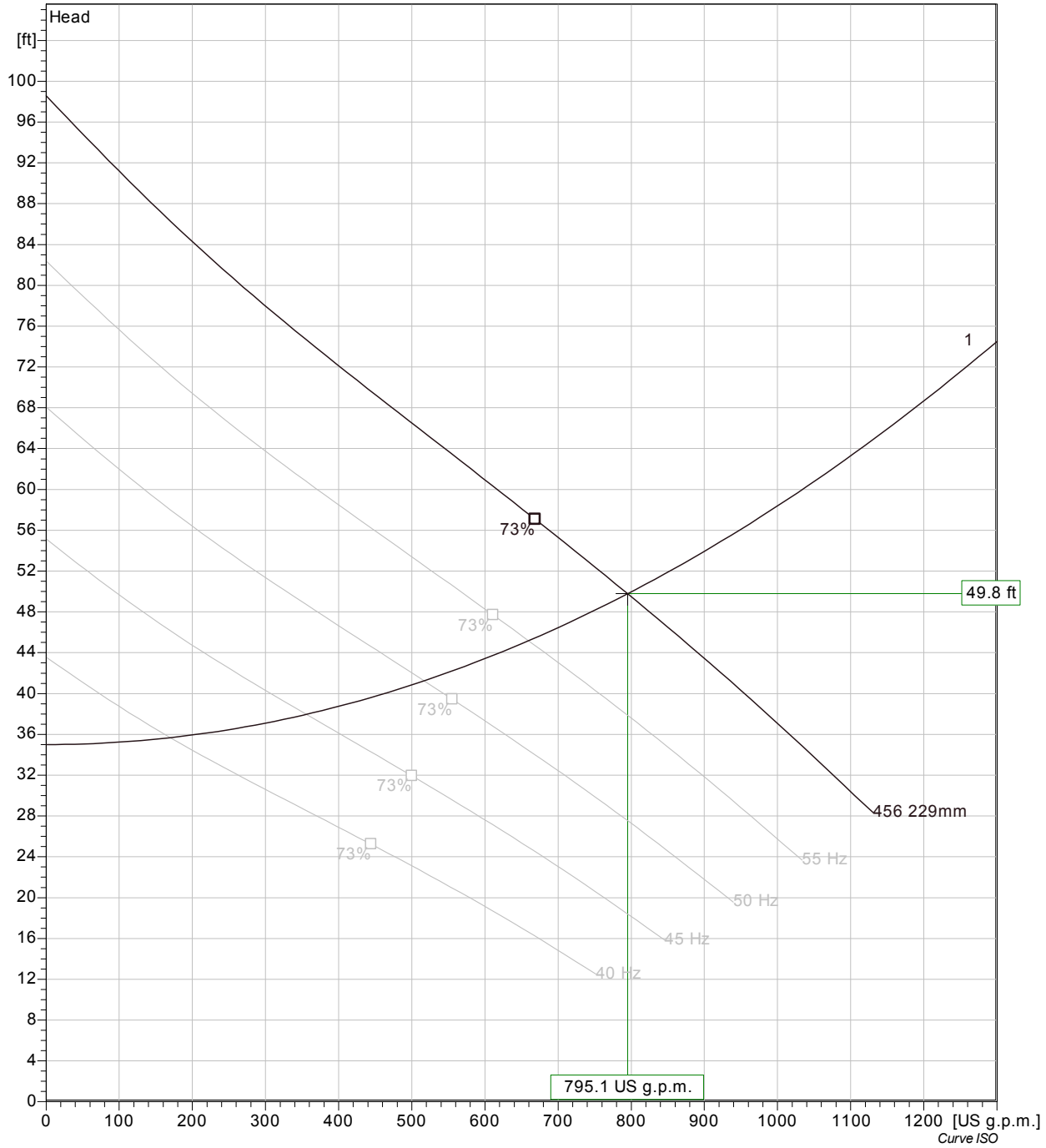
NP 3153 HT 3~ 456

VFD Analysis

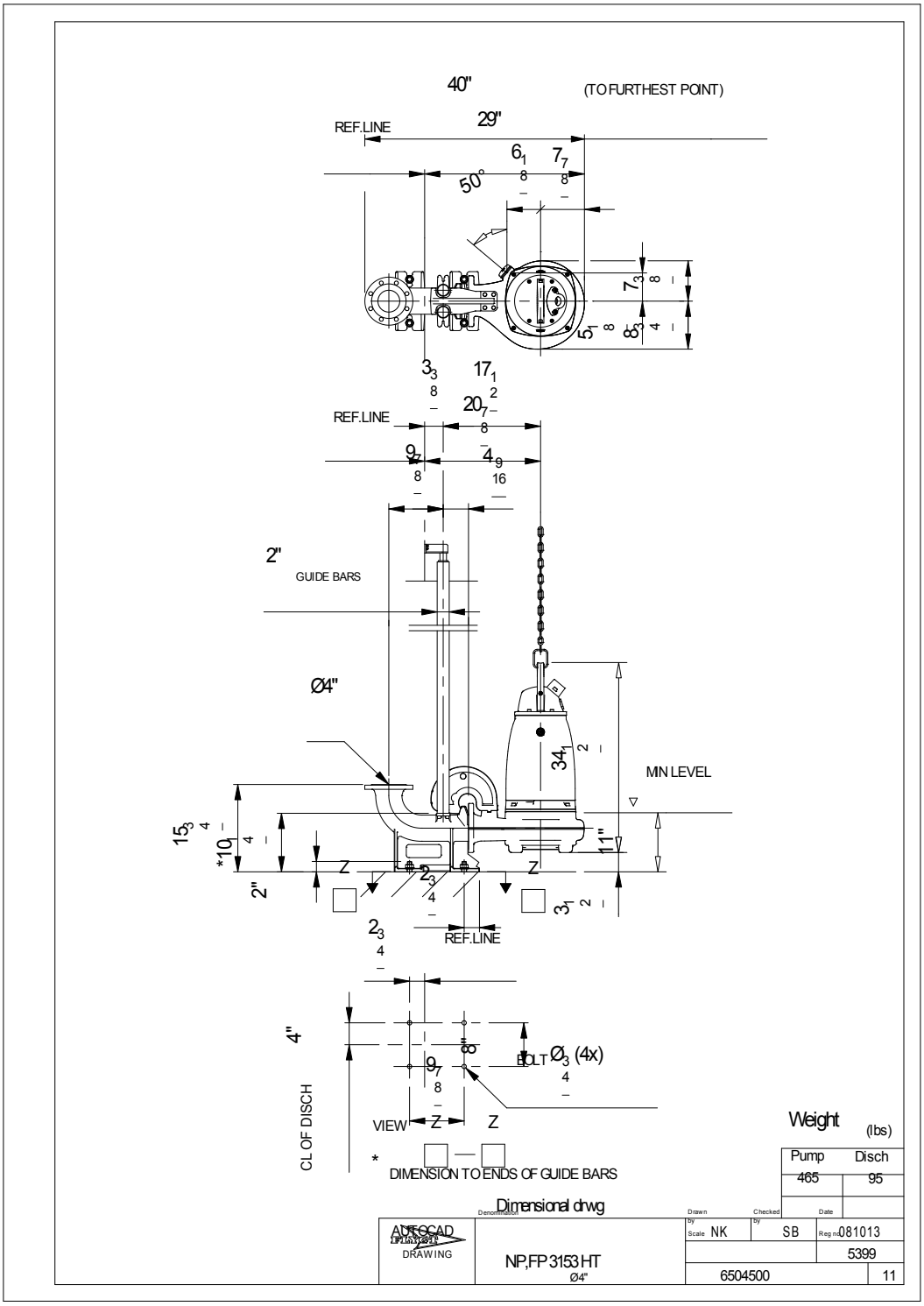


Pumps running /System	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hyd eff.	Specific energy	NPSHre
1	60 Hz	795 US g.p.m.	49.8 ft	13.9 hp	795 US g.p.m.	49.8 ft	13.9 hp	71.8 %	249 kWh/US MG	15.8 ft
1	55 Hz	660 US g.p.m.	45.2 ft	10.4 hp	660 US g.p.m.	45.2 ft	10.4 hp	72.8 %	220 kWh/US MG	13.1 ft
1	50 Hz	517 US g.p.m.	41.2 ft	7.41 hp	517 US g.p.m.	41.2 ft	7.41 hp	72.8 %	201 kWh/US MG	11 ft
1	45 Hz	356 US g.p.m.	38 ft	4.89 hp	356 US g.p.m.	38 ft	4.89 hp	69.9 %	197 kWh/US MG	9.65 ft
1	40 Hz	170 US g.p.m.	35.7 ft	2.81 hp	170 US g.p.m.	35.7 ft	2.81 hp	54.6 %	253 kWh/US MG	8.73 ft

Project	Project ID	Created by	Created on	Last update
			2016-03-12 21:42:28	

NP 3153 HT 3~ 456

Dimensional drawing



Project	Project ID	Created by	Created on	Last update
			2016-03-12 21:42:28	

North Mitchell Way Lift Station

Design Parameters

New Station or Replace Existing?	**REPLACE**

New Wet Well?	IF NEEDED
New Force Main?	IF NEEDED

Max. Current PHF Flow (gpm)	5
Future PHF Flow (gpm)	668
Tested Capacity (gpm)	264.5
Current Design Flow (gpm)	525

Existing Pump Station and Force Main Information

Wet Well

Operating Depth (ft)	2
Diameter (ft)	8
Operating Volume (gallons)	752
Surface El @ Ex. Wet Well	139
Bottom El.	121
Wet Well Depth	18

Existing Force Main

Pipe Nominal Diameter	6
Pipe Material	HDPE
Pipe Inside Diameter	6.085
Force Main Length	1965
Equivalent Length	2010
Pumps Off El.	123
Top El.	145
Velocity @ Current Capacity	2.92
Static Head	22
Chezy C	120

Existing Pumps

Number	2
Make	Flygt
Model	CP3127
Horsepower	7.5
Impeller Dia./Code	424*

**denotes code*

Local Losses in Existing System

Fitting	Count	Pipe Length	Equivalent
90 deg. Bend	0	20	0
45 deg bend	0	10.6	0
22.5 deg bend	0	10.6	0
Plug Valve	1	12	12
Check Valve	1	33	33
TOTAL			45

Pump and System Curve Data

System Curve

PS Pumping Capacity (gpm) (Q)	Velocity (fps) (V)	Unit Friction head loss	Friction Head Loss	TDH (ft)
0	0.00	0.000	0.0	22
100	1.10	0.001	2.3	24
260	2.87	0.007	13.4	35
264.5	2.92	0.007	13.8	36
364.5	4.02	0.012	25.0	47
525	5.79	0.024	49.2	71
564.5	6.23	0.028	56.3	78
664.5	7.33	0.038	76.1	98
764.5	8.43	0.049	98.6	121

Pump Curve

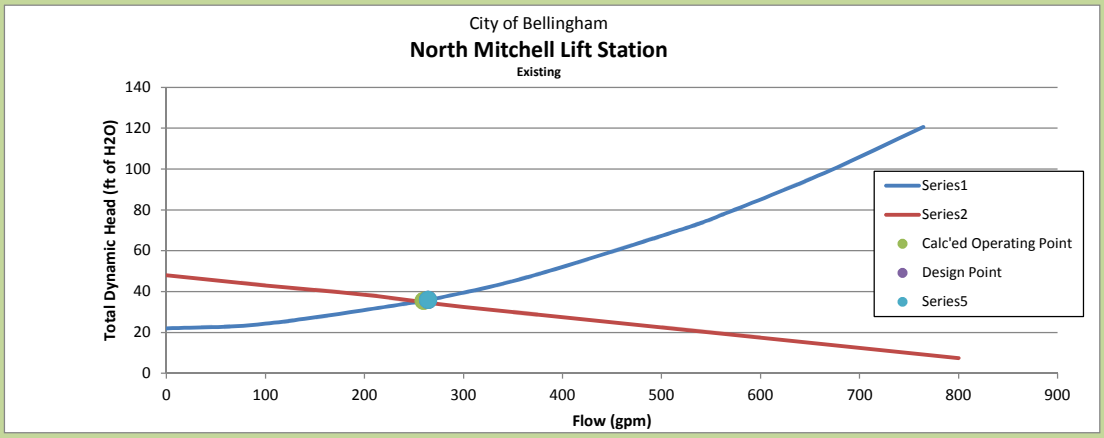
PS Pumping Capacity (gpm) (Q)	TDH (ft)
0	48
100	43
200	38.5
300	33
400	28
500	23
600	18
700	13
800	8
900	3

Pump and System Curves

Design Point	Flow (gpm)	Head (ft)
	264.5	36

Flow and head for operating point determined iteratively

Calculated Operating Point	Flow (gpm)	Head (ft)
	260	35



North Mitchell Way Lift Station

Ex. System Analysis

Existing Force Main Analysis

Existing Force Main Evaluation

Design Flow (gpm)	668
Velocity in Ex. FM	7.37
TDH in Ex. FM	99
New FM?	NO

New force main considered if velocity exceeds 8 ft/s and/or TDH exceeds 200 ft H2O

Existing Wet Well Evaluation

Operating Volume (gallons)	752
Design Flow (gpm)	668
Max Starts/hr (4V/Q)	13.3
New Wet Well?	YES

New Wet Well considered if starts/hr > 12

Proposed System

New Force Main Sizing and Pump Selection

Solved by iteration for preferred head (generally less than 200 ft TDH) and velocity conditions (generally b/w 3 and 6 fps)

Material	HDPE
Class/ Thickness	17
Nominal Diameter	8
Inside DIameter	7.549
Chezy C	130
Velocity at Design Flow	4.8
TDH @ Design Flow	45

Proposed Wet Well Diameter

Starts/Hr	12
Op. Volume	835 gallons
Op. Depth	2 ft
Calced Dia.	8.43 ft
WW Dia.	10 ft.
Selected Dia.	10 ft.

Confirm WW is large enough for pumps

Proposed Pumps

Number	2
Make	Flygt
Model	NP3171SH
Horsepower	35
Impeller Dia./Code	195 mm

**denotes code*

Pump and System Curve Data

System Curve

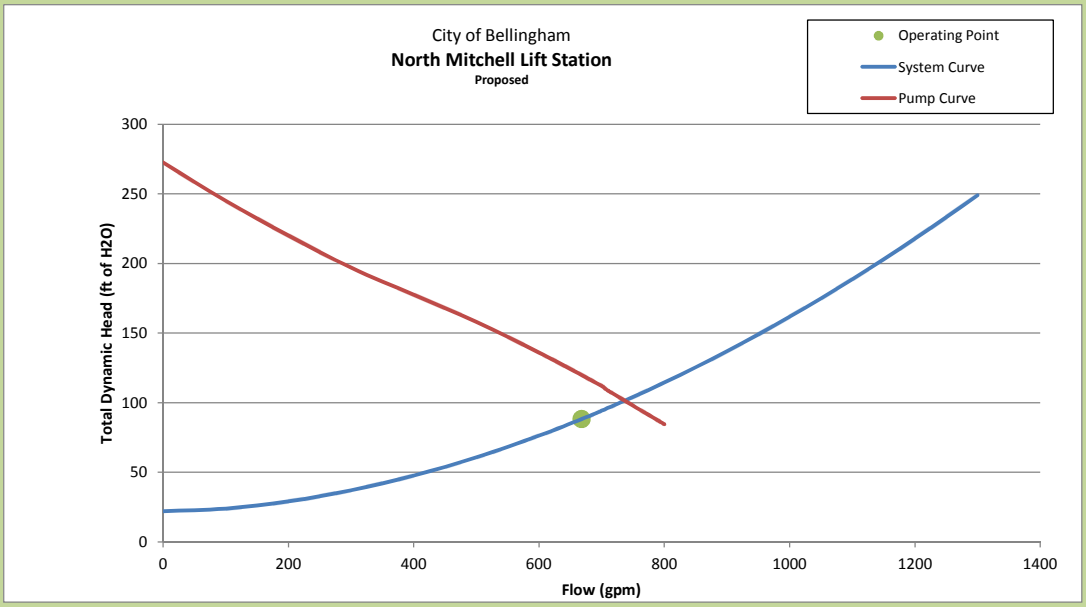
PS Pumping Capacity (gpm) (Q)	Velocity (fps) (V)	Unit Friction head loss	Friction Head Loss	TDH (ft)
0	0.00	0.0000	0.0	22
100	1.10	0.0010	2.0	24
200	2.21	0.0035	7.1	29
300	3.31	0.0075	15.1	37
400	4.41	0.0128	25.7	48
500	5.52	0.0193	38.8	61
600	6.62	0.0270	54.3	76
668	7.37	0.0330	66.2	88
700	7.72	0.0359	72.2	94
800	8.83	0.0460	92.5	114
900	9.93	0.0572	115.0	137
1000	11.03	0.0695	139.7	162
1100	12.14	0.0829	166.7	189
1200	13.24	0.0974	195.8	218
1300	14.34	0.1129	227.0	249

Pump Curve

PS Pumping Capacity (gpm) (Q)	TDH (ft)
0	272.50
100	245.00
200	220.00
300	197.00
400	177.50
500	158.00
600	136.00
700	112.00
708.9	109.00
800	84.50

Pump and System Curves

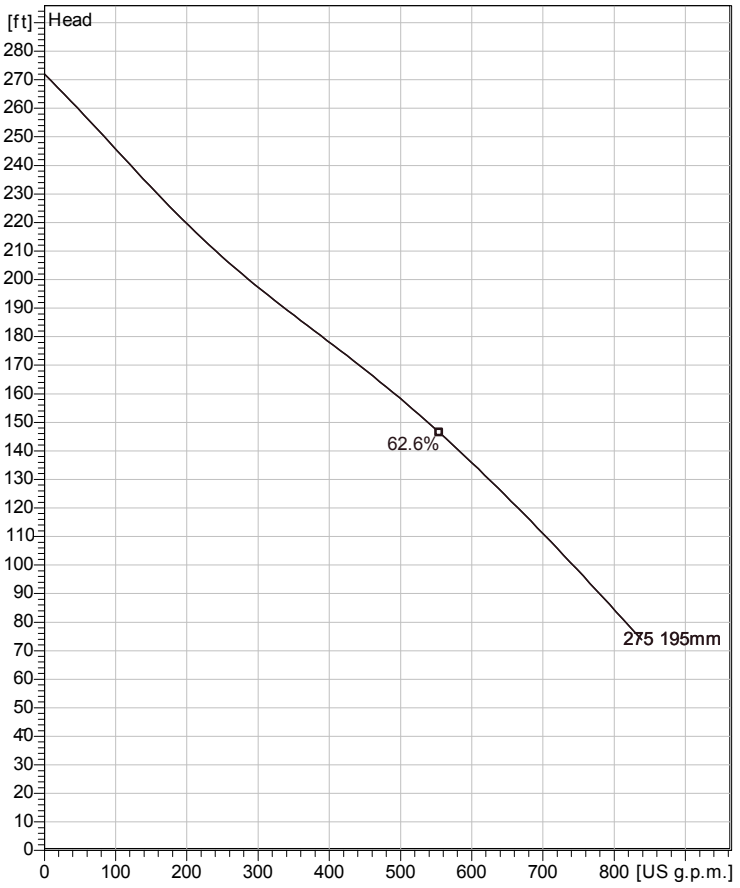
Operating Point	Flow (gpm)	Head (ft)
	668	88



North Mitchell Alternative No. 1

NP 3171 SH 3~ 275

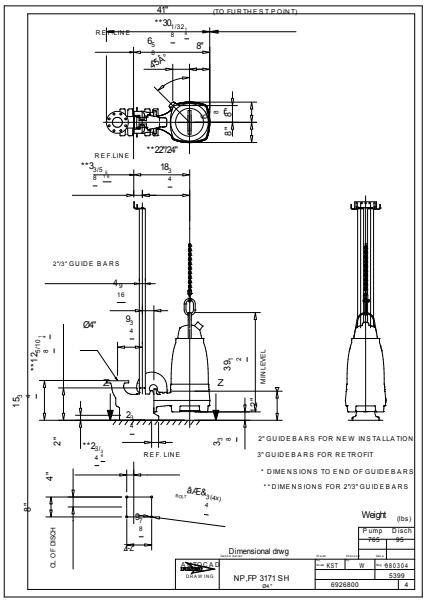
Technical specification



Water, pure *Curve ISO*

Note: Picture might not correspond to the current configuration.

Installation: P - Semi permanent, Wet



General

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Possible to be upgraded with Guide-pin® for even better clogging resistance. Modular based design with high adaptation grade.

Impeller

Impeller material	Grey cast iron
Discharge Flange Diameter	3 15/16 inch
Inlet diameter	3 15/16 inch
Impeller diameter	195 mm
Number of blades	2

Motor

Motor #	N3171.181 25-18-2AA-W 35hp
Stator variant	9
Frequency	60 Hz
Rated voltage	230 V
Number of poles	2
Phases	3~
Rated power	35 hp
Rated current	79 A
Starting current	585 A
Rated speed	3530 rpm
Power factor	
1/1 Load	0.91
3/4 Load	0.89
1/2 Load	0.82
Efficiency	
1/1 Load	91.0 %
3/4 Load	91.5 %
1/2 Load	92.0 %

Configuration

Project	Project ID	Created by	Created on	Last update
			2016-03-12 21:42:28	

NP 3171 SH 3~ 275

Performance curve

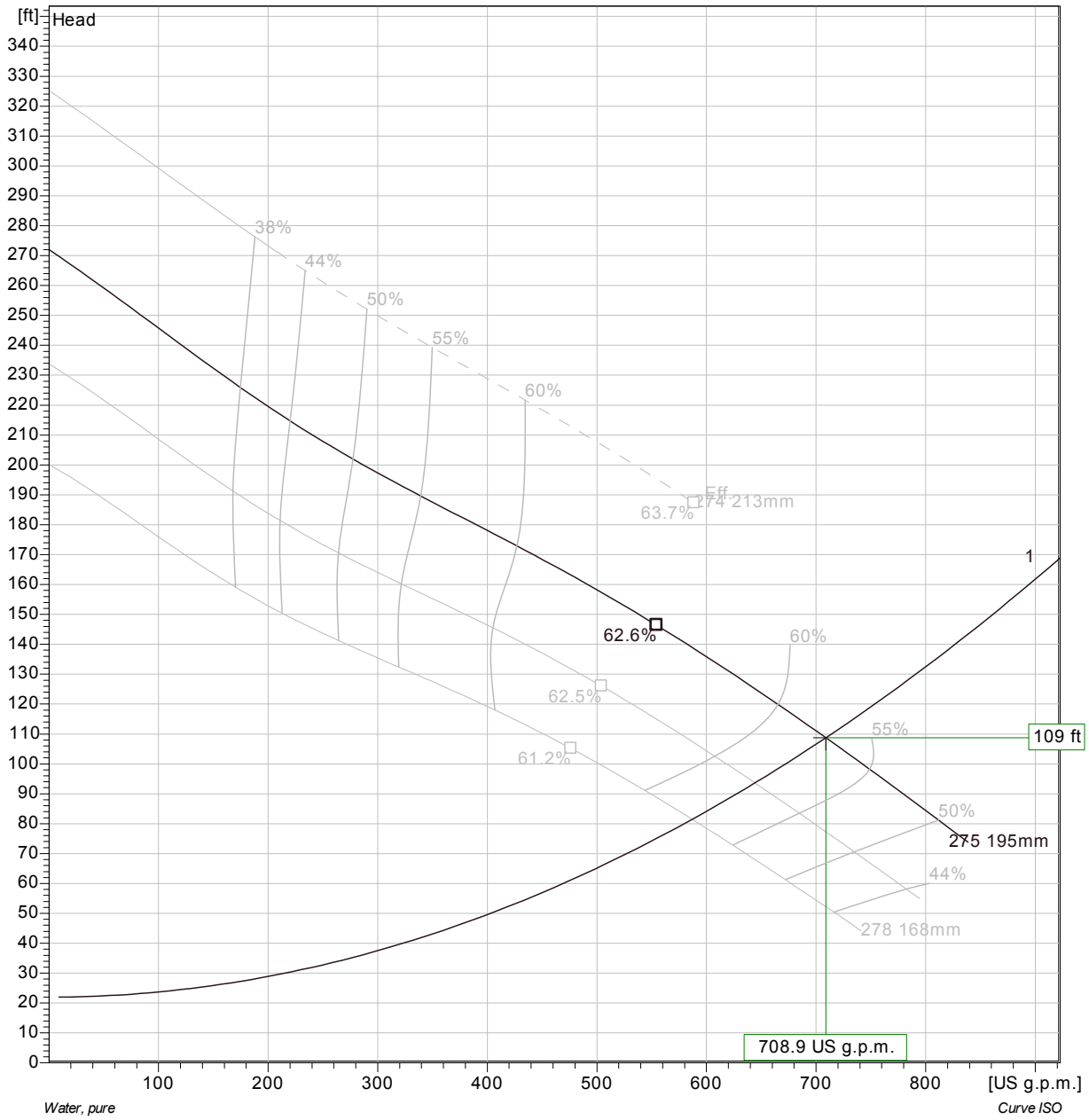
Pump

Discharge Flange Diameter	3 15/16 inch
Inlet diameter	100 mm
Impeller diameter	$7^{11}/_{16}$"
Number of blades	2

Motor

Motor #	N3171.181 25-18-2AA-W 35hp
Stator variant	9
Frequency	60 Hz
Rated voltage	230 V
Number of poles	2
Phases	3~
Rated power	35 hp
Rated current	79 A
Starting current	585 A
Rated speed	3530 rpm

Power factor	
1/1 Load	0.91
3/4 Load	0.89
1/2 Load	0.82
Efficiency	
1/1 Load	91.0 %
3/4 Load	91.5 %
1/2 Load	92.0 %



Project	Project ID	Created by	Created on	Last update
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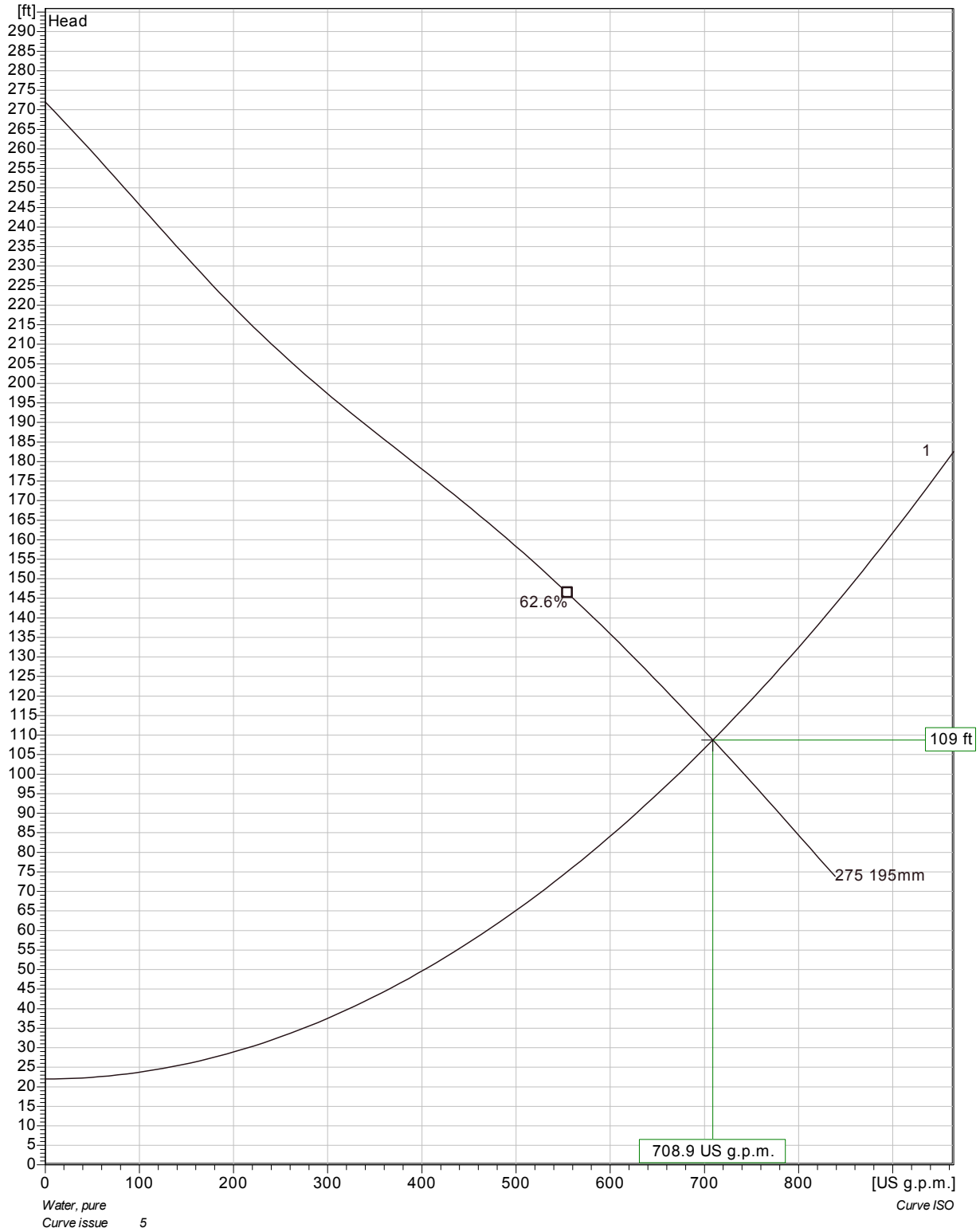
NP 3171 SH 3~ 275

Duty Analysis

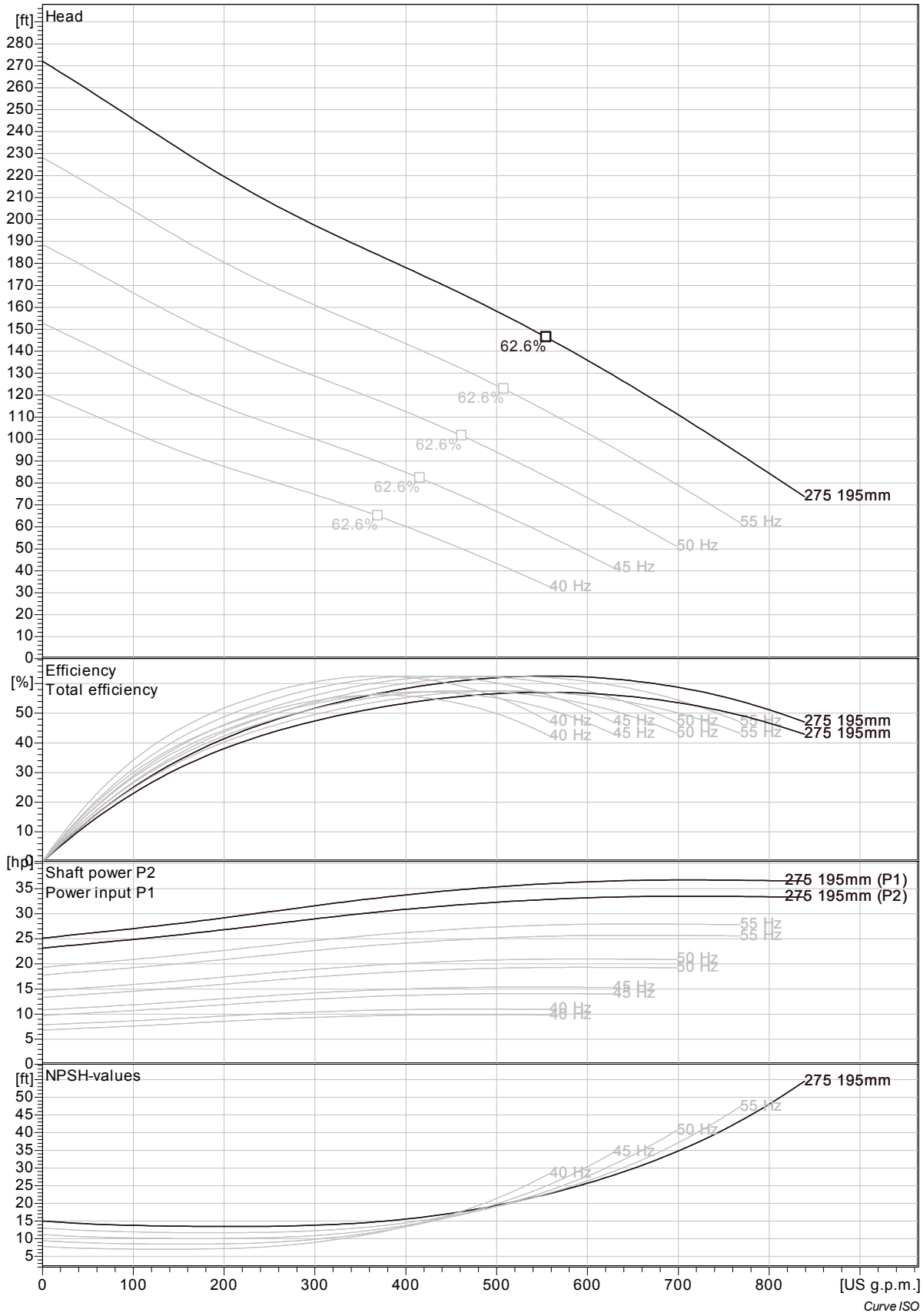


Pumps running /System	Individual pump			Total					
	Flow	Head	Shaft power	Flow	Head	Shaft power	Pump eff.	Specific energy	NPSHre
1	709 US g.p.m.	109 ft	33.5 hp	709 US g.p.m.	109 ft	33.5 hp	58.2 %	644 kWh/US MG	35.8 ft

Project	Project ID	Created by	Created on	Last update
			2016-03-12 21:42:28	

NP 3171 SH 3~ 275

VFD Curve



Project	Project ID	Created by	Created on	Last update
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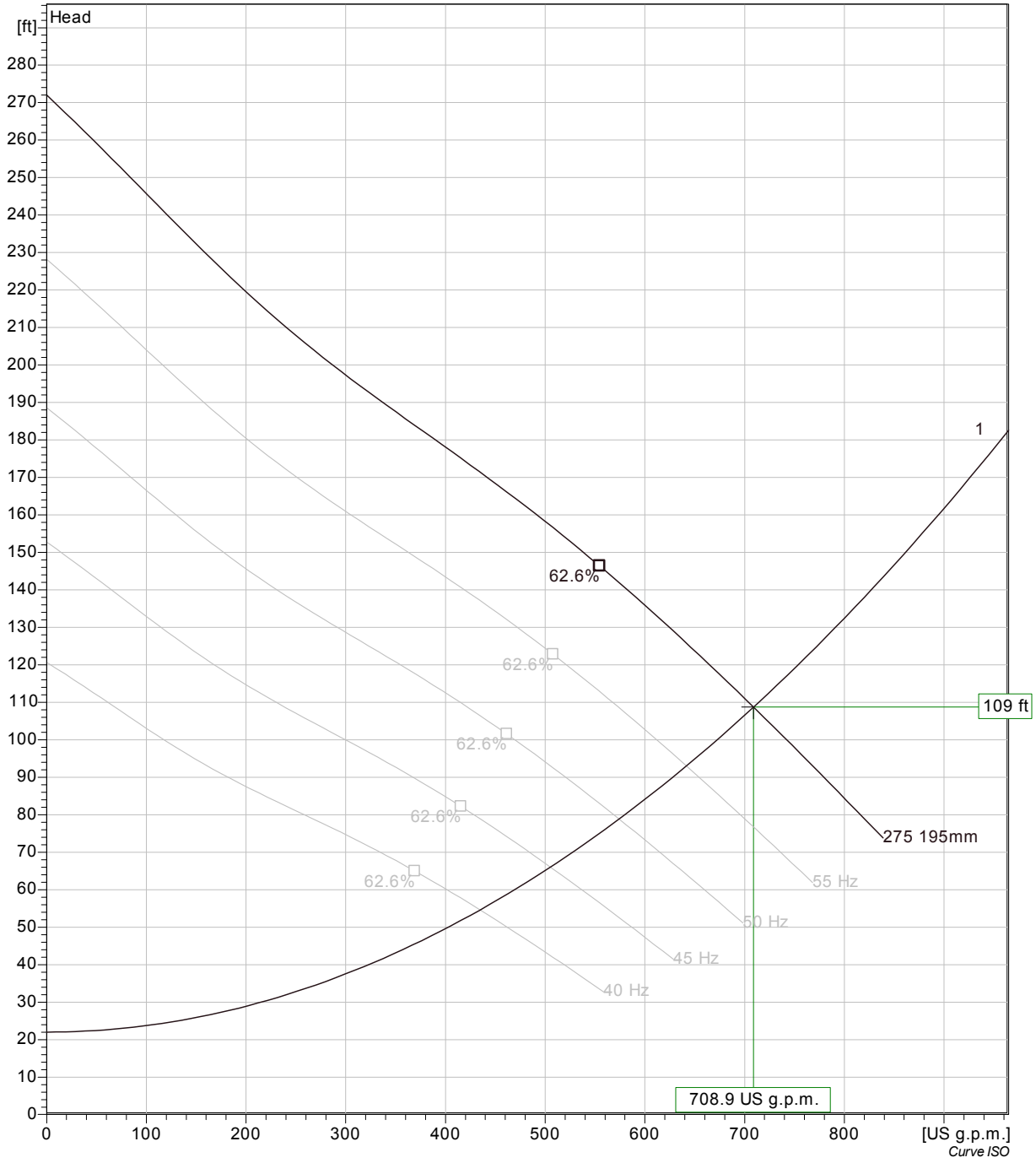
NP 3171 SH 3~ 275

VFD Analysis

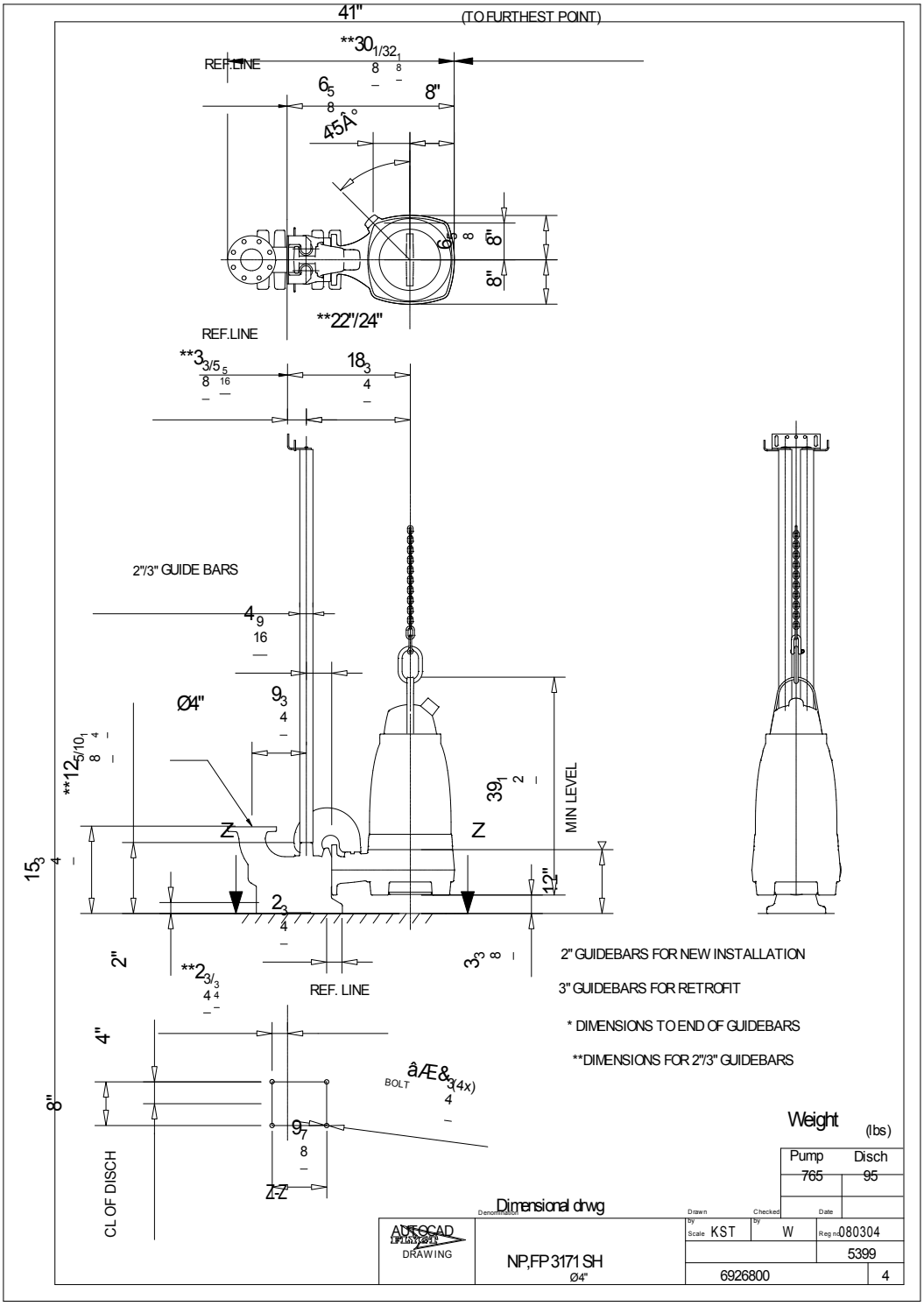


Pumps running /System	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hyd eff.	Specific energy	NPSHre
1	60 Hz	709 US g.p.m.	109 ft	33.5 hp	709 US g.p.m.	109 ft	33.5 hp	58.2 %	644 kWh/US MG	35.8 ft
1	55 Hz	642 US g.p.m.	93 ft	25.7 hp	642 US g.p.m.	93 ft	25.7 hp	58.7 %	542 kWh/US MG	30.3 ft
1	50 Hz	574 US g.p.m.	78.9 ft	19.3 hp	574 US g.p.m.	78.9 ft	19.3 hp	59.3 %	454 kWh/US MG	25.1 ft
1	45 Hz	505 US g.p.m.	66.1 ft	14.1 hp	505 US g.p.m.	66.1 ft	14.1 hp	60 %	378 kWh/US MG	20.3 ft
1	40 Hz	435 US g.p.m.	54.6 ft	9.87 hp	435 US g.p.m.	54.6 ft	9.87 hp	60.8 %	314 kWh/US MG	15.7 ft

Project	Project ID	Created by	Created on	Last update
			2016-03-12 21:42:28	

NP 3171 SH 3~ 275

Dimensional drawing



Project	Project ID	Created by	Created on	Last update
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Northshore Lift Station

Design Parameters

New Station or Replace Existing?	**REPLACE**
New Wet Well?	IF NEEDED
New Force Main?	IF NEEDED

Max. Current PHF Flow (gpm)	1215
Future PHF Flow (gpm)	878
Tested Capacity (gpm)	1580
Current Design Flow (gpm)	1500

Existing Pump Station and Force Main Information

Wet Well

Operating Depth (ft)	3
Diameter (ft)	8
Operating Volume (gallons)	1127.9574
Surface El @ Ex. Wet Well	0
Bottom El.	305
Wet Well Depth	21.416667

Existing Force Main

Pipe Nominal Diameter	10
Pipe Material	DI
Pipe Inside Diameter	10.16
Force Main Length	1512
Equivalent Length	1557
Pumps Off El.	305.2
Top El.	386.93
Velocity @ Current Capacity	6.25
Static Head	81.73
Chezy C	110

Existing Pumps

Number	2
Make	Smith & Loveless
Model	6D4C
Horsepower	75
Impeller Dia./Code	12.5"

**denotes code*

Local Losses in Existing System

Fitting	Count	Equivalent	Total
90 deg. Bend	0	20	0
45 deg bend	0	10.6	0
22.5 deg bend	0	10.6	0
Plug Valve	1	12	12
Check Valve	1	33	33
TOTAL			45

Pump and System Curve Data

System Curve

PS Pumping Capacity (gpm) (Q)	Velocity (fps) (V)	Unit Friction head loss	Friction Head Loss	TDH (ft)
0	0.00	0.000	0.0	82
200	0.79	0.000	0.6	82
400	1.58	0.001	2.2	84
600	2.37	0.003	4.7	86
800	3.17	0.005	8.1	90
1000	3.96	0.008	12.2	94
1200	4.75	0.011	17.1	99
1500	5.94	0.017	25.8	108
1580	6.25	0.018	28.4	110
1800	7.12	0.023	36.1	118
2100	8.31	0.031	48.0	130

Pump Curve

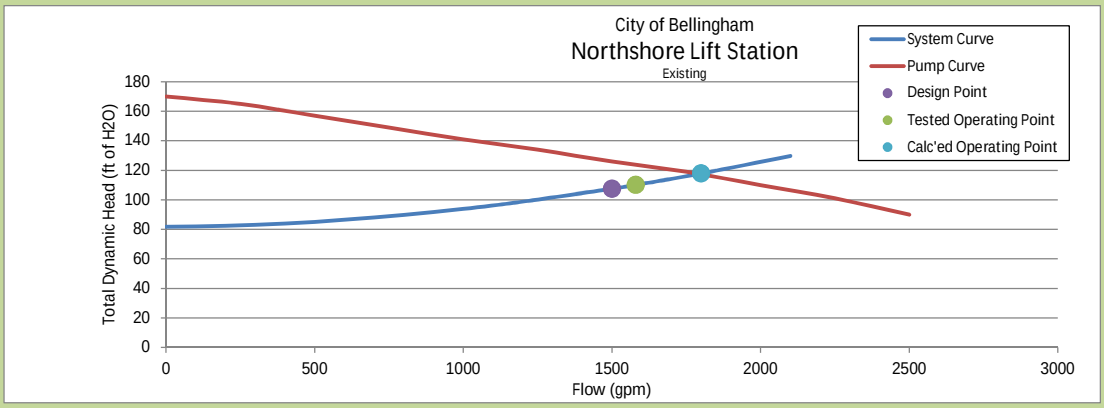
PS Pumping Capacity (gpm) (Q)	TDH (ft)
0	170
250	165
500	157
750	149
1000	141.0
1250	134
1500	126
1750	119
2000	110
2250	101
2500	90

Pump and System Curves

Design Point	Flow (gpm)	Head (ft)
	1500	108

Flow and head for operating point determined iteratively

Calculated Operating Point	Flow (gpm)	Head (ft)
	1800	118



Northshore Lift Station

Ex. System Analysis

Existing Force Main Analysis

Existing Force Main Evaluation

Design Flow (gpm)	1500
Velocity in Ex. FM	5.94
TDH in Ex. FM	108
New FM?	NO

New force main considered if velocity exceeds 8 ft/s and/or TDH exceeds 200 ft H2O

Existing Wet Well Evaluation

Operating Volume (gallons)	1128
Design Flow (gpm)	1500
Max Starts/hr (4V/Q)	19.9
New Wet Well?	YES

New Wet Well considered if starts/hr > 12

Proposed System

New Force Main Sizing and Pump Selection

Solved by iteration for preferred head (generally less than 200 ft TDH) and velocity conditions (generally b/w 3 and 6 fps)

Material	HDPE
Class/ Thickness	17
Nominal Diameter	10
Inside DIameter	9.409
Chezy C	130
Velocity at Design Flow	6.9
TDH @ Design Flow	87

Proposed Wet Well Diameter

Starts/Hr	12
Op. Volume	1875 gallons
Op. Depth	3 ft
Calced Dia.	10.31 ft
WW Dia.	12 ft.
Selected Dia.	12 ft.

Confirm WW is large enough for pumps

Proposed Pumps

Number	2
Make	Flygt
Model	NP3301HT
Horsepower	85
Impeller Dia./Code	370 mm

**denotes code*

Pump and System Curve Data

System Curve

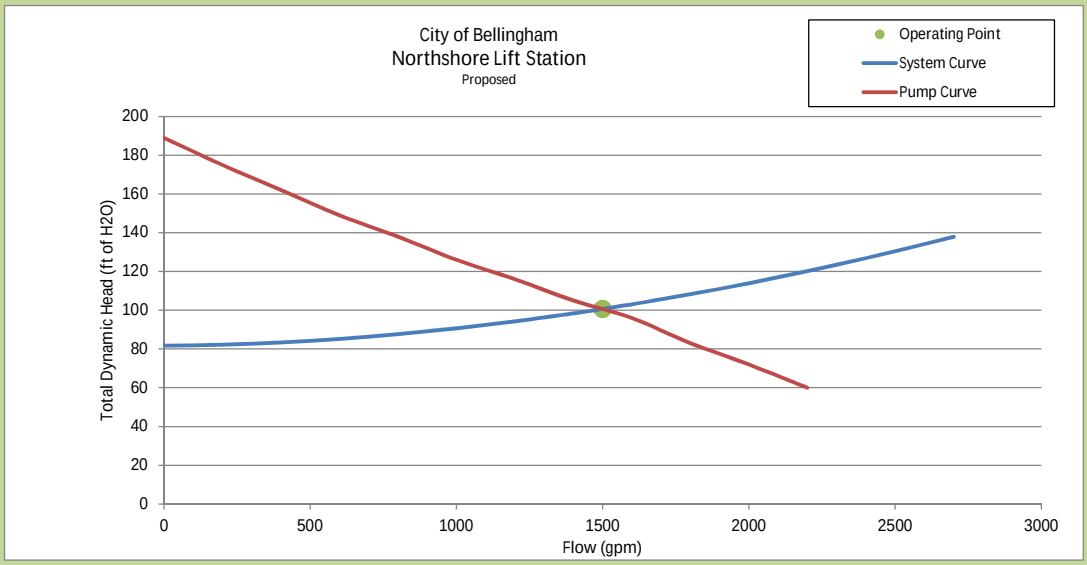
PS Pumping Capacity (gpm) (Q)	Velocity (fps) (V)	Unit Friction head loss	Friction Head Loss	TDH (ft)
0	0.00	0.0000	0.0	82
200	0.79	0.0003	0.5	82
400	1.58	0.0011	1.6	83
600	2.37	0.0022	3.5	85
800	3.17	0.0038	5.9	88
1000	3.96	0.0057	8.9	91
1200	4.75	0.0080	12.5	94
1400	5.54	0.0107	16.7	98
1500	5.94	0.0122	18.9	101
1700	6.73	0.0153	23.8	106
1900	7.52	0.0188	29.3	111
2100	8.31	0.0226	35.3	117
2300	9.10	0.0268	41.7	123
2500	9.89	0.0313	48.7	130
2700	10.68	0.0360	56.1	138

Pump Curve

PS Pumping Capacity (gpm) (Q)	TDH (ft)
0	189.00
200	175.00
400	162.00
600	149.00
800	138.00
1000	126.00
1200	116.00
1400	105.00
1600	96.00
1800	83.00
2000	72.00
2200	60.00

Pump and System Curves

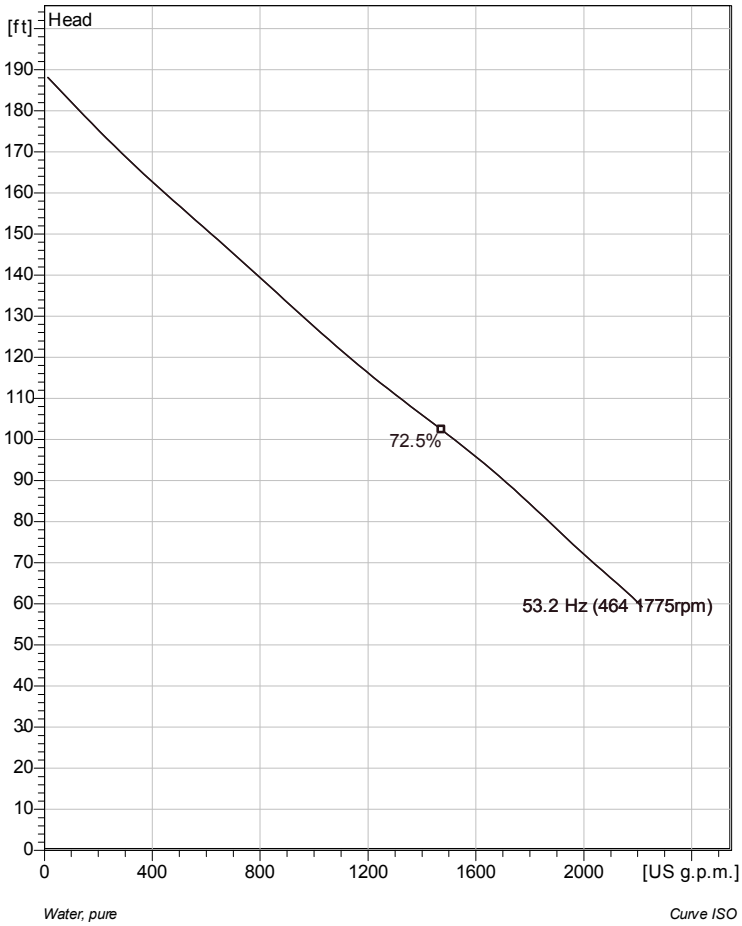
Operating Point	Flow (gpm)	Head (ft)
	1500	101



Northshore Alternative Nos. 1 and 2

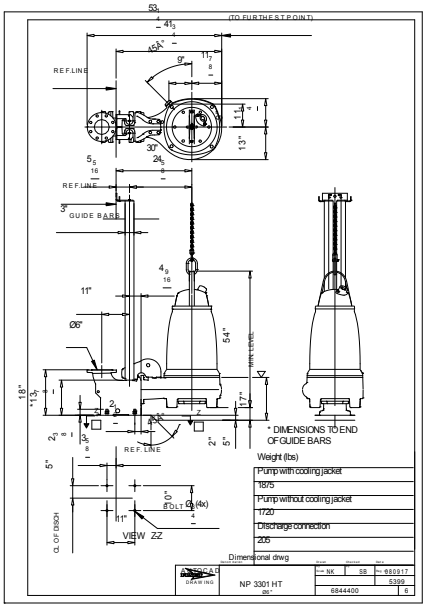
NP 3301 HT 3~ SmartRun 464

Technical specification



Note: Picture might not correspond to the current configuration.

Installation: P - Semi permanent, Wet



General

Patented self cleaning semi opened channel impeller, ideal for pumping in wastewater applications. Modular based design with high adaptation grade. Equipped with a user-friendly intelligent control unit, pre-programmed for wastewater pumping used for pumping station with one or two pumps.

Impeller

Impeller material	Grey cast iron
Discharge Flange Diameter	5 7/8 inch
Inlet diameter	5 7/8 inch
Impeller diameter	370 mm
Number of blades	2

Motor

Motor #	N3301.180 35-25-4AA-W 85hp
Stator variant	7
Frequency	60 Hz
Rated voltage	380 V
Number of poles	4
Phases	3~
Rated power	85 hp
Rated current	126 A
Starting current	709 A
Rated speed	1775 rpm
Power factor	
1/1 Load	0.82
3/4 Load	0.77
1/2 Load	0.66
Efficiency	
1/1 Load	93.0 %
3/4 Load	93.8 %
1/2 Load	93.8 %

Configuration

Project	Project ID	Created by	Created on	Last update
			2016-03-21 17:09:56	

NP 3301 HT 3~ SmartRun 464

Performance curve

Pump

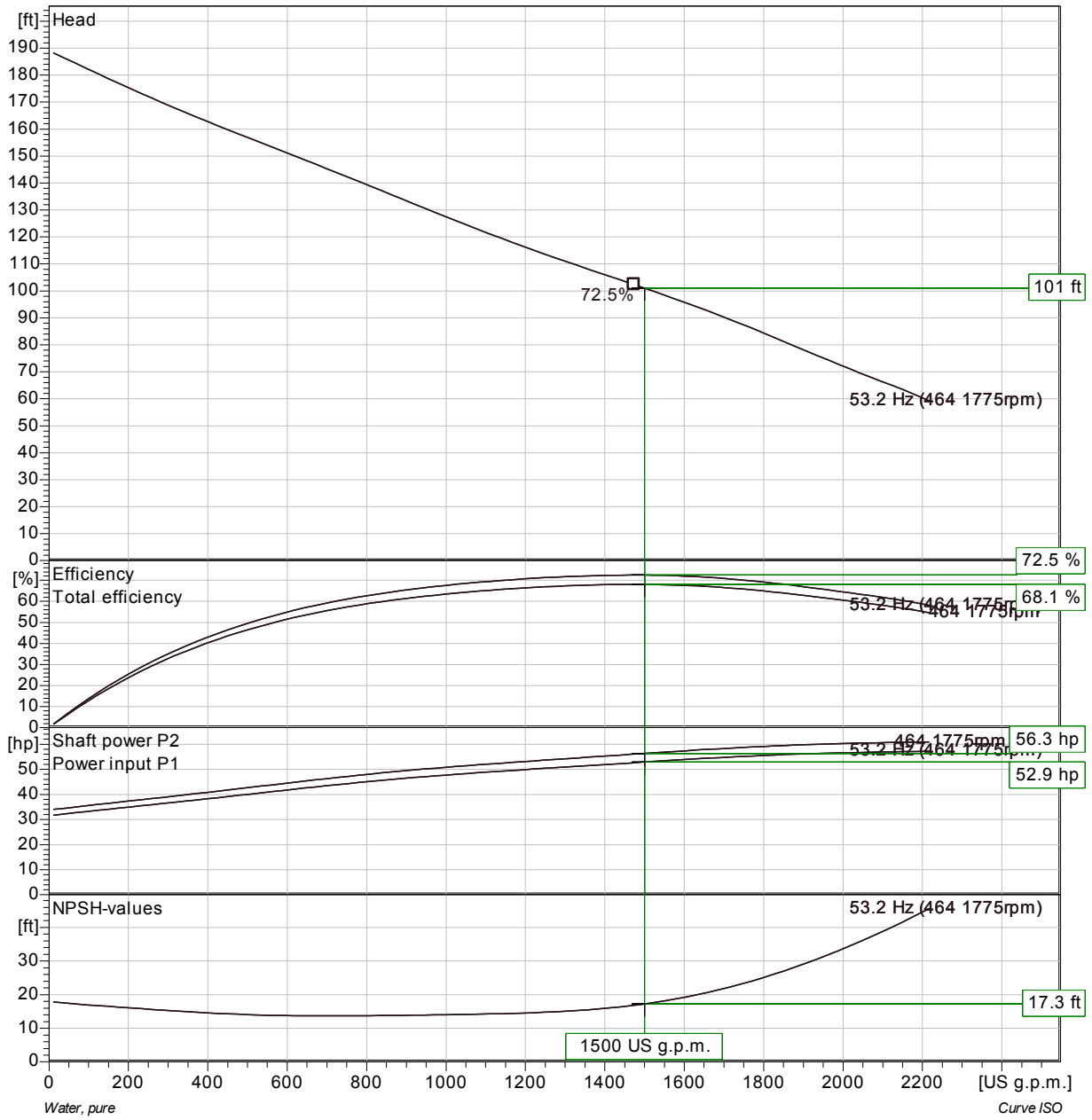
Discharge Flange Diameter	5 7/8 inch
Inlet diameter	150 mm
Impeller diameter	14 9/16"
Number of blades	2

Motor

Motor #	N3301.180 35-25-4AA-W 85hp
Stator variant	7
Frequency	60 Hz
Rated voltage	380 V
Number of poles	4
Phases	3~
Rated power	85 hp
Rated current	126 A
Starting current	709 A
Rated speed	1775 rpm

Power factor	
1/1 Load	0.82
3/4 Load	0.77
1/2 Load	0.66

Efficiency	
1/1 Load	93.0 %
3/4 Load	93.8 %
1/2 Load	93.8 %



Project	Project ID	Created by	Created on	Last update
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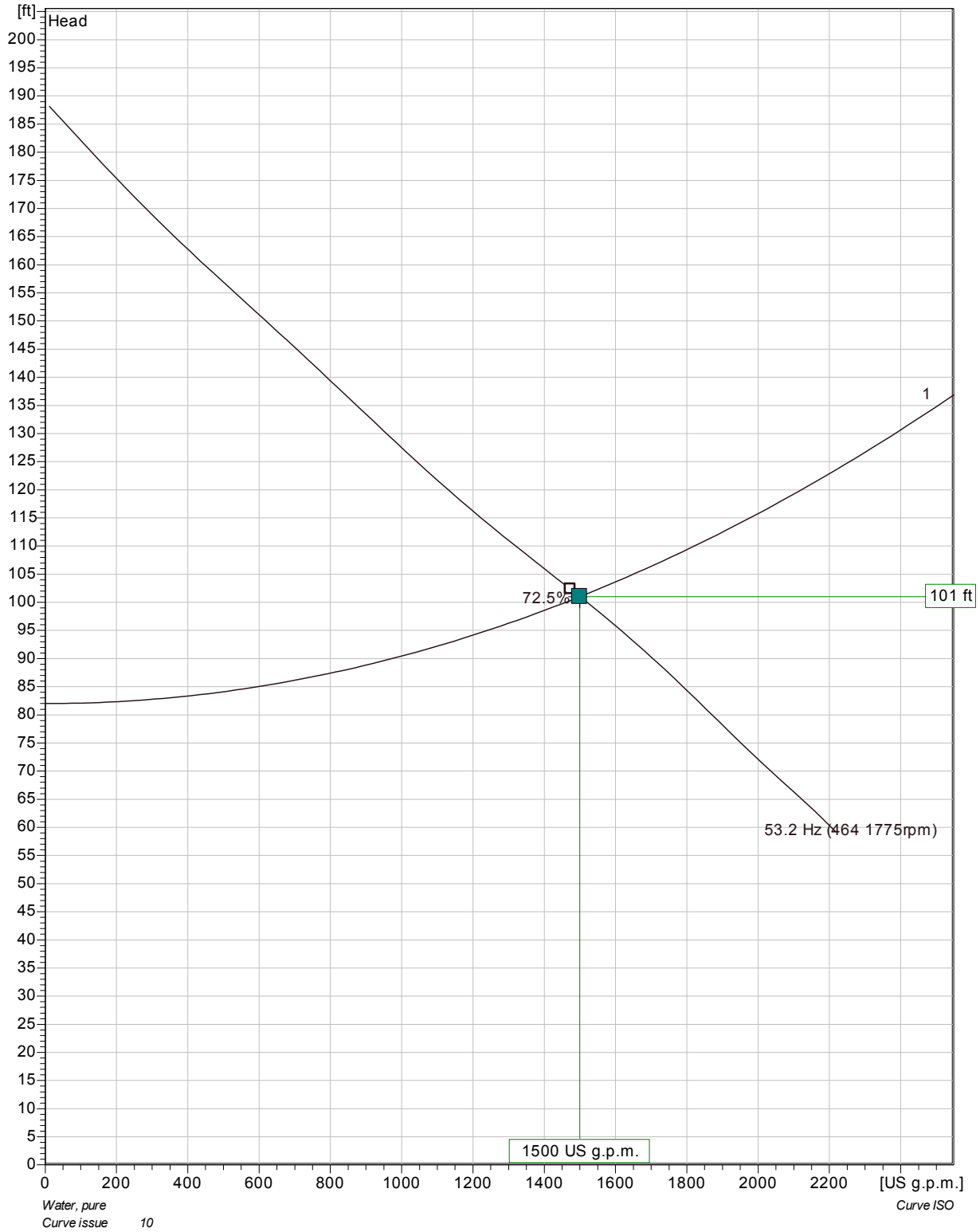
NP 3301 HT 3~ SmartRun 464

Duty Analysis



Pumps running /System	Individual pump Flow	Head	Shaft power	Total Flow	Head	Shaft power	Pump eff.	Specific energy	NPSHre
1	1500 US g.p.m.	101 ft	52.9 hp	1500 US g.p.m.	101 ft	52.9 hp	72.5 %	467 kWh/US MG	17.3 ft

Project	Project ID	Created by	Created on	Last update
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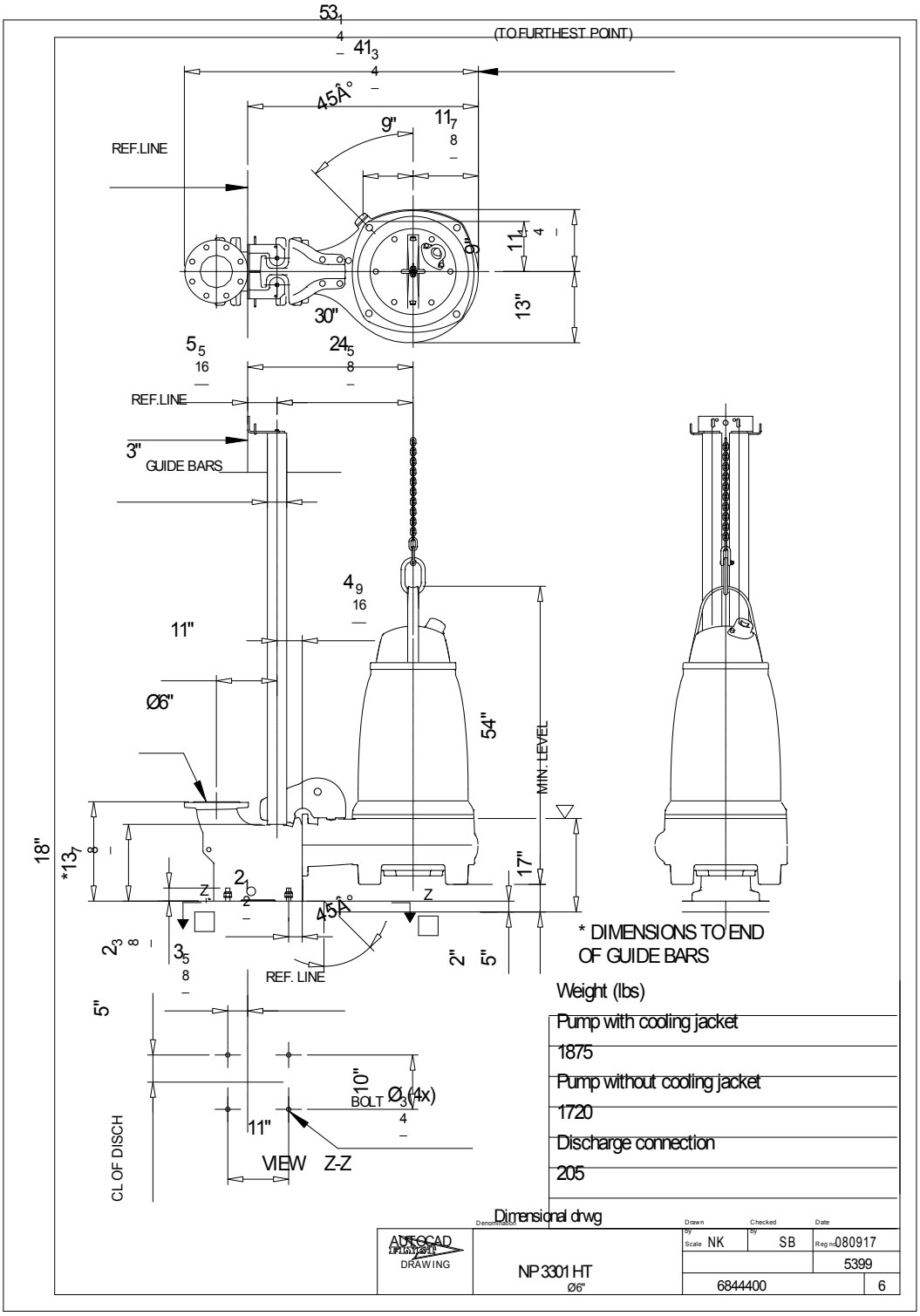
NP 3301 HT 3~ SmartRun 464

Dimensional drawing



Project	Project ID	Created by	Created on	Last update
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Edgemoor Lift Station

Design Parameters

New Station or Replace Existing?	**REPLACE**

New Wet Well?	IF NEEDED
New Force Main?	IF NEEDED

Max. Current PHF Flow (gpm)	0
Future PHF Flow (gpm)	268
Tested Capacity (gpm)	147
Current Design Flow (gpm)	150

Existing Pump Station and Force Main Information

Wet Well

Operating Depth (ft)	2
Diameter (ft)	4
Operating Volume (gallons)	187.9929
Surface El @ Ex. Wet Well	43
Bottom El.	27
Wet Well Depth	16

Existing Force Main

Pipe Nominal Diameter	4
Pipe Material	DI
Pipe Inside Diameter	3.98
Force Main Length	1557
Equivalent Length	1602
Pumps Off El.	28.5
Top El.	99.88
Velocity @ Current Capacity	3.79
Static Head	71.38
Chezy C	120

Existing Pumps

Number	2
Make	Smith & Loveless
Model	4B2
Horsepower	15
Impeller Dia./Code	9.5"

**denotes code*

Local Losses in Existing System

Fitting	Count	Pipe Length	Equivalent
90 deg. Bend	0	20	0
45 deg bend	0	10.6	0
22.5 deg bend	0	10.6	0
Plug Valve	1	12	12
Check Valve	1	33	33
TOTAL			45

Pump and System Curve Data

System Curve

PS Pumping Capacity (gpm) (Q)	Velocity (fps) (V)	Unit Friction head loss	Friction Head Loss	TDH (ft)
0	0.00	0.000	0.0	71
50	1.29	0.002	4.0	75
143	3.69	0.017	27.9	99
147	3.79	0.018	29.4	101
150	3.87	0.019	30.5	102
200	5.16	0.032	51.9	123
250	6.45	0.049	78.4	150
260	6.71	0.053	84.3	156
300	7.74	0.069	109.9	181
350	9.03	0.091	146.1	217
400	10.32	0.117	187.0	258

Pump Curve

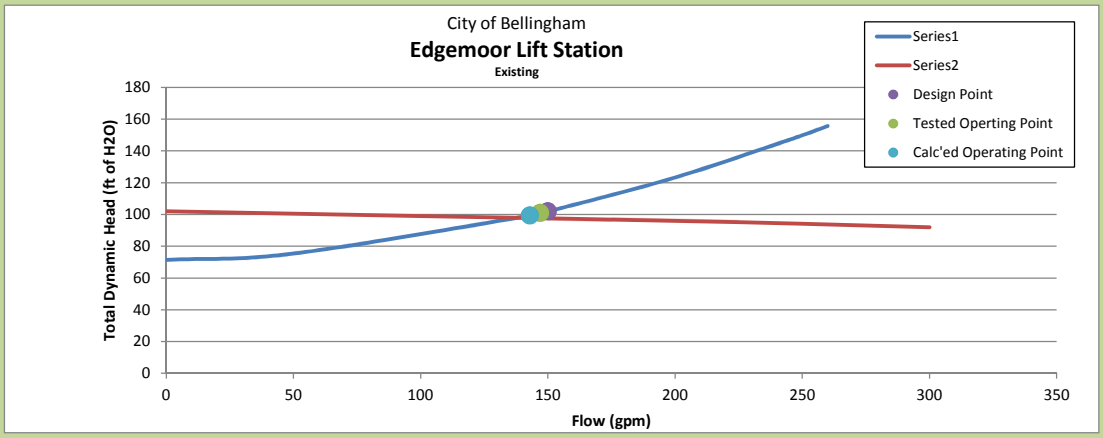
PS Pumping Capacity (gpm) (Q)	TDH (ft)
0	102
100	99
200	96
300	92
400	88.0
500	84
600	79
700	74
800	69
900	64
1000	59

Pump and System Curves

Design Point	Flow (gpm)	Head (ft)
	150	102

Flow and head for operating point determined iteratively

Calculated Operating Point	Flow (gpm)	Head (ft)
	143	99



Edgemoor Lift Station

Ex. System Analysis

Existing Force Main Analysis

Existing Force Main Evaluation

Design Flow (gpm)	268
Velocity in Ex. FM	6.91
TDH in Ex. FM	161
New FM?	NO

New force main considered if velocity exceeds 8 ft/s and/or TDH exceeds 200 ft H2O

Existing Wet Well Evaluation

Operating Volume (gallons)	188
Design Flow (gpm)	268
Max Starts/hr (4V/Q)	21.4
New Wet Well?	YES

New Wet Well considered if starts/hr > 12

Proposed System

New Force Main Sizing and Pump Selection

Solved by iteration for preferred head (generally less than 200 ft TDH) and velocity conditions (generally b/w 3 and 6 fps)

Material	HDPE
Class/ Thickness	17
Nominal Diameter	8
Inside DIameter	7.549
Chezy C	130
Velocity at Design Flow	1.9
TDH @ Design Flow	71

Proposed Wet Well Diameter

Starts/Hr	12
Op. Volume	335 gallons
Op. Depth	2 ft
Calced Dia.	5.34 ft
WW Dia.	6 ft.
Selected Dia.	6 ft.

Confirm WW is large enough for pumps

Proposed Pumps

Number	2
Make	
Model	
Horsepower	
Impeller Dia./Code	

**denotes code*

Pump and System Curve Data

System Curve

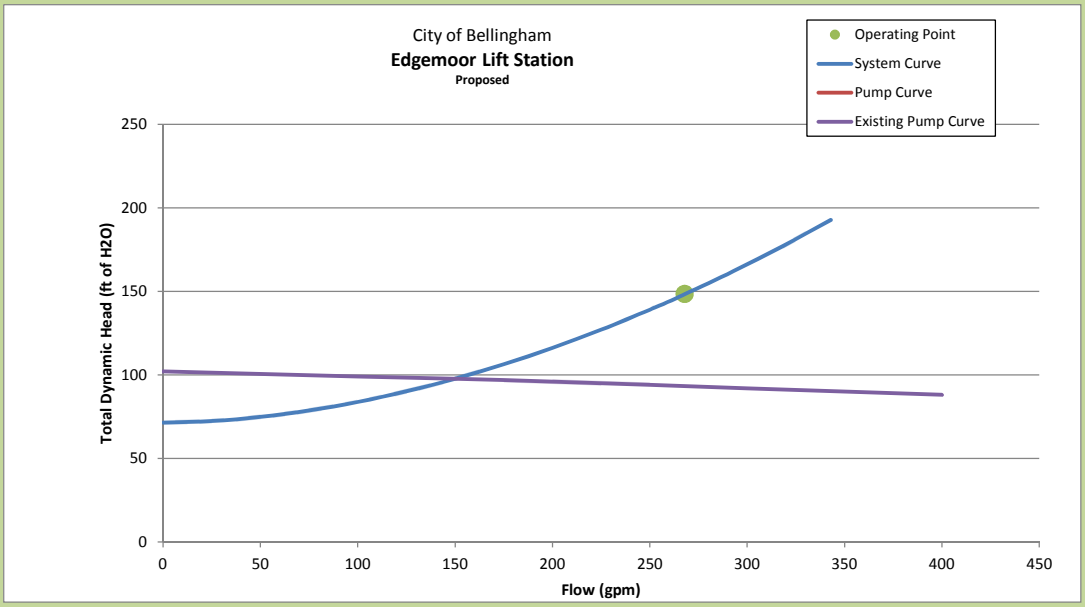
PS Pumping Capacity (gpm) (Q)	Velocity (fps) (V)	Unit Friction head loss	Friction Head Loss	TDH (ft)
0	0.00	0.0000	0.0	71
25	0.64	0.0006	1.0	72
50	1.29	0.0021	3.4	75
75	1.93	0.0046	7.3	79
100	2.58	0.0077	12.4	84
125	3.22	0.0117	18.8	90
150	3.87	0.0164	26.3	98
175	4.51	0.0218	35.0	106
200	5.16	0.0279	44.7	116
225	5.80	0.0347	55.6	127
250	6.45	0.0422	67.6	139
268	6.91	0.0480	76.9	148
293	7.56	0.0566	90.7	162
318	8.20	0.0659	105.5	177
343	8.85	0.0758	121.4	193

Pump Curve

PS Pumping Capacity (gpm) (Q)	TDH (ft)
0	
25	
50	
75	
100	
125	
150	
175	
200	
225	
250	
268	
293	
318	
343	

Pump and System Curves

Operating Point	Flow (gpm)	Head (ft)
	268	148



Edgemoor Lift Station

WILLOW LIFT STATION NEW WET WELL

Proposed Wet Well Diameter

Design Flow	500	GPM	
Starts/Hr	12		
Op. Volume	625	gallons	
Op. Depth	4	ft	Assumed
Calced Dia.	5.16	ft	
WW Dia.	6	ft.	
Selected Dia.	8	ft.	Select larger wet well because pumps are large (47 hp)

Pine St. Lift Station

Design Parameters

New Station or Replace Existing?	**REPLACE**

New Wet Well?	IF NEEDED
New Force Main?	IF NEEDED

Max. Current PHF Flow (gpm)	0
Future PHF Flow (gpm)	153
Tested Capacity (gpm)	0
Current Design Flow (gpm)	0

Existing Pump Station and Force Main Information

Wet Well

Operating Depth (ft)	3.1
Diameter (ft)	4
Operating Volume (gallons)	291.389
Surface El @ Ex. Wet Well	17
Bottom El.	6.5
Wet Well Depth	10.5

Existing Force Main

Pipe Nominal Diameter	8
Pipe Material	DI
Pipe Inside Diameter	8.15
Force Main Length	100
Equivalent Length	145
Pumps Off El.	7.5
Top El.	8.74
Velocity @ Current Capacity	0.00
Static Head	1.24
Chezy C	110

Existing Pumps

Number	2
Make	Flygt
Model	CP3085
Horsepower	3
Impeller Dia./Code	128mm

**denotes code*

Local Losses in Existing System

Fitting	Count	Equivalent	Total
90 deg. Bend	0	20	0
45 deg bend	0	10.6	0
22.5 deg bend	0	10.6	0
Plug Valve	1	12	12
Check Valve	1	33	33
TOTAL			45

Pump and System Curve Data

System Curve

PS Pumping Capacity (gpm) (Q)	Velocity (fps) (V)	Unit Friction head loss	Friction Head Loss	TDH (ft)
0	0.00	0.000	0.0	1
50	0.31	0.000	0.0	1
100	0.62	0.000	0.0	1
150	0.92	0.001	0.1	1
200	1.23	0.001	0.2	1
250	1.54	0.002	0.3	1
300	1.85	0.002	0.4	2
260	1.60	0.002	0.3	2
350	2.15	0.003	0.5	2
400	2.46	0.004	0.6	2
450	2.77	0.005	0.8	2

Pump Curve

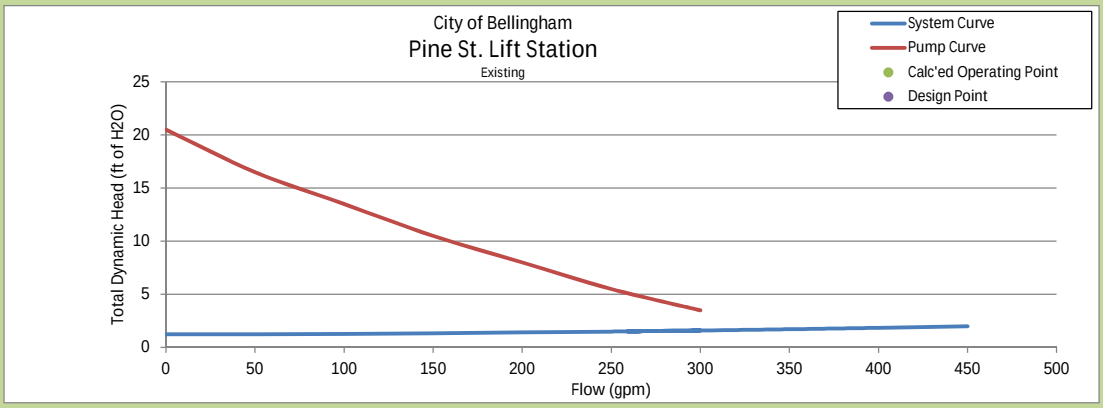
PS Pumping Capacity (gpm) (Q)	TDH (ft)
0	21
50	17
100	14
150	11
200	8.0
250	6
300	4

Pump and System Curves

Design Point	Flow (gpm)	Head (ft)
	0	

Flow and head for operating point determined iteratively

Calculated Operating Point	Flow (gpm)	Head (ft)



Pine St. Lift Station

Ex. System Analysis

Existing Force Main Analysis

Existing Force Main Evaluation

Design Flow (gpm)	153
Velocity in Ex. FM	0.94
TDH in Ex. FM	1
New FM?	NO

New force main considered if velocity exceeds 8 ft/s and/or TDH exceeds 200 ft H2O

Existing Wet Well Evaluation

Operating Volume (gallons)	291
Design Flow (gpm)	153
Max Starts/hr (4V/Q)	7.9
New Wet Well?	NO

New Wet Well considered if starts/hr > 12

Proposed System

New Force Main Sizing and Pump Selection

Solved by iteration for preferred head (generally less than 200 ft TDH) and velocity conditions (generally b/w 3 and 6 fps)

Material	HDPE
Class/ Thickness	17
Nominal Diameter	8
Inside DIameter	7.549
Chezy C	130
Velocity at Design Flow	1.1
TDH @ Design Flow	1

NOT USED

Proposed Wet Well Diameter

Starts/Hr	12
Op. Volume	191.25 gallons
Op. Depth	3.1 ft
Calced Dia.	3.24 ft
WW Dia.	4 ft.
Selected Dia.	4 ft.

Confirm WW is large enough for pumps

Proposed Pumps

Number	2
Make	
Model	
Horsepower	
Impeller Dia./Code	

**denotes code*

Pump and System Curve Data

System Curve

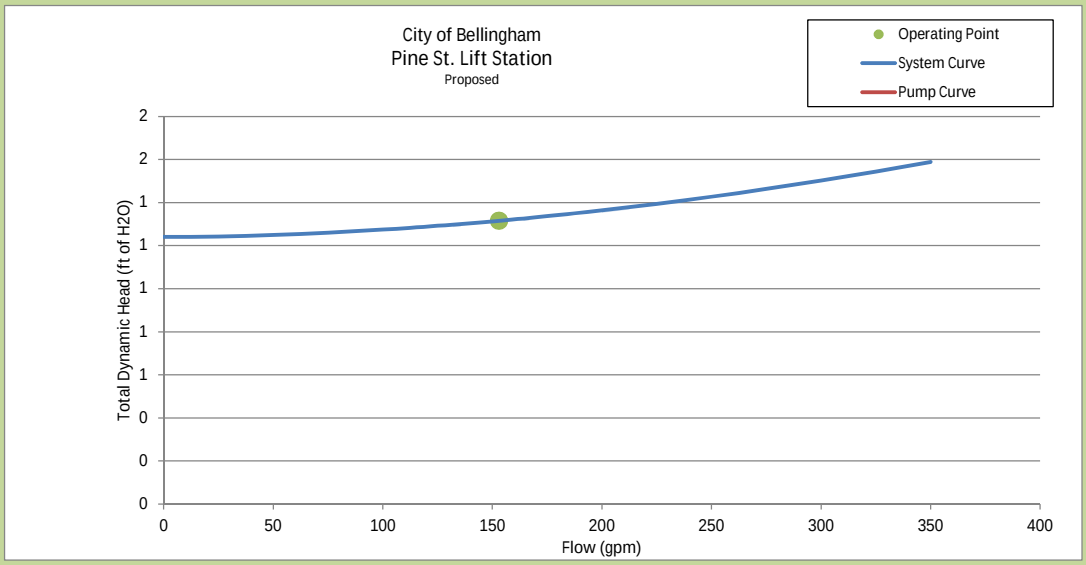
PS Pumping Capacity (gpm) (Q)	Velocity (fps) (V)	Unit Friction head loss	Friction Head Loss	TDH (ft)
0	0.00	0.0000	0.000	1.240
25	0.15	0.0000	0.003	1.243
50	0.31	0.0001	0.010	1.250
75	0.46	0.0001	0.020	1.260
100	0.62	0.0002	0.034	1.274
125	0.77	0.0004	0.052	1.292
153	0.94	0.0005	0.075	1.315
175	1.08	0.0007	0.097	1.337
200	1.23	0.0009	0.124	1.364
225	1.38	0.0011	0.154	1.394
250	1.54	0.0013	0.187	1.427
275	1.69	0.0015	0.223	1.463
300	1.85	0.0018	0.262	1.502
325	2.00	0.0021	0.304	1.544
350	2.15	0.0024	0.349	1.589

Pump Curve

PS Pumping Capacity (gpm) (Q)	TDH (ft)
0	
25	
50	
75	
100	
125	
153	
175	
200	
225	
250	
275	
300	
325	
350	

Pump and System Curves

Operating Point	Flow (gpm)	Head (ft)
	153	1



Roeder Lift Station

Design Parameters

New Station or Replace Existing?	**REPLACE**

New Wet Well?	IF NEEDED
New Force Main?	IF NEEDED

Max. Current PHF Flow (gpm)	0
Future PHF Flow (gpm)	12507
Tested Capacity (gpm)	0
Current Design Flow (gpm)	4000

Existing Pump Station and Force Main Information

Wet Well

Operating Depth (ft)	2.3
Area (SF)	66.02
Operating Volume (gallons)	1136
Surface El @ Ex. Wet Well	17.5
Bottom El.	-3.7
Wet Well Depth	21.2

Existing Force Main

Pipe Nominal Diameter	18
Pipe Material	CON
Pipe Inside Diameter	18
Force Main Length	1043
Equivalent Length	1088
Pumps Off El.	0.75
Top El.	15.93
Velocity @ Current Capacity	0.00
Static Head	15.18
Chezy C	100

Existing Pumps

Number	3
Make	Yeomans
Model	1215-4A
Horsepower	75
Impeller Dia./Code	14.125"

**denotes code*

Local Losses in Existing System

Fitting	Count	Pipe Length	Equivalent
90 deg. Bend	0	20	0
45 deg bend	0	10.6	0
22.5 deg bend	0	10.6	0
Plug Valve	1	12	12
Check Valve	1	33	33
TOTAL			45

Pump and System Curve Data

System Curve

PS Pumping Capacity (gpm) (Q)	Velocity (fps) (V)	Unit Friction head loss	Friction Head Loss	TDH (ft)
0	0.00	0.000	0.0	15
1000	1.26	0.001	0.6	16
2000	2.52	0.002	2.3	17
3000	3.78	0.004	4.8	20
4000	5.04	0.007	8.2	23
5350	6.75	0.013	14.0	29
6350	8.01	0.018	19.2	34
7700	9.71	0.025	27.4	43
8000	10.09	0.027	29.4	45
9000	11.35	0.034	36.6	52
10000	12.61	0.041	44.4	60

Pump Curve

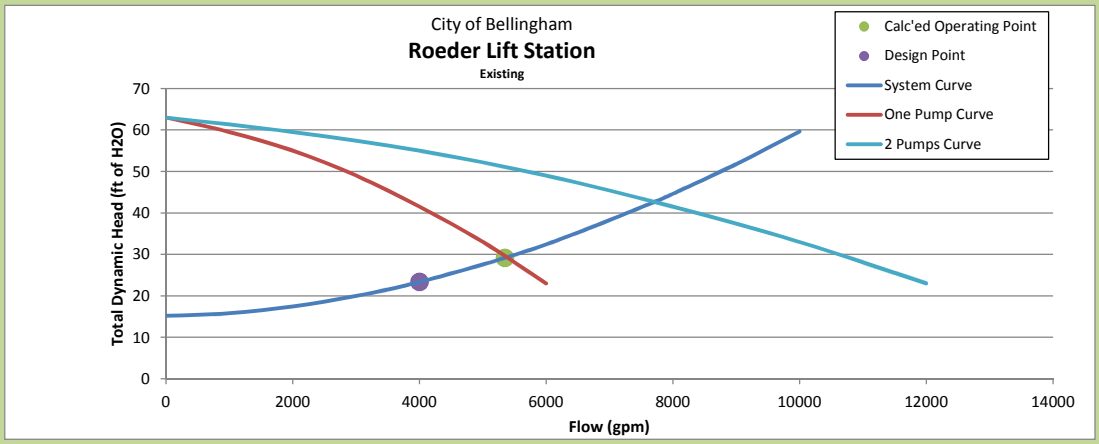
PS Pumping Capacity (gpm) (Q)		TDH (ft)
1 pump	2 pumps	
0	0	63
1000	2000	60
2000	4000	55
3000	6000	49
4000	8000	42
5000	10000	33
6000	12000	23

Pump and System Curves

Design Point	Flow (gpm)	Head (ft)
	4000	23

Flow and head for operating point determined iteratively

Calculated Operating Point	Flow (gpm)	Head (ft)
	5350	29



Roeder Lift Station

Ex. System Analysis

Existing Force Main Analysis

Existing Force Main Evaluation

Design Flow (gpm)	12507
Velocity in Ex. FM	15.77
TDH in Ex. FM	82
New FM?	YES

New force main considered if velocity exceeds 8 ft/s and/or TDH exceeds 200 ft H2O

Existing Wet Well Evaluation

Operating Volume (gallons)	1136
Design Flow (gpm)	12507
Max Starts/hr (4V/Q)	165.2
New Wet Well?	YES

New Wet Well considered if starts/hr > 12

New Force Main Sizing and Pump Selection

Solved by iteration for preferred head (generally less than 200 ft TDH) and velocity conditions (generally b/w 3 and 6 fps)

Material	DI
Class/ Thickness	52
Nominal Diameter	30
Inside DIameter	30
Chezy C	120
Velocity at Design Flow	5.7
TDH @ Design Flow	19

Proposed Wet Well Diameter

Starts/Hr	18
Op. Volume	5625 gallons
Op. Depth	4 ft
Calced Dia.	15.47 ft
WW Dia.	BIGGER ft.
Selected Dia.	16 ft.

Confirm WW is large enough for pumps

Proposed Pumps

Number	3	4
Make	Fairbanks Morse	
Model	16"5711	14"5711
Horsepower	50	50
Impeller Dia./Code	15.6875"	14.5

**denotes code*

New Force Main Sizing and Pump Selection

Pipe Dia (ft)	3
Area(sf)	7.1
Volume/ft. (assume pipe is half full)	26.4
Feet of Pipe Needed to Provide Operating Volume	213
Length Per Pipe (Solve iteratively for desired # of pipes	75
# of pipes to provide length	3

Pump and System Curve Data

Proposed System

THREE PUMP STATION

System Curve

PS Pumping Capacity (gpm) (Q)	Velocity (fps) (V)	Unit Friction head loss	Friction Head Loss	TDH (ft)
0	0.00	0.0000	0.0	15
1000	0.45	0.0000	0.0	15
2000	0.91	0.0001	0.1	15
3000	1.36	0.0003	0.3	15
4000	1.82	0.0004	0.5	16
5000	2.27	0.0007	0.7	16
6000	2.72	0.0009	1.0	16
7000	3.18	0.0013	1.4	17
8000	3.63	0.0016	1.7	17
9000	4.09	0.0020	2.2	17
10000	4.54	0.0024	2.6	18
11000	4.99	0.0029	3.2	18
12000	5.45	0.0034	3.7	19
12507	5.68	0.0037	4.0	19
13507	6.13	0.0042	4.6	20

Pump Curve

PS Pumping Capacity (gpm) (Q)		TDH (ft)
1 pump	2 pumps	
0	0	37
1000	2000	35
2000	4000	33
3000	6000	31
4000	8000	29
5000	10000	25
6000	12000	21
6750	13500	17
7000	14000	15

FOUR PUMP STATION

System Curve

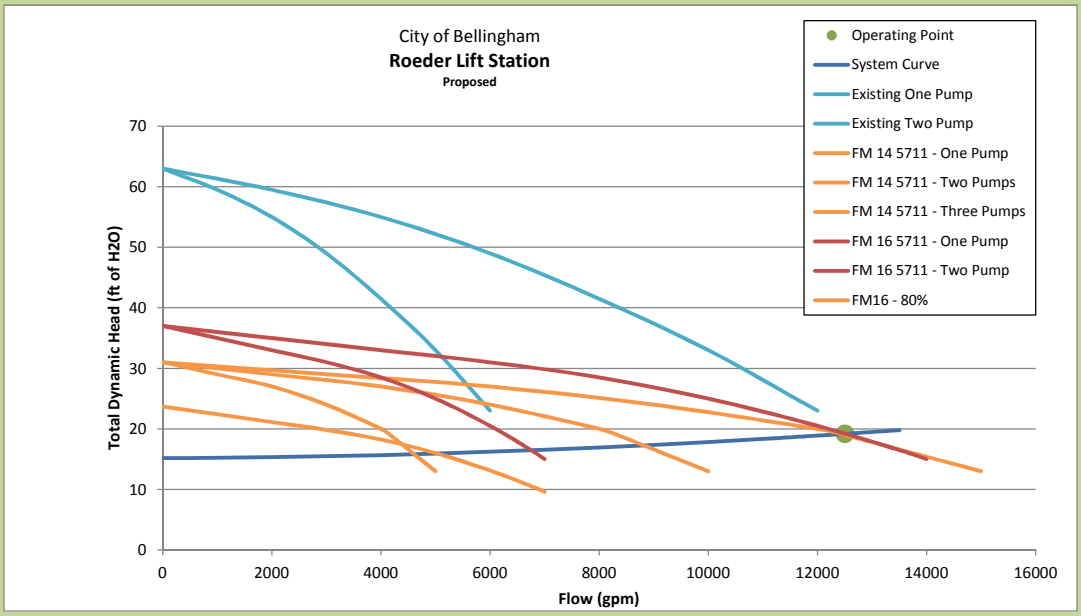
PS Pumping Capacity (gpm) (Q)	Velocity (fps) (V)	Unit Friction head loss	Friction Head Loss	TDH (ft)
0	0.00	0.0000	0.0	15
1000	0.45	0.0000	0.0	15
2000	0.91	0.0001	0.1	15
3000	1.36	0.0003	0.3	15
4000	1.82	0.0004	0.5	16
5000	2.27	0.0007	0.7	16
6000	2.72	0.0009	1.0	16
7000	3.18	0.0013	1.4	17
8000	3.63	0.0016	1.7	17
9000	4.09	0.0020	2.2	17
10000	4.54	0.0024	2.6	18
11000	4.99	0.0029	3.2	18
12000	5.45	0.0034	3.7	19
12507	5.68	0.0037	4.0	19
13507	6.13	0.0042	4.6	20

Pump Curve

PS Pumping Capacity (gpm) (Q)			TDH (ft)
1 pump	2 pumps	3 Pumps	
0	0	0	31
1000	2000	3000	29
2000	4000	6000	27
3000	6000	9000	24
4000	8000	12000	20
4167	8334	12501	19
5000	10000	15000	13

Pump and System Curves

Operating Point	Flow (gpm)	Head (ft)
	12507	19



Roeder Alternative Nos. 1A, 2A and 2B

roducts

Name: G & O- Bellingham

Date: 3/15/2016

Pump Data Sheet - Fairbanks Morse Pump, 60 Hz

Duplex pumps in parallel

Fairbanks Morse Pentair

Pump:

Size: 16"5711 (AM)

Type: 5700ANGLEFLO
Synch speed: 720 rpm

Speed: 705 rpm
Dia: 15.6875 in

Curve: 111610AM

Impeller: L16A1AM

Specific Speeds:

Ns: 3410
Nss: 7903

Dimensions:

Suction: 16 in
Discharge: 16 in

Pump Limits:

Temperature: 150 °F
Pressure: 50 psi g
Sphere size: 3 in

Power: ---
Eye area: ---

Search Criteria:

Flow: 6250 US gpm

Head: 19 ft

Fluid:

Water
Density: 62.3 lb/ft³
Viscosity: 0.9946 cP

Temperature: 68 °F
Vapor pressure: 0.3391 psi a
Atm pressure: 14.7 psi a

NPSHa: ---

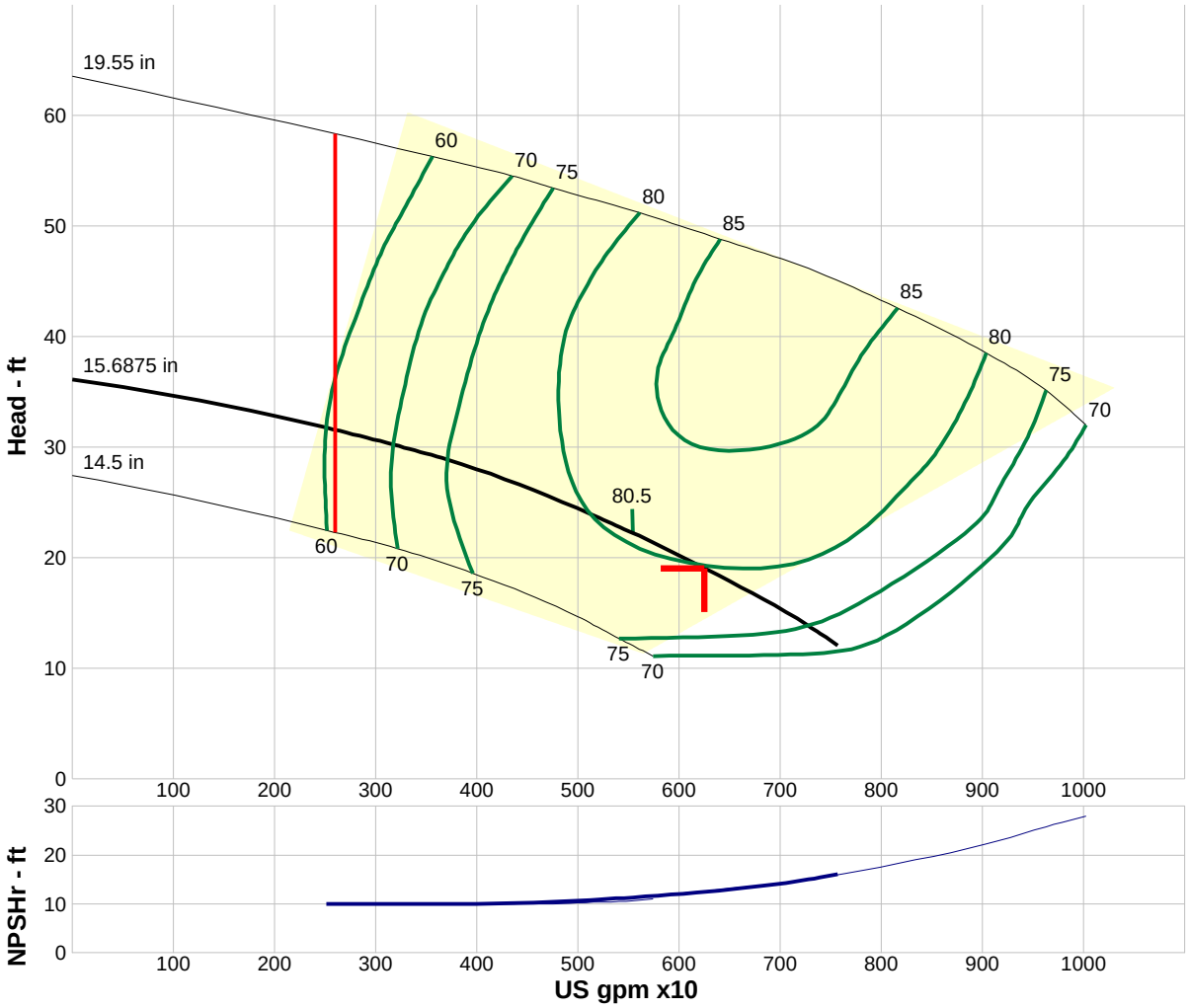
Motor:

Standard: ---
Enclosure: ---

Speed: ---
Frame: ---

Sizing criteria: Max Power on Design Curve

---- Data Point ----	
Flow:	6250 US gpm
Head:	19 ft
Eff:	80%
Power:	37.5 hp
NPSHr:	12.6 ft
---- Design Curve ----	
Shutoff head:	36.1 ft
Shutoff dP:	15.6 psi
Min flow:	2600 US gpm
BEP:	80% @ 5538 US gpm
NOL power:	38.8 hp @ 5125 US gpm
-- Max Curve --	
Max power:	116 hp @ 10020 US gpm



Curve efficiencies are typical. For guaranteed values, contact Fairbanks Morse or your local distributor. Las eficiencias en curvas son típicas. Para valores garantizados contacte a Fairbanks Morse o a su distribuidor local.

Performance Evaluation:

Flow US gpm	Speed rpm	Head ft	Efficiency %	Power hp	NPSHr ft
7500	705	12.5	71	33.3	15.9
6250	705	19	80	37.5	12.6
5000	705	24.4	80	38.5	10.8
3750	705	28.7	75	36.1	10
2500	705	---	---	---	---

Roeder Alternative
Nos. 1B and 4B

Products

Pump Data Sheet - Fairbanks Morse Pump, 60 Hz

Triplex pumps in parallel

Name: G & O- Bellingham

Date: 3/15/2016

Fairbanks Morse
Pentair

Pump:

Size: 14"5711 (D)

Type: 5700ANGLEFLO
Synch speed: 720 rpm

Speed: 705 rpm
Dia: 14.5 in

Curve: 111410D

Impeller: L14A1D

Specific Speeds:

Ns: 3616
Nss: 6956

Dimensions:

Suction: 14 in
Discharge: 14 in

Pump Limits:

Temperature: 150 °F
Pressure: 50 psi g
Sphere size: 3.5 in

Power: ---
Eye area: ---

Search Criteria:

Flow: 4167 US gpm

Head: 19 ft

Fluid:

Water
Density: 62.3 lb/ft³
Viscosity: 0.9946 cP

Temperature: 68 °F
Vapor pressure: 0.3391 psi a
Atm pressure: 14.7 psi a

NPSHa: ---

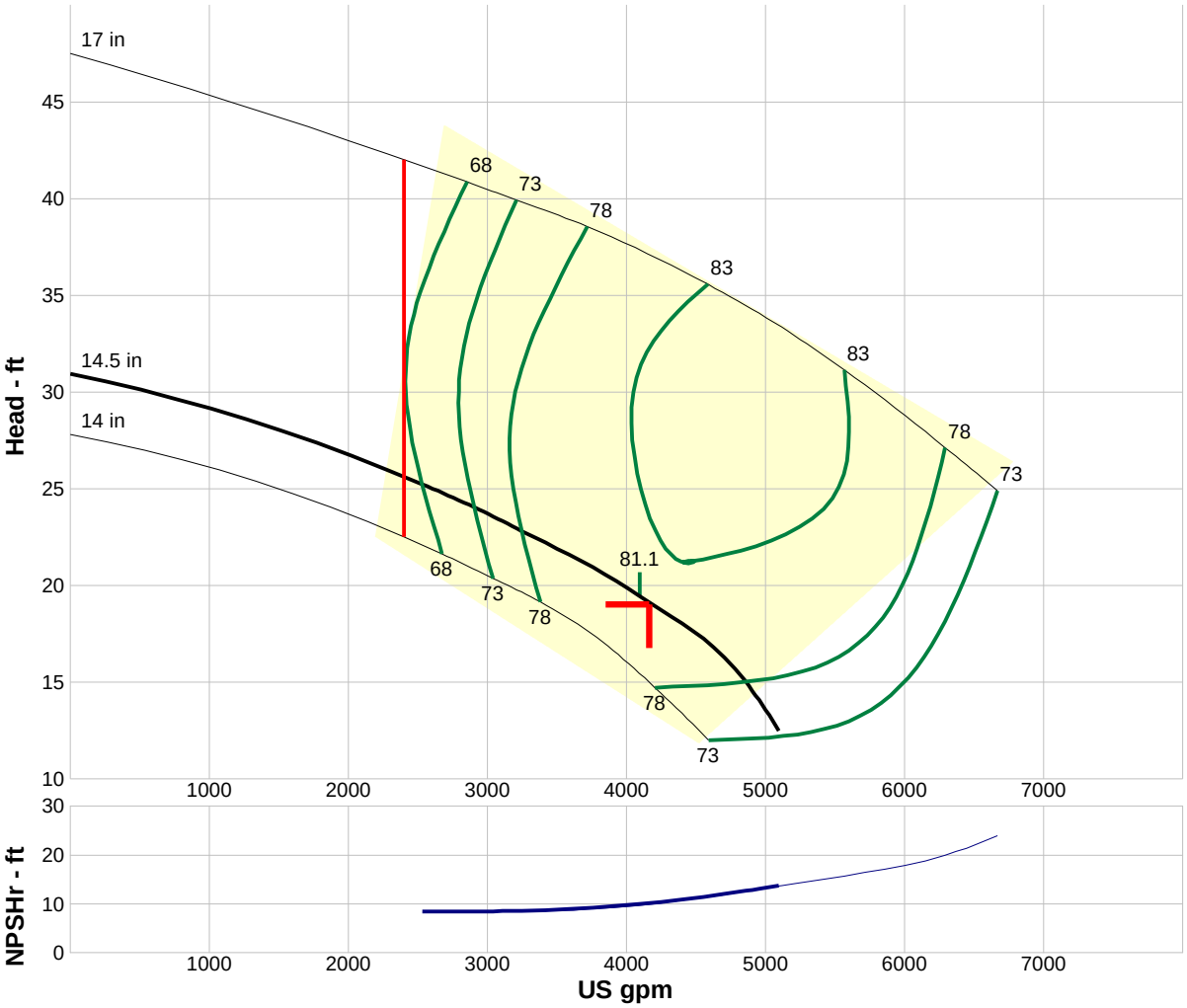
Motor:

Standard: ---
Enclosure: ---

Speed: ---
Frame: ---

Sizing criteria: Max Power on Design Curve

---- Data Point ----	
Flow:	4167 US gpm
Head:	19 ft
Eff:	81%
Power:	24.7 hp
NPSHr:	10.3 ft
---- Design Curve ----	
Shutoff head:	30.9 ft
Shutoff dP:	13.4 psi
Min flow:	2400 US gpm
BEP:	81% @ 4096 US gpm
NOL power:	24.8 hp @ 4096 US gpm
-- Max Curve --	
Max power:	57.4 hp @ 6667 US gpm



Curve efficiencies are typical. For guaranteed values, contact Fairbanks Morse or your local distributor. Las eficiencias en curvas son típicas. Para valores garantizados contacte a Fairbanks Morse o a su distribuidor local.

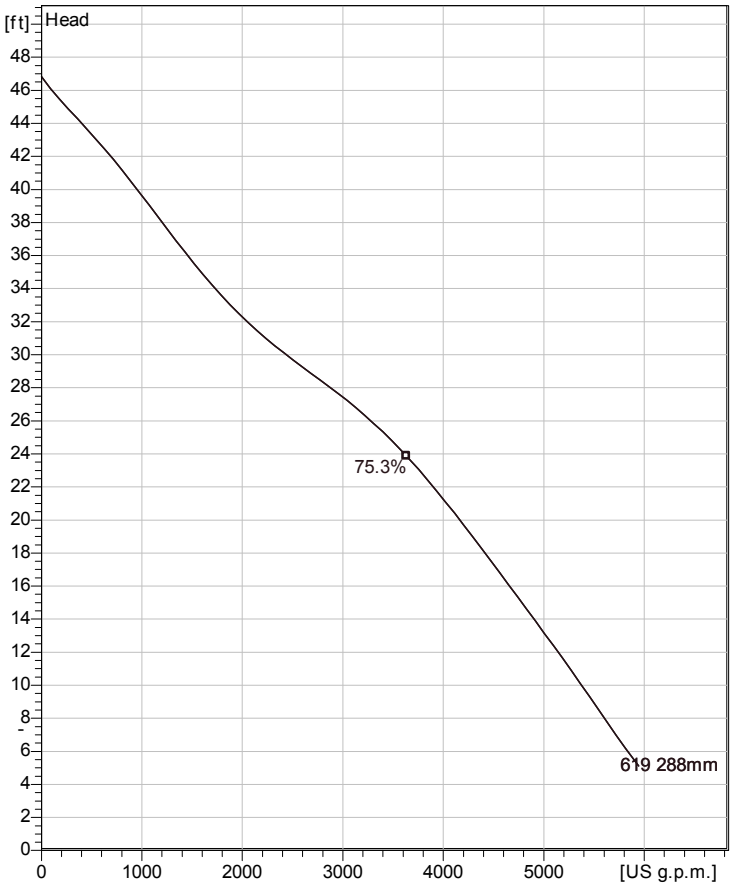
Performance Evaluation:

Flow US gpm	Speed rpm	Head ft	Efficiency %	Power hp	NPSHr ft
5000	705	13.5	75	22.7	13.3
4167	705	19	81	24.7	10.3
3334	705	22.5	78	24.1	8.77
2500	705	25.3	68	23.7	8.5
1667	705	---	---	---	---

Roeder Alternative Nos. 3 and 4A

NP 3202 LT 3~ 619

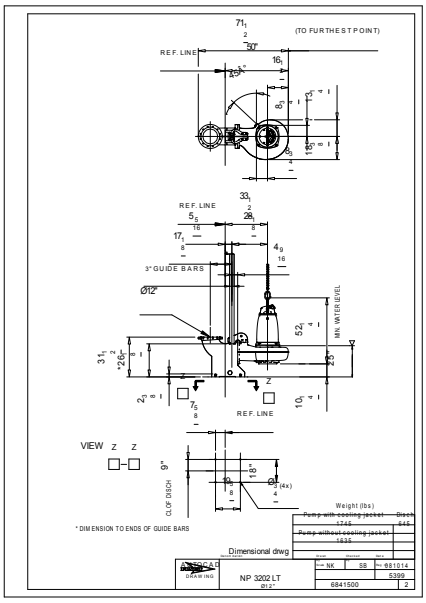
Technical specification



Water, pure *Curve ISO*

Note: Picture might not correspond to the current configuration.

Installation: P - Semi permanent, Wet



General

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Possible to be upgraded with Guide-pin® for even better clogging resistance. Modular based design with high adaptation grade.

Impeller

Impeller material	Grey cast iron
Discharge Flange Diameter	11 13/16 inch
Inlet diameter	11 13/16 inch
Impeller diameter	288 mm
Number of blades	2

Motor

Motor #	N3202.180 30-18-6AA-W 35hp
Stator variant	4
Frequency	60 Hz
Rated voltage	230 V
Number of poles	6
Phases	3~
Rated power	35 hp
Rated current	84 A
Starting current	450 A
Rated speed	1165 rpm
Power factor	
1/1 Load	0.88
3/4 Load	0.85
1/2 Load	0.79
Efficiency	
1/1 Load	89.0 %
3/4 Load	90.0 %
1/2 Load	90.5 %

Configuration

Project	Project ID	Created by	Created on	Last update
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NP 3202 LT 3~ 619

Performance curve

Pump

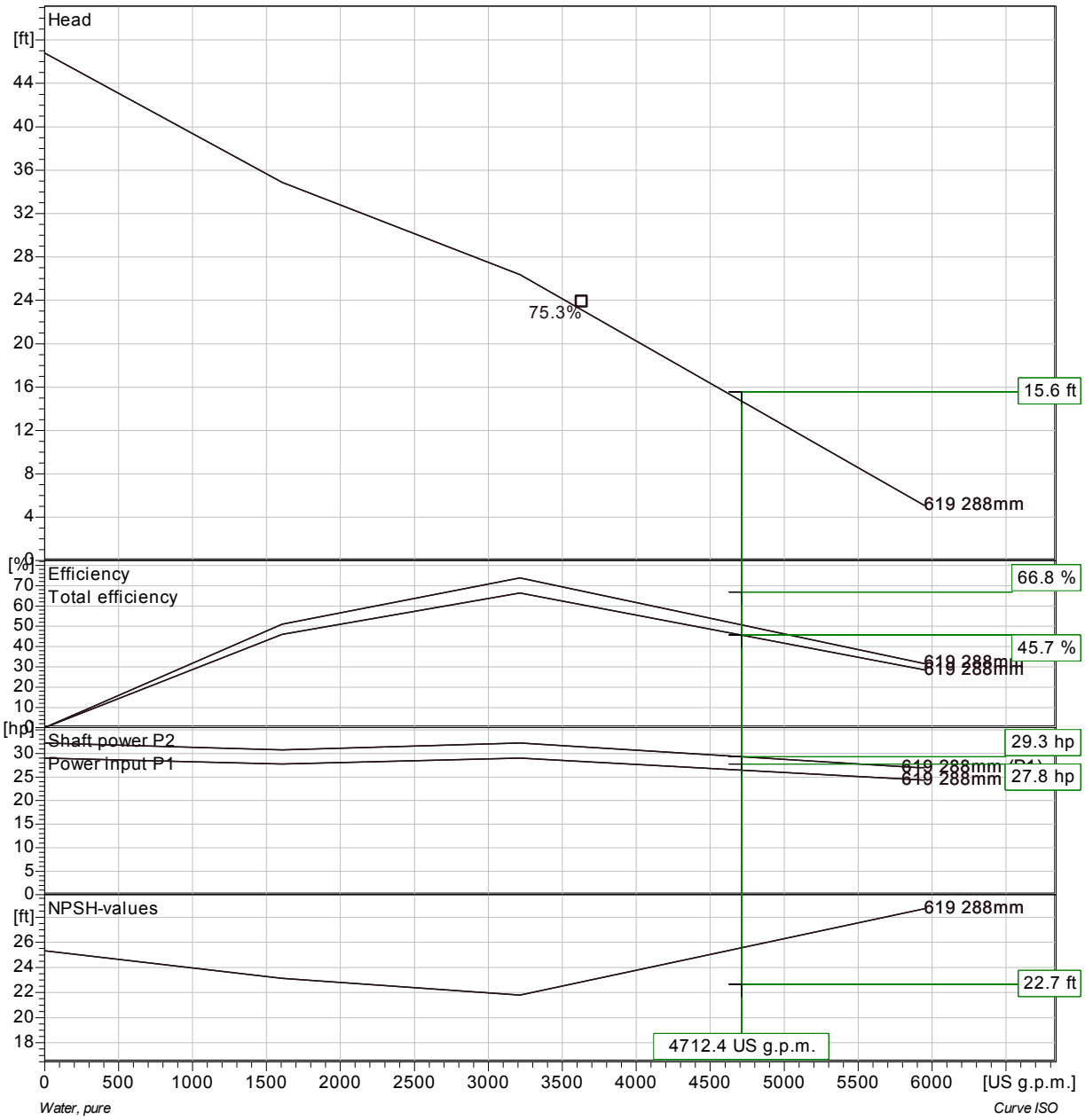
Discharge Flange Diameter	11 13/16 inch
Inlet diameter	300 mm
Impeller diameter	$11^{5}/_{16}$"
Number of blades	2

Motor

Motor #	N3202.180 30-18-6AA-W 35hp
Stator variant	4
Frequency	60 Hz
Rated voltage	230 V
Number of poles	6
Phases	3~
Rated power	35 hp
Rated current	84 A
Starting current	450 A
Rated speed	1165 rpm

Power factor	
1/1 Load	0.88
3/4 Load	0.85
1/2 Load	0.79

Efficiency	
1/1 Load	89.0 %
3/4 Load	90.0 %
1/2 Load	90.5 %



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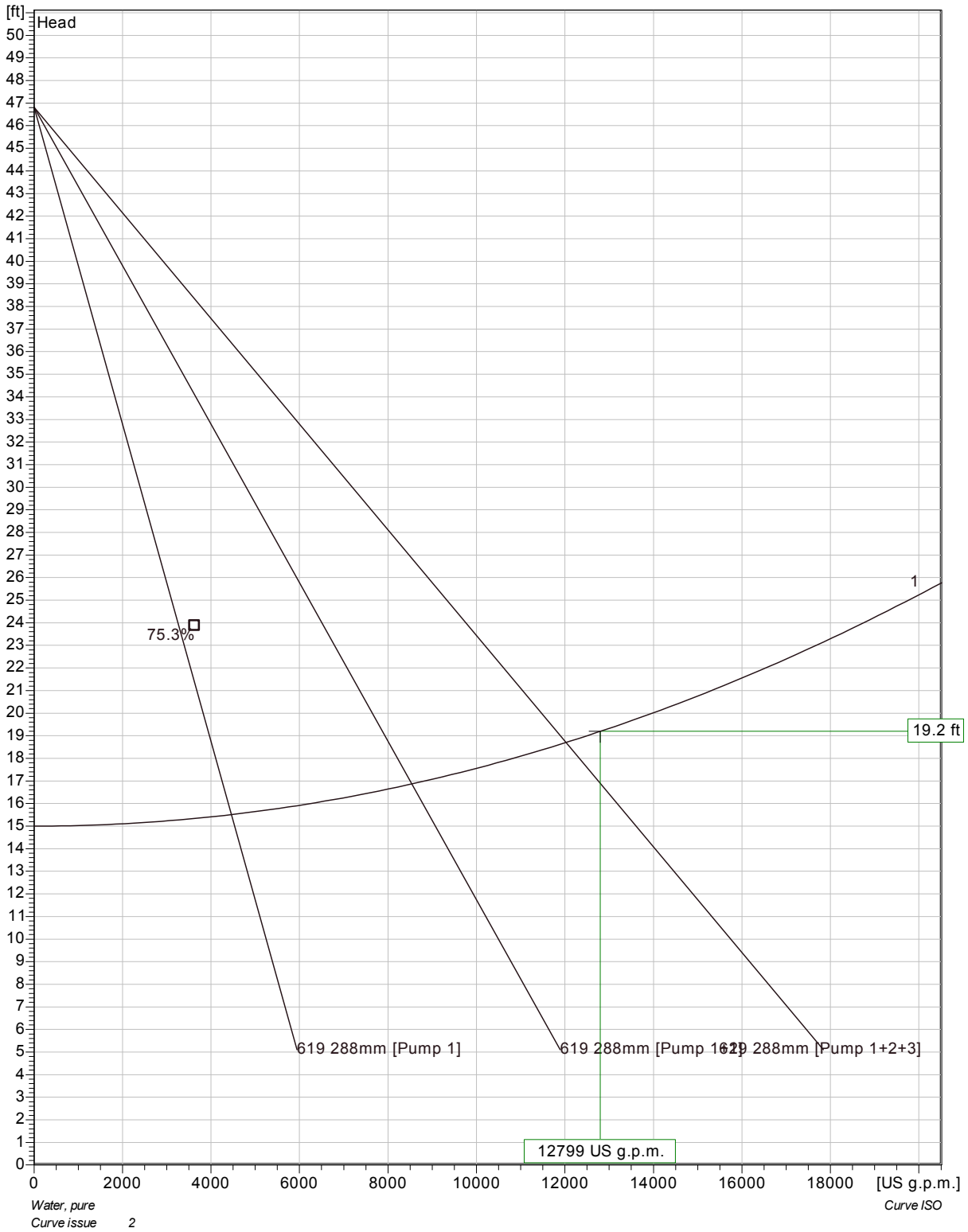
NP 3202 LT 3~ 619

Duty Analysis



Pumps running /System	Individual pump Flow	Head	Shaft power	Total Flow	Head	Shaft power	Pump eff.	Specific energy	NPSHre
1 / 1	4270 US g.p.m.	19.2 ft	28.7 hp	12800 US g.p.m.	19.2 ft	86 hp	72.2 %	92.8 kWh/US MG	21.9 ft

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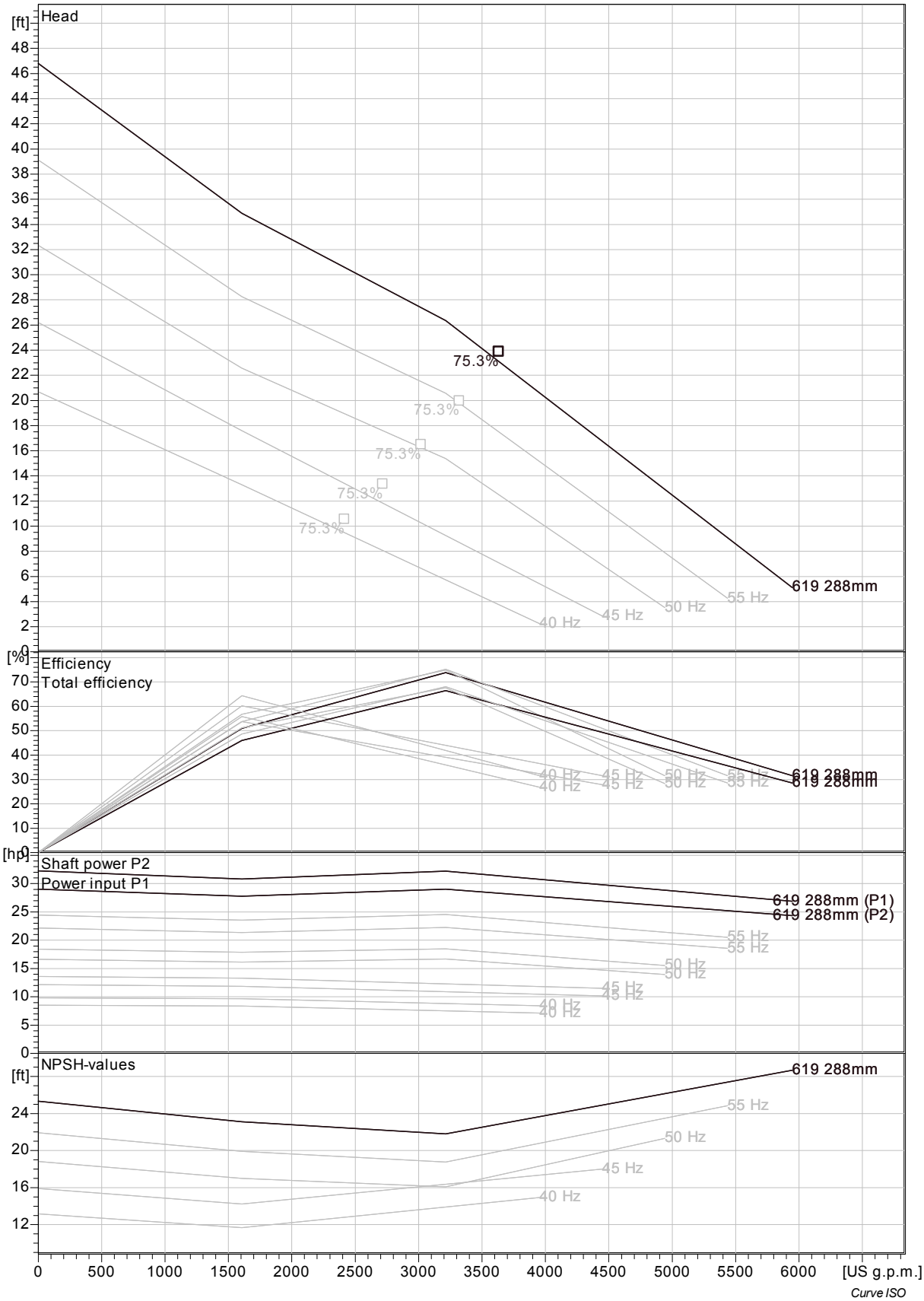
NP 3202 LT 3~ 619

VFD Curve



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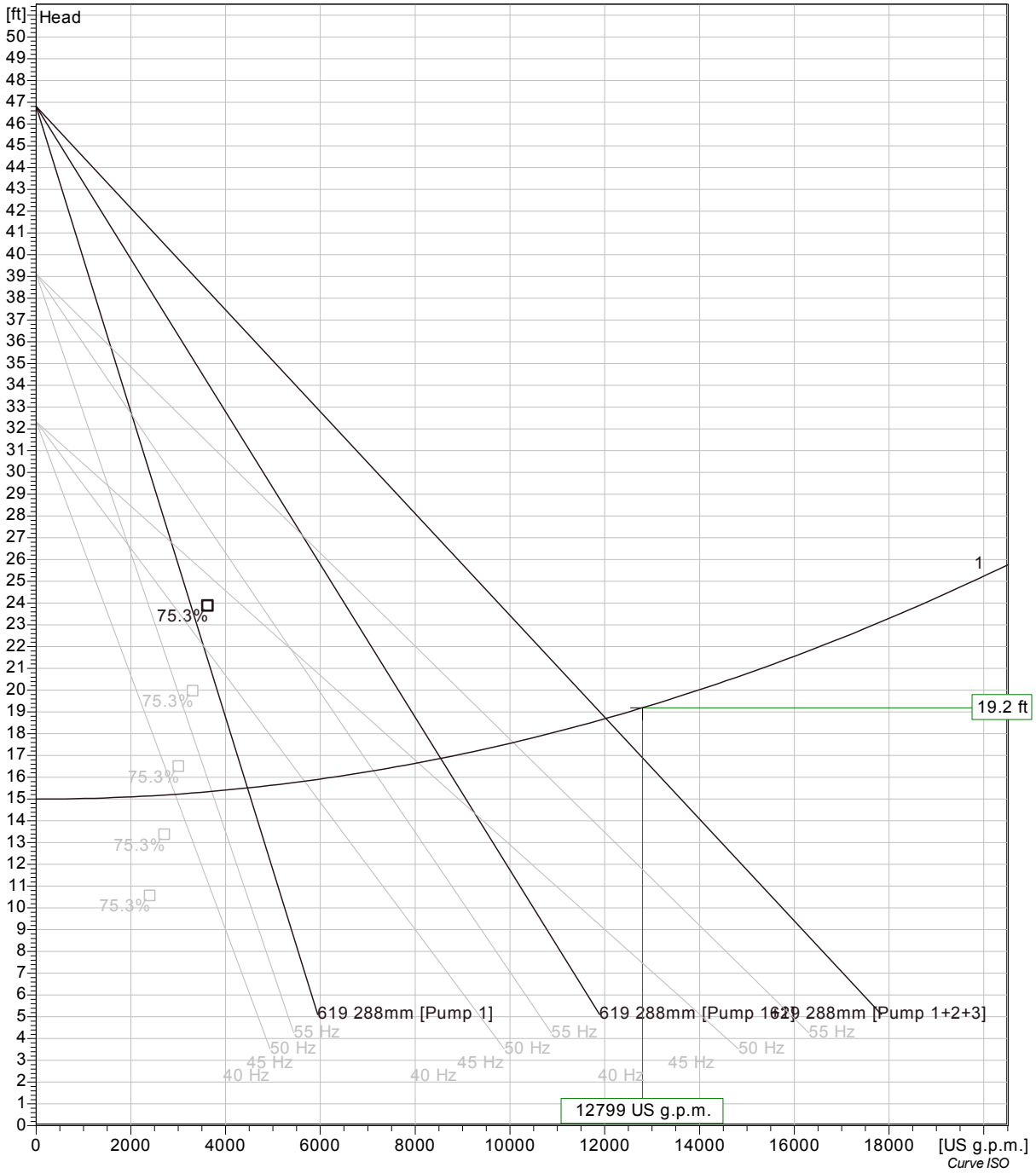
NP 3202 LT 3~ 619

VFD Analysis



Pumps running /System	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hyd eff.	Specific energy	NPSHre
1 / 1	60 Hz	4270 US g.p.m.	19.2 ft	28.7 hp	12800 US g.p.m.	19.2 ft	86 hp	72.2 %	92.8 kWh/US MG	21.9 ft
1 / 1	55 Hz	3620 US g.p.m.	18 ft	22.2 hp	10900 US g.p.m.	18 ft	66.5 hp	74.4 %	84 kWh/US MG	18.8 ft
1 / 1	50 Hz	2930 US g.p.m.	17 ft	16.7 hp	8780 US g.p.m.	17 ft	50.1 hp	75.2 %	78.5 kWh/US MG	16.1 ft
1 / 1	45 Hz	2060 US g.p.m.	16 ft	12 hp	6180 US g.p.m.	16 ft	36.1 hp	69.2 %	81.4 kWh/US MG	13.9 ft
1 / 1	40 Hz	1100 US g.p.m.	15.3 ft	8.18 hp	3290 US g.p.m.	15.3 ft	24.5 hp	51.8 %	107 kWh/US MG	12 ft

Project	Project ID	Created by	Created on	Last update
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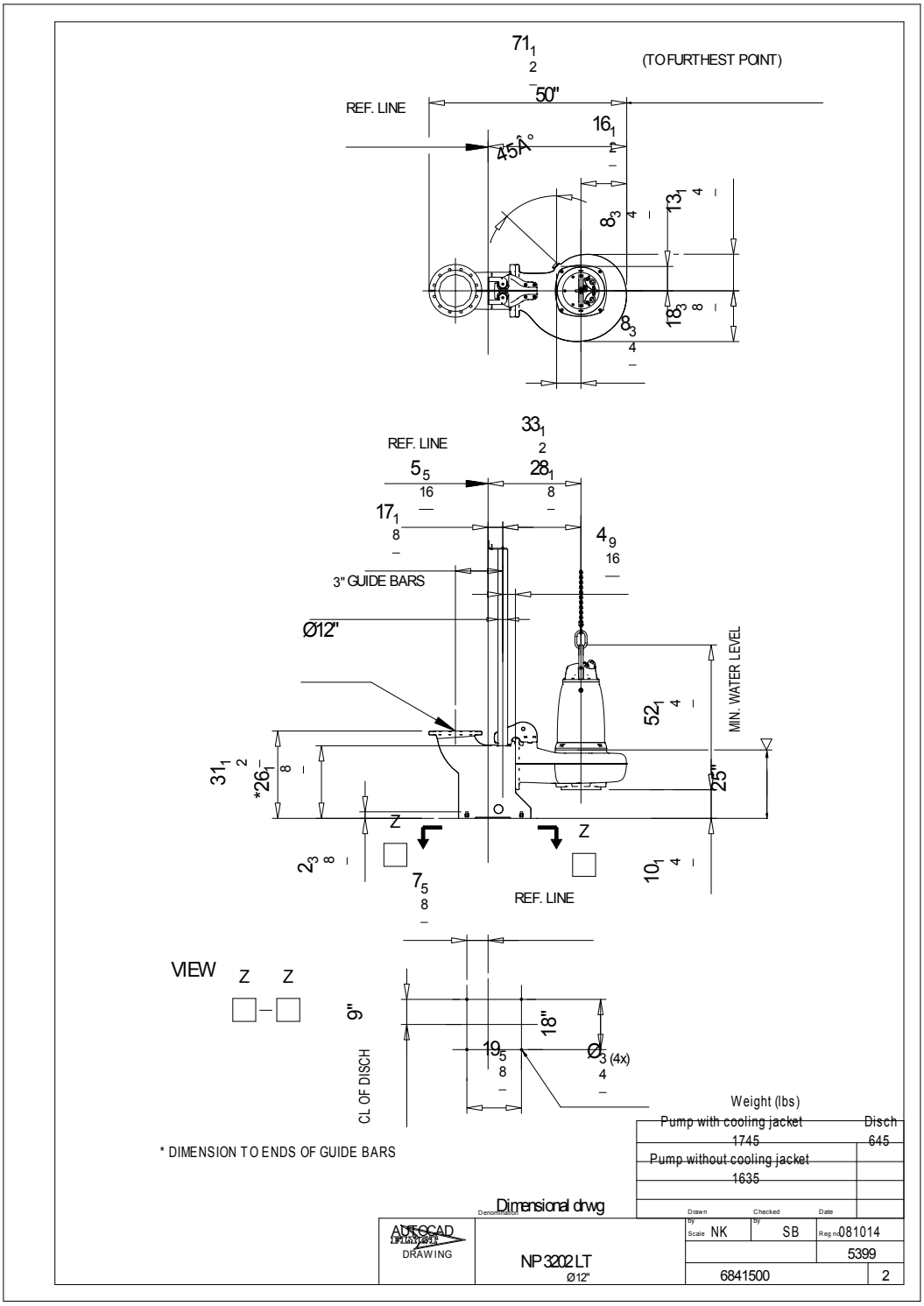
NP 3202 LT 3~ 619

Dimensional drawing



Project	Project ID	Created by	Created on	Last update
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West Bakerview Lift Station

Design Parameters

New Station or Replace Existing?	**REPLACE**

New Wet Well?	IF NEEDED
New Force Main?	IF NEEDED

Max. Current PHF Flow (gpm)	165
Future PHF Flow (gpm)	1190
Tested Capacity (gpm)	244
Current Design Flow (gpm)	350

Existing Pump Station and Force Main Information

Wet Well

Operating Depth (ft)	3.6
Diameter (ft)	8
Operating Volume (gallons)	1353.5489
Surface El @ Ex. Wet Well	178.5
Bottom El.	160
Wet Well Depth	18.5

Existing Force Main

Pipe Nominal Diameter	4
Pipe Material	PVC
Pipe Inside Diameter	4.39
Force Main Length	831
Equivalent Length	876
Pumps Off El.	162.67
Top El.	196.93
Velocity @ Current Capacity	5.17
Static Head	34.26
Chezy C	120

Existing Pumps

Number	2
Make	Meyers
Model	4VH
Horsepower	10
Impeller Dia./Code	8"

**denotes code*

Local Losses in Existing System

Fitting	Count	Pipe Length	Equivalent
90 deg. Bend	0	20	0
45 deg bend	0	10.6	0
22.5 deg bend	0	10.6	0
Plug Valve	1	12	12
Check Valve	1	33	33
TOTAL			45

Pump and System Curve Data

System Curve

PS Pumping Capacity (gpm) (Q)	Velocity (fps) (V)	Unit Friction head loss	Friction Head Loss	TDH (ft)
0	0.00	0.000	0.0	34
100	2.12	0.006	4.9	39
200	4.24	0.020	17.6	52
244	5.17	0.029	25.4	60
350	7.42	0.057	49.6	84
344	7.29	0.055	48.0	82
444	9.41	0.088	77.0	111
544	11.53	0.128	112.1	146
644	13.65	0.175	153.2	187

Pump Curve

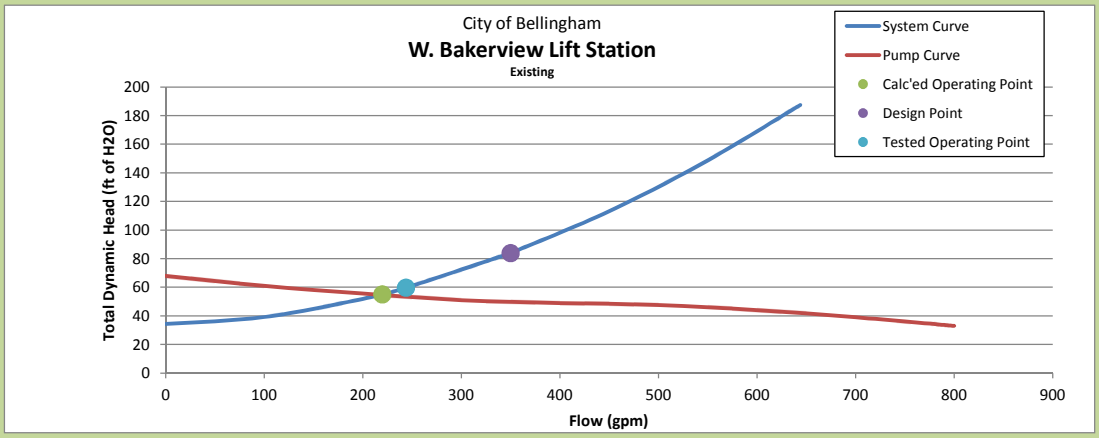
PS Pumping Capacity (gpm) (Q)	TDH (ft)
0	68
100	61
200	56
300	51
400	49
500	47.5
600	44
700	39
800	33

Pump and System Curves

Design Point	Flow (gpm)	Head (ft)
	350	84

Flow and head for operating point determined iteratively

Calculated Operating Point	Flow (gpm)	Head (ft)
	220	55



West Bakerview Lift Station

Ex. System Analysis

Existing Force Main Analysis

Existing Force Main Evaluation

Design Flow (gpm)	1190
Velocity in Ex. FM	25.22
TDH in Ex. FM	511
New FM?	YES

New force main considered if velocity exceeds 8 ft/s and/or TDH exceeds 200 ft H2O

Existing Wet Well Evaluation

Operating Volume (gallons)	1354
Design Flow (gpm)	1190
Max Starts/hr (4V/Q)	13.2
New Wet Well?	YES

New Wet Well considered if starts/hr > 12

Proposed System

New Force Main Sizing and Pump Selection

Solved by iteration for preferred head (generally less than 200 ft TDH) and velocity conditions (generally b/w 3 and 6 fps)

Material	HDPE
Class/ Thickness	17
Nominal Diameter	8
Inside DIameter	7.549
Chezy C	130
Velocity at Design Flow	8.5
TDH @ Design Flow	40

Proposed Wet Well Diameter

Starts/Hr	12
Op. Volume	1487.5 gallons
Op. Depth	3.6 ft
Calced Dia.	8.39 ft
WW Dia.	10 ft.
Selected Dia.	10 ft.

Confirm WW is large enough for pumps

Proposed Pumps

Number	2
Make	Flygt
Model	NP3171MT
Horsepower	30
Impeller Dia./Code	255 mm

**denotes code*

Pump and System Curve Data

System Curve

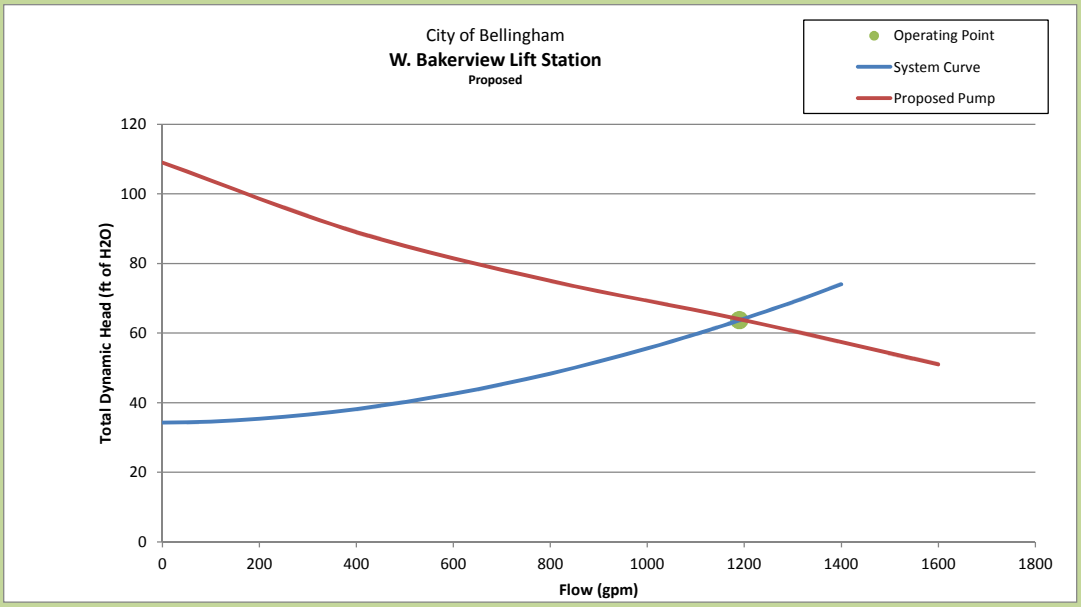
PS Pumping Capacity (gpm) (Q)	Velocity (fps) (V)	Unit Friction head loss	Friction Head Loss	TDH (ft)
0	0.00	0.0000	0.0	34
100	0.72	0.0003	0.3	35
200	1.43	0.0012	1.1	35
300	2.15	0.0026	2.3	37
400	2.87	0.0045	3.9	38
500	3.58	0.0068	5.9	40
600	4.30	0.0095	8.3	43
700	5.02	0.0126	11.0	45
800	5.73	0.0161	14.1	48
900	6.45	0.0200	17.6	52
1000	7.17	0.0244	21.3	56
1100	7.89	0.0290	25.4	60
1190	8.53	0.0336	29.4	64
1300	9.32	0.0396	34.7	69
1400	10.04	0.0454	39.8	74

Pump Curve

PS Pumping Capacity (gpm) (Q)	TDH (ft)
0	109.00
400	89.00
800	75.00
1190	64.00
1600	51.00
2000	39.00
2400	27.00

Pump and System Curves

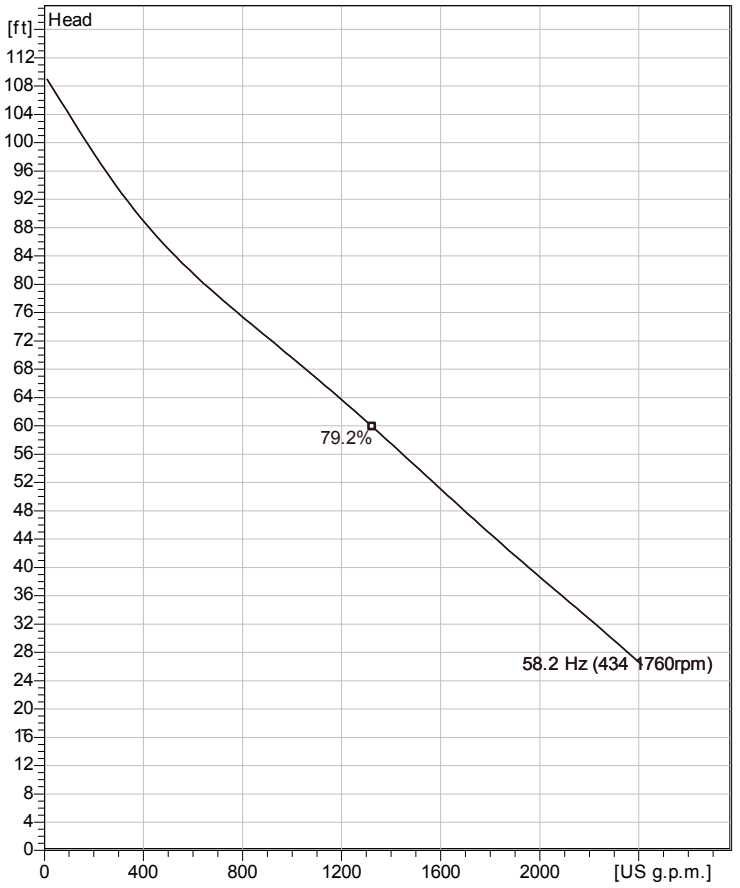
Operating Point	Flow (gpm)	Head (ft)
	1190	64



West Bakerview Alternative Nos. 1 and 2

NP 3171 MT 3~ SmartRun 434

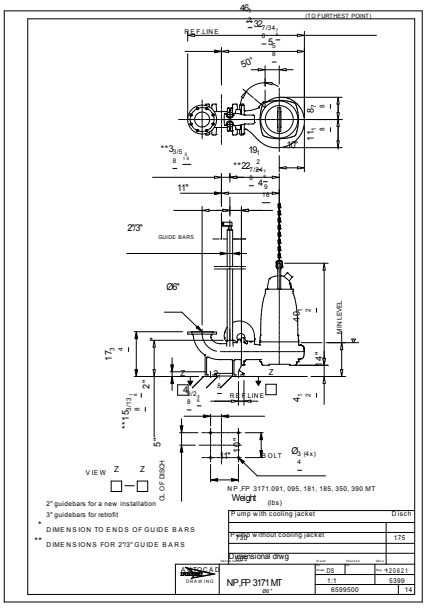
Technical specification



Water, pure *Curve ISO*

Note: Picture might not correspond to the current configuration.

Installation: P - Semi permanent, Wet



General

Patented self cleaning semi opened channel impeller, ideal for pumping in wastewater applications. Modular based design with high adaptation grade. Equipped with a user-friendly intelligent control unit, pre-programmed for wastewater pumping used for pumping station with one or two pumps.

Impeller

Impeller material	Grey cast iron
Discharge Flange Diameter	5 7/8 inch
Inlet diameter	5 7/8 inch
Impeller diameter	255 mm
Number of blades	2

Motor

Motor #	N3171.181 25-17-4AA-W 30hp
Stator variant	7
Frequency	60 Hz
Rated voltage	230 V
Number of poles	4
Phases	3~
Rated power	30 hp
Rated current	75 A
Starting current	515 A
Rated speed	1760 rpm
Power factor	
1/1 Load	0.83
3/4 Load	0.78
1/2 Load	0.66
Efficiency	
1/1 Load	89.5 %
3/4 Load	90.5 %
1/2 Load	90.0 %

Configuration

Project	Project ID	Created by	Created on	Last update
			2016-03-15 22:21:06	

NP 3171 MT 3~ SmartRun 434

Performance curve

Pump

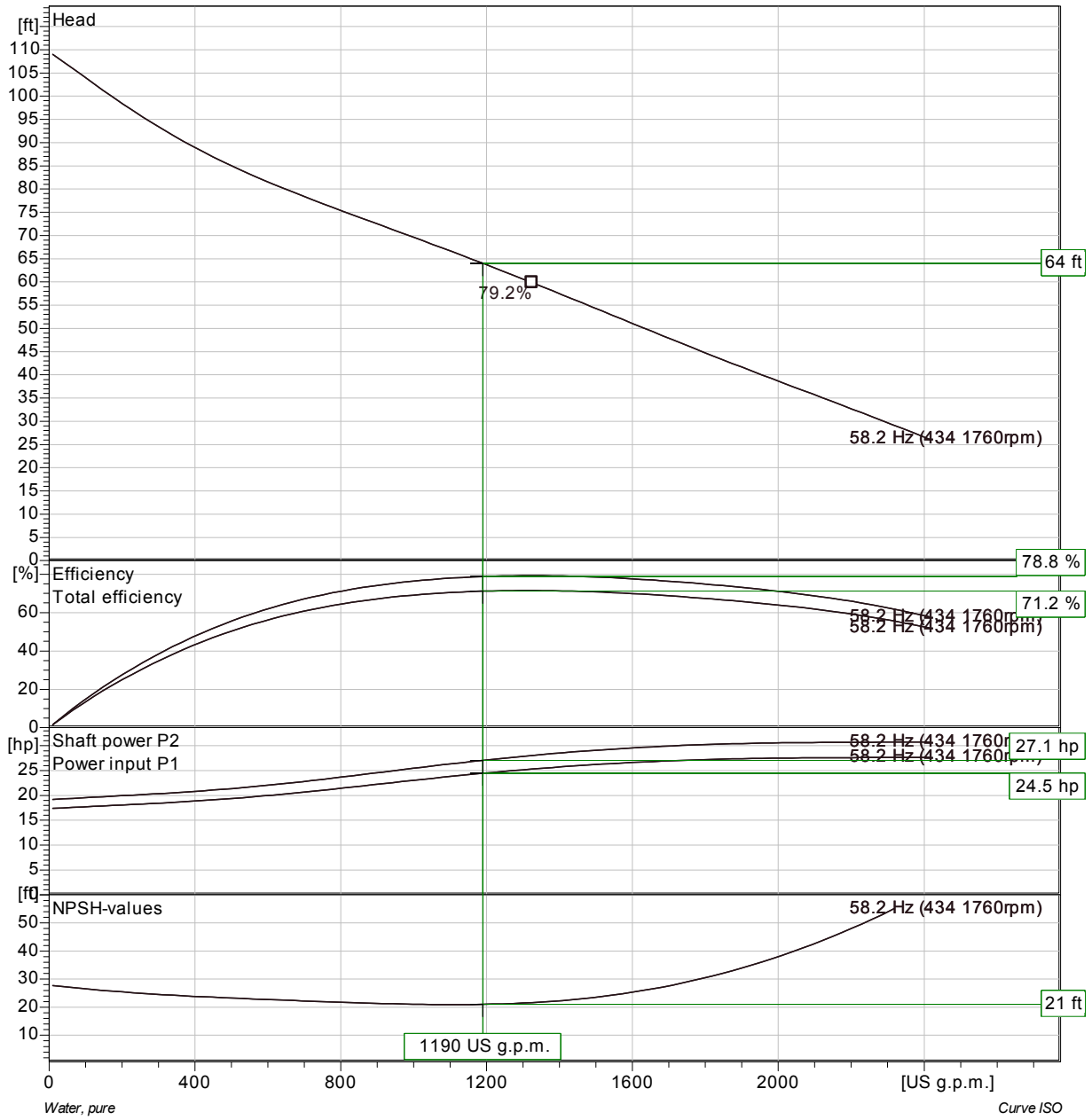
Discharge Flange Diameter	5 7/8 inch
Inlet diameter	150 mm
Impeller diameter	10 1/16"
Number of blades	2

Motor

Motor #	N3171.181 25-17-4AA-W 30hp
Stator variant	7
Frequency	60 Hz
Rated voltage	230 V
Number of poles	4
Phases	3~
Rated power	30 hp
Rated current	75 A
Starting current	515 A
Rated speed	1760 rpm

Power factor	
1/1 Load	0.83
3/4 Load	0.78
1/2 Load	0.66

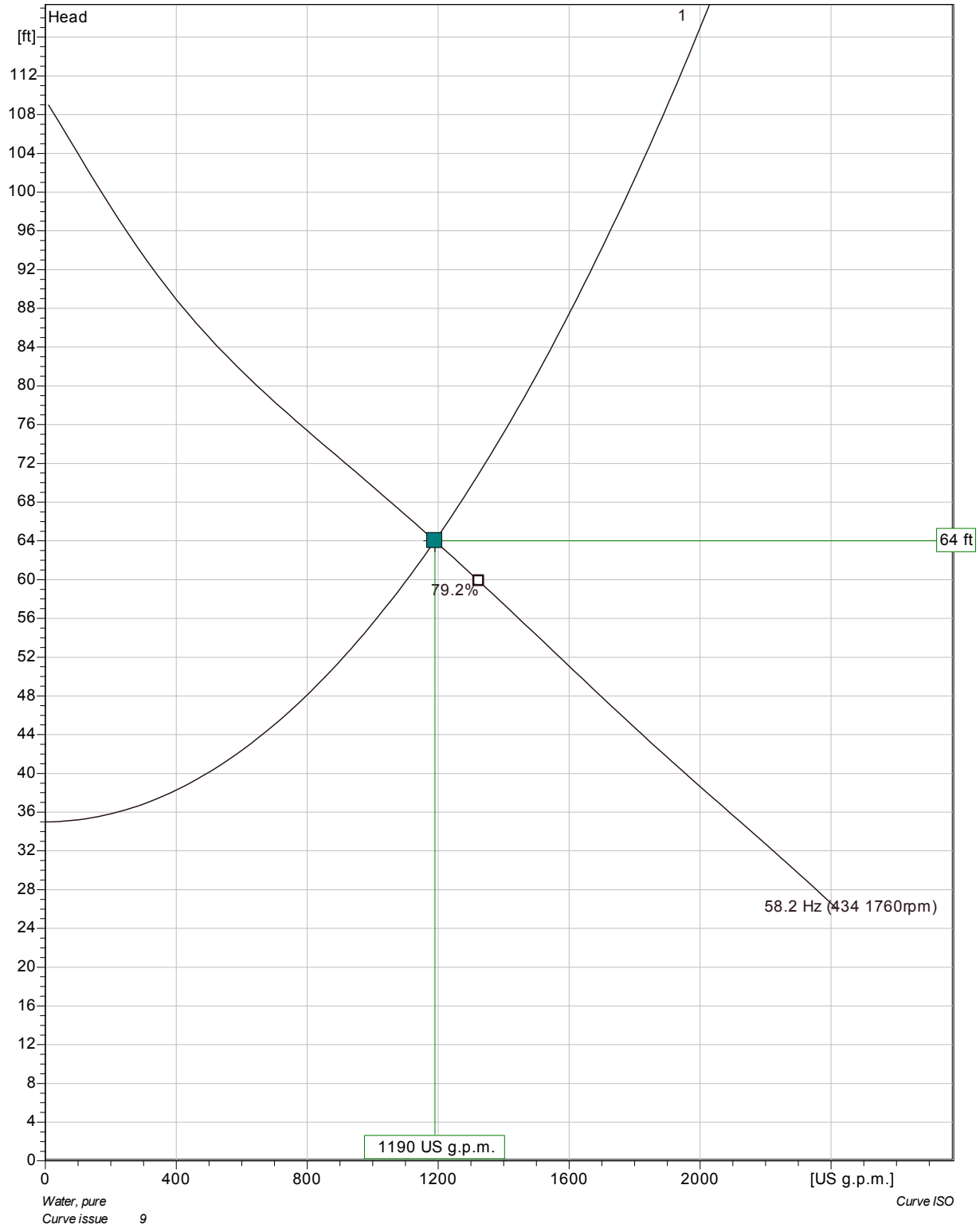
Efficiency	
1/1 Load	89.5 %
3/4 Load	90.5 %
1/2 Load	90.0 %



Project	Project ID	Created by	Created on	Last update
			2016-03-15 22:21:06	

NP 3171 MT 3~ SmartRun 434

Duty Analysis



Pumps running /System	Individual pump Flow	Head	Shaft power	Total Flow	Head	Shaft power	Pump eff.	Specific energy	NPSHre
1	1190 US g.p.m.	64 ft	24.5 hp	1190 US g.p.m.	64 ft	24.5 hp	78.8 %	283 kWh/US MG	21 ft

Project	Project ID	Created by	Created on	Last update
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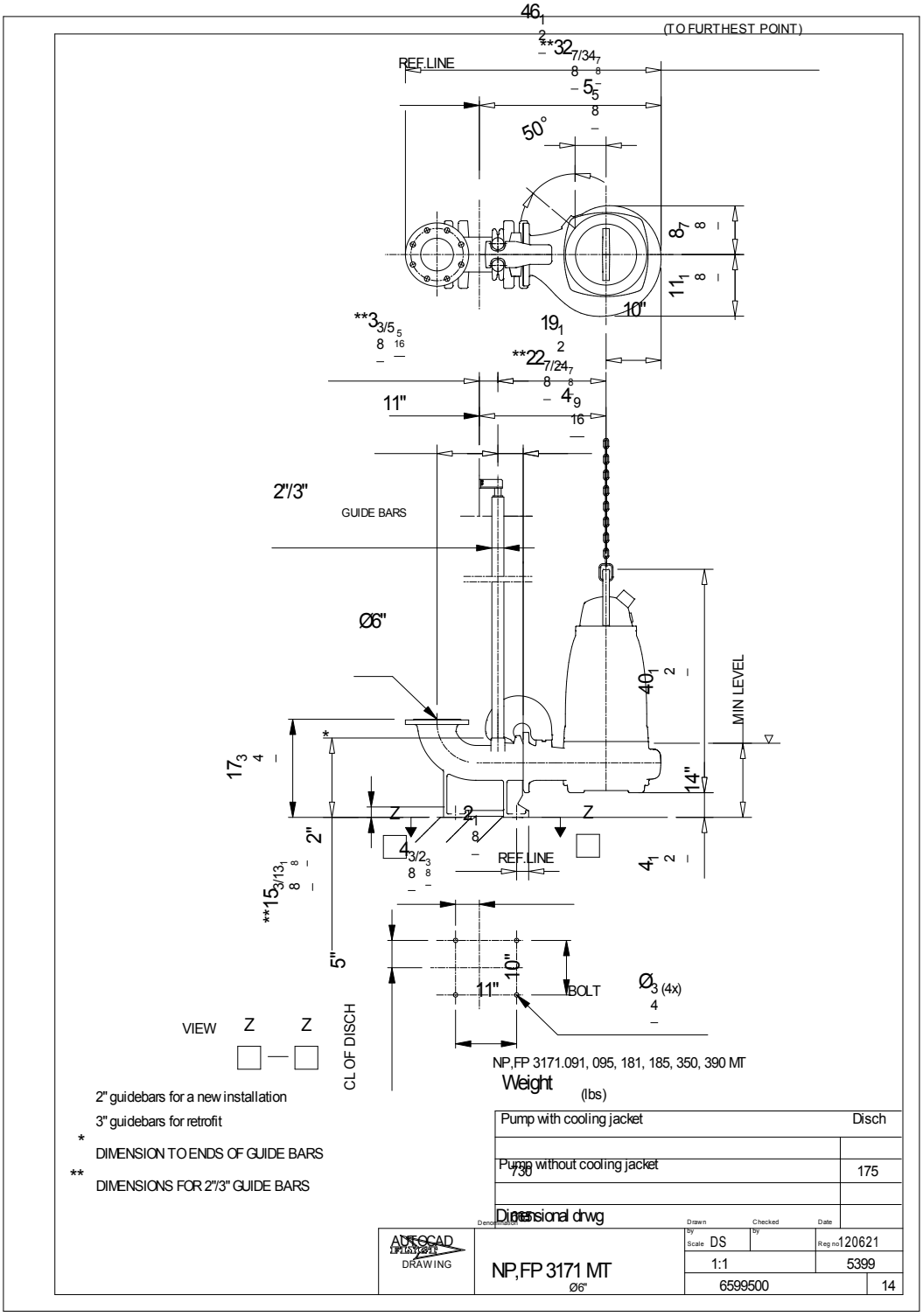
NP 3171 MT 3~ SmartRun 434

Dimensional drawing



Project	Project ID	Created by	Created on	Last update
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West Maplewood Lift Station

Design Parameters

New Station or Replace Existing?	**REPLACE**

New Wet Well?	IF NEEDED
New Force Main?	IF NEEDED

Max. Current PHF Flow (gpm)	198
Future PHF Flow (gpm)	895
Tested Capacity (gpm)	441
Current Design Flow (gpm)	350

Existing Pump Station and Force Main Information

Wet Well

Operating Depth (ft)	3
Diameter (ft)	8
Operating Volume (gallons)	1127.9574
Surface El @ Ex. Wet Well	170.5
Bottom El.	150
Wet Well Depth	20.5

Existing Force Main

Pipe Nominal Diameter	6
Pipe Material	CI
Pipe Inside Diameter	6
Force Main Length	97
Equivalent Length	142
Pumps Off El.	154.26
Top El.	167.93
Velocity @ Current Capacity	5.00
Static Head	13.67
Chezy C	110

Existing Pumps

Number	2
Make	Smith & Loveless
Model	4B2A
Horsepower	5
Impeller Dia./Code	S42L23 - 7.5"?

**denotes code*

Local Losses in Existing System

Fitting	Count	Pipe Length	Equivalent
90 deg. Bend	0	20	0
45 deg bend	0	10.6	0
22.5 deg bend	0	10.6	0
Plug Valve	1	12	12
Check Valve	1	33	33
TOTAL			45

Pump and System Curve Data

System Curve

PS Pumping Capacity (gpm) (Q)	Velocity (fps) (V)	Unit Friction head loss	Friction Head Loss	TDH (ft)
0	0.00	0.000	0.0	13.7
100	1.13	0.001	0.2	13.9
200	2.27	0.005	0.7	14.4
300	3.40	0.011	1.6	15.2
350	3.97	0.015	2.1	15.7
441	5.00	0.022	3.2	16.8
500	5.67	0.028	4.0	17.7
600	6.81	0.039	5.6	19
700	7.94	0.052	7.4	21
800	9.08	0.067	9.5	23

Pump Curve

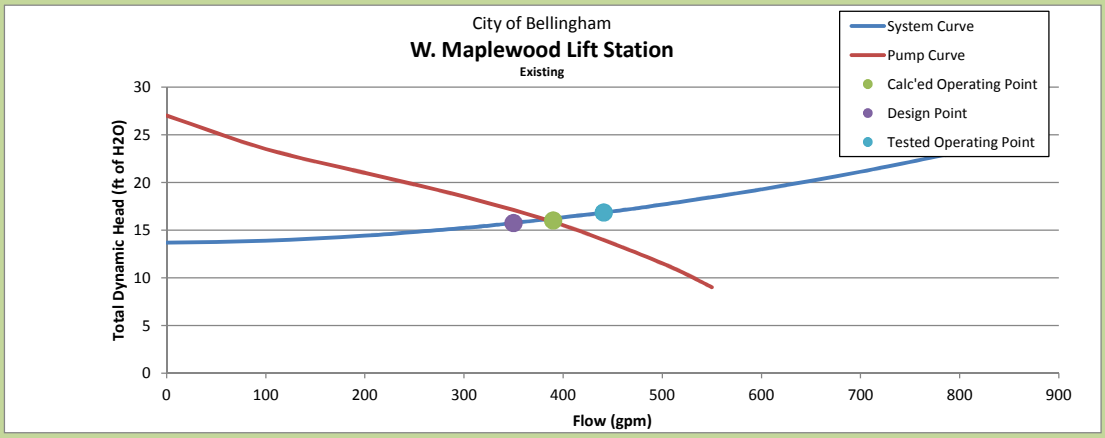
PS Pumping Capacity (gpm) (Q)	TDH (ft)
0	27
100	24
200	21
300	19
400	16
500	12
550	9

Pump and System Curves

Design Point	Flow (gpm)	Head (ft)
	350	15.7

Flow and head for operating point determined iteratively

Calculated Operating Point	Flow (gpm)	Head (ft)
	390	16



West Maplewood Lift Station

Ex. System Analysis

Existing Force Main Analysis

Existing Force Main Evaluation

Design Flow (gpm)	895
Velocity in Ex. FM	10.16
TDH in Ex. FM	25
New FM?	YES

New force main considered if velocity exceeds 8 ft/s and/or TDH exceeds 200 ft H2O

Existing Wet Well Evaluation

Operating Volume (gallons)	1128
Design Flow (gpm)	895
Max Starts/hr (4V/Q)	11.9
New Wet Well?	NO

New Wet Well considered if starts/hr > 12

Proposed System

New Force Main Sizing and Pump Selection

Solved by iteration for preferred head (generally less than 200 ft TDH) and velocity conditions (generally b/w 3 and 6 fps)

Material	HDPE
Class/ Thickness	17
Nominal Diameter	8
Inside DIameter	7.549
Chezy C	130
Velocity at Design Flow	6.4
TDH @ Design Flow	16

NOT USED

Proposed Wet Well Diameter

Starts/Hr	12
Op. Volume	1118.75 gallons
Op. Depth	3 ft
Calced Dia.	7.97 ft
WW Dia.	8 ft.
Selected Dia.	8 ft.

Confirm WW is large enough for pumps

Proposed Pumps

Number	2
Make	
Model	
Horsepower	
Impeller Dia./Code	

**denotes code*

Pump and System Curve Data

System Curve

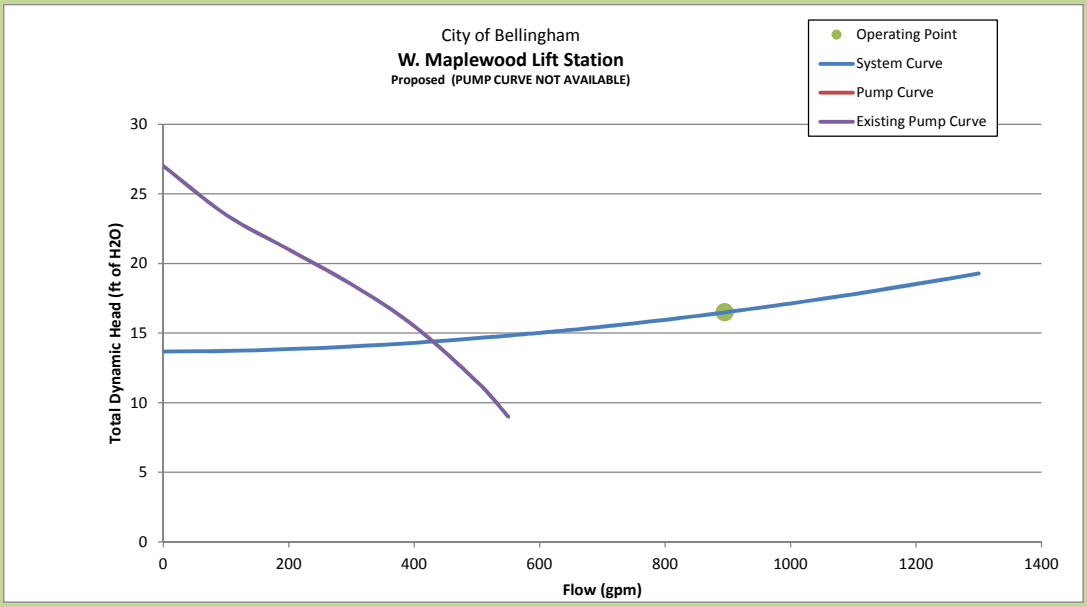
PS Pumping Capacity (gpm) (Q)	Velocity (fps) (V)	Unit Friction head loss	Friction Head Loss	TDH (ft)
0	0.00	0.0000	0.0	14
100	0.72	0.0003	0.0	14
200	1.43	0.0012	0.2	14
300	2.15	0.0026	0.4	14
400	2.87	0.0045	0.6	14
500	3.58	0.0068	1.0	15
596	4.27	0.0093	1.3	15
600	4.30	0.0095	1.3	15
700	5.02	0.0126	1.8	15
800	5.73	0.0161	2.3	16
895	6.42	0.0198	2.8	16
1000	7.17	0.0244	3.5	17
1100	7.89	0.0290	4.1	18
1200	8.60	0.0341	4.8	19
1300	9.32	0.0396	5.6	19

Pump Curve (NOT AVAILABLE)

PS Pumping Capacity (gpm) (Q)	TDH (ft)
0	
100	
200	
300	
400	
500	
596	
600	
700	
800	
895	
1000	
1100	
1200	
1300	

Pump and System Curves

Operating Point	Flow (gpm)	Head (ft)
	895	16



APPENDIX G

COST ESTIMATES

CITY OF BELLINGHAM
BELLINGHAM WASTEWATER CONVEYANCE PLAN
PRELIMINARY COST ESTIMATE
CIP No. NW1
(W. Maplewood Ave.; MH 14904 to MH 82133-01)
January 2016
G&O# 15448

NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Mobilization/Demobilization	1	LS	$ 63,000	$ 63,000
2	Survey	1	LS	$ 10,000	$ 10,000
3	Force Account	1	EST	$ 10,000	$ 10,000
4	Project Temporary Traffic Control	1	LS	$ 8,000	$ 8,000
5	Clearing and Grubbing	1	LS	$ 5,000	$ 5,000
6	Sawcutting Existing Pavement	1,650	LF	$ 3	$ 4,950
7	Locate Existing Utilities for Sewer	1	LS	$ 5,000	$ 5,000
8	Crushed Surfacing Top Course	30	TN	$ 40	$ 1,200
9	Crushed Surfacing Base Course	210	TN	$ 25	$ 5,250
10	HMA Cl. 1/2 IN. PG 64-22	200	TN	$ 170	$ 34,000
11	Manhole 48 In. Diam. Type 2	10	EA	$ 6,000	$ 60,000
12	Connection to Existing Manhole	5	EA	$ 4,000	$ 20,000
13	Dewatering for Sewer	1	LS	$ -	$ -
14	Removal of Unsuitable Material (Trench)	330	CY	$ 50	$ 16,500
15	Trench Excavation Safety Systems	1	LS	$ 20,000	$ 20,000
16	Temporary Sewer Bypass Pumping	1	LS	$ 30,000	$ 30,000
17	Bank Run Gravel for Trench Backfill	5,860	TN	$ 25	$ 146,500
18	PVC Sanitary Sewer Pipe 10 In. Diam.	1,330	LF	$ 60	$ 79,800
19	PVC Sanitary Sewer Pipe 12 In. Diam.	1,700	LF	$ 70	$ 119,000
20	Erosion/Water Pollution Control	1	LS	$ 5,000	$ 5,000
21	Seeding, Fertilizing and Mulching	1,660	SY	$ 10	$ 16,600
22	Topsoil Type A	190	CY	$ 60	$ 11,400
23	Cement Concrete Traffic Curb and Gutter	150	LF	$ 40	$ 6,000
24	Cement Concrete Sidewalk	80	SY	$ 75	$ 6,000
		Subtotal			$ 683,200
		Sales Tax (8.7%)			$ 59,438
	Total Construction Cost (rounded)				**$ 743,000**
	Construction Contingency (20%)				$ 148,600
	Engineering, Permitting, Administration (25%):				$ 222,900
	Total Project Cost (rounded)				**$ 1,115,000**

CITY OF BELLINGHAM
BELLINGHAM WASTEWATER CONVEYANCE PLAN
PRELIMINARY COST ESTIMATE
CIP No. NW2
(Northwest Dr.; MH 82134-08 to MH 82134-07 & MH82134-06 to MH 15120)
January 2016
G&O# 15448

NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Mobilization/Demobilization	1	LS	$ 89,000	$ 89,000
2	Survey	1	LS	$ 10,000	$ 10,000
3	Force Account	1	EST	$ 10,000	$ 10,000
4	Project Temporary Traffic Control	1	LS	$ 7,000	$ 7,000
5	Clearing and Grubbing	1	LS	$ 5,000	$ 5,000
6	Sawcutting Existing Pavement	3,780	LF	$ 3	$ 11,340
7	Locate Existing Utilities for Sewer	1	LS	$ 5,000	$ 5,000
8	Crushed Surfacing Top Course	0	TN	$ 40	$ -
9	Crushed Surfacing Base Course	540	TN	$ 25	$ 13,500
10	HMA Cl. 1/2 IN. PG 64-22	400	TN	$ 170	$ 68,000
11	Manhole 48 In. Diam. Type 2	11	EA	$ 6,000	$ 66,000
12	Connection to Existing Manhole	7	EA	$ 4,000	$ 28,000
13	Dewatering for Sewer	1	LS	$ -	$ -
14	Removal of Unsuitable Material (Trench)	360	CY	$ 50	$ 18,000
15	Trench Excavation Safety Systems	1	LS	$ 20,000	$ 20,000
16	Temporary Sewer Bypass Pumping	1	LS	$ 30,000	$ 30,000
17	Bank Run Gravel for Trench Backfill	6,340	TN	$ 25	$ 158,500
18	Boring PVC Sanitary Sewer Pipe 18 In. Diam.	182	LF	$ 700	$ 127,400
19	PVC Sanitary Sewer Pipe 10 In. Diam.	410	LF	$ 60	$ 24,600
20	PVC Sanitary Sewer Pipe 12 In. Diam.	2,250	LF	$ 70	$ 157,500
21	Erosion/Water Pollution Control	1	LS	$ 5,000	$ 5,000
22	Seeding, Fertilizing and Mulching	420	SY	$ 10	$ 4,200
23	Topsoil Type A	50	CY	$ 60	$ 3,000
24	Cement Concrete Traffic Curb and Gutter	1,330	LF	$ 40	$ 53,200
25	Cement Concrete Sidewalk	740	SY	$ 75	$ 55,500
		Subtotal			$ 969,740
		Sales Tax (8.7%)			$ 84,367
	Total Construction Cost (rounded)				**$ 1,054,000**
	Construction Contingency (20%)				$ 210,800
	Engineering, Permitting, Administration (25%):				$ 316,200
	Total Project Cost (rounded)				**$ 1,581,000**

Cost assumes boring will not be required along State Highway 99

CITY OF BELLINGHAM
BELLINGHAM WASTEWATER CONVEYANCE PLAN
PRELIMINARY COST ESTIMATE
CIP No. NW3
(Squalicum Way; MH 10507 to MH 17010)
January 2016
G&O# 15448

NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Mobilization/Demobilization	1	LS	$ 141,000	$ 141,000
2	Survey	1	LS	$ 10,000	$ 10,000
3	Force Account	1	EST	$ 10,000	$ 10,000
4	Project Temporary Traffic Control	1	LS	$ 17,000	$ 17,000
5	Clearing and Grubbing	1	LS	$ 15,000	$ 15,000
6	Sawcutting Existing Pavement	430	LF	$ 3	$ 1,290
7	Locate Existing Utilities for Sewer	1	LS	$ 10,000	$ 10,000
8	Crushed Surfacing Top Course	60	TN	$ 40	$ 2,400
9	Crushed Surfacing Base Course	50	TN	$ 25	$ 1,250
10	HMA Cl. 1/2 IN. PG 64-22	100	TN	$ 170	$ 17,000
11	Manhole 48 In. Diam. Type 2	25	EA	$ 6,000	$ 150,000
12	Connection to Existing Manhole	6	EA	$ 4,000	$ 24,000
13	Dewatering for Sewer	1	LS	$ 30,000	$ 30,000
14	Removal of Unsuitable Material (Trench)	590	CY	$ 50	$ 29,500
15	Trench Excavation Safety Systems	1	LS	$ 40,000	$ 40,000
16	Temporary Sewer Bypass Pumping	1	LS	$ 50,000	$ 50,000
17	Bank Run Gravel for Trench Backfill	10,560	TN	$ 25	$ 264,000
18	PVC Sanitary Sewer Pipe 21 In. Diam.	7,040	LF	$ 90	$ 633,600
19	Erosion/Water Pollution Control	1	LS	$ 10,000	$ 10,000
20	Seeding, Fertilizing and Mulching	5,140	SY	$ 10	$ 51,400
21	Topsoil Type A	570	CY	$ 60	$ 34,200
22	Cement Concrete Traffic Curb and Gutter	0	LF	$ 40	$ -
23	Cement Concrete Sidewalk	0	SY	$ 75	$ -
		Subtotal			$ 1,541,640
		Sales Tax (8.7%)			$ 134,123
	Total Construction Cost (rounded)				**$ 1,676,000**
	Construction Contingency (20%)				$ 335,200
	Engineering, Permitting, Administration (25%):				$ 502,800
	Total Project Cost (rounded)				**$ 2,514,000**

CITY OF BELLINGHAM
BELLINGHAM WASTEWATER CONVEYANCE PLAN
PRELIMINARY COST ESTIMATE
CIP No. CM1
(Guide Meridian; MH 83063-02 to MH 21206)
January 2016
G&O# 15448

NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Mobilization/Demobilization	1	LS	$ 241,000	$ 241,000
2	Survey	1	LS	$ 10,000	$ 10,000
3	Force Account	1	EST	$ 10,000	$ 10,000
4	Project Temporary Traffic Control	1	LS	$ 23,000	$ 23,000
5	Clearing and Grubbing	1	LS	$ 15,000	$ 15,000
6	Sawcutting Existing Pavement	5,520	LF	$ 3	$ 16,560
7	Locate Existing Utilities for Sewer	1	LS	$ 10,000	$ 10,000
8	Crushed Surfacing Top Course	30	TN	$ 40	$ 1,200
9	Crushed Surfacing Base Course	900	TN	$ 25	$ 22,500
10	HMA Cl. 1/2 IN. PG 64-22	600	TN	$ 170	$ 102,000
11	Manhole 48 In. Diam. Type 2	36	EA	$ 6,000	$ 216,000
12	Connection to Existing Manhole	15	EA	$ 4,000	$ 60,000
13	Dewatering for Sewer	1	LS	$ 30,000	$ 30,000
14	Removal of Unsuitable Material (Trench)	1,460	CY	$ 50	$ 73,000
15	Trench Excavation Safety Systems	1	LS	$ 40,000	$ 40,000
16	Temporary Sewer Bypass Pumping	1	LS	$ 50,000	$ 50,000
17	Bank Run Gravel for Trench Backfill	26,210	TN	$ 25	$ 655,250
18	PVC Sanitary Sewer Pipe 15 In. Diam.	8,100	LF	$ 75	$ 607,500
19	PVC Sanitary Sewer Pipe 24 In. Diam.	1,090	LF	$ 120	$ 130,800
20	Erosion/Water Pollution Control	1	LS	$ 10,000	$ 10,000
21	Seeding, Fertilizing and Mulching	3,090	SY	$ 10	$ 30,900
22	Topsoil Type A	340	CY	$ 60	$ 20,400
23	Cement Concrete Traffic Curb and Gutter	3,260	LF	$ 40	$ 130,400
24	Cement Concrete Sidewalk	1,810	SY	$ 75	$ 135,750
		Subtotal			$ 2,641,260
		Sales Tax (8.7%)			$ 229,790
	Total Construction Cost (rounded)				**$ 2,871,000**
	Construction Contingency (20%)				$ 574,200
	Engineering, Permitting, Administration (25%):				$ 861,300
	Total Project Cost (rounded)				**$ 4,307,000**

CITY OF BELLINGHAM
BELLINGHAM WASTEWATER CONVEYANCE PLAN
PRELIMINARY COST ESTIMATE
CIP No. CM2
(E. Bakerview Rd.; MH 83073-16 to MH 83184-02)
January 2016
G&O# 15448

NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Mobilization/Demobilization	1	LS	$ 22,000	$ 22,000
2	Survey	1	LS	$ 5,000	$ 5,000
3	Force Account	1	EST	$ 5,000	$ 5,000
4	Project Temporary Traffic Control	1	LS	$ 3,000	$ 3,000
5	Clearing and Grubbing	1	LS	$ 1,000	$ 1,000
6	Sawcutting Existing Pavement	140	LF	$ 3	$ 420
7	Locate Existing Utilities for Sewer	1	LS	$ 5,000	$ 5,000
8	Crushed Surfacing Top Course	0	TN	$ 40	$ -
9	Crushed Surfacing Base Course	20	TN	$ 25	$ 500
10	HMA Cl. 1/2 IN. PG 64-22	20	TN	$ 170	$ 3,400
11	Manhole 48 In. Diam. Type 2	5	EA	$ 6,000	$ 30,000
12	Connection to Existing Manhole	4	EA	$ 4,000	$ 16,000
13	Dewatering for Sewer	1	LS	$ 10,000	$ 10,000
14	Removal of Unsuitable Material (Trench)	0	CY	$ 50	$ -
15	Trench Excavation Safety Systems	1	LS	$ 10,000	$ 10,000
16	Temporary Sewer Bypass Pumping	1	LS	$ 10,000	$ 10,000
17	Bank Run Gravel for Trench Backfill	0	TN	$ 25	$ -
18	HDPE Sanitary Sewer Pipe, 12 In. Diam. for Pipe Burst	920	LF	$ 120	$ 110,400
19	Erosion/Water Pollution Control	1	LS	$ 10,000	$ 10,000
20	Seeding, Fertilizing and Mulching	0	SY	$ 10	$ -
21	Topsoil Type A	0	CY	$ 60	$ -
22	Cement Concrete Traffic Curb and Gutter	0	LF	$ 40	$ -
23	Cement Concrete Sidewalk	0	SY	$ 75	$ -
		Subtotal			$ 241,720
		Sales Tax (8.7%)			$ 21,030
	Total Construction Cost (rounded)				**$ 263,000**
	Construction Contingency (20%)				$ 52,600
	Engineering, Permitting, Administration (25%):				$ 78,900
	Total Project Cost (rounded)				**$ 395,000**

CITY OF BELLINGHAM
BELLINGHAM WASTEWATER CONVEYANCE PLAN
PRELIMINARY COST ESTIMATE
CIP No. CM3
(Deemer Rd.; MH STA85-S09 to MH STA85-S06)
January 2016
G&O# 15448

NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Mobilization/Demobilization	1	LS	$ 21,000	$ 21,000
2	Survey	1	LS	$ 5,000	$ 5,000
3	Force Account	1	EST	$ 5,000	$ 5,000
4	Project Temporary Traffic Control	1	LS	$ 2,000	$ 2,000
5	Clearing and Grubbing	1	LS	$ 1,000	$ 1,000
6	Sawcutting Existing Pavement	340	LF	$ 3	$ 1,020
7	Locate Existing Utilities for Sewer	1	LS	$ 5,000	$ 5,000
8	Crushed Surfacing Top Course	0	TN	$ 40	$ -
9	Crushed Surfacing Base Course	60	TN	$ 25	$ 1,500
10	HMA Cl. 1/2 IN. PG 64-22	40	TN	$ 170	$ 6,800
11	Manhole 48 In. Diam. Type 2	5	EA	$ 6,000	$ 30,000
12	Connection to Existing Manhole	4	EA	$ 4,000	$ 16,000
13	Dewatering for Sewer	1	LS	$ 10,000	$ 10,000
14	Removal of Unsuitable Material (Trench)	0	CY	$ 50	$ -
15	Trench Excavation Safety Systems	1	LS	$ 10,000	$ 10,000
16	Temporary Sewer Bypass Pumping	1	LS	$ 10,000	$ 10,000
17	Bank Run Gravel for Trench Backfill	0	TN	$ 25	$ -
18	HDPE Sanitary Sewer Pipe, 18 In. Diam. for Pipe Burst	580	LF	$ 150	$ 87,000
19	Erosion/Water Pollution Control	1	LS	$ 10,000	$ 10,000
20	Seeding, Fertilizing and Mulching	0	SY	$ 10	$ -
21	Topsoil Type A	0	CY	$ 60	$ -
22	Cement Concrete Traffic Curb and Gutter	0	LF	$ 40	$ -
23	Cement Concrete Sidewalk	0	SY	$ 75	$ -
		Subtotal			$ 221,320
		Sales Tax (8.7%)			$ 19,255
	Total Construction Cost (rounded)				**$ 241,000**
	Construction Contingency (20%)				$ 48,200
	Engineering, Permitting, Administration (25%):				$ 72,300
	Total Project Cost (rounded)				**$ 362,000**

CITY OF BELLINGHAM
BELLINGHAM WASTEWATER CONVEYANCE PLAN
PRELIMINARY COST ESTIMATE
CIP No. CM4
(E. Bellis Fair Pkwy.; MH 37405 to MH 23210)
January 2016
G&O# 15448

NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Mobilization/Demobilization	1	LS	$ 40,000	$ 40,000
2	Survey	1	LS	$ 8,000	$ 8,000
3	Force Account	1	EST	$ 5,000	$ 5,000
4	Project Temporary Traffic Control	1	LS	$ 4,000	$ 4,000
5	Clearing and Grubbing	1	LS	$ 1,000	$ 1,000
6	Sawcutting Existing Pavement	60	LF	$ 3	$ 180
7	Locate Existing Utilities for Sewer	1	LS	$ 5,000	$ 5,000
8	Crushed Surfacing Top Course	0	TN	$ 40	$ -
9	Crushed Surfacing Base Course	10	TN	$ 25	$ 250
10	HMA Cl. 1/2 IN. PG 64-22	100	TN	$ 170	$ 17,000
11	Manhole 48 In. Diam. Type 2	8	EA	$ 6,000	$ 48,000
12	Connection to Existing Manhole	3	EA	$ 4,000	$ 12,000
13	Dewatering for Sewer	1	LS	$ 10,000	$ 10,000
14	Removal of Unsuitable Material (Trench)	0	CY	$ 50	$ -
15	Trench Excavation Safety Systems	1	LS	$ 10,000	$ 10,000
16	Temporary Sewer Bypass Pumping	1	LS	$ 30,000	$ 30,000
17	Bank Run Gravel for Trench Backfill	0	TN	$ 25	$ -
18	HDPE Sanitary Sewer Pipe, 18 In. Diam. for Pipe Burst	1,550	LF	$ 150	$ 232,500
19	Erosion/Water Pollution Control	1	LS	$ 10,000	$ 10,000
20	Seeding, Fertilizing and Mulching	40	SY	$ 10	$ 400
21	Topsoil Type A	10	CY	$ 60	$ 600
22	Cement Concrete Traffic Curb and Gutter	0	LF	$ 40	$ -
23	Cement Concrete Sidewalk	0	SY	$ 75	$ -
		Subtotal			$ 433,930
		Sales Tax (8.7%)			$ 37,752
	Total Construction Cost (rounded)				**$ 472,000**
	Construction Contingency (20%)				$ 94,400
	Engineering, Permitting, Administration (25%):				$ 141,600
	Total Project Cost (rounded)				**$ 708,000**

CITY OF BELLINGHAM
BELLINGHAM WASTEWATER CONVEYANCE PLAN
PRELIMINARY COST ESTIMATE
CIP No. CM5
(Telegraph Rd.; MH 83184-13 to MH 22403)
January 2016
G&O# 15448

NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Mobilization/Demobilization	1	LS	$ 34,000	$ 34,000
2	Survey	1	LS	$ 5,000	$ 5,000
3	Force Account	1	EST	$ 5,000	$ 5,000
4	Project Temporary Traffic Control	1	LS	$ 3,000	$ 3,000
5	Clearing and Grubbing	1	LS	$ 1,000	$ 1,000
6	Sawcutting Existing Pavement	1,950	LF	$ 3	$ 5,850
7	Locate Existing Utilities for Sewer	1	LS	$ 5,000	$ 5,000
8	Crushed Surfacing Top Course	0	TN	$ 40	$ -
9	Crushed Surfacing Base Course	340	TN	$ 25	$ 8,500
10	HMA Cl. 1/2 IN. PG 64-22	300	TN	$ 170	$ 51,000
11	Manhole 48 In. Diam. Type 2	4	EA	$ 6,000	$ 24,000
12	Connection to Existing Manhole	4	EA	$ 4,000	$ 16,000
13	Dewatering for Sewer	1	LS	$ 10,000	$ 10,000
14	Removal of Unsuitable Material (Trench)	230	CY	$ 50	$ 11,500
15	Trench Excavation Safety Systems	1	LS	$ 10,000	$ 10,000
16	Temporary Sewer Bypass Pumping	1	LS	$ 10,000	$ 10,000
17	Bank Run Gravel for Trench Backfill	4,130	TN	$ 25	$ 103,250
18	PVC Sanitary Sewer Pipe 10 In. Diam.	970	LF	$ 60	$ 58,200
19	Erosion/Water Pollution Control	1	LS	$ 5,000	$ 5,000
20	Seeding, Fertilizing and Mulching	0	SY	$ 10	$ -
21	Topsoil Type A	0	CY	$ 60	$ -
22	Cement Concrete Traffic Curb and Gutter	0	LF	$ 40	$ -
23	Cement Concrete Sidewalk	0	SY	$ 75	$ -
		Subtotal			$ 366,300
		Sales Tax (8.7%)			$ 31,868
	Total Construction Cost (rounded)				**$ 398,000**
	Construction Contingency (20%)				$ 79,600
	Engineering, Permitting, Administration (25%):				$ 119,400
	Total Project Cost (rounded)				**$ 597,000**

CITY OF BELLINGHAM
BELLINGHAM WASTEWATER CONVEYANCE PLAN
PRELIMINARY COST ESTIMATE
CIP No. SM1
(Strider Rd./ E. Bakerview Rd.; MH U0099-S03 to MH S0271-S03)
January 2016
G&O# 15448

NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Mobilization/Demobilization	1	LS	$ 32,000	$ 32,000
2	Survey	1	LS	$ 5,000	$ 5,000
3	Force Account	1	EST	$ 5,000	$ 5,000
4	Project Temporary Traffic Control	1	LS	$ 3,000	$ 3,000
5	Clearing and Grubbing	1	LS	$ 1,000	$ 1,000
6	Sawcutting Existing Pavement	1,590	LF	$ 3	$ 4,770
7	Locate Existing Utilities for Sewer	1	LS	$ 5,000	$ 5,000
8	Crushed Surfacing Top Course	0	TN	$ 40	$ -
9	Crushed Surfacing Base Course	240	TN	$ 25	$ 6,000
10	HMA Cl. 1/2 IN. PG 64-22	200	TN	$ 170	$ 34,000
11	Manhole 48 In. Diam. Type 2	5	EA	$ 6,000	$ 30,000
12	Connection to Existing Manhole	5	EA	$ 4,000	$ 20,000
13	Dewatering for Sewer	1	LS	$ -	$ -
14	Removal of Unsuitable Material (Trench)	140	CY	$ 50	$ 7,000
15	Trench Excavation Safety Systems	1	LS	$ 10,000	$ 10,000
16	Temporary Sewer Bypass Pumping	1	LS	$ 10,000	$ 10,000
17	Bank Run Gravel for Trench Backfill	2,360	TN	$ 25	$ 59,000
18	PVC Sanitary Sewer Pipe 24 In. Diam.	930	LF	$ 120	$ 111,600
19	Erosion/Water Pollution Control	1	LS	$ 5,000	$ 5,000
20	Seeding, Fertilizing and Mulching	150	SY	$ 10	$ 1,500
21	Topsoil Type A	20	CY	$ 60	$ 1,200
22	Cement Concrete Traffic Curb and Gutter	0	LF	$ 40	$ -
23	Cement Concrete Sidewalk	0	SY	$ 75	$ -
		Subtotal			$ 351,070
		Sales Tax (8.7%)			$ 30,543
	Total Construction Cost (rounded)				**$ 382,000**
	Construction Contingency (20%)				$ 76,400
	Engineering, Permitting, Administration (25%):				$ 114,600
	Total Project Cost (rounded)				**$ 573,000**

CITY OF BELLINGHAM
BELLINGHAM WASTEWATER CONVEYANCE PLAN
PRELIMINARY COST ESTIMATE
CIP No. SM2
(E. Bakerview Rd./ Irongate Rd.; MH 53903 to MH 53901)
January 2016
G&O# 15448

NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Mobilization/Demobilization	1	LS	$ 21,000	$ 21,000
2	Survey	1	LS	$ 5,000	$ 5,000
3	Force Account	1	EST	$ 5,000	$ 5,000
4	Project Temporary Traffic Control	1	LS	$ 2,000	$ 2,000
5	Clearing and Grubbing	1	LS	$ 1,000	$ 1,000
6	Sawcutting Existing Pavement	740	LF	$ 3	$ 2,220
7	Locate Existing Utilities for Sewer	1	LS	$ 5,000	$ 5,000
8	Crushed Surfacing Top Course	0	TN	$ 40	$ -
9	Crushed Surfacing Base Course	110	TN	$ 25	$ 2,750
10	HMA Cl. 1/2 IN. PG 64-22	100	TN	$ 170	$ 17,000
11	Manhole 48 In. Diam. Type 2	3	EA	$ 6,000	$ 18,000
12	Connection to Existing Manhole	4	EA	$ 4,000	$ 16,000
13	Dewatering for Sewer	1	LS	$ 30,000	$ 30,000
14	Removal of Unsuitable Material (Trench)	70	CY	$ 50	$ 3,500
15	Trench Excavation Safety Systems	1	LS	$ 10,000	$ 10,000
16	Temporary Sewer Bypass Pumping	1	LS	$ 10,000	$ 10,000
17	Bank Run Gravel for Trench Backfill	1,220	TN	$ 25	$ 30,500
18	PVC Sanitary Sewer Pipe 18 In. Diam.	480	LF	$ 80	$ 38,400
19	Erosion/Water Pollution Control	1	LS	$ 10,000	$ 10,000
20	Seeding, Fertilizing and Mulching	120	SY	$ 10	$ 1,200
21	Topsoil Type A	20	CY	$ 60	$ 1,200
22	Cement Concrete Traffic Curb and Gutter	0	LF	$ 40	$ -
23	Cement Concrete Sidewalk	0	SY	$ 75	$ -
		Subtotal			$ 229,770
		Sales Tax (8.7%)			$ 19,990
	Total Construction Cost (rounded)				**$ 250,000**
	Construction Contingency (20%)				$ 50,000
	Engineering, Permitting, Administration (25%):				$ 75,000
	Total Project Cost (rounded)				**$ 375,000**

CITY OF BELLINGHAM
BELLINGHAM WASTEWATER CONVEYANCE PLAN
PRELIMINARY COST ESTIMATE
CIP No. SM3
(Hannegan Rd.; MH 53106 to MH 53005)
January 2016
G&O# 15448

NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Mobilization/Demobilization	1	LS	$ 33,000	$ 33,000
2	Survey	1	LS	$ 5,000	$ 5,000
3	Force Account	1	EST	$ 5,000	$ 5,000
4	Project Temporary Traffic Control	1	LS	$ 4,000	$ 4,000
5	Clearing and Grubbing	1	LS	$ 1,000	$ 1,000
6	Sawcutting Existing Pavement	570	LF	$ 3	$ 1,710
7	Locate Existing Utilities for Sewer	1	LS	$ 5,000	$ 5,000
8	Crushed Surfacing Top Course	10	TN	$ 40	$ 400
9	Crushed Surfacing Base Course	60	TN	$ 25	$ 1,500
10	HMA Cl. 1/2 IN. PG 64-22	100	TN	$ 170	$ 17,000
11	Manhole 48 In. Diam. Type 2	5	EA	$ 6,000	$ 30,000
12	Connection to Existing Manhole	3	EA	$ 4,000	$ 12,000
13	Dewatering for Sewer	1	LS	$ 30,000	$ 30,000
14	Removal of Unsuitable Material (Trench)	100	CY	$ 50	$ 5,000
15	Trench Excavation Safety Systems	1	LS	$ 20,000	$ 20,000
16	Temporary Sewer Bypass Pumping	1	LS	$ 10,000	$ 10,000
17	Bank Run Gravel for Trench Backfill	1,630	TN	$ 25	$ 40,750
18	PVC Sanitary Sewer Pipe 12 In. Diam.	1,550	LF	$ 70	$ 108,500
19	Erosion/Water Pollution Control	1	LS	$ 10,000	$ 10,000
20	Seeding, Fertilizing and Mulching	1,080	SY	$ 10	$ 10,800
21	Topsoil Type A	120	CY	$ 60	$ 7,200
22	Cement Concrete Traffic Curb and Gutter	0	LF	$ 40	$ -
23	Cement Concrete Sidewalk	0	SY	$ 75	$ -
		Subtotal			$ 357,860
		Sales Tax (8.7%)			$ 31,134
	Total Construction Cost (rounded)				**$ 389,000**
	Construction Contingency (20%)				$ 77,800
	Engineering, Permitting, Administration (25%):				$ 116,700
	Total Project Cost (rounded)				**$ 584,000**

CITY OF BELLINGHAM
BELLINGHAM WASTEWATER CONVEYANCE PLAN
PRELIMINARY COST ESTIMATE
CIP No. SM4
(E. Orchard Dr./ James St.; MH 52701 to MH W0073-S03)
January 2016
G&O# 15448

NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Mobilization/Demobilization	1	LS	$ 77,000	$ 77,000
2	Survey	1	LS	$ 10,000	$ 10,000
3	Force Account	1	EST	$ 5,000	$ 5,000
4	Project Temporary Traffic Control	1	LS	$ 8,000	$ 8,000
5	Clearing and Grubbing	1	LS	$ 15,000	$ 15,000
6	Sawcutting Existing Pavement	1,100	LF	$ 3	$ 3,300
7	Locate Existing Utilities for Sewer	1	LS	$ 5,000	$ 5,000
8	Crushed Surfacing Top Course	80	TN	$ 40	$ 3,200
9	Crushed Surfacing Base Course	120	TN	$ 25	$ 3,000
10	HMA Cl. 1/2 IN. PG 64-22	100	TN	$ 170	$ 17,000
11	Manhole 48 In. Diam. Type 2	12	EA	$ 6,000	$ 72,000
12	Connection to Existing Manhole	9	EA	$ 4,000	$ 36,000
13	Dewatering for Sewer	1	LS	$ 30,000	$ 30,000
14	Removal of Unsuitable Material (Trench)	190	CY	$ 50	$ 9,500
15	Trench Excavation Safety Systems	1	LS	$ 20,000	$ 20,000
16	Temporary Sewer Bypass Pumping	1	LS	$ 30,000	$ 30,000
17	Bank Run Gravel for Trench Backfill	3,280	TN	$ 25	$ 82,000
18	PVC Sanitary Sewer Pipe 24 In. Diam.	3,120	LF	$ 120	$ 374,400
19	Erosion/Water Pollution Control	1	LS	$ 10,000	$ 10,000
20	Seeding, Fertilizing and Mulching	1,630	SY	$ 10	$ 16,300
21	Topsoil Type A	180	CY	$ 60	$ 10,800
22	Cement Concrete Traffic Curb and Gutter	0	LF	$ 40	$ -
23	Cement Concrete Sidewalk	0	SY	$ 75	$ -
		Subtotal			$ 837,500
		Sales Tax (8.7%)			$ 72,863
	Total Construction Cost (rounded)				**$ 910,000**
	Construction Contingency (20%)				$ 182,000
	Engineering, Permitting, Administration (25%):				$ 273,000
	Total Project Cost (rounded)				**$ 1,365,000**

CITY OF BELLINGHAM
BELLINGHAM WASTEWATER CONVEYANCE PLAN
PRELIMINARY COST ESTIMATE
CIP No. SM5
(E Sunset Dr.; MH 11003 to MH 09804)
January 2016
G&O# 15448

NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Mobilization/Demobilization	1	LS	$ 170,000	$ 170,000
2	Survey	1	LS	$ 8,000	$ 8,000
3	Force Account	1	EST	$ 10,000	$ 10,000
4	Project Temporary Traffic Control	1	LS	$ 8,000	$ 8,000
5	Clearing and Grubbing	1	LS	$ 5,000	$ 5,000
6	Sawcutting Existing Pavement	5,220	LF	$ 3	$ 15,660
7	Locate Existing Utilities for Sewer	1	LS	$ 10,000	$ 10,000
8	Crushed Surfacing Top Course	0	TN	$ 40	$ -
9	Crushed Surfacing Base Course	1,040	TN	$ 25	$ 26,000
10	HMA Cl. 1/2 IN. PG 64-22	700	TN	$ 170	$ 119,000
11	Manhole 48 In. Diam. Type 2	15	EA	$ 6,000	$ 90,000
12	Connection to Existing Manhole	5	EA	$ 4,000	$ 20,000
13	Dewatering for Sewer	1	LS	$ -	$ -
14	Removal of Unsuitable Material (Trench)	1,050	CY	$ 50	$ 52,500
15	Trench Excavation Safety Systems	1	LS	$ 40,000	$ 40,000
16	Temporary Sewer Bypass Pumping	1	LS	$ 30,000	$ 30,000
17	Bank Run Gravel for Trench Backfill	18,850	TN	$ 25	$ 471,250
18	Boring PVC Sanitary Sewer Pipe 24 In. Diam.	445	LF	$ 1,000	$ 445,000
19	PVC Sanitary Sewer Pipe 21 In. Diam.	1,890	LF	$ 90	$ 170,100
20	PVC Sanitary Sewer Pipe 24 In. Diam.	1,340	LF	$ 120	$ 160,800
21	Erosion/Water Pollution Control	1	LS	$ 5,000	$ 5,000
22	Seeding, Fertilizing and Mulching	260	SY	$ 10	$ 2,600
23	Topsoil Type A	30	CY	$ 60	$ 1,800
24	Cement Concrete Traffic Curb and Gutter	0	LF	$ 40	$ -
25	Cement Concrete Sidewalk	0	SY	$ 75	$ -
		Subtotal			$ 1,860,710
		Sales Tax (8.7%)			$ 161,882
	Total Construction Cost (rounded)				**$ 2,023,000**
	Construction Contingency (20%)				$ 404,600
	Engineering, Permitting, Administration (25%):				$ 606,900
	Total Project Cost (rounded)				**$ 3,035,000**

Cost assumes boring will not be required for State Highway 542 except where the I-5 onramp joins the highway.

CITY OF BELLINGHAM
BELLINGHAM WASTEWATER CONVEYANCE PLAN
PRELIMINARY COST ESTIMATE
CIP No. SM6
(E. Illinois St./ Broadway; MH 09713 to MH 08310)
January 2016
G&O# 15448

NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Mobilization/Demobilization	1	LS	$ 18,000	$ 18,000
2	Survey	1	LS	$ 5,000	$ 5,000
3	Force Account	1	EST	$ 5,000	$ 5,000
4	Project Temporary Traffic Control	1	LS	$ 1,000	$ 1,000
5	Clearing and Grubbing	1	LS	$ 5,000	$ 5,000
6	Sawcutting Existing Pavement	80	LF	$ 3	$ 240
7	Locate Existing Utilities for Sewer	1	LS	$ 5,000	$ 5,000
8	Crushed Surfacing Top Course	30	TN	$ 40	$ 1,200
9	Crushed Surfacing Base Course	10	TN	$ 25	$ 250
10	HMA Cl. 1/2 IN. PG 64-22	100	TN	$ 170	$ 17,000
11	Manhole 48 In. Diam. Type 2	3	EA	$ 6,000	$ 18,000
12	Connection to Existing Manhole	4	EA	$ 4,000	$ 16,000
13	Dewatering for Sewer	1	LS	$ -	$ -
14	Removal of Unsuitable Material (Trench)	90	CY	$ 50	$ 4,500
15	Trench Excavation Safety Systems	1	LS	$ 10,000	$ 10,000
16	Temporary Sewer Bypass Pumping	1	LS	$ 10,000	$ 10,000
17	Bank Run Gravel for Trench Backfill	1,520	TN	$ 25	$ 38,000
18	PVC Sanitary Sewer Pipe 18 In. Diam.	380	LF	$ 80	$ 30,400
19	Erosion/Water Pollution Control	1	LS	$ 5,000	$ 5,000
20	Seeding, Fertilizing and Mulching	300	SY	$ 10	$ 3,000
21	Topsoil Type A	40	CY	$ 60	$ 2,400
22	Cement Concrete Traffic Curb and Gutter	10	LF	$ 40	$ 400
23	Cement Concrete Sidewalk	10	SY	$ 75	$ 750
		Subtotal			$ 196,140
		Sales Tax (8.7%)			$ 17,064
	Total Construction Cost (rounded)				**$ 213,000**
	Construction Contingency (20%)				$ 42,600
	Engineering, Permitting, Administration (25%):				$ 63,900
	Total Project Cost (rounded)				**$ 320,000**

CITY OF BELLINGHAM
BELLINGHAM WASTEWATER CONVEYANCE PLAN
PRELIMINARY COST ESTIMATE
CIP No. SM7
(Cornwall Ave.; MH 10703 to MH 09615)
January 2016
G&O# 15448

NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Mobilization/Demobilization	1	LS	$ 46,000	$ 46,000
2	Survey	1	LS	$ 8,000	$ 8,000
3	Force Account	1	EST	$ 10,000	$ 10,000
4	Project Temporary Traffic Control	1	LS	$ 5,000	$ 5,000
5	Clearing and Grubbing	1	LS	$ 15,000	$ 15,000
6	Sawcutting Existing Pavement	1,450	LF	$ 3	$ 4,350
7	Locate Existing Utilities for Sewer	1	LS	$ 5,000	$ 5,000
8	Crushed Surfacing Top Course	10	TN	$ 40	$ 400
9	Crushed Surfacing Base Course	190	TN	$ 25	$ 4,750
10	HMA Cl. 1/2 IN. PG 64-22	200	TN	$ 170	$ 34,000
11	Manhole 48 In. Diam. Type 2	7	EA	$ 6,000	$ 42,000
12	Connection to Existing Manhole	3	EA	$ 4,000	$ 12,000
13	Dewatering for Sewer	1	LS	$ -	$ -
14	Removal of Unsuitable Material (Trench)	200	CY	$ 50	$ 10,000
15	Trench Excavation Safety Systems	1	LS	$ 20,000	$ 20,000
16	Temporary Sewer Bypass Pumping	1	LS	$ 30,000	$ 30,000
17	Bank Run Gravel for Trench Backfill	3,430	TN	$ 25	$ 85,750
18	PVC Sanitary Sewer Pipe 18 In. Diam.	1,820	LF	$ 80	$ 145,600
19	Erosion/Water Pollution Control	1	LS	$ 5,000	$ 5,000
20	Seeding, Fertilizing and Mulching	970	SY	$ 10	$ 9,700
21	Topsoil Type A	110	CY	$ 60	$ 6,600
22	Cement Concrete Traffic Curb and Gutter	0	LF	$ 40	$ -
23	Cement Concrete Sidewalk	0	SY	$ 75	$ -
		Subtotal			$ 499,150
		Sales Tax (8.7%)			$ 43,426
	Total Construction Cost (rounded)				**$ 543,000**
	Construction Contingency (20%)				$ 108,600
	Engineering, Permitting, Administration (25%):				$ 162,900
	Total Project Cost (rounded)				**$ 815,000**

CITY OF BELLINGHAM
BELLINGHAM WASTEWATER CONVEYANCE PLAN
PRELIMINARY COST ESTIMATE
CIP No. C1
(Woburn St..; MH 06806 to MH 83201-15)
January 2016
G&O# 15448

NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Mobilization/Demobilization	1	LS	$ 52,000	$ 52,000
2	Survey	1	LS	$ 8,000	$ 8,000
3	Force Account	1	EST	$ 10,000	$ 10,000
4	Project Temporary Traffic Control	1	LS	$ 5,000	$ 5,000
5	Clearing and Grubbing	1	LS	$ 5,000	$ 5,000
6	Sawcutting Existing Pavement	4,120	LF	$ 3	$ 12,360
7	Locate Existing Utilities for Sewer	1	LS	$ 5,000	$ 5,000
8	Crushed Surfacing Top Course	0	TN	$ 40	$ -
9	Crushed Surfacing Base Course	590	TN	$ 25	$ 14,750
10	HMA Cl. 1/2 IN. PG 64-22	400	TN	$ 170	$ 68,000
11	Manhole 48 In. Diam. Type 2	7	EA	$ 6,000	$ 42,000
12	Connection to Existing Manhole	3	EA	$ 4,000	$ 12,000
13	Dewatering for Sewer	1	LS	$ -	$ -
14	Removal of Unsuitable Material (Trench)	280	CY	$ 50	$ 14,000
15	Trench Excavation Safety Systems	1	LS	$ 20,000	$ 20,000
16	Temporary Sewer Bypass Pumping	1	LS	$ 30,000	$ 30,000
17	Bank Run Gravel for Trench Backfill	4,890	TN	$ 25	$ 122,250
18	PVC Sanitary Sewer Pipe 12 In. Diam.	2,050	LF	$ 70	$ 143,500
19	Erosion/Water Pollution Control	1	LS	$ 5,000	$ 5,000
20	Seeding, Fertilizing and Mulching	110	SY	$ 10	$ 1,100
21	Topsoil Type A	20	CY	$ 60	$ 1,200
22	Cement Concrete Traffic Curb and Gutter	0	LF	$ 40	$ -
23	Cement Concrete Sidewalk	0	SY	$ 75	$ -
		Subtotal			$ 571,160
		Sales Tax (8.7%)			$ 49,691
	Total Construction Cost (rounded)				**$ 621,000**
	Construction Contingency (20%)				$ 124,200
	Engineering, Permitting, Administration (25%):				$ 186,300
	Total Project Cost (rounded)				**$ 932,000**

CITY OF BELLINGHAM
BELLINGHAM WASTEWATER CONVEYANCE PLAN
PRELIMINARY COST ESTIMATE
CIP No. C2
(Humboldt St./ Iron St.; MH 01912 to MH 03307)
January 2016
G&O# 15448

NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Mobilization/Demobilization	1	LS	$ 95,000	$ 95,000
2	Survey	1	LS	$ 10,000	$ 10,000
3	Force Account	1	EST	$ 10,000	$ 10,000
4	Project Temporary Traffic Control	1	LS	$ 8,000	$ 8,000
5	Clearing and Grubbing	1	LS	$ 5,000	$ 5,000
6	Sawcutting Existing Pavement	5,740	LF	$ 3	$ 17,220
7	Locate Existing Utilities for Sewer	1	LS	$ 5,000	$ 5,000
8	Crushed Surfacing Top Course	10	TN	$ 40	$ 400
9	Crushed Surfacing Base Course	860	TN	$ 25	$ 21,500
10	HMA Cl. 1/2 IN. PG 64-22	600	TN	$ 170	$ 102,000
11	Manhole 48 In. Diam. Type 2	14	EA	$ 6,000	$ 84,000
12	Connection to Existing Manhole	4	EA	$ 4,000	$ 16,000
13	Dewatering for Sewer	1	LS	$ 30,000	$ 30,000
14	Removal of Unsuitable Material (Trench)	550	CY	$ 50	$ 27,500
15	Trench Excavation Safety Systems	1	LS	$ 40,000	$ 40,000
16	Temporary Sewer Bypass Pumping	1	LS	$ 50,000	$ 50,000
17	Bank Run Gravel for Trench Backfill	9,770	TN	$ 25	$ 244,250
18	PVC Sanitary Sewer Pipe 18 In. Diam.	3,220	LF	$ 80	$ 257,600
19	Erosion/Water Pollution Control	1	LS	$ 10,000	$ 10,000
20	Seeding, Fertilizing and Mulching	320	SY	$ 10	$ 3,200
21	Topsoil Type A	40	CY	$ 60	$ 2,400
22	Cement Concrete Traffic Curb and Gutter	20	LF	$ 40	$ 800
23	Cement Concrete Sidewalk	10	SY	$ 75	$ 750
		Subtotal			$ 1,040,620
		Sales Tax (8.7%)			$ 90,534
	Total Construction Cost (rounded)				**$ 1,131,000**
	Construction Contingency (20%)				$ 226,200
	Engineering, Permitting, Administration (25%):				$ 339,300
	Total Project Cost (rounded)				**$ 1,697,000**

CITY OF BELLINGHAM
BELLINGHAM WASTEWATER CONVEYANCE PLAN
PRELIMINARY COST ESTIMATE
CIP No. CM3
(Franklin St./Ellis St.; MH 03209 to MH 03211)
January 2016
G&O# 15448

NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Mobilization/Demobilization	1	LS	$ 38,000	$ 38,000
2	Survey	1	LS	$ 5,000	$ 5,000
3	Force Account	1	EST	$ 5,000	$ 5,000
4	Project Temporary Traffic Control	1	LS	$ 3,000	$ 3,000
5	Clearing and Grubbing	1	LS	$ 5,000	$ 5,000
6	Sawcutting Existing Pavement	1,420	LF	$ 3	$ 4,260
7	Locate Existing Utilities for Sewer	1	LS	$ 5,000	$ 5,000
8	Crushed Surfacing Top Course	110	TN	$ 40	$ 4,400
9	Crushed Surfacing Base Course	230	TN	$ 25	$ 5,750
10	HMA Cl. 1/2 IN. PG 64-22	200	TN	$ 170	$ 34,000
11	Manhole 48 In. Diam. Type 2	7	EA	$ 6,000	$ 42,000
12	Connection to Existing Manhole	4	EA	$ 4,000	$ 16,000
13	Dewatering for Sewer	1	LS	$ -	$ -
14	Removal of Unsuitable Material (Trench)	240	CY	$ 50	$ 12,000
15	Trench Excavation Safety Systems	1	LS	$ 20,000	$ 20,000
16	Temporary Sewer Bypass Pumping	1	LS	$ 10,000	$ 10,000
17	Bank Run Gravel for Trench Backfill	4,260	TN	$ 25	$ 106,500
18	PVC Sanitary Sewer Pipe 12 In. Diam.	1,050	LF	$ 70	$ 73,500
19	PVC Sanitary Sewer Pipe 21 In. Diam.	180	LF	$ 90	$ 16,200
20	Erosion/Water Pollution Control	1	LS	$ 5,000	$ 5,000
21	Seeding, Fertilizing and Mulching	140	SY	$ 10	$ 1,400
22	Topsoil Type A	20	CY	$ 60	$ 1,200
23	Cement Concrete Traffic Curb and Gutter	50	LF	$ 40	$ 2,000
24	Cement Concrete Sidewalk	30	SY	$ 75	$ 2,250
		Subtotal			$ 417,460
		Sales Tax (8.7%)			$ 36,319
	Total Construction Cost (rounded)				**$ 454,000**
	Construction Contingency (20%)				$ 90,800
	Engineering, Permitting, Administration (25%):				$ 136,200
	Total Project Cost (rounded)				**$ 681,000**

Number of replaced Manholes and lengths of pipe and restoration were adjusted to lay new pipe around the buildings between MH 83302-12 and MH 03211

CITY OF BELLINGHAM
BELLINGHAM WASTEWATER CONVEYANCE PLAN
PRELIMINARY COST ESTIMATE
CIP No. C4
(Dean Ave.; MH 03114 to MH 03111)
January 2016
G&O# 15448

NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Mobilization/Demobilization	1	LS	$ 13,000	$ 13,000
2	Survey	1	LS	$ 5,000	$ 5,000
3	Force Account	1	EST	$ 5,000	$ 5,000
4	Project Temporary Traffic Control	1	LS	$ 1,000	$ 1,000
5	Clearing and Grubbing	1	LS	$ 1,000	$ 1,000
6	Sawcutting Existing Pavement	20	LF	$ 3	$ 60
7	Locate Existing Utilities for Sewer	1	LS	$ 5,000	$ 5,000
8	Crushed Surfacing Top Course	0	TN	$ 40	$ -
9	Crushed Surfacing Base Course	0	TN	$ 25	$ -
10	HMA Cl. 1/2 IN. PG 64-22	0	TN	$ 170	$ -
11	Manhole 48 In. Diam. Type 2	2	EA	$ 6,000	$ 12,000
12	Connection to Existing Manhole	3	EA	$ 4,000	$ 12,000
13	Dewatering for Sewer	1	LS	$ 30,000	$ 30,000
14	Removal of Unsuitable Material (Trench)	30	CY	$ 50	$ 1,500
15	Trench Excavation Safety Systems	1	LS	$ 5,000	$ 5,000
16	Temporary Sewer Bypass Pumping	1	LS	$ 10,000	$ 10,000
17	Bank Run Gravel for Trench Backfill	380	TN	$ 25	$ 9,500
18	PVC Sanitary Sewer Pipe 18 In. Diam.	140	LF	$ 80	$ 11,200
19	Erosion/Water Pollution Control	1	LS	$ 10,000	$ 10,000
20	Seeding, Fertilizing and Mulching	0	SY	$ 10	$ -
21	Topsoil Type A	0	CY	$ 60	$ -
22	Cement Concrete Traffic Curb and Gutter	140	LF	$ 40	$ 5,600
23	Cement Concrete Sidewalk	80	SY	$ 75	$ 6,000
		Subtotal			$ 142,860
		Sales Tax (8.7%)			$ 12,429
	Total Construction Cost (rounded)				**$ 155,000**
	Construction Contingency (20%)				$ 31,000
	Engineering, Permitting, Administration (25%):				$ 46,500
	Total Project Cost (rounded)				**$ 233,000**

CITY OF BELLINGHAM
BELLINGHAM WASTEWATER CONVEYANCE PLAN
PRELIMINARY COST ESTIMATE
CIP No. C5
(Roeder Ave.; MH 17009 to MH 05201)
January 2016
G&O# 15448

NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Mobilization/Demobilization	1	LS	$ 56,000	$ 56,000
2	Survey	1	LS	$ 8,000	$ 8,000
3	Force Account	1	EST	$ 10,000	$ 10,000
4	Project Temporary Traffic Control	1	LS	$ 2,000	$ 2,000
5	Clearing and Grubbing	1	LS	$ 5,000	$ 5,000
6	Sawcutting Existing Pavement	1,110	LF	$ 3	$ 3,330
7	Locate Existing Utilities for Sewer	1	LS	$ 5,000	$ 5,000
8	Crushed Surfacing Top Course	0	TN	$ 40	$ -
9	Crushed Surfacing Base Course	190	TN	$ 25	$ 4,750
10	HMA Cl. 1/2 IN. PG 64-22	200	TN	$ 170	$ 34,000
11	Manhole 48 In. Diam. Type 2	5	EA	$ 6,000	$ 30,000
12	Connection to Existing Manhole	4	EA	$ 4,000	$ 16,000
13	Dewatering for Sewer	1	LS	$ 30,000	$ 30,000
14	Removal of Unsuitable Material (Trench)	130	CY	$ 50	$ 6,500
15	Trench Excavation Safety Systems	1	LS	$ 10,000	$ 10,000
16	Temporary Sewer Bypass Pumping	1	LS	$ 10,000	$ 10,000
17	Bank Run Gravel for Trench Backfill	2,180	TN	$ 25	$ 54,500
18	Boring PVC Sanitary Sewer Pipe 42 In. Diam.	177	LF	$ 1,200	$ 212,400
19	ADS SaniTite Sanitary Sewer Pipe 36 In. Diam.	760	LF	$ 140	$ 106,400
20	Erosion/Water Pollution Control	1	LS	$ 10,000	$ 10,000
21	Seeding, Fertilizing and Mulching	30	SY	$ 10	$ 300
22	Topsoil Type A	10	CY	$ 60	$ 600
23	Cement Concrete Traffic Curb and Gutter	0	LF	$ 40	$ -
24	Cement Concrete Sidewalk	0	SY	$ 75	$ -
		Subtotal			$ 614,780
		Sales Tax (8.7%)			$ 53,486
	Total Construction Cost (rounded)				**$ 668,000**
	Construction Contingency (20%)				$ 133,600
	Engineering, Permitting, Administration (25%):				$ 200,400
	Total Project Cost (rounded)				**$ 1,002,000**

CITY OF BELLINGHAM
BELLINGHAM WASTEWATER CONVEYANCE PLAN
PRELIMINARY COST ESTIMATE
CIP No. C6
(Whatcom Creek Tunnel; MH03509 to MH02617)
January 2016
G&O# 15448

NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Mobilization/Demobilization	1	LS	$ 273,000	$ 273,000
2	Survey	1	LS	$ 10,000	$ 10,000
3	Force Account	1	EST	$ 10,000	$ 10,000
4	Project Temporary Traffic Control	1	LS	$ 7,000	$ 7,000
5	Clearing and Grubbing	1	LS	$ 1,000	$ 1,000
6	Sawcutting Existing Pavement	220	LF	$ 3	$ 660
7	Locate Existing Utilities for Sewer	1	LS	$ 10,000	$ 10,000
8	Crushed Surfacing Top Course	0	TN	$ 40	$ -
9	Crushed Surfacing Base Course	20	TN	$ 25	$ 500
10	HMA Cl. 1/2 IN. PG 64-22	100	TN	$ 170	$ 17,000
11	Manhole 48 In. Diam. Sliplining Replacement	27	EA	$ 7,500	$ 202,500
12	Connection to Existing Manhole	15	EA	$ 4,000	$ 60,000
13	Dewatering for Sewer	1	LS	$ -	$ -
14	Removal of Unsuitable Material (Trench)	30	CY	$ 50	$ 1,500
15	Trench Excavation Safety Systems	1	LS	$ 10,000	$ 10,000
16	Temporary Sewer Bypass Pumping	1	LS	$ 50,000	$ 50,000
17	Bank Run Gravel for Trench Backfill	490	TN	$ 25	$ 12,250
18	Insituform C&TV 54"	2,110	LF	$ 450	$ 949,500
19	Insituform C&TV 42"	4,225	LF	$ 310	$ 1,309,750
20	Insituform C&TV 36"	215	LF	$ 275	$ 59,125
21	Erosion/Water Pollution Control	1	LS	$ 10,000	$ 10,000
22	Seeding, Fertilizing and Mulching	60	SY	$ 10	$ 600
23	Topsoil Type A	10	CY	$ 60	$ 600
24	Cement Concrete Traffic Curb and Gutter	50	LF	$ 40	$ 2,000
25	Cement Concrete Sidewalk	30	SY	$ 75	$ 2,250
		Subtotal			$ 2,999,235
		Sales Tax (8.7%)			$ 260,933
	Total Construction Cost (rounded)				**$ 3,260,000**
	Construction Contingency (20%)				$ 652,000
	Engineering, Permitting, Administration (25%):				$ 978,000
	Total Project Cost (rounded)				**$ 4,890,000**

CITY OF BELLINGHAM
BELLINGHAM WASTEWATER CONVEYANCE PLAN
PRELIMINARY COST ESTIMATE
CIP No. C7
(Roeder Ave.; MH 05104 to MH 02820)
January 2016
G&O# 15448

NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Mobilization/Demobilization	1	LS	$ 121,000	$ 121,000
2	Survey	1	LS	$ 10,000	$ 10,000
3	Force Account	1	EST	$ 10,000	$ 10,000
4	Project Temporary Traffic Control	1	LS	$ 10,000	$ 10,000
5	Clearing and Grubbing	1	LS	$ 5,000	$ 5,000
6	Sawcutting Existing Pavement	7,600	LF	$ 3	$ 22,800
7	Locate Existing Utilities for Sewer	1	LS	$ 10,000	$ 10,000
8	Crushed Surfacing Top Course	0	TN	$ 40	$ -
9	Crushed Surfacing Base Course	1,030	TN	$ 25	$ 25,750
10	HMA Cl. 1/2 IN. PG 64-22	700	TN	$ 170	$ 119,000
11	Manhole 48 In. Diam. Type 2	14	EA	$ 6,000	$ 84,000
12	Connection to Existing Manhole	5	EA	$ 4,000	$ 20,000
13	Dewatering for Sewer	1	LS	$ 30,000	$ 30,000
14	Removal of Unsuitable Material (Trench)	150	CY	$ 50	$ 7,500
15	Trench Excavation Safety Systems	1	LS	$ 20,000	$ 20,000
16	Temporary Sewer Bypass Pumping	1	LS	$ 50,000	$ 50,000
17	Bank Run Gravel for Trench Backfill	2,630	TN	$ 25	$ 65,750
18	Boring PVC Sanitary Sewer Pipe 54 In. Diam.	41	LF	$ 1,500	$ 61,500
19	ADS SaniTite Sanitary Sewer Pipe 36 In. Diam.	830	LF	$ 140	$ 116,200
20	ADS SaniTite Sanitary Sewer Pipe 42 In. Diam.	2,640	LF	$ 170	$ 448,800
21	ADS SaniTite Sanitary Sewer Pipe 48 In. Diam.	410	LF	$ 200	$ 82,000
22	Erosion/Water Pollution Control	1	LS	$ 5,000	$ 5,000
23	Seeding, Fertilizing and Mulching	0	SY	$ 10	$ -
24	Topsoil Type A	0	CY	$ 60	$ -
25	Cement Concrete Traffic Curb and Gutter	30	LF	$ 40	$ 1,200
26	Cement Concrete Sidewalk	20	SY	$ 75	$ 1,500
		Subtotal			$ 1,327,000
		Sales Tax (8.7%)			$ 115,449
	Total Construction Cost (rounded)				**$ 1,442,000**
	Construction Contingency (20%)				$ 288,400
	Engineering, Permitting, Administration (25%):				$ 432,600
	Total Project Cost (rounded)				**$ 2,163,000**

CITY OF BELLINGHAM
BELLINGHAM WASTEWATER CONVEYANCE PLAN
PRELIMINARY COST ESTIMATE
CIP No. LW1
(Yew St.; MH 20901 to MH 20805)
January 2016
G&O# 15448

NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Mobilization/Demobilization	1	LS	$ 66,000	$ 66,000
2	Survey	1	LS	$ 8,000	$ 8,000
3	Force Account	1	EST	$ 10,000	$ 10,000
4	Project Temporary Traffic Control	1	LS	$ 7,000	$ 7,000
5	Clearing and Grubbing	1	LS	$ 1,000	$ 1,000
6	Sawcutting Existing Pavement	5,210	LF	$ 3	$ 15,630
7	Locate Existing Utilities for Sewer	1	LS	$ 5,000	$ 5,000
8	Crushed Surfacing Top Course	0	TN	$ 40	$ -
9	Crushed Surfacing Base Course	740	TN	$ 25	$ 18,500
10	HMA Cl. 1/2 IN. PG 64-22	500	TN	$ 170	$ 85,000
11	Manhole 48 In. Diam. Type 2	9	EA	$ 6,000	$ 54,000
12	Connection to Existing Manhole	4	EA	$ 4,000	$ 16,000
13	Dewatering for Sewer	1	LS	$ -	$ -
14	Removal of Unsuitable Material (Trench)	390	CY	$ 50	$ 19,500
15	Trench Excavation Safety Systems	1	LS	$ 20,000	$ 20,000
16	Temporary Sewer Bypass Pumping	1	LS	$ 30,000	$ 30,000
17	Bank Run Gravel for Trench Backfill	7,000	TN	$ 25	$ 175,000
18	PVC Sanitary Sewer Pipe 12 In. Diam.	2,590	LF	$ 70	$ 181,300
19	Erosion/Water Pollution Control	1	LS	$ 5,000	$ 5,000
20	Seeding, Fertilizing and Mulching	0	SY	$ 10	$ -
21	Topsoil Type A	0	CY	$ 60	$ -
22	Cement Concrete Traffic Curb and Gutter	0	LF	$ 40	$ -
23	Cement Concrete Sidewalk	0	SY	$ 75	$ -
		Subtotal			$ 716,930
		Sales Tax (8.7%)			$ 62,373
	Total Construction Cost (rounded)				**$ 779,000**
	Construction Contingency (20%)				$ 155,800
	Engineering, Permitting, Administration (25%):				$ 233,700
	Total Project Cost (rounded)				**$ 1,169,000**

CITY OF BELLINGHAM
BELLINGHAM WASTEWATER CONVEYANCE PLAN
PRELIMINARY COST ESTIMATE
CIP No. LW2
(Old Woburn St.; MH 12503 to MH 12402)
January 2016
G&O# 15448

NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Mobilization/Demobilization	1	LS	$ 20,000	$ 20,000
2	Survey	1	LS	$ 5,000	$ 5,000
3	Force Account	1	EST	$ 5,000	$ 5,000
4	Project Temporary Traffic Control	1	LS	$ 2,000	$ 2,000
5	Clearing and Grubbing	1	LS	$ 10,000	$ 10,000
6	Sawcutting Existing Pavement	910	LF	$ 3	$ 2,730
7	Locate Existing Utilities for Sewer	1	LS	$ 5,000	$ 5,000
8	Crushed Surfacing Top Course	0	TN	$ 40	$ -
9	Crushed Surfacing Base Course	120	TN	$ 25	$ 3,000
10	HMA Cl. 1/2 IN. PG 64-22	100	TN	$ 170	$ 17,000
11	Manhole 48 In. Diam. Type 2	3	EA	$ 6,000	$ 18,000
12	Connection to Existing Manhole	2	EA	$ 4,000	$ 8,000
13	Dewatering for Sewer	1	LS	$ -	$ -
14	Removal of Unsuitable Material (Trench)	90	CY	$ 50	$ 4,500
15	Trench Excavation Safety Systems	1	LS	$ 10,000	$ 10,000
16	Temporary Sewer Bypass Pumping	1	LS	$ 10,000	$ 10,000
17	Bank Run Gravel for Trench Backfill	1,460	TN	$ 25	$ 36,500
18	PVC Sanitary Sewer Pipe 18 In. Diam.	660	LF	$ 80	$ 52,800
19	Erosion/Water Pollution Control	1	LS	$ 5,000	$ 5,000
20	Seeding, Fertilizing and Mulching	190	SY	$ 10	$ 1,900
21	Topsoil Type A	30	CY	$ 60	$ 1,800
22	Cement Concrete Traffic Curb and Gutter	0	LF	$ 40	$ -
23	Cement Concrete Sidewalk	0	SY	$ 75	$ -
		Subtotal			$ 218,230
		Sales Tax (8.7%)			$ 18,986
	Total Construction Cost (rounded)				**$ 237,000**
	Construction Contingency (20%)				$ 47,400
	Engineering, Permitting, Administration (25%):				$ 71,100
	Total Project Cost (rounded)				**$ 356,000**

CITY OF BELLINGHAM
BELLINGHAM WASTEWATER CONVEYANCE PLAN
PRELIMINARY COST ESTIMATE
CIP No. LW3
(North of Gladstone St.; MH 83292-01 to MH 83293-09)
January 2016
G&O# 15448

NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Mobilization/Demobilization	1	LS	$ 28,000	$ 28,000
2	Survey	1	LS	$ 5,000	$ 5,000
3	Force Account	1	EST	$ 5,000	$ 5,000
4	Project Temporary Traffic Control	1	LS	$ 3,000	$ 3,000
5	Clearing and Grubbing	1	LS	$ 15,000	$ 15,000
6	Sawcutting Existing Pavement	20	LF	$ 3	$ 60
7	Locate Existing Utilities for Sewer	1	LS	$ 5,000	$ 5,000
8	Crushed Surfacing Top Course	0	TN	$ 40	$ -
9	Crushed Surfacing Base Course	0	TN	$ 25	$ -
10	HMA Cl. 1/2 IN. PG 64-22	0	TN	$ 170	$ -
11	Manhole 48 In. Diam. Type 2	4	EA	$ 6,000	$ 24,000
12	Connection to Existing Manhole	3	EA	$ 4,000	$ 12,000
13	Dewatering for Sewer	1	LS	$ 30,000	$ 30,000
14	Removal of Unsuitable Material (Trench)	130	CY	$ 50	$ 6,500
15	Trench Excavation Safety Systems	1	LS	$ 10,000	$ 10,000
16	Temporary Sewer Bypass Pumping	1	LS	$ 10,000	$ 10,000
17	Bank Run Gravel for Trench Backfill	2,270	TN	$ 25	$ 56,750
18	PVC Sanitary Sewer Pipe 12 In. Diam.	950	LF	$ 70	$ 66,500
19	Erosion/Water Pollution Control	1	LS	$ 10,000	$ 10,000
20	Seeding, Fertilizing and Mulching	900	SY	$ 10	$ 9,000
21	Topsoil Type A	100	CY	$ 60	$ 6,000
22	Cement Concrete Traffic Curb and Gutter	0	LF	$ 40	$ -
23	Cement Concrete Sidewalk	0	SY	$ 75	$ -
		Subtotal			$ 301,810
		Sales Tax (8.7%)			$ 26,257
	Total Construction Cost (rounded)				**$ 328,000**
	Construction Contingency (20%)				$ 65,600
	Engineering, Permitting, Administration (25%):				$ 98,400
	Total Project Cost (rounded)				**$ 492,000**

CITY OF BELLINGHAM
BELLINGHAM WASTEWATER CONVEYANCE PLAN
PRELIMINARY COST ESTIMATE
CIP No. LW4
(Electric Ave.; MH 13214 to MH 13213)
January 2016
G&O# 15448

NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Mobilization/Demobilization	1	LS	$ 12,000	$ 12,000
2	Survey	1	LS	$ 5,000	$ 5,000
3	Force Account	1	EST	$ 5,000	$ 5,000
4	Project Temporary Traffic Control	1	LS	$ 1,000	$ 1,000
5	Clearing and Grubbing	1	LS	$ 1,000	$ 1,000
6	Sawcutting Existing Pavement	30	LF	$ 3	$ 90
7	Locate Existing Utilities for Sewer	1	LS	$ 5,000	$ 5,000
8	Crushed Surfacing Top Course	0	TN	$ 40	$ -
9	Crushed Surfacing Base Course	10	TN	$ 25	$ 250
10	HMA Cl. 1/2 IN. PG 64-22	100	TN	$ 170	$ 17,000
11	Manhole 48 In. Diam. Type 2	2	EA	$ 6,000	$ 12,000
12	Connection to Existing Manhole	4	EA	$ 4,000	$ 16,000
13	Dewatering for Sewer	1	LS	$ -	$ -
14	Removal of Unsuitable Material (Trench)	30	CY	$ 50	$ 1,500
15	Trench Excavation Safety Systems	1	LS	$ 10,000	$ 10,000
16	Temporary Sewer Bypass Pumping	1	LS	$ 10,000	$ 10,000
17	Bank Run Gravel for Trench Backfill	460	TN	$ 25	$ 11,500
18	PVC Sanitary Sewer Pipe 24 In. Diam.	130	LF	$ 120	$ 15,600
19	Erosion/Water Pollution Control	1	LS	$ 5,000	$ 5,000
20	Seeding, Fertilizing and Mulching	120	SY	$ 10	$ 1,200
21	Topsoil Type A	20	CY	$ 60	$ 1,200
22	Cement Concrete Traffic Curb and Gutter	10	LF	$ 40	$ 400
23	Cement Concrete Sidewalk	10	SY	$ 75	$ 750
		Subtotal			$ 131,490
		Sales Tax (8.7%)			$ 11,440
	Total Construction Cost (rounded)				**$ 143,000**
	Construction Contingency (20%)				$ 28,600
	Engineering, Permitting, Administration (25%):				$ 42,900
	Total Project Cost (rounded)				**$ 215,000**

CITY OF BELLINGHAM
BELLINGHAM WASTEWATER CONVEYANCE PLAN
PRELIMINARY COST ESTIMATE
CIP No. SS1
(Chuckanut Dr. N; MH 31912 to MH 30905)
January 2016
G&O# 15448

NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Mobilization/Demobilization	1	LS	$ 36,000	$ 36,000
2	Survey	1	LS	$ 5,000	$ 5,000
3	Force Account	1	EST	$ 5,000	$ 5,000
4	Project Temporary Traffic Control	1	LS	$ 3,000	$ 3,000
5	Clearing and Grubbing	1	LS	$ 5,000	$ 5,000
6	Sawcutting Existing Pavement	1,230	LF	$ 3	$ 3,690
7	Locate Existing Utilities for Sewer	1	LS	$ 5,000	$ 5,000
8	Crushed Surfacing Top Course	0	TN	$ 40	$ -
9	Crushed Surfacing Base Course	170	TN	$ 25	$ 4,250
10	HMA Cl. 1/2 IN. PG 64-22	200	TN	$ 170	$ 34,000
11	Manhole 48 In. Diam. Type 2	6	EA	$ 6,000	$ 36,000
12	Connection to Existing Manhole	5	EA	$ 4,000	$ 20,000
13	Dewatering for Sewer	1	LS	$ -	$ -
14	Removal of Unsuitable Material (Trench)	140	CY	$ 50	$ 7,000
15	Trench Excavation Safety Systems	1	LS	$ 10,000	$ 10,000
16	Temporary Sewer Bypass Pumping	1	LS	$ 10,000	$ 10,000
17	Bank Run Gravel for Trench Backfill	2,450	TN	$ 25	$ 61,250
18	PVC Sanitary Sewer Pipe 21 In. Diam.	1,110	LF	$ 90	$ 99,900
19	Erosion/Water Pollution Control	1	LS	$ 5,000	$ 5,000
20	Seeding, Fertilizing and Mulching	10	SY	$ 10	$ 100
21	Topsoil Type A	10	CY	$ 60	$ 600
22	Cement Concrete Traffic Curb and Gutter	490	LF	$ 40	$ 19,600
23	Cement Concrete Sidewalk	280	SY	$ 75	$ 21,000
		Subtotal			$ 391,390
		Sales Tax (8.7%)			$ 34,051
	Total Construction Cost (rounded)				**$ 425,000**
	Construction Contingency (20%)				$ 85,000
	Engineering, Permitting, Administration (25%):				$ 127,500
	Total Project Cost (rounded)				**$ 638,000**

CITY OF BELLINGHAM
BELLINGHAM WASTEWATER CONVEYANCE PLAN
PRELIMINARY COST ESTIMATE
CIP No. B1
(Bancroft St.; MH 04805 to MH 04823)
January 2016
G&O# 15448

NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Mobilization/Demobilization	1	LS	$ 17,000	$ 17,000
2	Survey	1	LS	$ 5,000	$ 5,000
3	Force Account	1	EST	$ 5,000	$ 5,000
4	Project Temporary Traffic Control	1	LS	$ 1,000	$ 1,000
5	Clearing and Grubbing	1	LS	$ 5,000	$ 5,000
6	Sawcutting Existing Pavement	150	LF	$ 3	$ 450
7	Locate Existing Utilities for Sewer	1	LS	$ 5,000	$ 5,000
8	Crushed Surfacing Top Course	0	TN	$ 40	$ -
9	Crushed Surfacing Base Course	30	TN	$ 25	$ 750
10	HMA Cl. 1/2 IN. PG 64-22	100	TN	$ 170	$ 17,000
11	Manhole 48 In. Diam. Type 2	2	EA	$ 6,000	$ 12,000
12	Connection to Existing Manhole	3	EA	$ 4,000	$ 12,000
13	Dewatering for Sewer	1	LS	$ -	$ -
14	Removal of Unsuitable Material (Trench)	70	CY	$ 50	$ 3,500
15	Trench Excavation Safety Systems	1	LS	$ 10,000	$ 10,000
16	Temporary Sewer Bypass Pumping	1	LS	$ 10,000	$ 10,000
17	Bank Run Gravel for Trench Backfill	1,170	TN	$ 25	$ 29,250
18	ADS SaniTite Sanitary Sewer Pipe 36 In. Diam.	300	LF	$ 140	$ 42,000
19	Erosion/Water Pollution Control	1	LS	$ 5,000	$ 5,000
20	Seeding, Fertilizing and Mulching	270	SY	$ 10	$ 2,700
21	Topsoil Type A	30	CY	$ 60	$ 1,800
22	Cement Concrete Traffic Curb and Gutter	20	LF	$ 40	$ 800
23	Cement Concrete Sidewalk	10	SY	$ 75	$ 750
		Subtotal			$ 186,000
		Sales Tax (8.7%)			$ 16,182
	Total Construction Cost (rounded)				**$ 202,000**
	Construction Contingency (20%)				$ 40,400
	Engineering, Permitting, Administration (25%):				$ 60,600
	Total Project Cost (rounded)				**$ 303,000**

CITY OF BELLINGHAM
BELLINGHAM WASTEWATER CONVEYANCE PLAN
PRELIMINARY COST ESTIMATE
CIP No. B2
(Eldridge Ave.; MH 05218 to MH 05105)
January 2016
G&O# 15448

NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Mobilization/Demobilization	1	LS	$ 65,000	$ 65,000
2	Survey	1	LS	$ 8,000	$ 8,000
3	Force Account	1	EST	$ 10,000	$ 10,000
4	Project Temporary Traffic Control	1	LS	$ 4,000	$ 4,000
5	Clearing and Grubbing	1	LS	$ 1,000	$ 1,000
6	Sawcutting Existing Pavement	3,660	LF	$ 3	$ 10,980
7	Locate Existing Utilities for Sewer	1	LS	$ 5,000	$ 5,000
8	Crushed Surfacing Top Course	0	TN	$ 40	$ -
9	Crushed Surfacing Base Course	640	TN	$ 25	$ 16,000
10	HMA Cl. 1/2 IN. PG 64-22	400	TN	$ 170	$ 68,000
11	Manhole 48 In. Diam. Type 2	8	EA	$ 6,000	$ 48,000
12	Connection to Existing Manhole	7	EA	$ 4,000	$ 28,000
13	Dewatering for Sewer	1	LS	$ 30,000	$ 30,000
14	Removal of Unsuitable Material (Trench)	310	CY	$ 50	$ 15,500
15	Trench Excavation Safety Systems	1	LS	$ 20,000	$ 20,000
16	Temporary Sewer Bypass Pumping	1	LS	$ 30,000	$ 30,000
17	Bank Run Gravel for Trench Backfill	5,580	TN	$ 25	$ 139,500
18	PVC Sanitary Sewer Pipe 30 In. Diam.	940	LF	$ 135	$ 126,900
19	ADS SaniTite Sanitary Sewer Pipe 36 In. Diam.	600	LF	$ 140	$ 84,000
20	Erosion/Water Pollution Control	1	LS	$ 5,000	$ 5,000
21	Seeding, Fertilizing and Mulching	0	SY	$ 10	$ -
22	Topsoil Type A	0	CY	$ 60	$ -
23	Cement Concrete Traffic Curb and Gutter	0	LF	$ 40	$ -
24	Cement Concrete Sidewalk	0	SY	$ 75	$ -
		Subtotal			$ 714,880
		Sales Tax (8.7%)			$ 62,195
	Total Construction Cost (rounded)				**$ 777,000**
	Construction Contingency (20%)				$ 155,400
	Engineering, Permitting, Administration (25%):				$ 233,100
	Total Project Cost (rounded)				**$ 1,166,000**

CITY OF BELLINGHAM
BELLINGHAM WASTEWATER CONVEYANCE PLAN
PRELIMINARY COST ESTIMATE
CIP No. LS1

(Arbutus Lift Station - New Lift Station & Force Main in Edgewood)

April 2016
G&O# 15448

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
GENERAL				
1.	Mobilization, Demobilization and Cleanup	1 LS	$ 56,000	$ 56,000
2.	Survey	1 LS	$ 16,000	$ 16,000
3.	Locate Existing Utilities	1 LS	$ 5,000	$ 5,000
4.	Temporary Erosion and Sediment Control	1 LS	$ 10,000	$ 10,000
5.	Dewatering	1 LS	$ 5,000	$ 5,000
6.	Minor Changes	1 CALC	$ 15,000	$ 15,000
LIFT STATION				
7.	23 hp Flygt NP3153 Submersible Pumps	2 EA	$ 39,000	$ 78,000
8.	6' Dia. Wet Well	1 LS	$ 25,000	$ 25,000
9.	Piping and Valves	1 LS	$ 35,000	$ 35,000
10.	Electrical, Telemetry, Generator and Instrumentation	1 LS	$ 130,000	$ 130,000
11.	Electrical Service	1 LS	$ 10,000	$ 10,000
12.	Valve Vault	1 EA	$ 8,000	$ 8,000
13.	Excavation for Utility Structures	200 CY	$ 40	$ 8,000
14.	Bank Run Gravel for Trench Backfill	150 CY	$ 25	$ 3,750
15.	Demolition	1 LS	$ 10,000	$ 10,000
16.	Unsuitable Excavation	15 CY	$ 50	$ 750
17.	Foundation Gravel	30 TN	$ 30	$ 900
18.	Crushed Surfacing Top Course	40 TN	$ 40	$ 1,600
19.	Asphalt	50 TN	$ 170	$ 8,500
FORCE MAIN				
20.	Trench Excavation Safety Systems	1 LS	$ 10,000	$ 10,000
21.	Unsuitable Excavation	60 CY	$ 50	$ 3,000
22.	HDPE Force Main, 6 in. Diam., Incl. Bedding	1,300 LF	$ 50	$ 65,000
23.	Crushed Surfacing Top Course	300 TN	$ 40	$ 12,000
24.	Crushed Surfacing Base Course	500 TN	$ 25	$ 12,500
25.	Bank Run Gravel for Trench Backfill	1200 TN	$ 25	$ 30,000
GRAVITY SEWER FROM ARBUTUS TO EDGEWOOD				
26.	Unsuitable Excavation	130 CY	$ 50	$ 6,500
27.	Landscape Restoration	1 LS	$ 20,000	$ 20,000
28.	Trench Excavation Safety Systems	1 LS	$ 25,000	$ 25,000
29.	Bank Run Gravel for Trench Backfill	2,700 TN	$ 25	$ 67,500
30.	Rock Excavation	130 CY	$ 300	$ 39,000
31.	Manhole, 48 In. Diam.	3 EA	$ 5,000	$ 15,000
32.	PVC Sanitary Sewer Pipe, 8 In. Diam.	600 LF	$ 65	$ 39,000

Subtotal	$ 771,000
Contingency (20%)	$ 154,200
Subtotal	$ 925,200
Sales Tax (8.7%)	$ 81,000
Subtotal	$ 1,006,200
Design and Construction Management (25%)	$ 252,000
TOTAL PROJECT COST	**$ 1,259,000**

CITY OF BELLINGHAM
BELLINGHAM WASTEWATER CONVEYANCE PLAN
PRELIMINARY COST ESTIMATE
CIP No. LS2

(Bakerview Lift Station - New Force Main, Pump & Electrical in 2 Phases)

April 2016
G&O# 15448

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
PHASE 1 - REPLACE FORCE MAIN				
1.	Mobilization, Demobilization and Cleanup	1 LS	$ 39,000	$ 39,000
2.	Survey	1 LS	$ 5,000	$ 5,000
3.	Locate Existing Utilities	1 LS	$ 5,000	$ 5,000
4.	Temporary Erosion and Sediment Control	1 LS	$ 10,000	$ 10,000
5.	Traffic Control	1 LS	$ 5,000	$ 5,000
6.	Dewatering	1 LS	$ 5,000	$ 5,000
7.	Bypass Pumping	1 LS	$ 5,000	$ 5,000
8.	Trench Excavation Safety Systems	1 LS	$ 10,000	$ 10,000
9.	Unsuitable Excavation	90 CY	$ 50	$ 4,500
10.	HDPE Force Main, 8 in. Diam., Incl. Bedding	1,905 LF	$ 65	$ 123,825
11.	Crushed Surfacing Top Course	300 TN	$ 40	$ 12,000
12.	Crushed Surfacing Base Course	500 TN	$ 25	$ 12,500
13.	Bank Run Gravel for Trench Backfill	1800 TN	$ 25	$ 45,000
14.	Asphalt	500 TN	$ 170	$ 85,000
15.	General Restoration	1 LS	$ 20,000	$ 20,000
16.	Minor Changes	1 CALC	$ 15,000	$ 15,000
	Subtotal			$ 386,900
	Contingency (20%)			$ 77,380
	Subtotal			$ 464,280
	Sales Tax (8.7%)			$ 41,000
	Subtotal			$ 505,280
	Design and Construction Management (25%)			$ 127,000
	TOTAL COST - PHASE 1			**$ 632,280**
PHASE 2 - LIFT STATION				
1.	Mobilization, Demobilization and Cleanup	1 LS	$ 11,000	$ 11,000
2.	Survey	1 LS	$ 5,000	$ 5,000
3.	Bypass Pumping	1 LS	$ 25,000	$ 25,000
4.	20 hp Flygt NP3153 Submersible Pumps	2 EA	$ 38,000	$ 76,000
5.	Electrical, Telemetry, and Instrumentation	1 LS	$ 20,000	$ 20,000
6.	Minor Changes	1 CALC	$ 15,000	$ 15,000
	Subtotal			$ 152,000
	Contingency (20%)			$ 30,400
	Subtotal			$ 182,400
	Sales Tax (8.7%)			$ 16,000
	Subtotal			$ 198,400
	Design and Construction Management (25%)			$ 50,000
	TOTAL COST - PHASE 2			**$ 248,400**
	TOTAL PROJECT COST			**$ 881,000**

CITY OF BELLINGHAM
BELLINGHAM WASTEWATER CONVEYANCE PLAN
PRELIMINARY COST ESTIMATE
CIP No. LS3
(Horton Lift Station - Second Parallel Force Main)
April 2016
G&O# 15448

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1.	Mobilization, Demobilization and Cleanup	1 LS	$ 51,000	$ 51,000
2.	Survey	1 LS	$ 10,000	$ 10,000
3.	Locate Existing Utilities	1 LS	$ 5,000	$ 5,000
4.	Temporary Erosion and Sediment Control	1 LS	$ 10,000	$ 10,000
5.	Dewatering	1 LS	$ 5,000	$ 5,000
6.	Bypass Pumping	1 LS	$ 5,000	$ 5,000
7.	Trench Excavation Safety Systems	1 LS	$ 10,000	$ 10,000
8.	Traffic Control	1 LS	$ 25,000	$ 25,000
8.	Unsuitable Excavation	120 CY	$ 50	$ 6,000
9.	HDPE Force Main, 8 in. Diam., Incl. Bedding	2,400 LF	$ 65	$ 156,000
10.	Crushed Surfacing Top Course	300 TN	$ 40	$ 12,000
11.	Crushed Surfacing Base Course	500 TN	$ 25	$ 12,500
12.	Bank Run Gravel for Trench Backfill	2400 TN	$ 25	$ 60,000
13.	Asphalt	600 TN	$ 170	$ 102,000
14.	General Restoration	1 LS	$ 20,000	$ 20,000
15.	Minor Changes	1 CALC	$ 15,000	$ 15,000
16.	Electrical	1 LS	$ 5,000	$ 5,000

Subtotal	$ 509,500
Contingency (20%)	$ 101,900
Subtotal	$ 611,400
Sales Tax (8.7%)	$ 54,000
Subtotal	$ 665,400
Design and Construction Management (25%)	$ 167,000
TOTAL PROJECT COST	**$ 833,000**

CITY OF BELLINGHAM
BELLINGHAM WASTEWATER CONVEYANCE PLAN
PRELIMINARY COST ESTIMATE
CIP No. LS4

(James St. Lift Station - New Lift Station & Second Force Main)

April 2016
G&O# 15448

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
GENERAL				
1.	Mobilization, Demobilization and Cleanup	1 LS	$ 182,000	$ 182,000
2.	Survey	1 LS	$ 16,000	$ 16,000
3.	Locate Existing Utilities	1 LS	$ 5,000	$ 5,000
4.	Temporary Erosion and Sediment Control	1 LS	$ 10,000	$ 10,000
5.	Dewatering	1 LS	$ 5,000	$ 5,000
6.	Bypass Pumping	1 LS	$ 10,000	$ 10,000
7.	Minor Changes	1 CALC	$ 15,000	$ 15,000
LIFT STATION				
8.	70 hp Flygt NP3301 Submersible Pumps	3 EA	$ 184,000	$ 552,000
9.	12' Dia. Wet Well	1 LS	$ 115,000	$ 115,000
10.	Piping and Valves	1 LS	$ 75,000	$ 75,000
11.	Electrical, Telemetry, Generator and Instrumentation	1 LS	$ 400,000	$ 400,000
12.	Electrical Service	1 LS	$ 20,000	$ 20,000
13.	Valve Vault	1 EA	$ 25,000	$ 25,000
14.	Magnetic Flow Meter and Vault	1 LS	$ 30,000	$ 30,000
14.	Excavation for Utility Structures	200 CY	$ 35	$ 7,000
15.	Bank Run Gravel for Trench Backfill	150 CY	$ 25	$ 3,750
16.	Demolition	1 LS	$ 20,000	$ 20,000
17.	Unsuitable Excavation	10 CY	$ 50	$ 500
18.	Foundation Gravel	20 TN	$ 30	$ 600
19.	Crushed Surfacing Top Course	35 TN	$ 40	$ 1,400
20.	Asphalt	25 TN	$ 175	$ 4,375
21.	Restoration	1 LS	$ 20,000	$ 20,000
FORCE MAIN				
22.	Traffic Control	1 LS	$ 15,000	$ 15,000
23.	Trench Excavation Safety Systems	1 LS	$ 10,000	$ 10,000
24.	Unsuitable Excavation	70 CY	$ 50	$ 3,500
25.	HDPE Force Main, 10 in. Diam., Incl. Bedding	1,550 LF	$ 80	$ 124,000
26.	Crushed Surfacing Top Course	200 TN	$ 40	$ 8,000
27.	Crushed Surfacing Base Course	500 TN	$ 25	$ 12,500
28.	Bank Run Gravel for Trench Backfill	1500 TN	$ 25	$ 37,500
29.	Asphalt	400 TN	$ 170	$ 68,000
30.	General Restoration	1 LS	$ 20,000	$ 20,000

Subtotal	$ 1,816,200
Contingency (20%)	$ 363,240
Subtotal	$ 2,179,440
Sales Tax (8.7%)	$ 190,000
Subtotal	$ 2,369,440
Design and Construction Management (25%)	$ 593,000
TOTAL PROJECT COST	**$ 2,963,000**

CITY OF BELLINGHAM
BELLINGHAM WASTEWATER CONVEYANCE PLAN
PRELIMINARY COST ESTIMATE
CIP No. LS5

(Mitchell Way Lift Station - New Lift Station & Force Main)

April 2016
G&O# 15448

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
GENERAL				
1.	Mobilization, Demobilization and Cleanup	1 LS	$ 60,000	$ 60,000
2.	Survey	1 LS	$ 16,000	$ 16,000
3.	Locate Existing Utilities	1 LS	$ 5,000	$ 5,000
4.	Temporary Erosion and Sediment Control	1 LS	$ 10,000	$ 10,000
5.	Dewatering	1 LS	$ 5,000	$ 5,000
6.	Bypass Pumping	1 LS	$ 5,000	$ 5,000
7.	Minor Changes	1 CALC	$ 15,000	$ 15,000
LIFT STATION				
8.	20 hp Flygt NP3153 Submersible Pumps	2 EA	$ 38,000	$ 76,000
9.	6' Dia. Wet Well	1 LS	$ 25,000	$ 25,000
10.	Piping and Valves	1 LS	$ 35,000	$ 35,000
11.	Electrical, Telemetry and Instrumentation	1 LS	$ 100,000	$ 100,000
12.	Valve Vault	1 EA	$ 8,000	$ 8,000
13.	Excavation for Utility Structures	200 CY	$ 35	$ 7,000
14.	Bank Run Gravel for Trench Backfill	150 TN	$ 25	$ 3,750
15.	Demolition	1 LS	$ 10,000	$ 10,000
16.	Unsuitable Excavation	10 CY	$ 50	$ 500
17.	Foundation Gravel	20 TN	$ 30	$ 600
18.	Crushed Surfacing Top Course	25 TN	$ 40	$ 1,000
19.	Asphalt	20 TN	$ 170	$ 3,400
20.	Restoration	1 LS	$ 5,000	$ 5,000
FORCE MAIN				
21.	Traffic Control	1 LS	$ 15,000	$ 15,000
22.	Trench Excavation Safety Systems	1 LS	$ 10,000	$ 10,000
23.	Unsuitable Excavation	40 CY	$ 50	$ 2,000
24.	HDPE Force Main, 8 in. Diam., Incl. Bedding	930 LF	$ 65	$ 60,450
25.	Crushed Surfacing Top Course	200 TN	$ 40	$ 8,000
26.	Crushed Surfacing Base Course	500 TN	$ 25	$ 12,500
27.	Bank Run Gravel for Trench Backfill	900 TN	$ 25	$ 22,500
28.	Asphalt	300 TN	$ 170	$ 51,000
29.	General Restoration	1 LS	$ 20,000	$ 20,000

Subtotal	$ 592,700
Contingency (20%)	$ 118,540
Subtotal	$ 711,240
Sales Tax (8.7%)	$ 62,000
Subtotal	$ 773,240
Design and Construction Management (25%)	$ 194,000
TOTAL PROJECT COST	**$ 968,000**

CITY OF BELLINGHAM
BELLINGHAM WASTEWATER CONVEYANCE PLAN
PRELIMINARY COST ESTIMATE
CIP No. LS6
(North Mitchell Way Lift Station - New Pumps)
April 2016
G&O# 15448

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
GENERAL				
1.	Mobilization, Demobilization and Cleanup	1 LS	$ 30,000	$ 30,000
2.	Bypass Pumping	1 LS	$ 25,000	$ 25,000
3.	35 hp Flygt NP3171 Submersible Pumps	2 EA	$ 56,000	$ 112,000
4.	Electrical Improvements and Generator	1 LS	$ 110,000	$ 110,000
5.	Electrical Service	1 LS	$ 10,000	$ 10,000
6.	Demolition	1 LS	$ 5,000	$ 5,000
7.	Minor Changes	1 CALC	$ 15,000	$ 15,000

Subtotal	$ 292,000
Contingency (20%)	$ 58,400
Subtotal	$ 350,400
Sales Tax (8.7%)	$ 31,000
Subtotal	$ 381,400
Design and Construction Management (25%)	$ 96,000
TOTAL PROJECT COST	**$ 478,000**

CITY OF BELLINGHAM
BELLINGHAM WASTEWATER CONVEYANCE PLAN
PRELIMINARY COST ESTIMATE
CIP No. LS7

(Northshore Lift Station - Convert Existing Station to Submersible)

April 2016
G&O# 15448

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
GENERAL				
1.	Mobilization, Demobilization and Cleanup	1 LS	$ 69,000	$ 69,000
2.	Survey	1 LS	$ 5,000	$ 5,000
3.	Locate Existing Utilities	1 LS	$ 5,000	$ 5,000
4.	Temporary Erosion and Sediment Control	1 LS	$ 10,000	$ 10,000
5.	Traffic Control	1 LS	$ 5,000	$ 5,000
6.	Dewatering	1 LS	$ 50,000	$ 50,000
7.	Bypass Pumping	1 LS	$ 40,000	$ 40,000
8.	85 hp Flygt NP3301 Submersible Pumps	2 EA	$ 106,000	$ 212,000
9.	8' Dia. Wet Well	1 LS	$ 25,000	$ 25,000
10.	Piping and Valves	1 LS	$ 35,000	$ 35,000
11.	Electrical, Telemetry, Generator and Instrumentation	1 LS	$ 175,000	$ 175,000
12.	Upgrade Electrical Service	1 LS	$ 10,000	$ 10,000
13.	Valve Vault	1 EA	$ 8,000	$ 8,000
14.	Excavation for Utility Structures	200 CY	$ 35	$ 7,000
15.	Bank Run Gravel for Trench Backfill	150 CY	$ 25	$ 3,750
16.	Demolition	1 LS	$ 10,000	$ 10,000
17.	Unsuitable Excavation	10 CY	$ 50	$ 500
18.	Foundation Gravel	20 TN	$ 30	$ 600
19.	Crushed Surfacing Top Course	25 TN	$ 40	$ 1,000
20.	Asphalt	30 TN	$ 170	$ 5,100
21.	Restoration	1 LS	$ 10,000	$ 10,000
22.	Minor Changes	1 CALC	$ 15,000	$ 15,000

Subtotal	$ 687,000
Contingency (20%)	$ 137,400
Subtotal	$ 824,400
Sales Tax (8.7%)	$ 72,000
Subtotal	$ 896,400
Design and Construction Management (25%)	$ 225,000
Permitting	$ 25,000
TOTAL PROJECT COST	**$ 1,147,000**

CITY OF BELLINGHAM
BELLINGHAM WASTEWATER CONVEYANCE PLAN
PRELIMINARY COST ESTIMATE
CIP No. LS8

(Edgemoor Lift Station - Gravity Sewer to Willow Lift Station)

April 2016

G&O# 15448

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1.	Mobilization, Cleanup, and Demobilization	1 LS	$ 47,000	$ 47,000
2.	Survey	1 LS	$ 8,000	$ 8,000
3.	Locate Existing Utilities	1 LS	$ 5,000	$ 5,000
4.	Temporary Erosion and Sediment Control	1 LS	$ 10,000	$ 10,000
5.	Dewatering	1 LS	$ 5,000	$ 5,000
6.	Minor Changes	1 CALC	$ 15,000	$ 15,000
GRAVITY SEWER FROM EDGEMOOR TO WILLOW				
7.	Unsuitable Excavation	130 CY	$ 50	$ 6,500
8.	Trench Excavation Safety Systems	1 LS	$ 25,000	$ 25,000
9.	Landscape Restoration	1 LS	$ 100,000	$ 100,000
10.	Bank Run Gravel for Trench Backfill	2,700 TN	$ 25	$ 67,500
11.	Manhole, 48 In. Diam.	3 EA	$ 5,000	$ 15,000
12.	PVC Sanitary Sewer Pipe, 8 In. Diam.	600 LF	$ 65	$ 39,000
WILLOW LIFT STATION WET WELL				
13.	Bypass Pumping	1 LS	$ 5,000	$ 5,000
14.	8' Dia. Wet Well	1 LS	$ 30,000	$ 30,000
15.	Reinstall Pumps and Piping	1 LS	$ 50,000	$ 50,000
16.	Excavation for Utility Structures	200 CY	$ 35	$ 7,000
17.	Bank Run Gravel for Trench Backfill	150 TN	$ 25	$ 3,750
18.	Demolition	1 LS	$ 10,000	$ 10,000
19.	Unsuitable Excavation	10 CY	$ 50	$ 500
20.	Foundation Gravel	20 TN	$ 30	$ 600
21.	Crushed Surfacing Top Course	20 TN	$ 40	$ 800
22.	Asphalt	15 TN	$ 170	$ 2,550
23.	Restoration	1 LS	$ 10,000	$ 10,000

Subtotal	$ 463,200
Contingency (20%)	$ 92,640
Subtotal	$ 555,840
Sales Tax (8.7%)	$ 49,000
Subtotal	$ 604,840
Design and Construction Management (25%)	$ 152,000
Easements and Permitting	$ 100,000
TOTAL PROJECT COST	**$ 857,000**

CITY OF BELLINGHAM
BELLINGHAM WASTEWATER CONVEYANCE PLAN
PRELIMINARY COST ESTIMATE
CIP No. LS9

(Roeder Lift Station - New Pumps, Expanded Operating Volume, New FM)

April 2016

G&O# 15448

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
GENERAL				
1.	Mobilization, Demobilization and Cleanup	1 LS	$ 265,000	$ 265,000
2.	Survey	1 LS	$ 16,000	$ 16,000
3.	Locate Existing Utilities	1 LS	$ 5,000	$ 5,000
4.	Temporary Erosion and Sediment Control	1 LS	$ 10,000	$ 10,000
5.	Dewatering	1 LS	$ 5,000	$ 5,000
6.	Bypass Pumping	1 LS	$ 100,000	$ 100,000
7.	Minor Changes	1 CALC	$ 15,000	$ 15,000
LIFT STATION				
8.	50 hp Fairbanks Morse 16"5711 Pumps	3 EA	$ 147,000	$ 441,000
9.	36-inch Dia. Storage Pipe, 75 LF	3 EA	$ 20,000	$ 60,000
10.	Miscellaneous Valves and Fittings	1 LS	$ 75,000	$ 75,000
11.	10 ft x 24 ft Access Vault	1 LS	$ 65,000	$ 65,000
12.	Electrical, Telemetry, Generator and Instrumentation	1 LS	$ 625,000	$ 625,000
13.	Upgrade Electrical Service	1 LS	$ 15,000	$ 15,000
14.	Magnetic Flow Meter	1 LS	$ 55,000	$ 55,000
15.	Excavation for Utility Structures	3000 CY	$ 35	$ 105,000
16.	Bank Run Gravel for Trench Backfill	2500 TN	$ 25	$ 62,500
17.	Demolition	1 LS	$ 20,000	$ 20,000
18.	Unsuitable Excavation	620 CY	$ 50	$ 31,000
19.	Foundation Gravel	1300 TN	$ 30	$ 39,000
20.	Crushed Surfacing Top Course	120 TN	$ 40	$ 4,800
21.	Asphalt	150 TN	$ 170	$ 25,500
22.	Restoration	1 LS	$ 25,000	$ 25,000
FORCE MAIN				
23.	Traffic Control	1 LS	$ 50,000	$ 50,000
24.	Trench Excavation Safety Systems	1 LS	$ 25,000	$ 25,000
25.	Unsuitable Excavation	150 CY	$ 50	$ 7,500
26.	DI Force Main, 30 in. Diam., Incl. Bedding	1,050 LF	$ 230	$ 241,500
27.	Crushed Surfacing Top Course	200 TN	$ 40	$ 8,000
28.	Crushed Surfacing Base Course	300 TN	$ 25	$ 7,500
29.	Bank Run Gravel for Trench Backfill	3000 TN	$ 25	$ 75,000
30.	Asphalt	400 TN	$ 170	$ 68,000
31.	Connect to Exisiting System	1 LS	$ 50,000	$ 50,000
32.	General Restoration	1 LS	$ 50,000	$ 50,000

Subtotal	$ 2,647,300
Contingency (20%)	$ 529,460
Subtotal	$ 3,176,760
Sales Tax (8.7%)	$ 277,000
Subtotal	$ 3,453,760
Design and Construction Management (25%)	$ 864,000
Permitting and Easements	$ 100,000
TOTAL PROJECT COST	**$ 4,418,000**

*Estimate does not include any geotechnical improvements that may be required or removal of any contaminated soils that may be present within project area

CITY OF BELLINGHAM
BELLINGHAM WASTEWATER CONVEYANCE PLAN
PRELIMINARY COST ESTIMATE
CIP No. LS10

(West Bakerview Lift Station - New Pumps & Force Main, Second Wet Well)

April 2016
G&O# 15448

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
GENERAL				
1.	Mobilization, Demobilization and Cleanup	1 LS	$ 53,000	$ 53,000
2.	Survey	1 LS	$ 10,000	$ 10,000
3.	Locate Existing Utilities	1 LS	$ 5,000	$ 5,000
4.	Temporary Erosion and Sediment Control	1 LS	$ 10,000	$ 10,000
5.	Dewatering	1 LS	$ 5,000	$ 5,000
6.	Bypass Pumping	1 LS	$ 25,000	$ 25,000
7.	Minor Changes	1 CALC	$ 15,000	$ 15,000
LIFT STATION				
8.	30 hp Flygt NP3171 Submersible Pumps	2 EA	$ 56,000	$ 112,000
9.	4' Dia. Wet Well	1 LS	$ 15,000	$ 15,000
10.	Piping and Valves	1 LS	$ 35,000	$ 35,000
11.	Electrical, Telemetry and Instrumentation	1 LS	$ 20,000	$ 20,000
12.	Valve Vault	1 EA	$ 8,000	$ 8,000
13.	Excavation for Utility Structures	200 CY	$ 35	$ 7,000
14.	Bank Run Gravel for Trench Backfill	150 CY	$ 25	$ 3,750
15.	Demolition	1 LS	$ 10,000	$ 10,000
16.	Unsuitable Excavation	10 CY	$ 50	$ 500
17.	Foundation Gravel	20 TN	$ 30	$ 600
18.	Crushed Surfacing Top Course	40 TN	$ 40	$ 1,600
19.	Asphalt	50 TN	$ 170	$ 8,500
20.	Restoration	1 LS	$ 5,000	$ 5,000
FORCE MAIN				
21.	Traffic Control	1 LS	$ 15,000	$ 15,000
22.	Trench Excavation Safety Systems	1 LS	$ 10,000	$ 10,000
23.	Unsuitable Excavation	40 CY	$ 50	$ 2,000
24.	HDPE Force Main, 8 in. Diam., Incl. Bedding	850 LF	$ 65	$ 55,250
25.	Crushed Surfacing Top Course	100 TN	$ 40	$ 4,000
26.	Crushed Surfacing Base Course	500 TN	$ 25	$ 12,500
27.	Bank Run Gravel for Trench Backfill	800 TN	$ 25	$ 20,000
28.	Asphalt	200 TN	$ 170	$ 34,000
29.	General Restoration	1 LS	$ 20,000	$ 20,000

Subtotal	$ 522,700
Contingency (20%)	$ 104,540
Subtotal	$ 627,240
Sales Tax (8.7%)	$ 55,000
Subtotal	$ 682,240
Design and Construction Management (25%)	$ 171,000
TOTAL PROJECT COST	**$ 854,000**

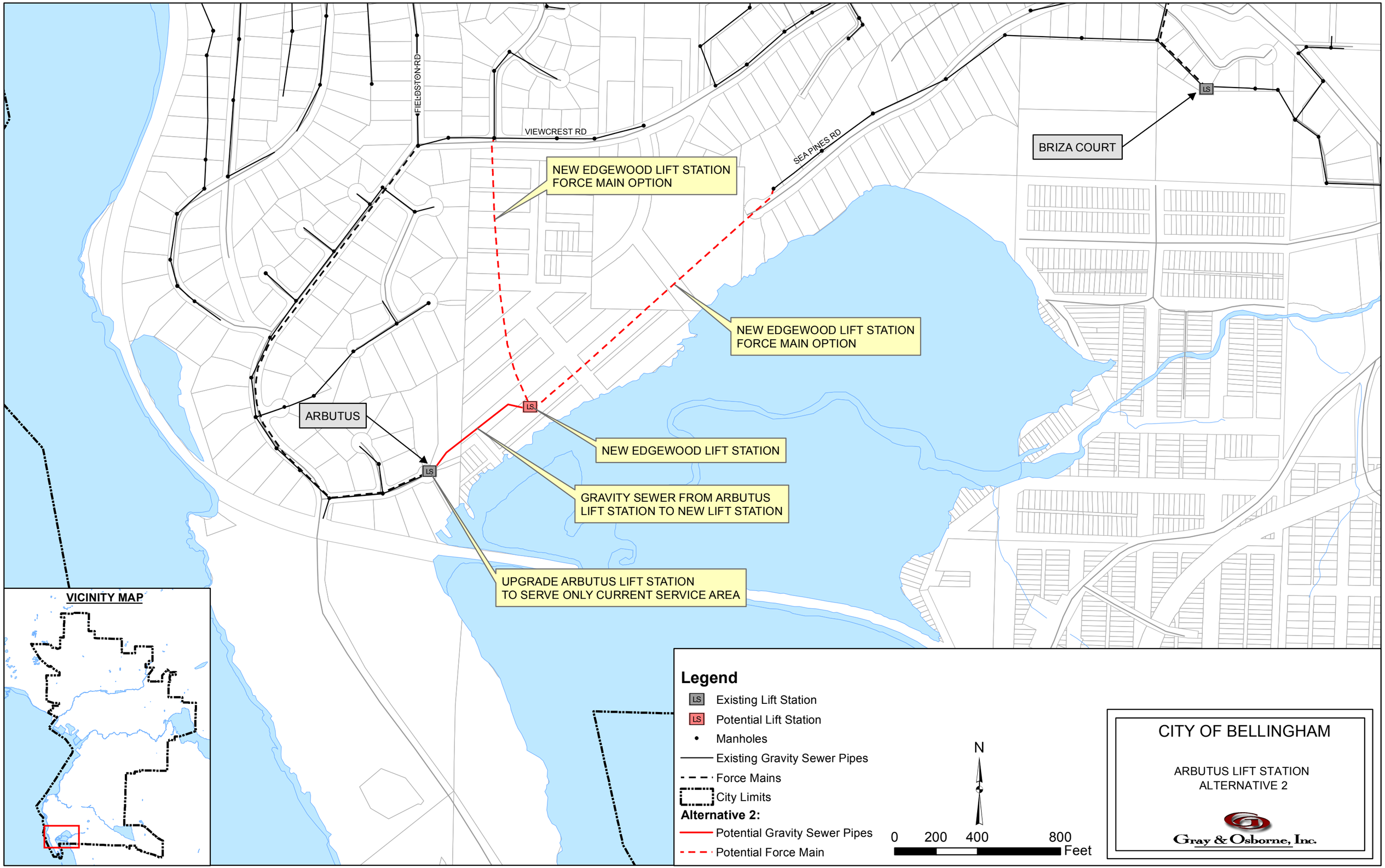
CITY OF BELLINGHAM
BELLINGHAM WASTEWATER CONVEYANCE PLAN
PRELIMINARY COST ESTIMATE
CIP No. LS11
(West Maplewood Lift Station - New Lift Station & Force Main)
April 1, 2016
G&O# 15448

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
GENERAL				
1.	Mobilization, Demobilization and Cleanup	1 LS	$ 56,000	$ 56,000
2.	Survey	1 LS	$ 4,800	$ 4,800
3.	Locate Existing Utilities	1 LS	$ 5,000	$ 5,000
4.	Temporary Erosion and Sediment Control	1 LS	$ 10,000	$ 10,000
5.	Dewatering	1 LS	$ 5,000	$ 5,000
6.	Bypass Pumping	1 LS	$ 5,000	$ 5,000
7.	Minor Changes	1 CALC	$ 15,000	$ 15,000
LIFT STATION				
8.	Wet Pit-Dry Pit Package Station w/ 2-10 hp pumps	1 LS	$ 250,000	$ 250,000
9.	8' Dia. Wet Well	1 LS	$ 30,000	$ 30,000
10.	Piping and Valves	1 LS	$ 35,000	$ 35,000
11.	Electrical, Telemetry, Generator and Instrumentation	1 LS	$ 20,000	$ 20,000
12.	Extend Utility Service	1 EA	$ 5,000	$ 5,000
13.	Excavation for Utility Structures	200 CY	$ 35	$ 7,000
14.	Bank Run Gravel for Trench Backfill	150 CY	$ 25	$ 3,750
15.	Demolition	1 LS	$ 10,000	$ 10,000
16.	Unsuitable Excavation	10 CY	$ 50	$ 500
17.	Foundation Gravel	20 TN	$ 30	$ 600
18.	Crushed Surfacing Top Course	40 TN	$ 40	$ 1,600
19.	Asphalt	50 TN	$ 170	$ 8,500
20.	Restoration	0 LS	$ 5,000	$ -
FORCE MAIN				
21.	Traffic Control	1 LS	$ 10,000	$ 10,000
21.	Trench Excavation Safety Systems	1 LS	$ 10,000	$ 10,000
22.	Unsuitable Excavation	10 CY	$ 50	$ 500
23.	HDPE Force Main, 8 in. Diam., Incl. Bedding	100 LF	$ 65	$ 6,500
24.	Crushed Surfacing Top Course	100 TN	$ 40	$ 4,000
25.	Crushed Surfacing Base Course	500 TN	$ 25	$ 12,500
26.	Bank Run Gravel for Trench Backfill	100 TN	$ 25	$ 2,500
27.	Asphalt	100 TN	$ 170	$ 17,000
28.	General Restoration	1 LS	$ 20,000	$ 20,000

Subtotal	$ 555,800
Contingency (20%)	$ 111,160
Subtotal	$ 666,960
Sales Tax (8.7%)	$ 59,000
Subtotal	$ 725,960
Design and Construction Management (25%)	$ 182,000
Easements	$ 50,000
TOTAL PROJECT COST	**$ 958,000**

APPENDIX H

LIFT STATION ALTERNATIVES FIGURES



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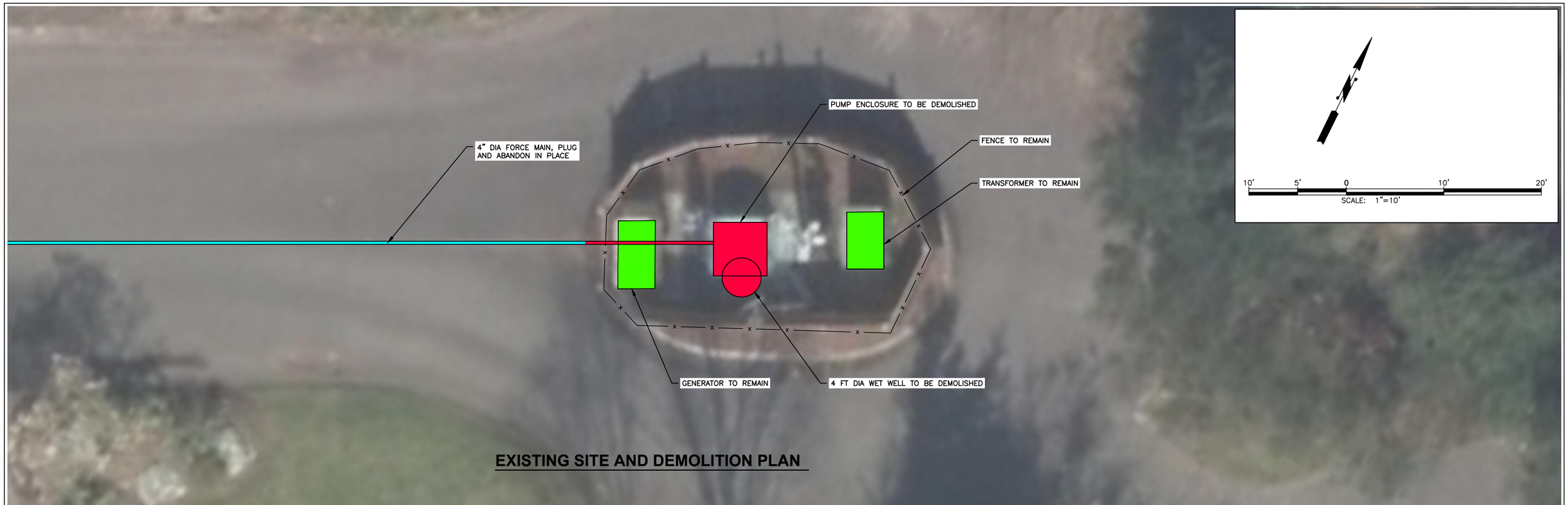

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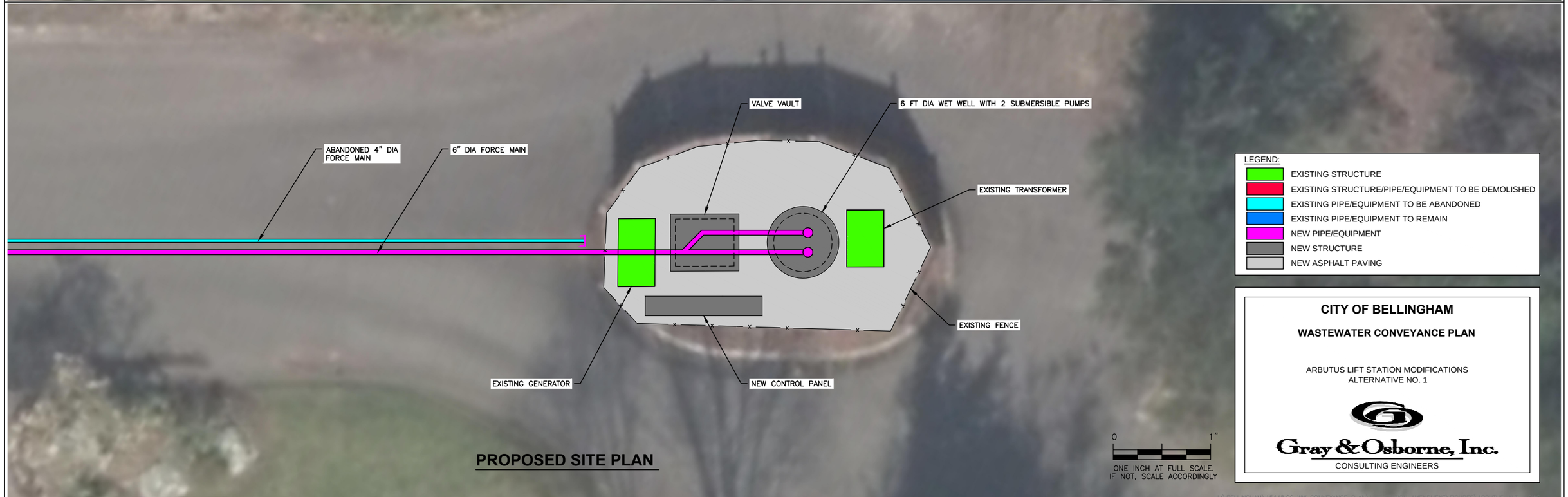

PROPOSED SITE PLAN

CITY OF BELLINGHAM

WASTEWATER CONVEYANCE PLAN

ARBUTUS LIFT STATION MODIFICATIONS
ALTERNATIVE NO. 1

Gray & Osborne, Inc.
CONSULTING ENGINEERS

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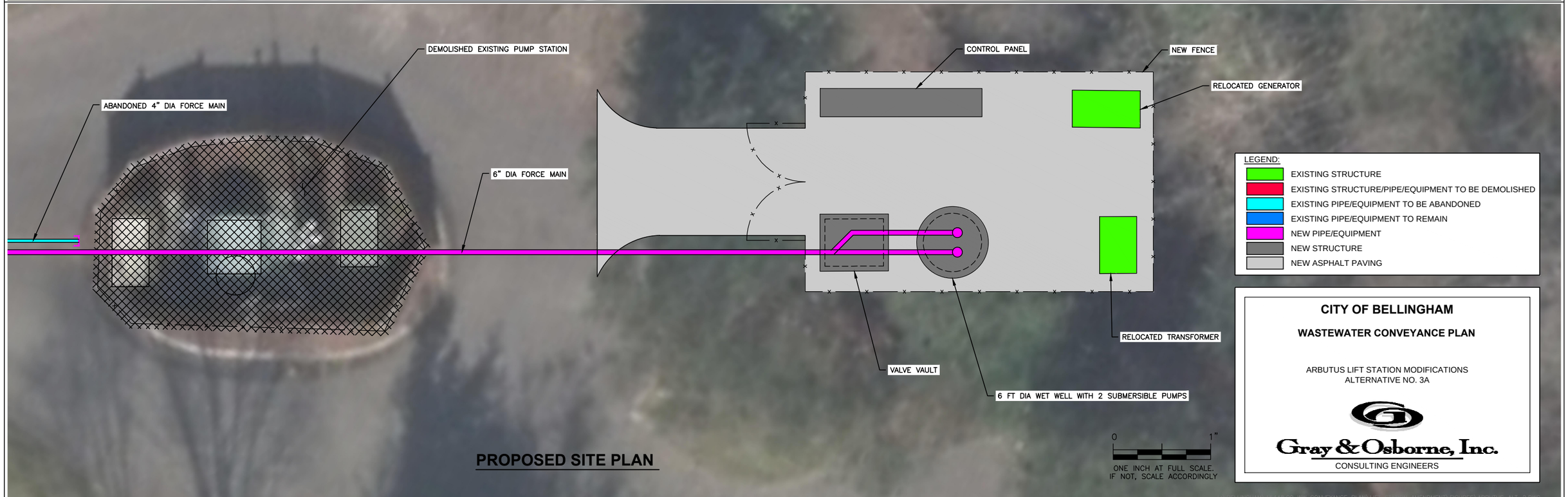

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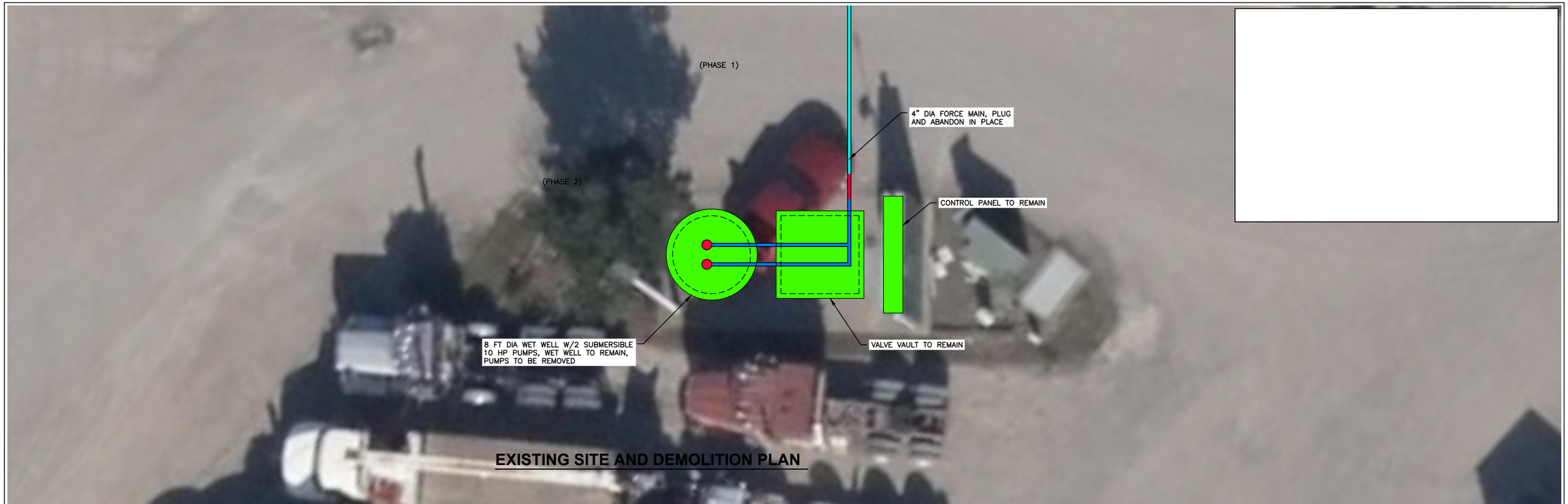

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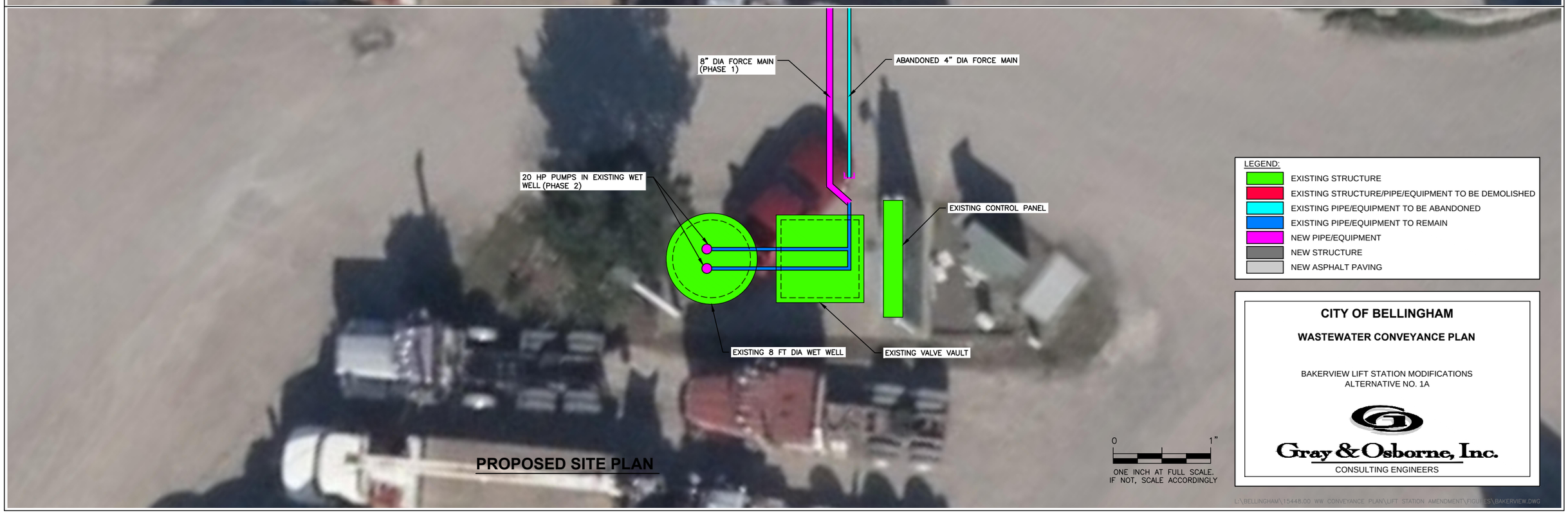

PROPOSED SITE PLAN

LEGEND:

- EXISTING STRUCTURE
- EXISTING STRUCTURE/PIPE/EQUIPMENT TO BE DEMOLISHED
- EXISTING PIPE/EQUIPMENT TO BE ABANDONED
- EXISTING PIPE/EQUIPMENT TO REMAIN
- NEW PIPE/EQUIPMENT
- NEW STRUCTURE
- NEW ASPHALT PAVING

CITY OF BELLINGHAM

WASTEWATER CONVEYANCE PLAN

BAKERVIEW LIFT STATION MODIFICATIONS
ALTERNATIVE NO. 1A

Gray & Osborne, Inc.
CONSULTING ENGINEERS

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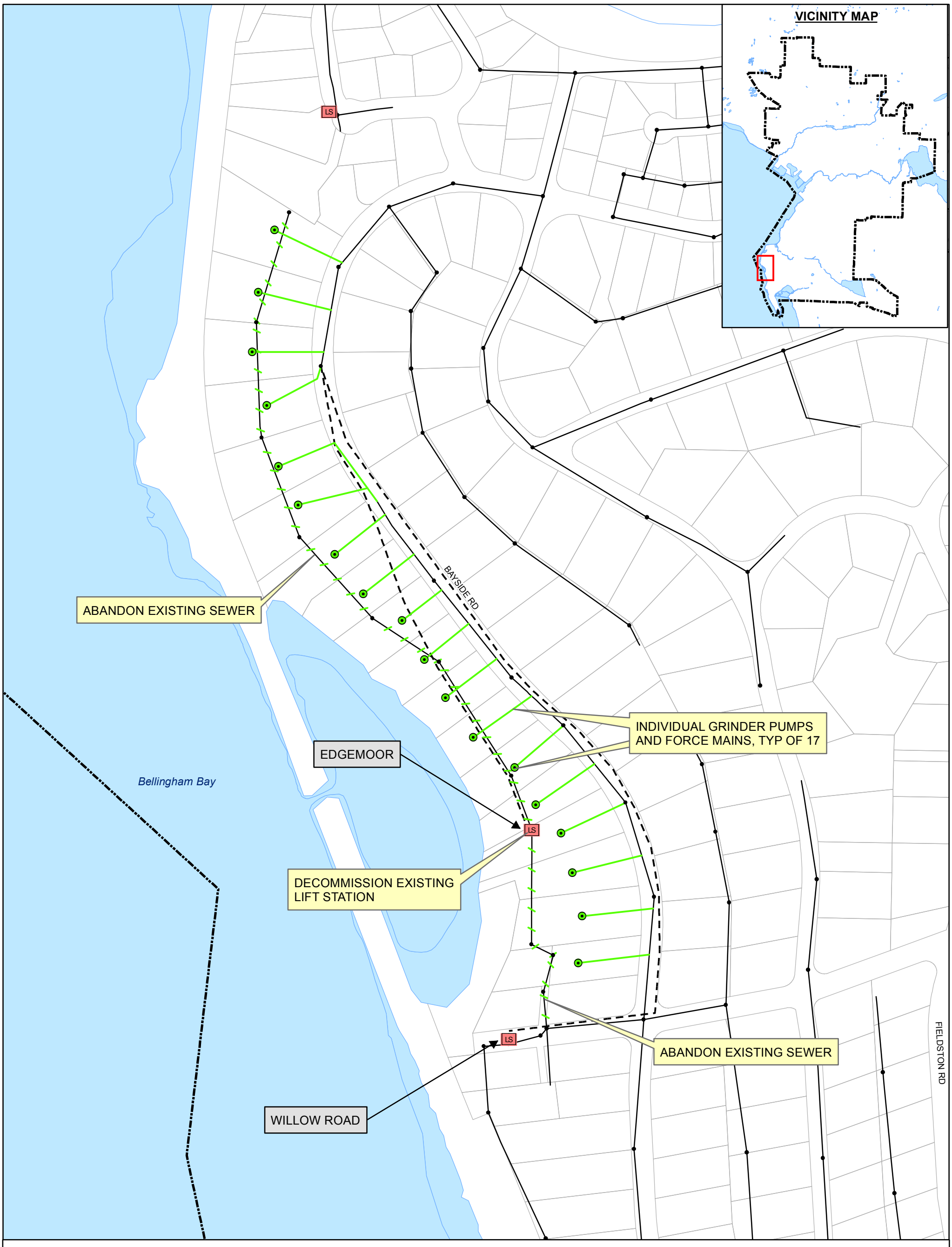

Legend

- LS Existing Lift Station
- Manholes
- Force Mains
- Existing Gravity Sewer Pipes
- City Limits

Alternative 1:

- Potential Grinder Pump
- Existing Gravity Sewer to be Abandoned
- Potential Grinder Pump Force Main

N

0 125 250 500 Feet

CITY OF BELLINGHAM

WASTEWATER CONVEYANCE PLAN
EDGEMOOR LIFT STATION ALTERNATIVE
NO. 1

Gray & Osborne, Inc.

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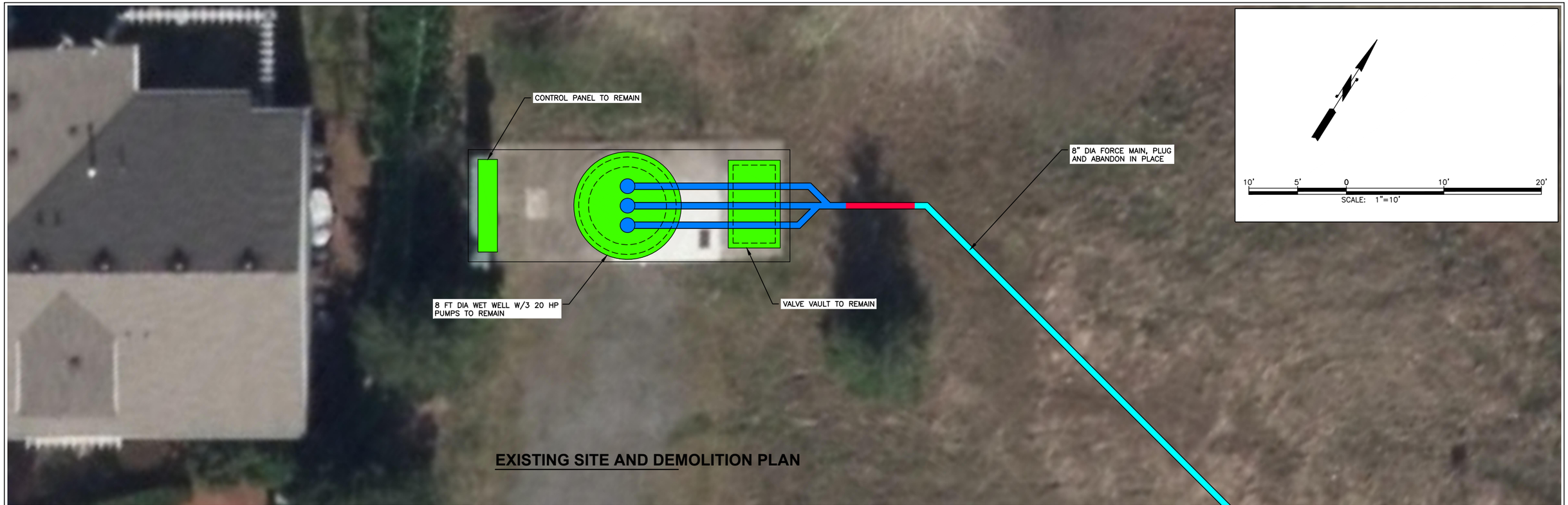

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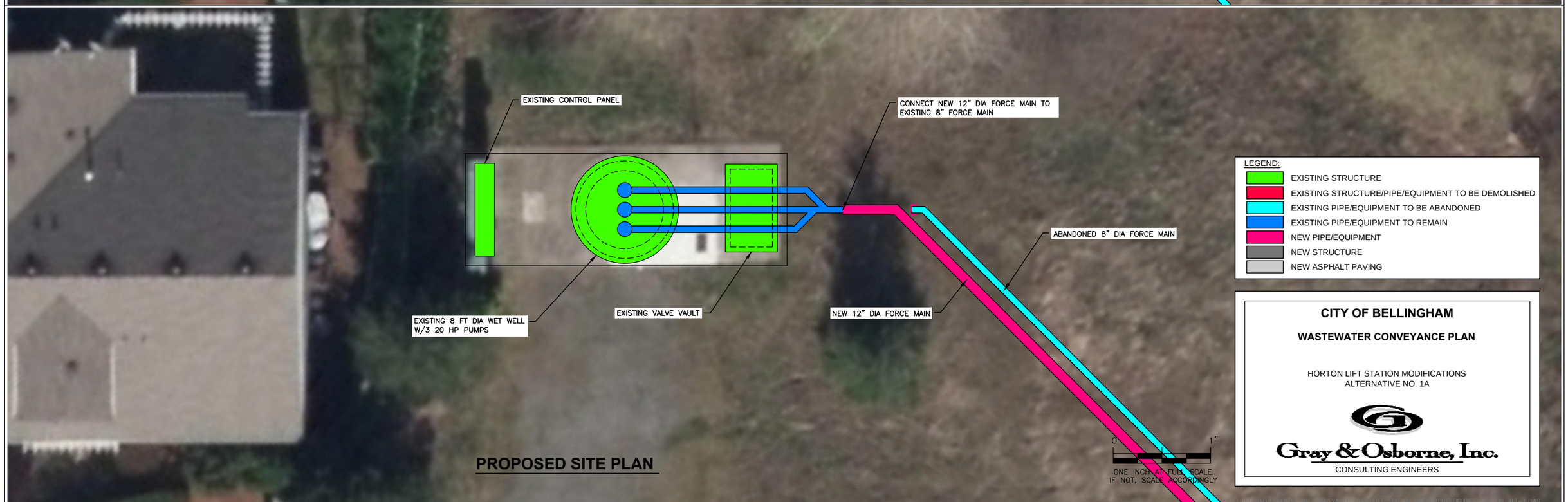

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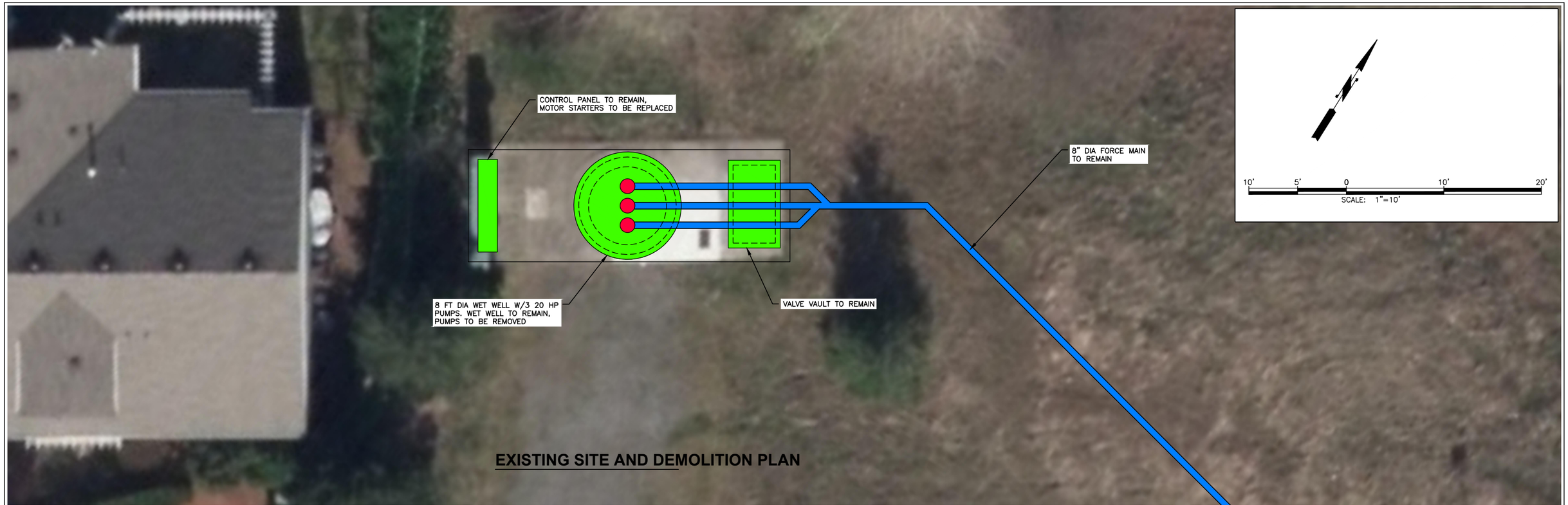

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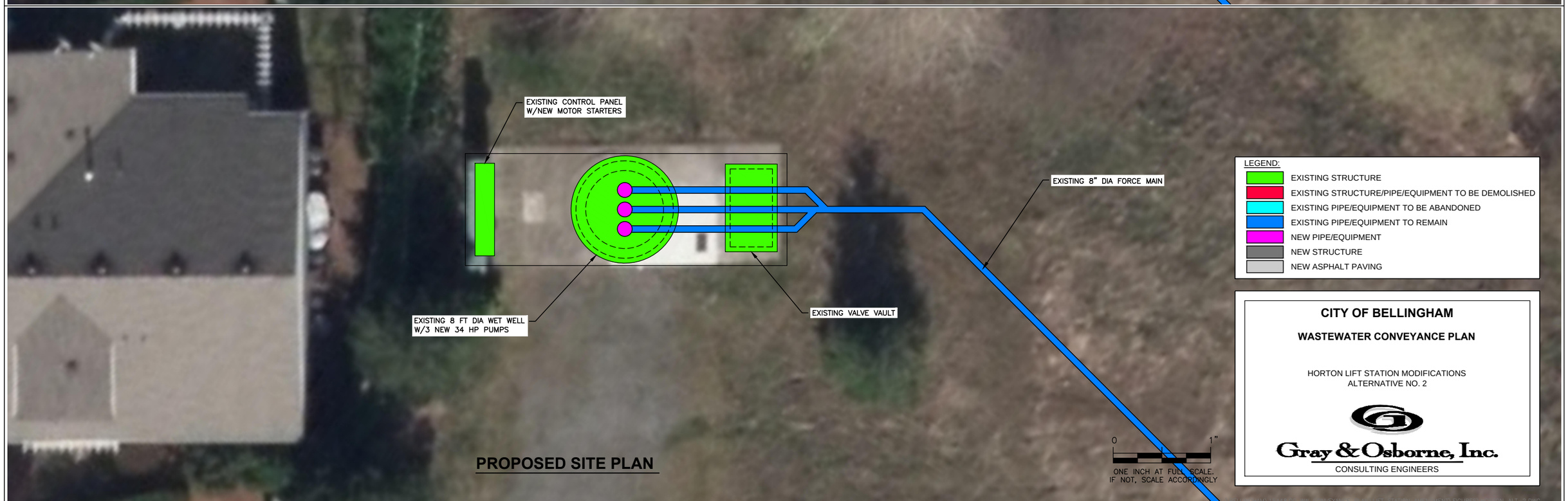

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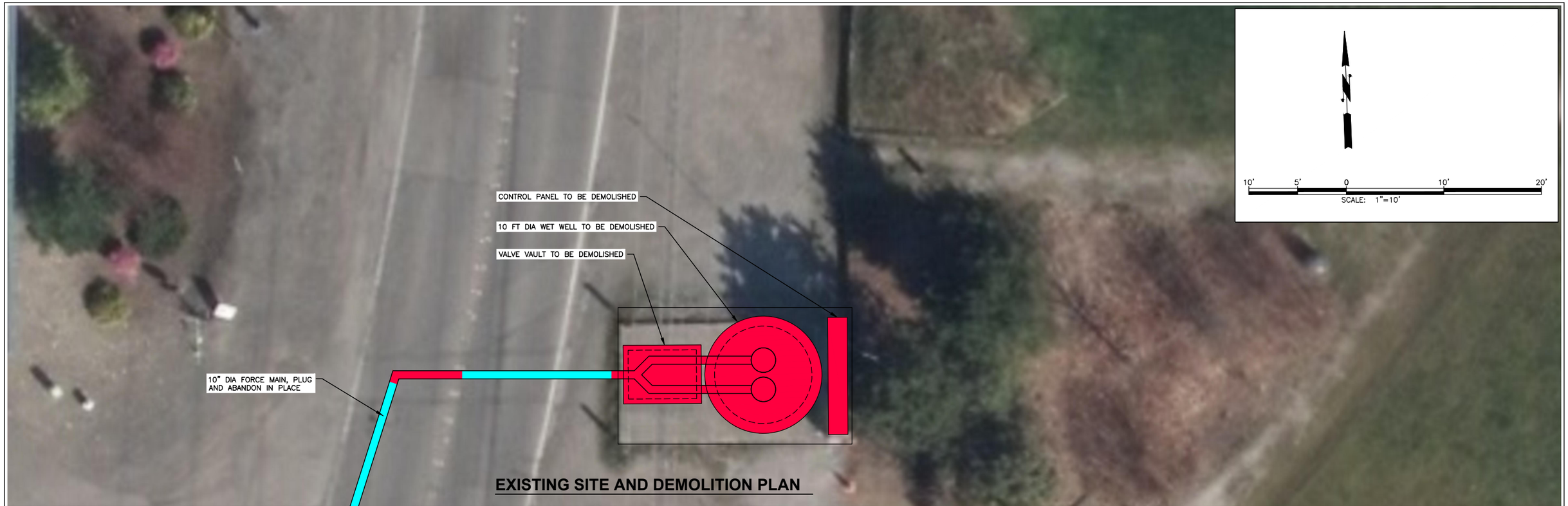

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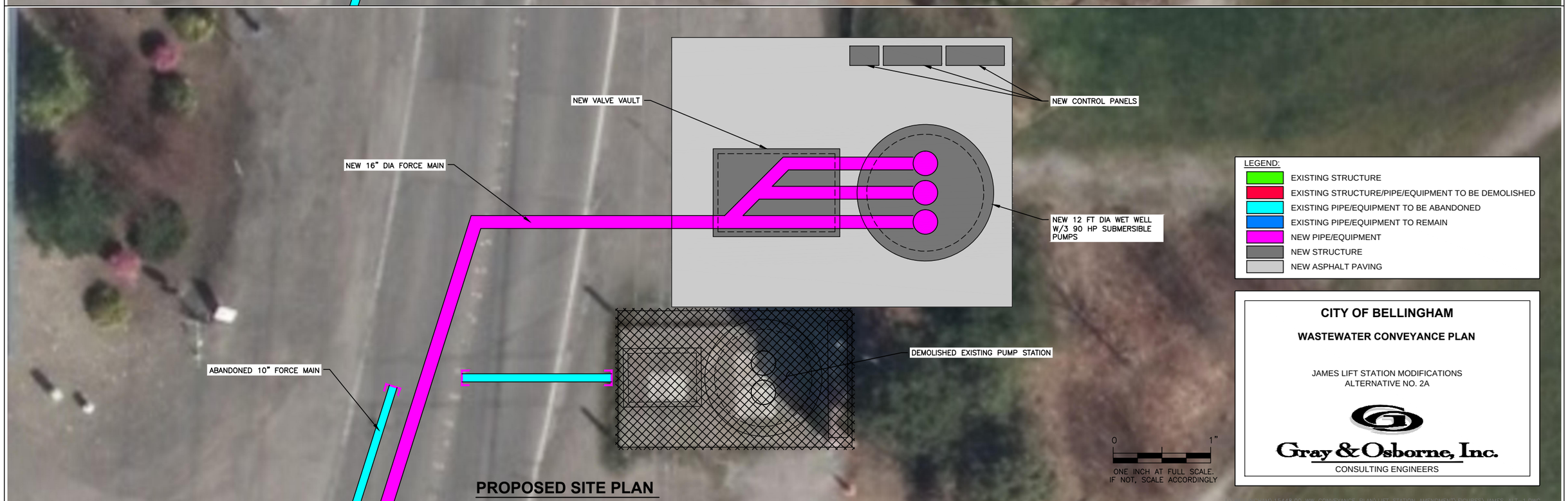

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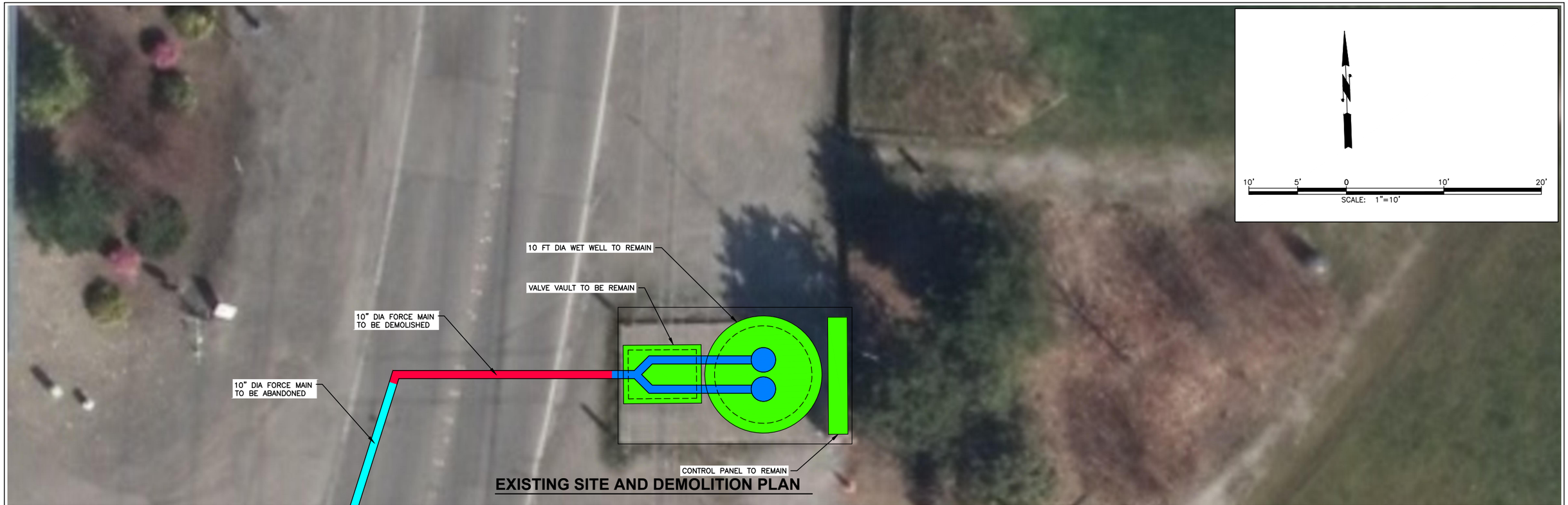

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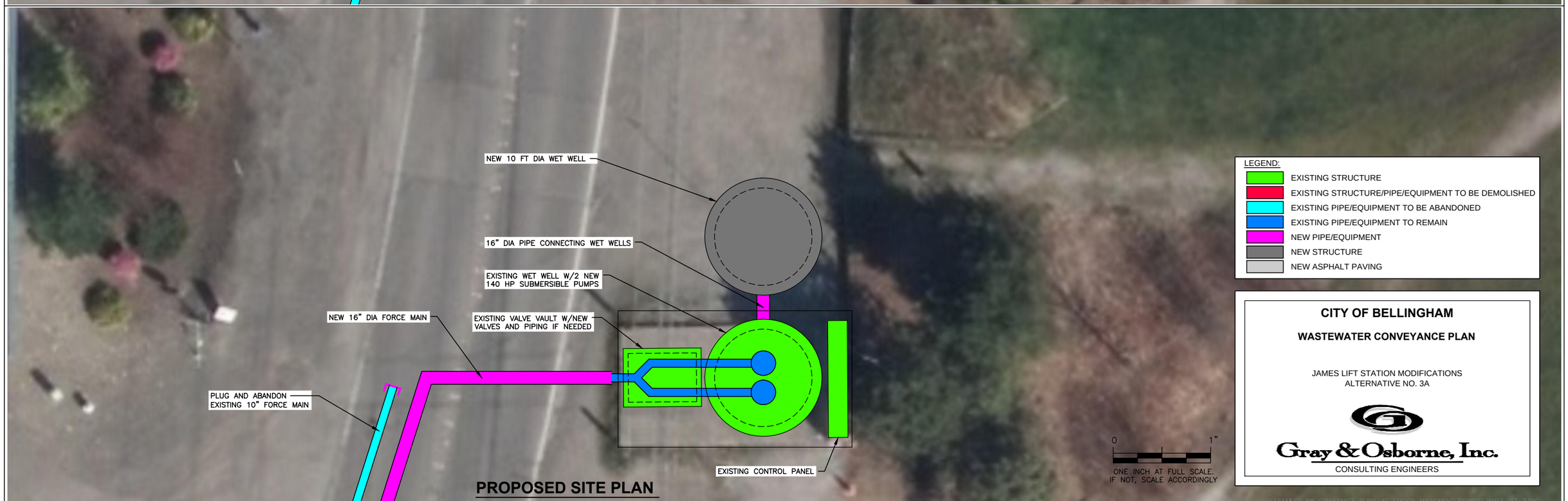

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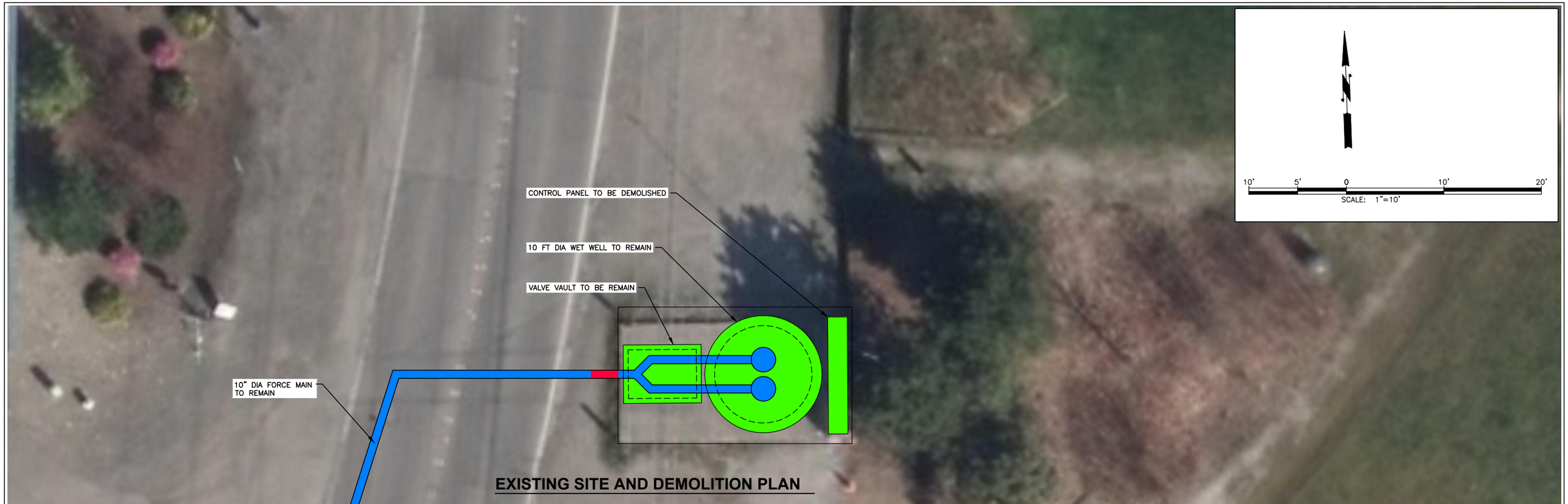

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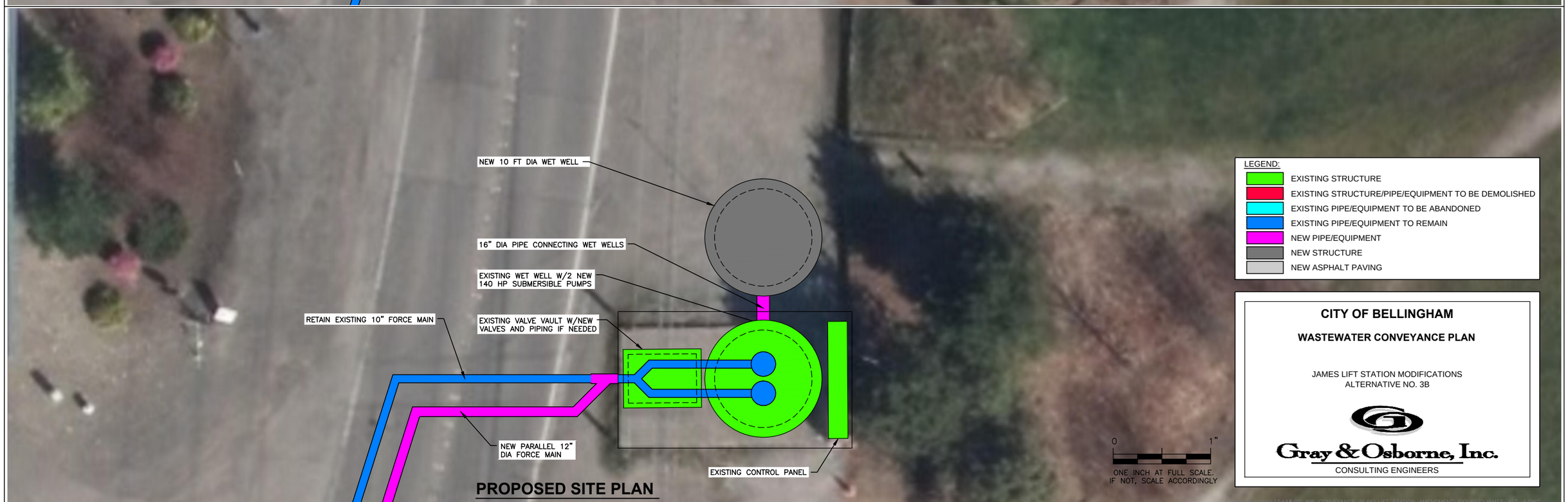

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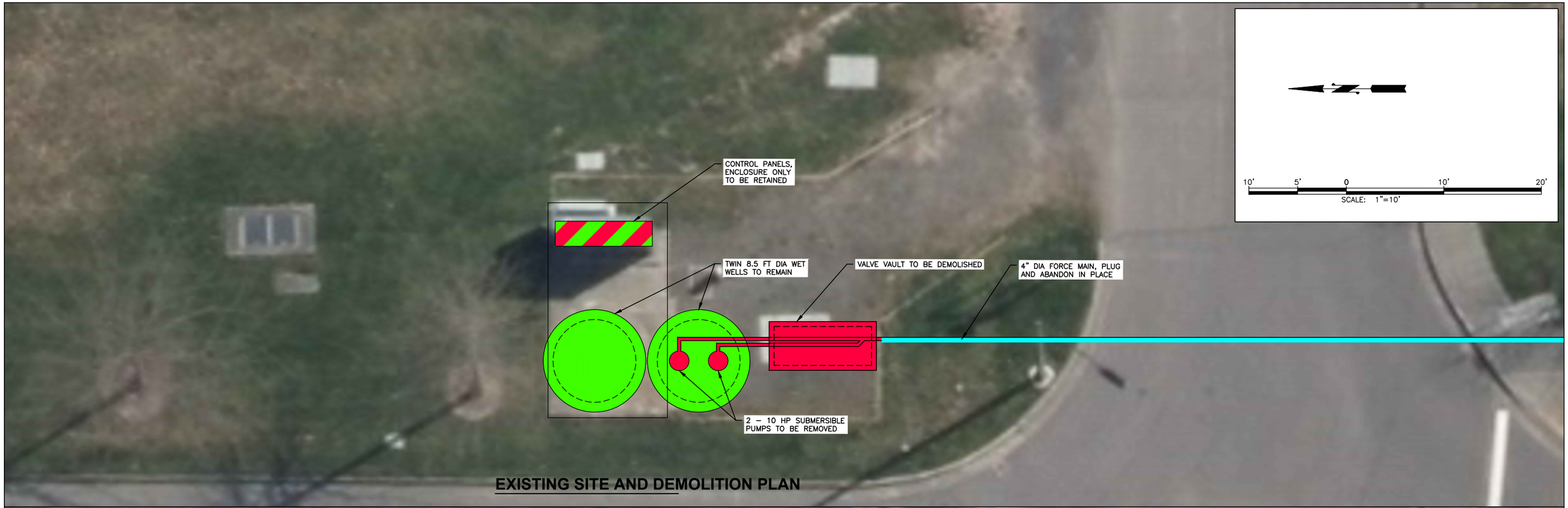

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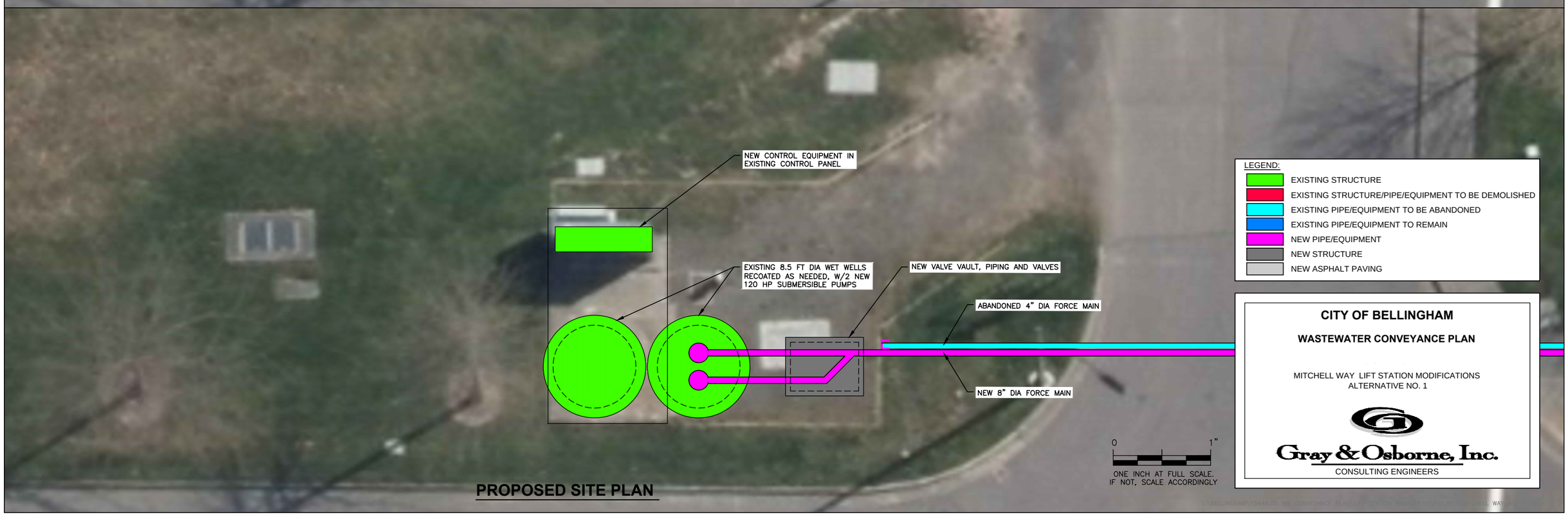

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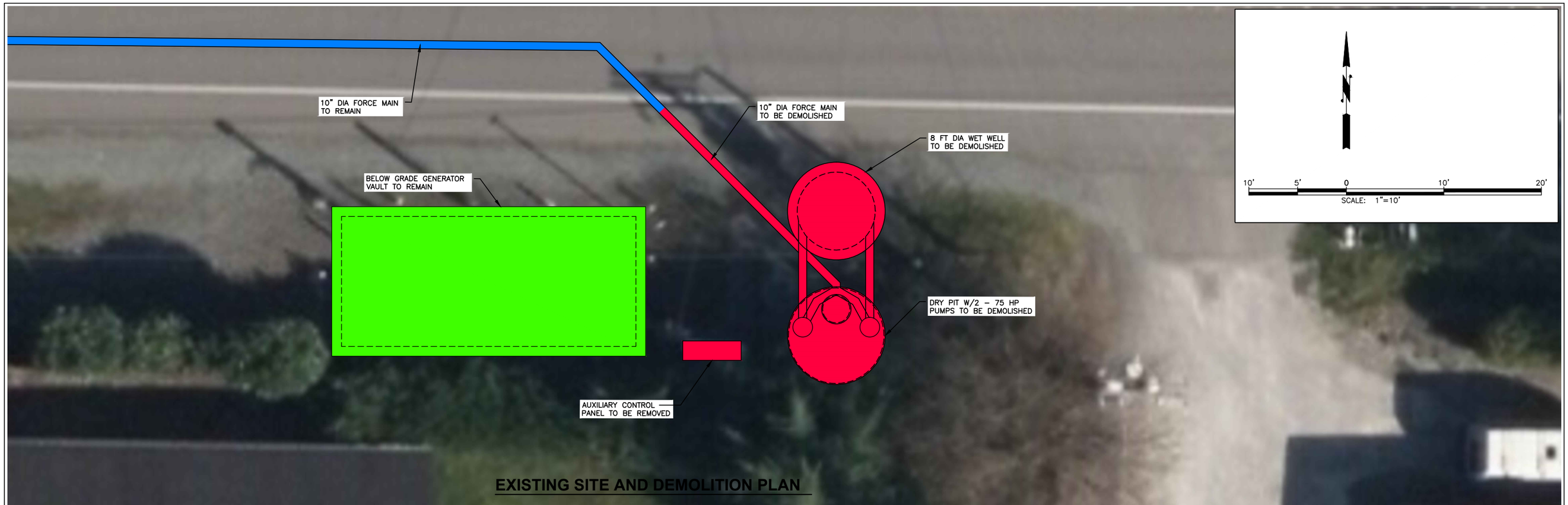

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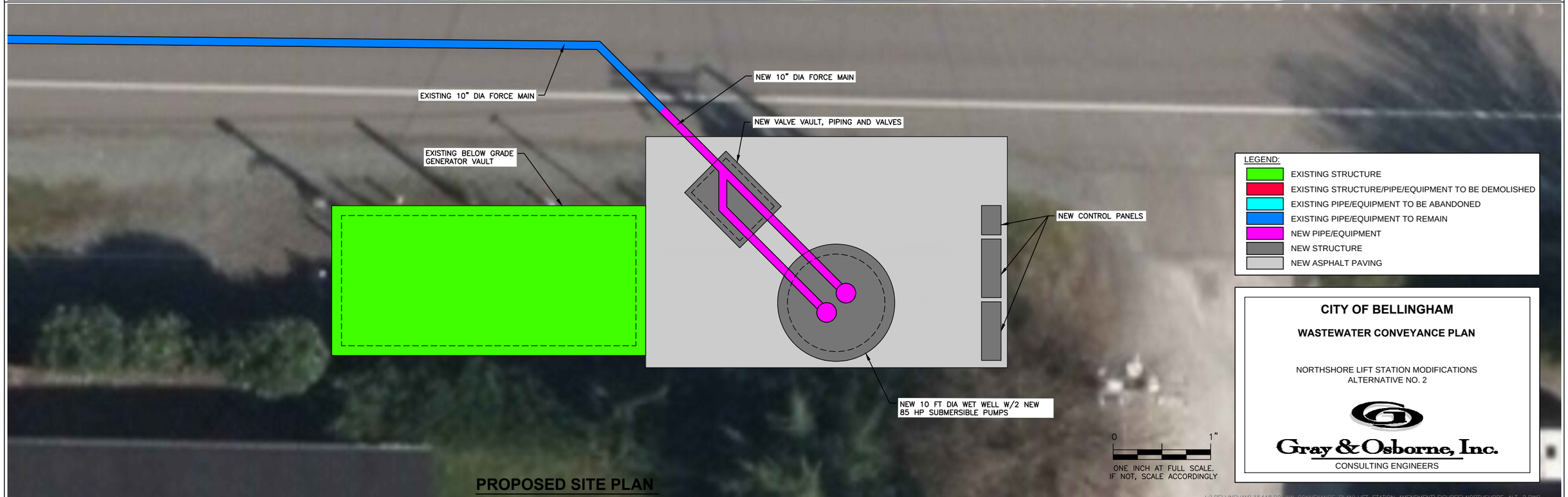

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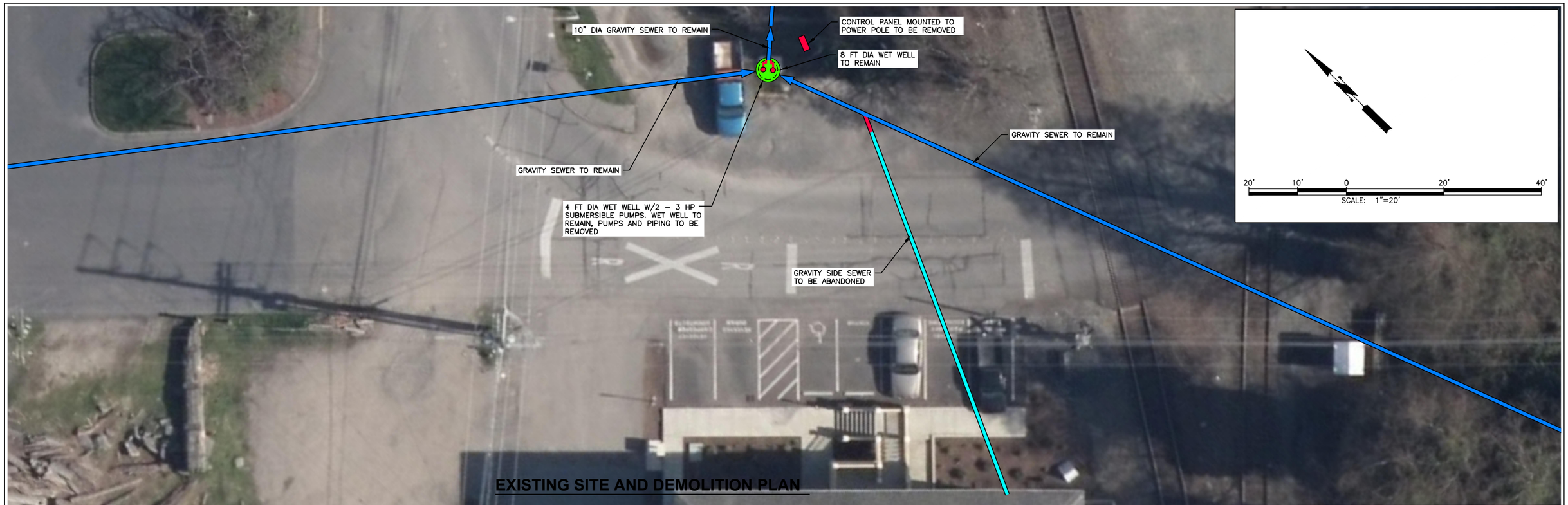

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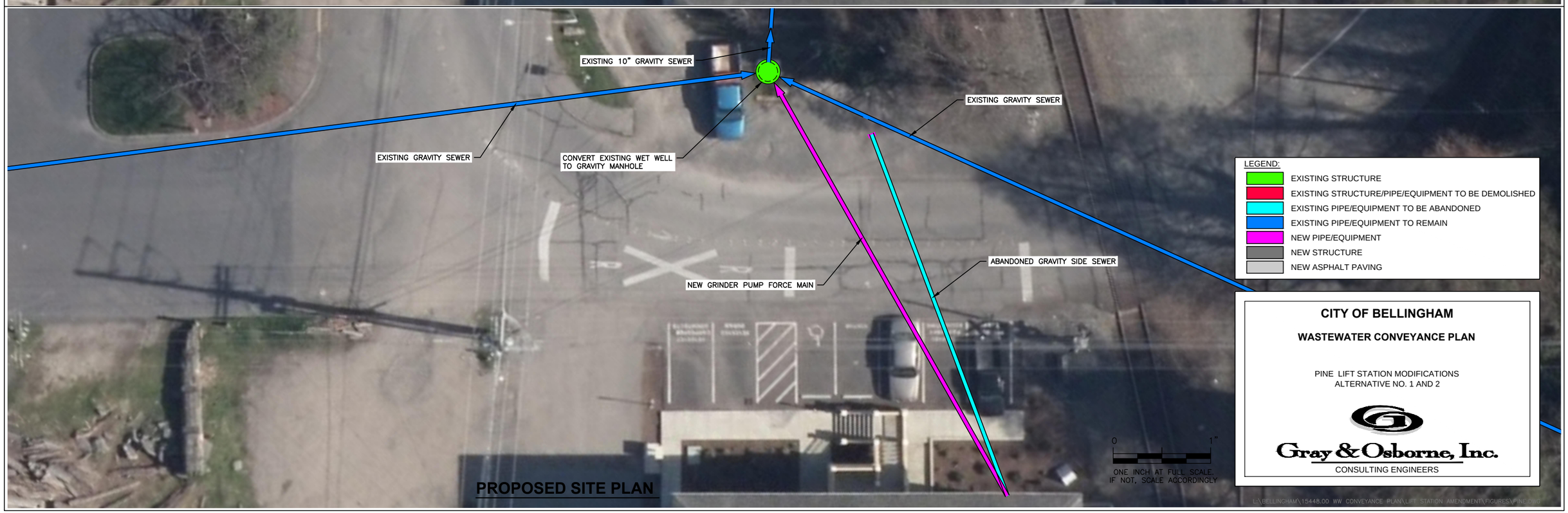

PROPOSED SITE PLAN

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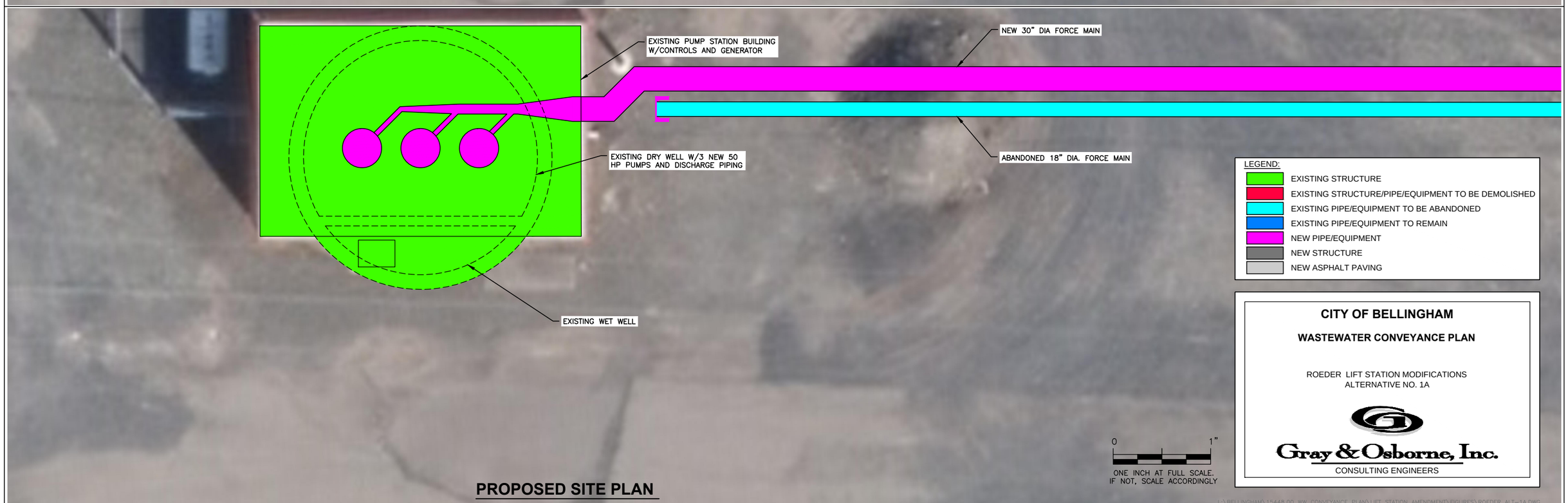

PROPOSED SITE PLAN

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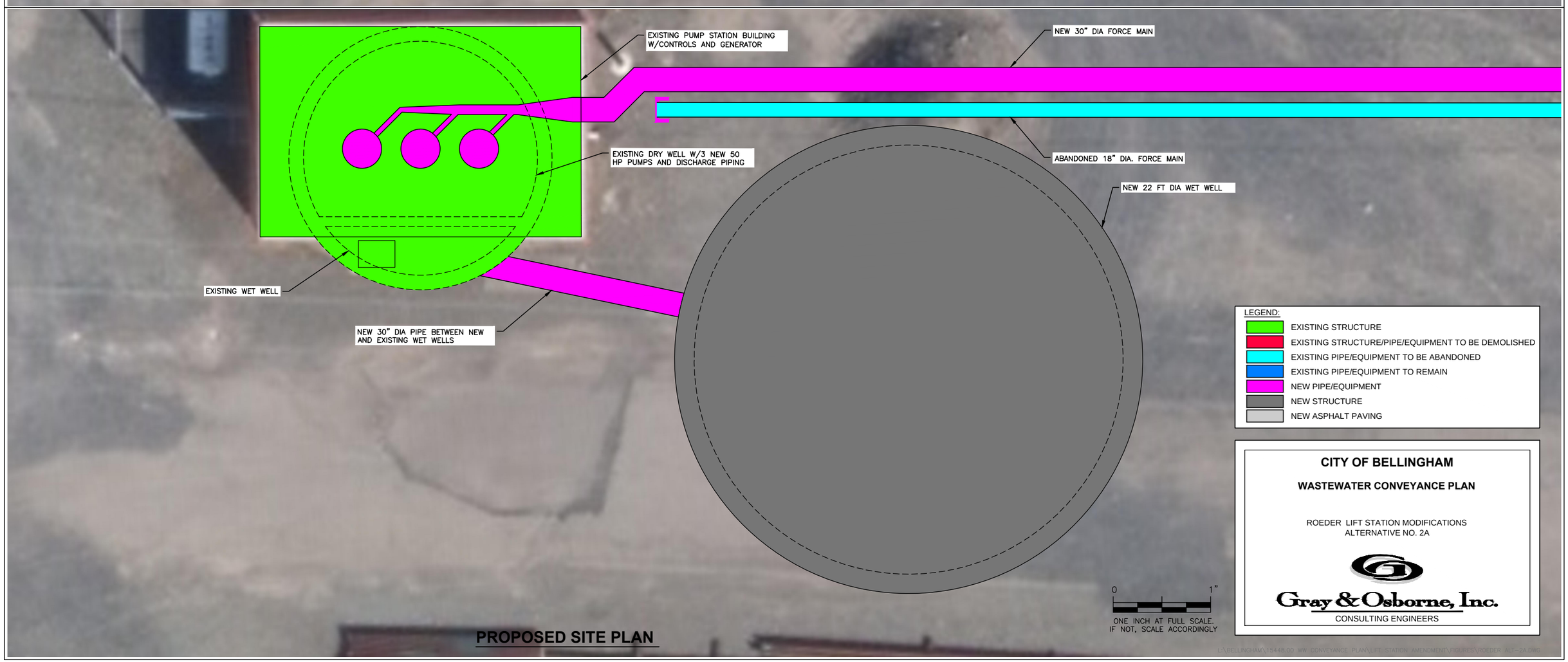
EXISTING SITE AND DEMOLITION PLAN



PROPOSED SITE PLAN

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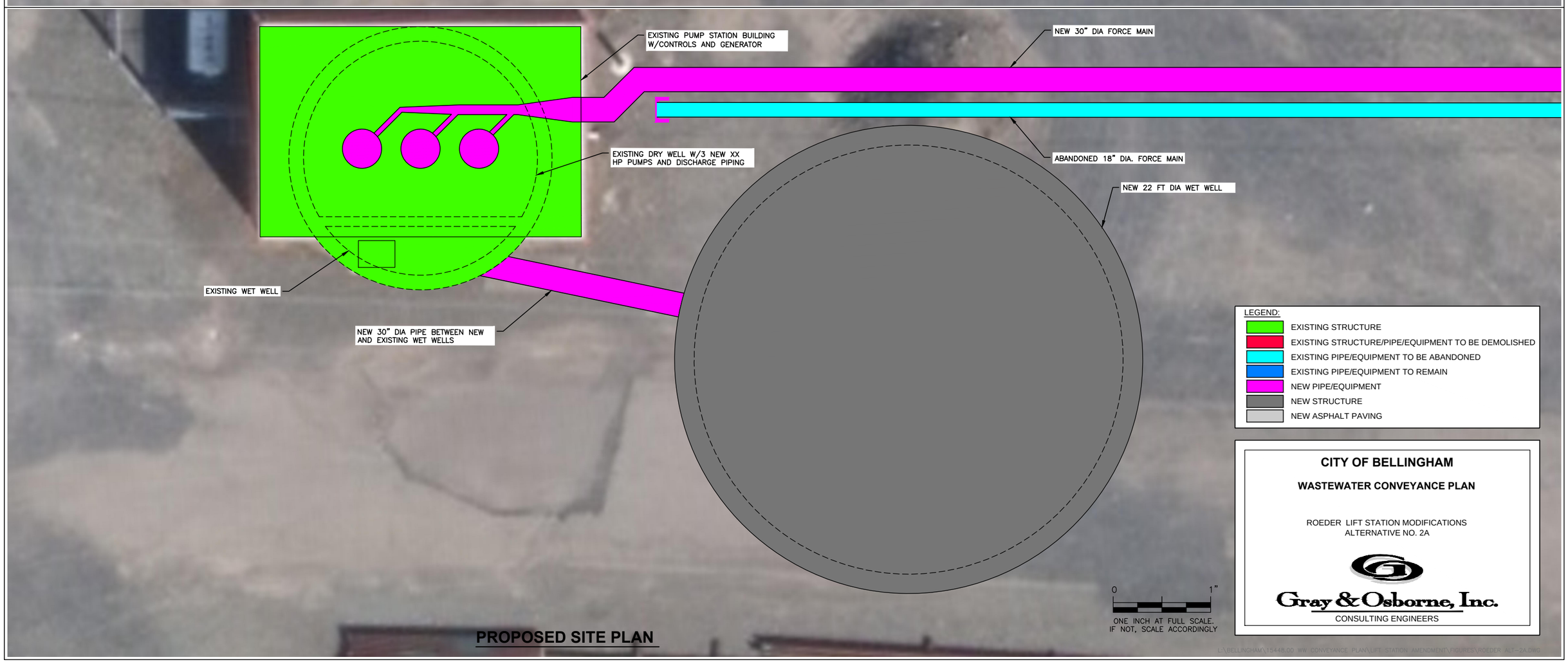
EXISTING SITE AND DEMOLITION PLAN



PROPOSED SITE PLAN

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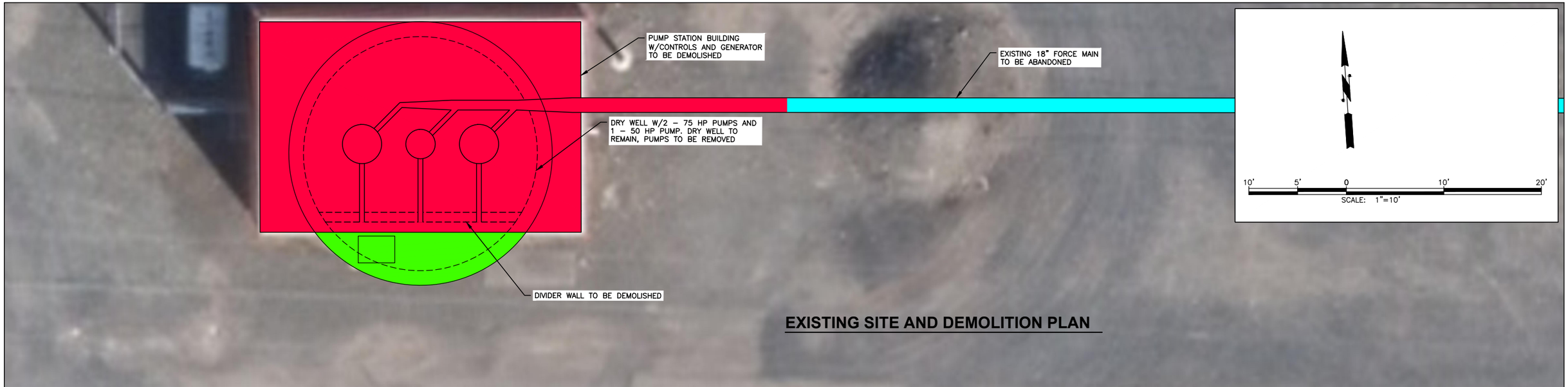
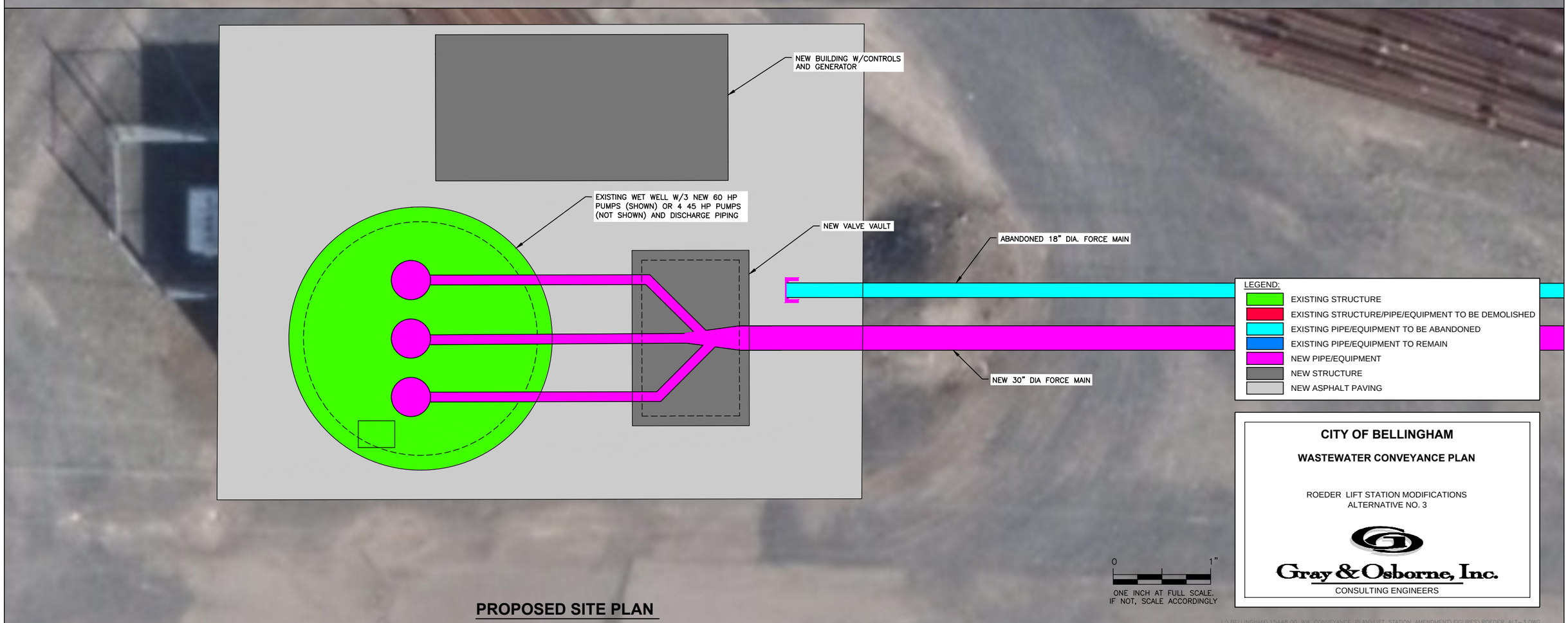


EXISTING SITE AND DEMOLITION PLAN



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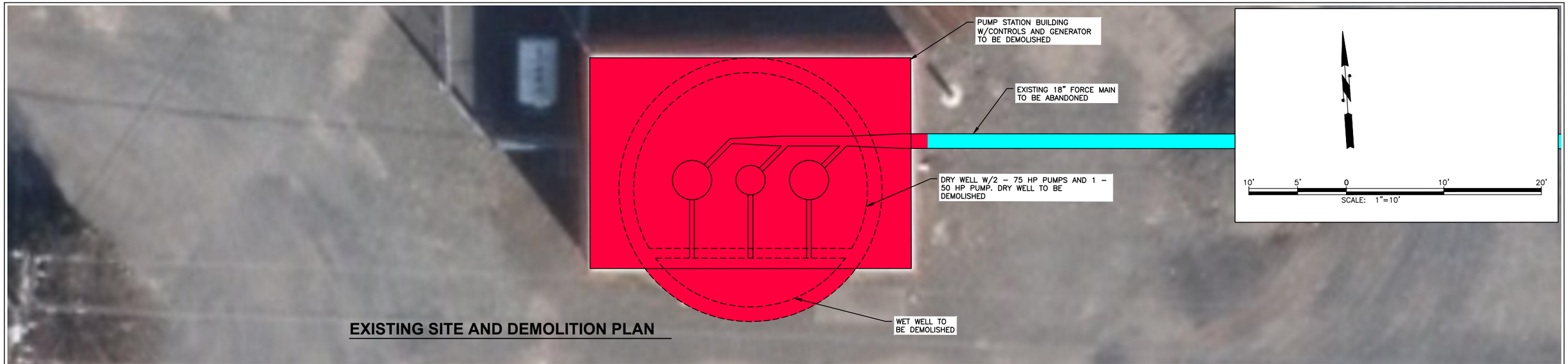

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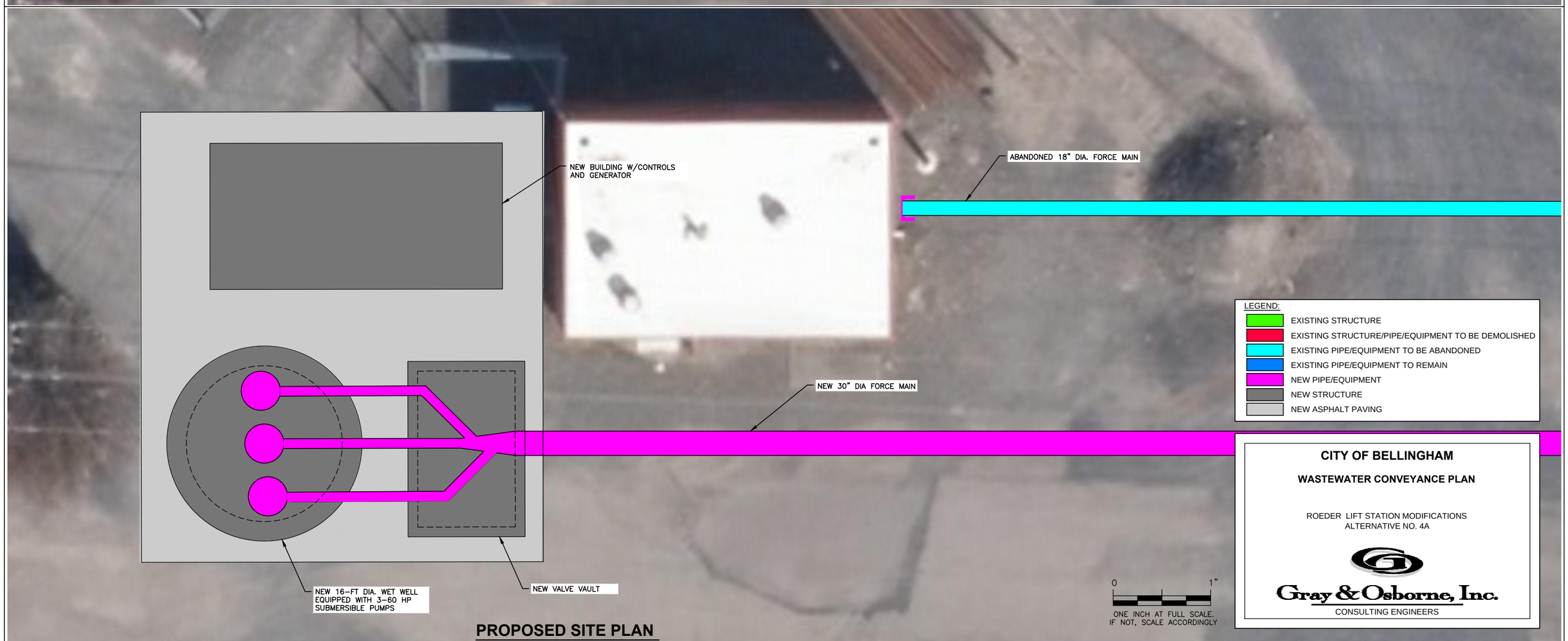

PROPOSED SITE PLAN

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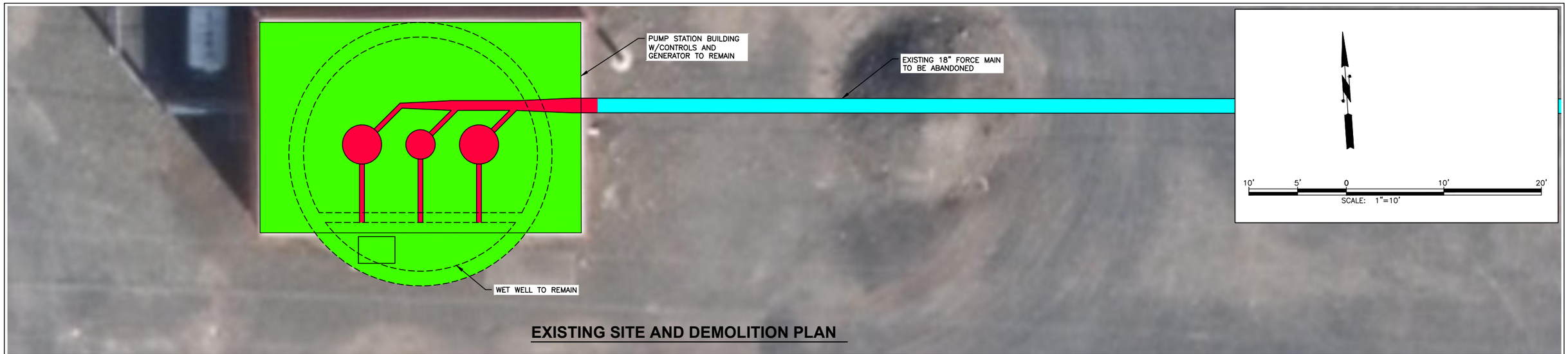

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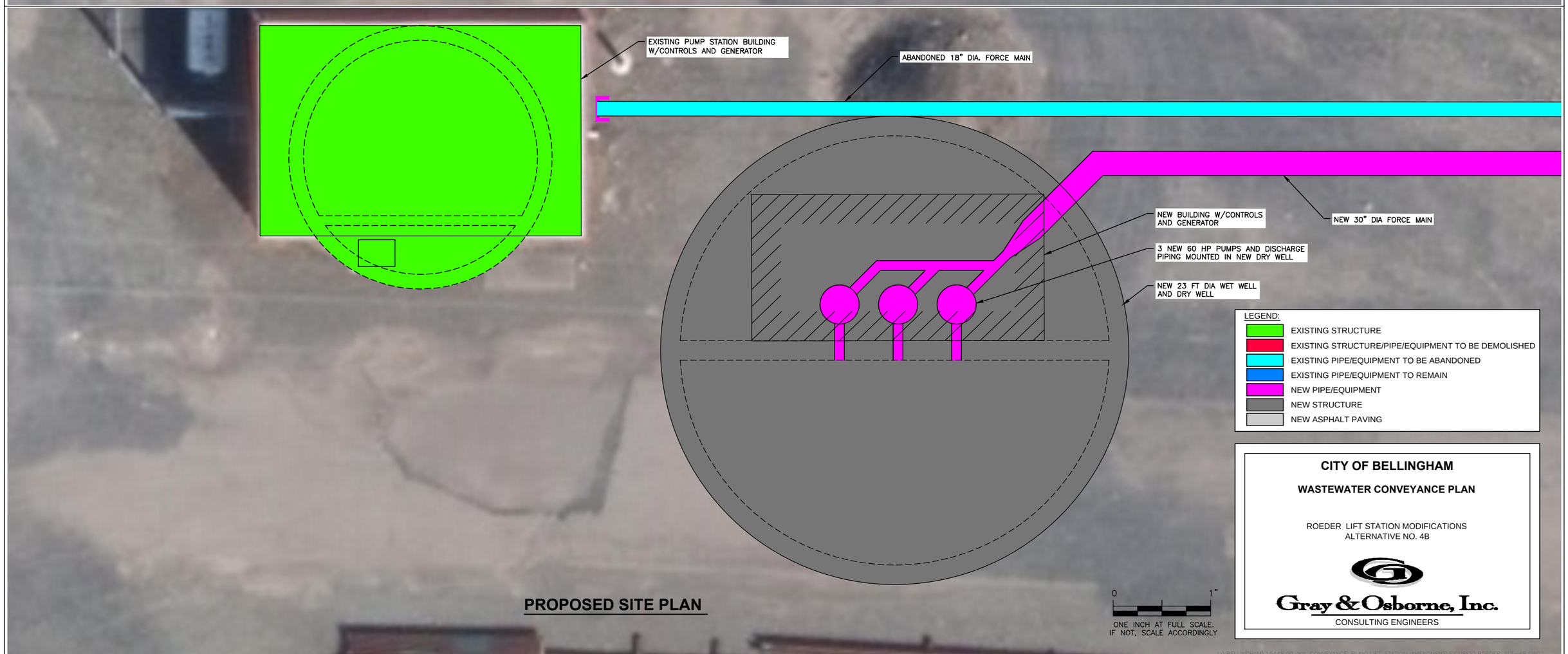

PROPOSED SITE PLAN

CITY OF BELLINGHAM

WASTEWATER CONVEYANCE PLAN

ROEDER LIFT STATION MODIFICATIONS
ALTERNATIVE NO. 4B

Gray & Osborne, Inc.
CONSULTING ENGINEERS

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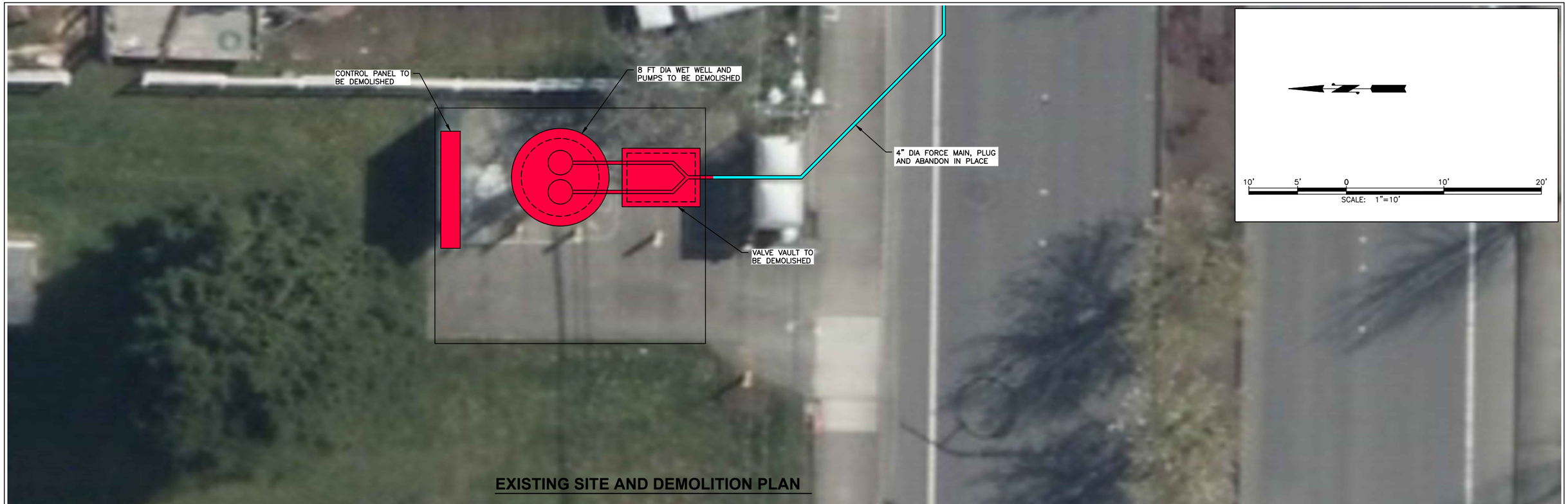

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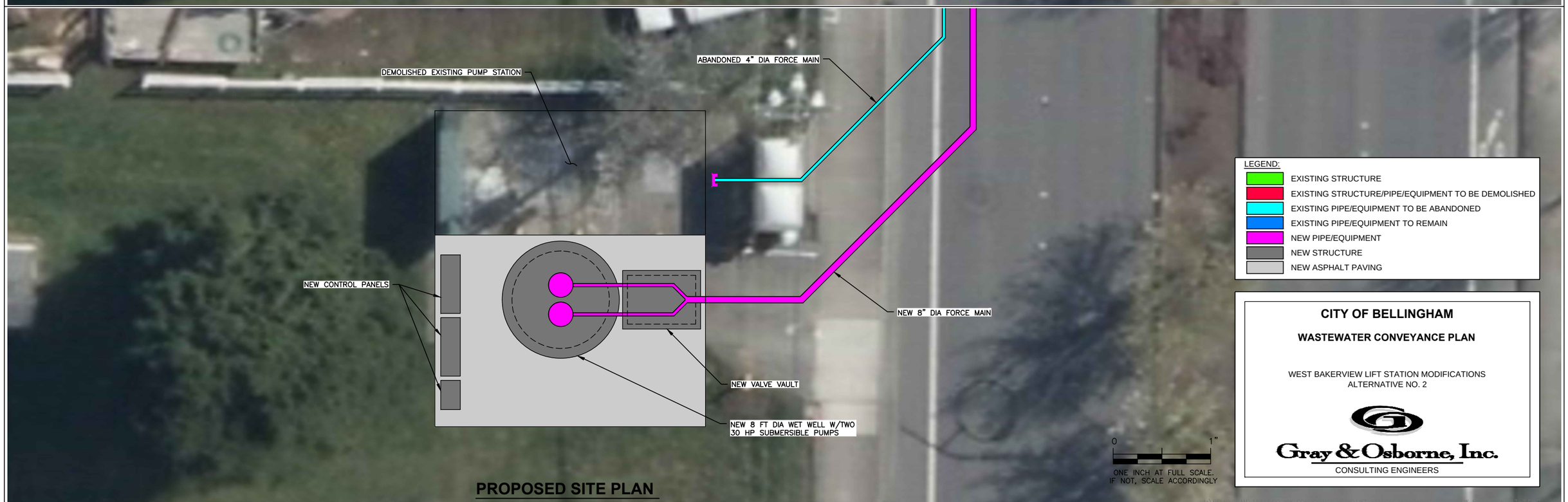

PROPOSED SITE PLAN

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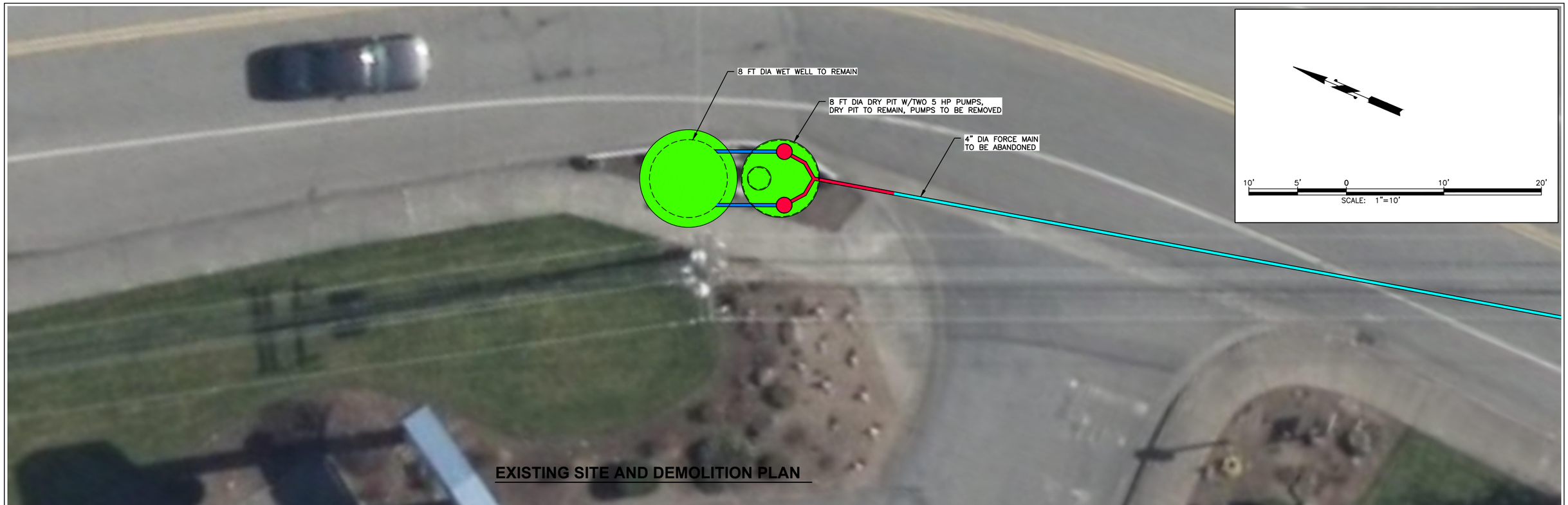

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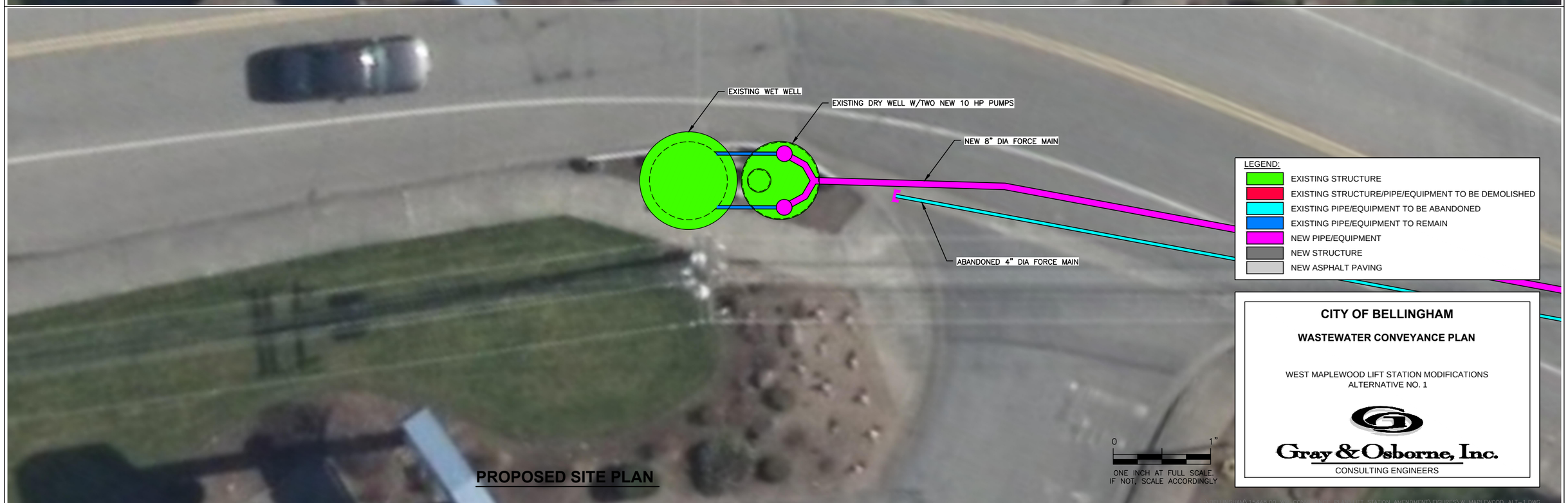

PROPOSED SITE PLAN

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