APPENDIX - D

TETRA TECH/KCM
230 South Franklin, Suite #212
Juneau, Alaska 99801-1364

Memorandum

City and Borough of Juneau
NORTH DOUGLAS SEWER, PHASE II (SUB-AREAS E AND F)
DESIGN OF EAGLE CREEK AND TOWER LIFT STATIONS

December 3, 2007

BACKGROUND INFORMATION

The CBJ has requested R&M Engineering to prepare construction documents for the installation of wastewater collection systems for three different areas along the North Douglas Highway. The overall area and existing lift stations are shown on Fig. 1. The systems to be designed include:

- A gravity system along the highway immediately north of Kowee Creek flowing to the existing West Juneau Lift Station (a 33-acre portion of Sub-Area D on Fig. 2, designated D-1 in Tables 1 through 6).

- A pumped system from the existing trailer parks near Eagle Creek on N. Douglas Highway to the most southerly beach manhole (BMH-18) installed in Phase I of the North Douglas Sewer project (serving Sub-Areas A, B, and E on Fig. 2).

- A pumped system from the beach near an existing radio tower that discharges into the gravity system installed to serve Sub-Area D (serving Sub-Areas C, F and a portion of D on Fig. 2). If the Eagle Creek lift station pumps to Sub-Area F, the Tower lift station will also pump the Eagle Creek flows.

R&M Engineering has requested that Tetratech/KCM prepare construction documents for the Eagle Creek and Tower Lift Stations as part of this phase of the project. The lift stations are intended to be sized so that they perform suitably with present estimated flows as well as with future flows that may be anticipated. In addition, Tt/KCM will review the condition of three lift stations downstream from the Eagle Creek lift station to ensure that they will function adequately with additional flows that may be proposed.

WASTEWATER FLOWS

Table 6 summarizes the minimum and maximum flows anticipated for the proposed lift stations. These flows are derived from the calculations shown in Table 1 through Table 5. The calculations are based on population and flow estimates prepared by R&M in their 1998 report and 8/28/06 project update, with modifications to allow for the possibility of transitional zoning in Sub-Areas A, B, D, E and F.

The design flows are generally based on development of each sub-area to about 31% of saturation density. The basis of the 1998 design flow estimates was the year 2028 which corresponded to about 31% of saturation flows. It is important that CBJ staff with knowledge of development plans for these sub-areas verify the population and flow estimates. We have generally discussed this with the Engineering Department, but if others in Engineering or Community Development have additional

information on specific plans or projects, it could affect the design flows. A few specific items that should be confirmed are:

LIFT STATION DESIGN CRITERIA

The minimum and maximum possible design flows to each proposed lift station are shown in Table 6. Using these estimates, it appears that the stations should be designed for the following conditions:

1. Eagle Creek Lift Station will meet its functional goals if it can accommodate the design flow anticipated for all of Sub-Areas A, B and E (130,200 gpd and 280 gpm) and also operate adequately at the present flows estimated for Sub-Area A only (28,100 gpd and 73 gpm).

2. Tower Lift Station will meet its functional goals if it can accommodate the design flow anticipated for all of Sub-Areas C, F and a portion of D not served by gravity to West Juneau (156,700 gpd and 337 gpm) and also operate adequately at the present flows estimated for these sub-areas (19,700 gpd and 51 gpm).

3. If the Eagle Creek Lift Station is designed to discharge in a northerly direction to the Falls Creek system, the existing lift stations at Channel Drive and Channel Vista should be evaluated to accommodate the additional flows indicated in Item 1 above (130,200 gpd and 280 gpm - design, 28,100 gpd and 73 gpm - initial).

4. If the Eagle Creek Lift Station is designed to discharge to the proposed Tower Lift Station system, the Tower Lift should be designed to accommodate flows from all the sub-areas not served by gravity to West Juneau (286,900 gpd and 618 gpm - design, 57,800 gpd and 149 gpm - initial).

5. Phasing of the work will be important in determining initial pump sizes. For example, if only Sub-Area F is initially connected to the Tower Lift Station, the minimum flows during startup could be as low as 13,100 gpd and 34 gpm.

If the CBJ staff and other project stakeholders are in agreement with these criteria, we will determine the final pump and forcemain sizes for these conditions and recommend any interim changes to existing lift stations that may be needed. Hopefully, the forcemains can be sized to meet any of the anticipated conditions without modifications in the future, and any pump future changes that may be required will be minor. It is also our understanding that the proposed lift stations will not require emergency generator sets or buildings.

Initial review of Falls Creek, Channel Drive and Channel Vista lift stations is shown in Table 7. Looking at a typical winter month's records (Dec 2005), the pumps at these stations currently operate at the following approximate rates:

Falls Creek – 2 hours per day
Channel Drive – 4.2 hours per day
Channel Vista – 5 hours per day

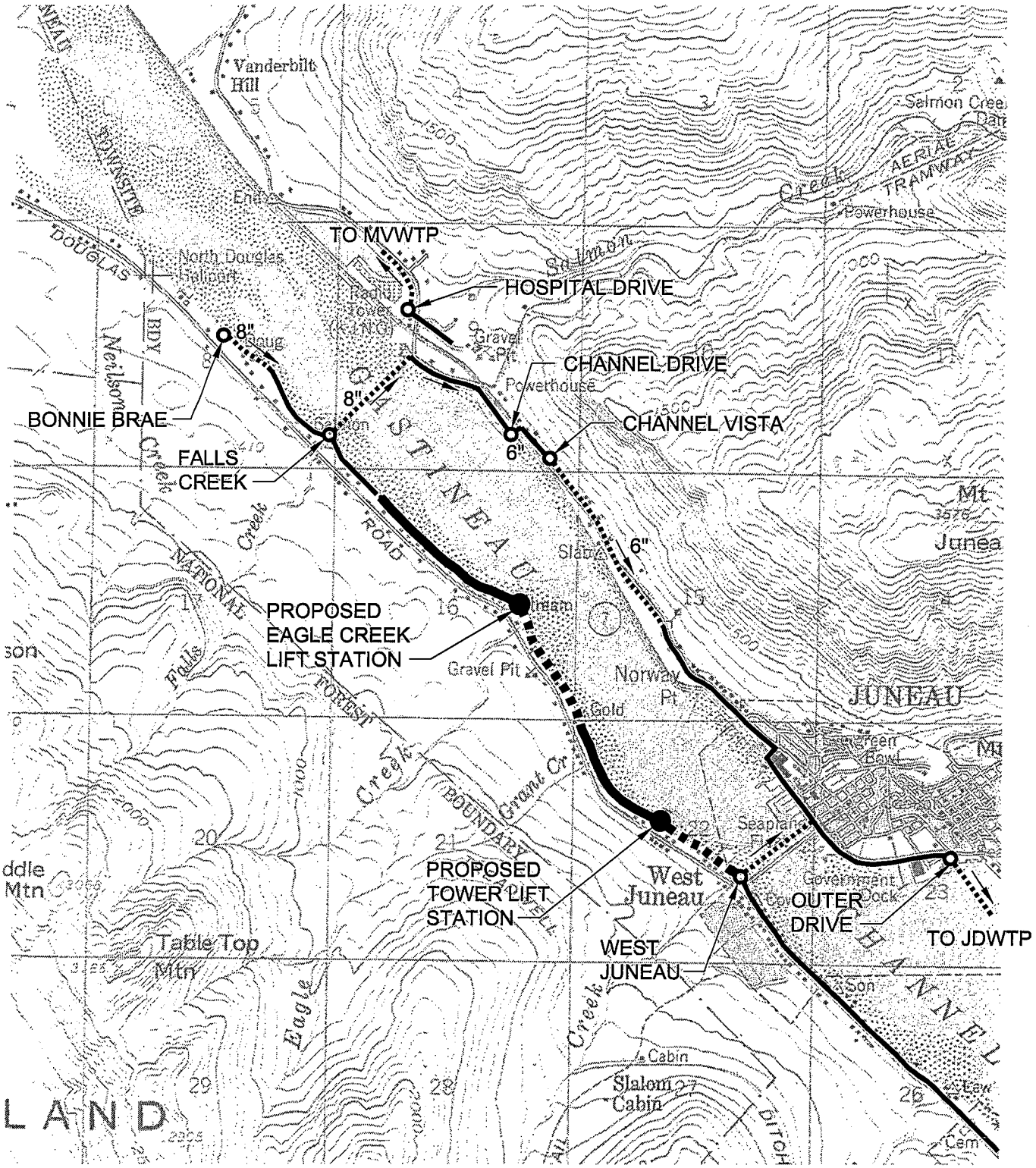
These stations are pumping a dry weather average of about 50,000 to 60,000 gpd, so the proposed addition from Eagle Creek of 28,600 to 130,200 gpd will result in about a 50% to 200% increase in dry

weather flows. Even with this increase, the pump operating times at Falls Creek will not be unusually high. However, the design year flows would more than double the wet weather flows at Channel Drive and Channel Vista. Because both these stations are operating at 10 to 12 hours of pumping per day during peak rainfall events, it appears that both stations will need larger pumps within the near future if the Eagle Creek Lift Station flows are directed northerly toward Falls Creek. Even the present flows from Eagle Creek will exacerbate a problem that already exists between the Channel Drive and Channel Vista stations, where Channel Drive's pumps have somewhat higher flows than Channel Vista's and occasionally cause high level alarms at Channel Vista.

DESIGN SERVICES

In order to provide the most cost-effective installation, some judgments will be necessary which we assume the CBJ will participate in making. After the above design flows are agreed upon, we would propose the following services for Tt/KCM:

1. Determine sizing of pumps and forcemain for Eagle Creek and Tower lift stations.
2. Determine the improvements required at Falls Creek, Channel Drive and Channel Vista lift stations if Eagle Creek flows are directed northerly.
3. After concurrence from CBJ on the recommended plan, prepare construction documents for the Eagle Creek and Tower lift stations and improvements at the other stations. At this time, it is anticipated that the only improvements required at the other stations will be the possible change in pumps at Channel Vista. Any additional work required at the other stations will not be included in our design services unless requested.



0 1/4 1/2 3/4 1 MILES

N

LEGEND

- Existing Lift Station
- Existing Gravity Sewer
- Existing Force Main
- Proposed Lift Station
- Proposed Gravity Sewer
- Proposed Force Main

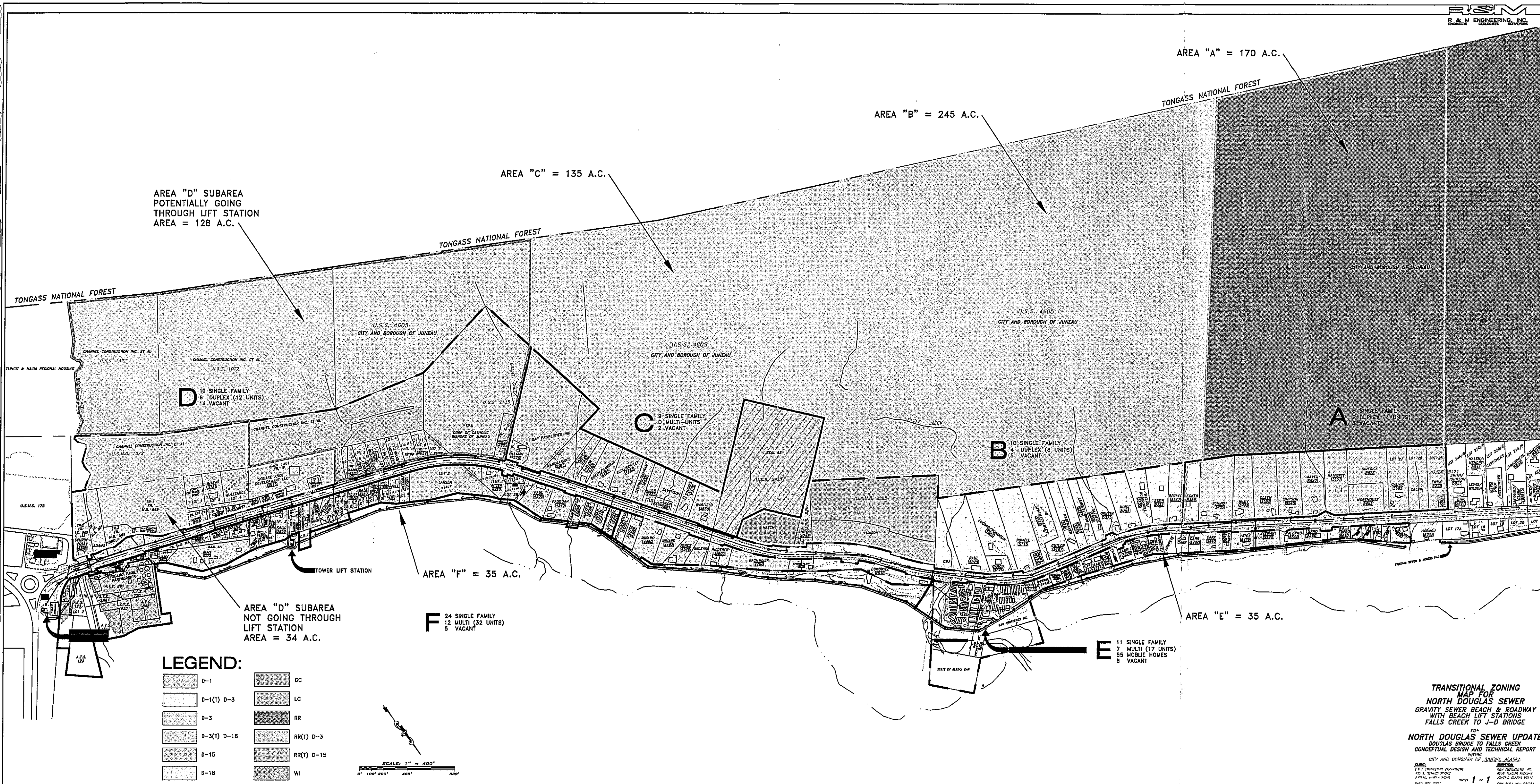
LIFT STATION LOCATIONS AND SYSTEM SCHEMATIC

FIGURE 1

TETRA TECH
www.tetratech.com
230 South Franklin, Suite 212
Juneau, Alaska 99801
Phone: 907-586-6400 Fax: 907-463-3677

City and Borough of Juneau
North Douglas Sewer Extension

Path: S:\CADD\36900026 Juneau Lift Sta\Figure1.dwg Plot date: Nov 06, 2007-06:44:23am CAD User: Jeff.Wicke.
Xref Filename:


R & M ENGINEERING, INC.
AREA "A" = 170 A.C.
AREA "B" = 245 A.C.
AREA "C" = 135 A.C.
AREA "D" SUBAREA
POTENTIALLY GOING
THROUGH LIFT STATION
AREA = 128 A.C.
TONGASS NATIONAL FOREST
TONGASS NATIONAL FOREST
TONGASS NATIONAL FOREST
U.S.S. 4605
CITY AND BOROUGH OF JUNEAU
CITY AND BOROUGH OF JUNEAU
D
10 SINGLE FAMILY
6 DUPLEX (12 UNITS)
14 VACANT
C
9 SINGLE FAMILY
0 MULTI-UNITS
2 VACANT
B
10 SINGLE FAMILY
4 DUPLEX (8 UNITS)
5 VACANT
A
8 SINGLE FAMILY
2 DUPLEX (4 UNITS)
3 VACANT
TOWER LIFT STATION
AREA "F" = 35 A.C.
AREA "D" SUBAREA
NOT GOING THROUGH
LIFT STATION
AREA = 34 A.C.
F
24 SINGLE FAMILY
12 MULTI (32 UNITS)
5 VACANT
AREA "E" = 35 A.C.
E
11 SINGLE FAMILY
7 MULTI (17 UNITS)
55 MOBLIE HOMES
8 VACANT
LEGEND:
D-1
D-1(T) D-3
D-3
D-3(T) D-18
D-15
D-18
GC
LC
RR
RR(T) D-3
RR(T) D-15
WI
SCALE: 1" = 400'
TRANSITIONAL ZONING
MAP FOR
NORTH DOUGLAS SEWER
GRAVITY SEWER BEACH & ROADWAY
WITH BEACH LIFT STATIONS
FALLS CREEK TO J-D BRIDGE
FOR
NORTH DOUGLAS SEWER UPDATE
DOUGLAS BRIDGE TO FALLS CREEK
CONCEPTUAL DESIGN AND TECHNICAL REPORT
WITHIN
CITY AND BOROUGH OF JUNEAU, ALASKA
1 OF 1

NORTH DOUGLAS
TRANSITIONAL ZONING

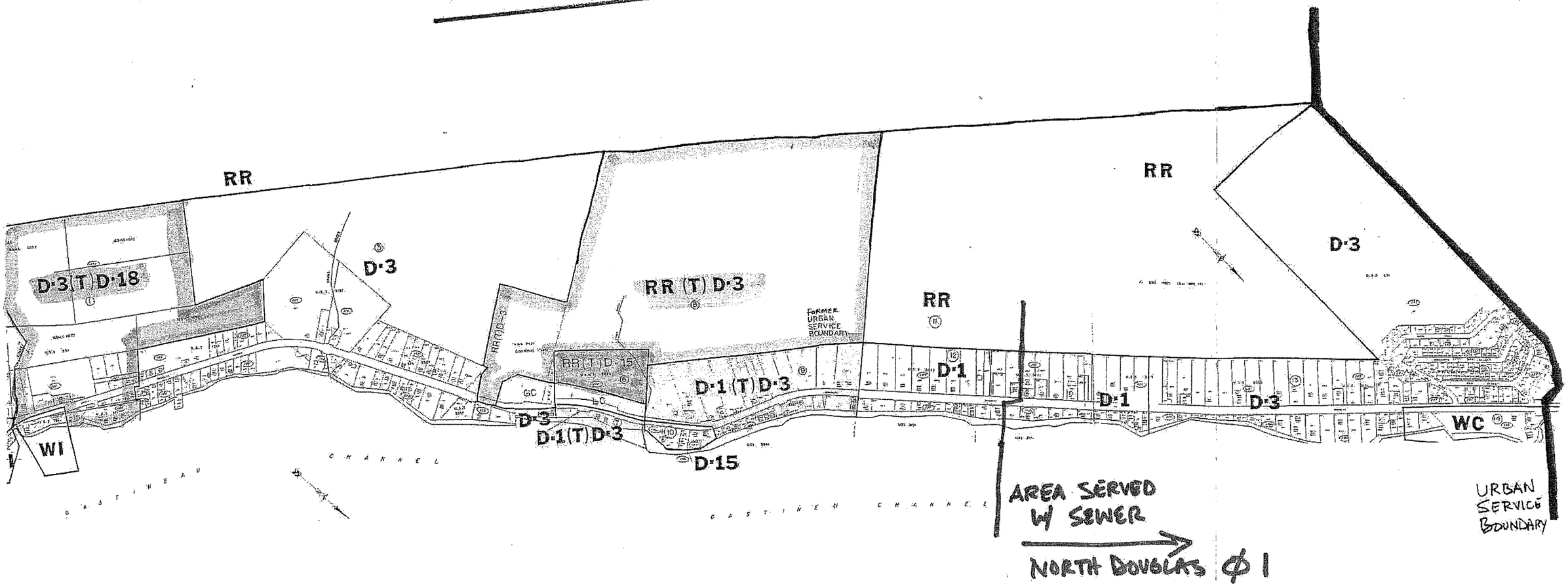


FIG. 3

North Douglas Sewer, Phase II 12/3/2007
Eagle Cr and Tower Lift Stations
Preliminary Review of Force Main and Pump Sizing

Table 1. Design Flows

	Sub-Areas to Falls Creek or West Juneau			Sub-Areas to West Juneau			Total of All Sub-Areas		
	Sub-Area E Only (per 1998 Plan)	Sub-Area, A, B, E (per 1998 Plan)	Sub-Areas A, B, E Based on Zoning	Sub-Areas C,D, F (per 1998 Plan)	Sub-Areas C,D, F Based on Zoning	Sub-Areas C,D-2,F Based on Zoning	Sub-Areas A thru F (per 1998 Plan)	A thru F Based on Zoning	A thru F excluding D-2 Based on Zoning
Present Flows									
Average Daily	28,100 gpd	38,100 gpd	38,100 gpd	22,300 gpd	22,300 gpd	19,700 gpd	60,400 gpd	60,400 gpd	0 gpd
Peak Hourly	73 gpm	98 gpm	98 gpm	57 gpm	57 gpm	51 gpm	155 gpm	155 gpm	0 gpm
Design Flows									
Average Daily	30,990 gpd	56,000 gpd	130,200 gpd*	32,510 gpd	204,100 gpd*	156,700 gpd*	88,510 gpd	334,300 gpd*	286,900 gpd*
Peak Hourly	76 gpm	136 gpm	280 gpm	80 gpm	439 gpm	337 gpm	216 gpm	720 gpm	618 gpm
Saturation Flows									
Average Daily	30,990 gpd	133,300 gpd	420,000 gpd**	156,400 gpd	658,500 gpd**	505,500 gpd**	289,700 gpd	1,078,500 gpd**	925,500 gpd**
Peak Hourly	65 gpm	286 gpm	904 gpm	336 gpm	1,418 gpm	1,088 gpm	622 gpm	2,322 gpm	1,992 gpm

* Assuming 31% of saturation (approx 31% used in 1998 plan to estimate design flows)
** Based on Zoning from Table 4 below

Table 2. Force Main and Pump Sizes

Force main size	6	6	8	8	8
Nominal pumping rate (gpm)	200	400	400	600	800
Pipeline velocity (fps)	2.3	4.4	2.8	4.0	5.3
Friction loss(psi/100')	0.13	0.47	0.13	0.28	0.47
Pipeline length	4000	4000	4000	4000	4000
Total friction loss (ft)	12.0	43.4	12.0	25.9	43.4
Static head	14.0	14.0	14.0	14.0	14.0
TDH	26.0	57.4	26.0	39.9	57.4
Approx HP	2.6	11.6	5.3	12.1	23.2
Power (kwh/1000 gallon pumped)	0.163	0.361	0.163	0.250	0.361
Energy consumption, average (kwh/year	4,719	10,418	4,719	7,233	10,418
Electrical energy cost/year	$472	$1,042	$472	$723	$1,042
Flygt Pump	CP3085-434	CP3127-483	CT3127-433	NP3127-438	NP3153-433
Duty point flow (gpm)	230	380	480	640	790
Running times - each pump (hours per day)					
Present flows (Sub-Areas E only	1.2	0.6	0.6	0.4	0.3
Present flows (Sub-Areas A thru F)	2.5	1.3	1.3	0.8	0.6
Design Flows (Sub-Areas A thru F)	3.7	1.8	1.8	1.2	0.9
Saturation Flows (Sub-Areas A thru F)	12.1	6.0	6.0	4.0	3.0
Saturation Flows (Sub-Areas A thru F w/ rezone)	44.9	22.5	22.5	15.0	11.2

Pump HP based on 50% efficiency
Energy consumption based on average of 28,100 gpd and 130,200 gpd
Electrical energy cost based on $0.10 per kwh (consumption only, no demand charge included)

Table 3. Total Pumping Costs to Outer Drive Lift Station

	Sub-Area E		Sub-Areas A, B, E		Sub-Areas C,D,F	
Present Flow	28,100 gpd		38,100 gpd		22,300 gpd	
Design Flow	30,990 gpd		130,200 gpd		204,100 gpd	
Pumping direction	Falls Cr	W. Juneau	Falls Cr	W. Juneau	Falls Cr	W. Juneau
Number of lift stations	4	3	4	3	5	2
Power required (kwh/1000 gal pumped)	1	0.75	1	0.75	1.25	0.5
Energy consumption, at average (kwh/year)	10,784	8,088	30,715	23,036	51,648	20,659
Electrical energy cost/year	$1,078	$809	$3,071	$2,304	$5,165	$2,066

Assume power reqt (kwh/1000 gal pumped) = 0.25
Energy consumption based on average of present flow and design year flow
Electrical energy cost based on $0.10 per kwh (consumption only, no demand charge included)

Table 4. Saturation and Design Flow Estimates Based on Existing and Transitional Zoning

	Area 'D-1'	Area 'D-2'		Area C		Area B					Area A			Area E				Area F		
Current Zoning	D3 T D18	D3 T D18	D3	D3	SEAL	RR T D3	RR T D15	D1 T D3	LC	GC	RR	D-1	D-1 T D-3	D-3	D-1 T D-18	D-15	D-1	D-3	D-3 T D-18	WI
Future Zoning	D18	D18	D3	D3	RR	D3	D15	D3	18	18	D3	D3	D3	D3	D18	D15	D3	D3	D18	18
Area (ac)	34	63	65	135	15	200	10	28	4	3	142	26	2	8	7	3	5	18	5	8
Lot Size (sf)		126																		
1998 plan																				
Possible min																				
Dwelling units																				
1998 plan [3]																				
Possible max	612	1134	195	405	0	600	150	84	72	54	426	78	6	24	126	45	15	54	90	144
Saturation Pop [1]																				
1998 plan [3]																				
Possible max	1,530	2,835	488	1,013	0	1,500	375	210	180	135	1,065	195	15	60	315	113	38	135	225	360
Daily flow (gpd) [2]																				
1998 plan [3]																				
Possible max	153,000	283,500	48,750	101,250	0	150,000	37,500	21,000	18,000	13,500	106,500	19,500	1,500	6,000	31,500	11,250	3,750	13,500	22,500	36,000
Increase																				
Peak hourly flow (gpm) [2]																				
1998 plan [3]																				
Possible max	329	610	105	218	0	323	81	45	39	29	229	42	3	13	68	24	8	29	48	78
Increase																				
Design Flows [4]																				
Average Daily (gpd)	47,430	102,998		31,388		74,400					39,525			16,275				22,320		
Peak Hourly (gpm)	102	222		68		160					85			35				48		
Highway Crossings																				
GPM		222		68		160					85									
Gravity Main Size		8" Main Size		6" Main Size		6" Main Size					8" Sewer Main									
Beach Gravity																				
GPM															280				594	
Gravity Main Size															6" Gravity Main				10" Gravity Main	
Force Main																				
Eagle GPM															280					
Out of Eagle															6" Force Main					
Tower GPM																			618	
Out of Towe																			8" Force Main	
Kowee Creek Bridge																				
GPM	720																			
Gravity Main Size	10" Main																			

[1] Based on 2.5 persons/dwelling unit, (composite of 1998 assumptions)
[Note that saturation pop estimated for 1998 plan (1634) exceeds estimate actually used in 1998 plan]
[2] Based on 100 gpcd and peak factor of 3.1
[3] Based on the same zoning as now exists, however areas are increased from 1998 plan to include all of transitionally-zoned lots.
[4] Based on 0.31 of Saturation, which accounts for ROW, greenbelts, undevelopable areas and undeveloped areas. 0.31 approximates the 1998 study.

Table 5. Flow Estimates by Sub-Area derived from R&M 8/28/06 Report

	Sub-Area A	Sub-Area B	Sub-Area C	Sub-Area D	Sub-Area E	Sub-Area F	Total All Sub-Areas
Present Flows							
Average Daily	3,800 gpd	5,100 gpd	4,000 gpd	5,200 gpd	29,200 gpd	13,100 gpd	60,400 gpd
Peak Hourly	10 gpm	13 gpm	10 gpm	13 gpm	75 gpm	34 gpm	155 gpm
Design Flows (Year 2028)							
Average Daily	8,390 gpd	16,620 gpd	8,000 gpd	10,390 gpd	30,990 gpd	14,120 gpd	88,510 gpd
Peak Hourly	20 gpm	40 gpm	20 gpm	25 gpm	76 gpm	35 gpm	216 gpm
Saturation Flows							
Average Daily	38,390 gpd	63,920 gpd	61,860 gpd	80,420 gpd	30,990 gpd	14,120 gpd	289,700 gpd
Peak Hourly	83 gpm	138 gpm	133 gpm	173 gpm	65 gpm	30 gpm	622 gpm

North Douglas Sewer, Phases II
Table 6. Proposed Lift Station Design Flows
11/28/2007

	Eagle Creek Lift Station		Tower Lift Station		
	Minimum Possible Flows	Maximum Possible Flows	Minimum Possible Flows	Maximum Possible Flows	Maximum Possible Flows (w/ Eagle Cr)
	Sub-Area E Only	Sub-Areas A, B, E w/Sub-Area B trans	Sub-Areas C, F, and Portion of D	Sub-Areas C, F and Portion of D w/re-zone	Sum of Max Estimated to Each Lift Station
Present Flows					
Average Daily	28,100 gpd	38,100 gpd	19,700 gpd	19,700 gpd	57,800 gpd
Peak Hourly	**73** gpm	98 gpm	**51** gpm	51 gpm	**149** gpm
Design Flows (Year 2028)					
Average Daily	28,600 gpd	130,200 gpd	27,315 gpd	156,700 gpd	286,900 gpd
Peak Hourly	70 gpm	**280** gpm	68 gpm	**337** gpm	**618** gpm
Saturation Flows					
Average Daily	28,600 gpd	420,000 gpd	156,400 gpd	505,500 gpd	925,500 gpd
Peak Hourly	61 gpm	904 gpm	336 gpm	1,088 gpm	1,992 gpm

Eagle Creek Lift Station
Table 7. Summary of Existing Lift Stations
10/1/2007

	Bonnie Brae	Falls Creek	Channel Drive	Channel Vista	Hospital Drive (Salmon Creek)	Salmon Creek [1] (Hospital Drive)
Pumps						
Spec'd flow at duty point (gpm)	400	420	220	200	n/a	n/a
Flow observed at startup (gpm)	275 to 350	390	200	320	185	490
Flow used in CBJ records (gpm)	425	680	220	200	80	490
Horsepower	7.5	10	5	10	n/a	n/a
Equipment spec	Flygt CP3127-434	Flygt NP3127-439	Hydro S4NX500JC	Hydro S4MX1000JC	old pumps	new pumps
Force Main						
Size	8" SDR 17	8" SDR 17	6" DIP	6" DIP	6"	6"
Length (ft)	1100	2700	150	4000	20 (+/-)	20 (+/-)
Static Head (ft)	18	18	26	42	15	15
Estimate of Approx Existing Daily Flows						
Pumping rate used for flow estimate (gpm)	300	390	220	205	80	490
Typ dry day (Dec 2005)						
Total pump running time/day (hr)	1.6	2	4.2	5	6	1.0
Flow (gpd)	28,800	46,800	55,440	61,500	28,800	28,800
Typ wet day (Dec 2005)						
Total pump running time/day (hr)	2.4	3.2	8	9	7	1.1
Flow (gpd)	43,200	74,880	105,600	110,700	33,600	33,600
Very wet day (11/19/05, Hospital using 11/21/05)						
Total pump running time/day (hr)	2.9	3.4	10.2	11.9	16.5	2.7
Flow (gpd)	52,200	79,560	134,640	146,370	79,200	79,200

[1] Estimated running time of new station using same total flow and new pump capacity

Table 8.
Channel Vista Flow Observations
Feb - Mar, 2007

	10-inch flow gpd	8-inch flow gpd	Total flow gpd	Pump #1 hours hours	Pump #2 hours hours	Total pump hours hours	Flow Rate gpm	Flow Rate gpm
21-Feb	30,845	7,797	38,642	2.3	2.2	4.5	143	143
22-Feb	40,299	9,430	49,729	2.2	2.3	4.5	184	184
23-Feb	39,917	7,197	47,114	2.0	1.9	3.9	201	201
24-Feb	42,746	7,109	49,855	2.1	1.9	4.0	208	208
25-Feb	49,700	14,658	64,358	2.5	2.2	4.7	228	
26-Feb	35,882	4,590	40,472	3.4	2.9	6.3	107	
27-Feb	33,248	8,150	41,398	2.0	1.8	3.8	182	182
28-Feb	35,073	24,313	59,386	2.0	1.9	3.9	254	
1-Mar	33,552	4,490	38,042	2.4	2.2	4.6	138	
2-Mar	38,057	5,728	43,785	2.5	2.4	4.9	149	
3-Mar	34,856	8,241	43,097	2.1	2.0	4.1	175	175
4-Mar	43,181	8,515	51,696	2.4	2.2	4.6	187	187
5-Mar	41,363	2,790	44,153	3.0	2.7	5.7	129	
6-Mar	40,328	2,339	42,667	2.4	2.1	4.5	158	
7-Mar	38,703	5,792	44,495	2.3	2.0	4.3	172	172
8-Mar	36,325	1,154	37,479	2.3	1.9	4.2	149	
9-Mar	21,996	1,349	23,345	2.2	1.9	4.1	95	
Average	37,416	7,273	44,689	2.4	2.1	4.5	168	182

APPENDIX - E

TETRA TECH

Memorandum

City and Borough of Juneau
NORTH DOUGLAS SEWER, PHASE II (SUB-AREA F)
DESIGN OF TOWER LIFT STATION

February 5, 2008

BASIS OF DESIGN

On 1/11/08, a meeting was held with representatives of the CBJ Engineering Department, Public Works Department, Toner Nordling Associates and Tetratech. Attendees included John Bohan, Joe Castillo and Tom Trego from the CBJ; Pete Hildre, Martin, Erich Schaal from Toner Nordling, and Don Beard from Tetratech. The purpose of the meeting was for the design team to present preliminary designs to the CBJ and to receive design direction from the CBJ. After some discussion, it appeared that the CBJ staff was in general agreement with Toner Nordling's proposed sewer and lift station layout, which is shown on the attached sketch and includes the following:

1. A 10" gravity sewer from the north at 0.35% and an 8" gravity sewer from the south at 0.4%. This results in invert elevations of the incoming sewers of about +2.7.

2. A top slab and fill elevation of +25.0 at the lift station. This elevation is relative to MLLW as adjusted to the current NOAA datum and is about 1.8 feet above the EHW of +23.2 commonly used for the Juneau area. It is also about +1.4 feet below the fill elevation at Falls Creek. See Pete's 1/9/08 email for further explanations.

3. The CBJ would prefer HDPE pipe for the force main, probably 8" because of Tower's location to handle potentially high flows. They would also like a more positive method of locating the pipe than the location tape in the CBJ standard details. Perhaps a copper wire taped to the pipe when it's buried and stubbed up at each end.

4. The electrical panel location will be considered at the south side of the fill pad as shown, in order to provide protection from prevailing SE wind and rain.

Regarding the lift station design, the following design elements were agreed upon:

1. The design flows of 50 gpm initially and 618 gpm design were not questioned by the CBJ and we will use them to size pumps and the force main.

2. Tom Trego would like to see a 10-ft diameter wet well at Tower. Because almost all flow in coming from the 10" sewer from the north, two inlet sewers as Pete is showing are acceptable, with only one bar screen on the 10".

3. The wet well ladder should be full height to access to the bottom of the wet well.

4. The CBJ would like us to consider N Series (recessed impeller) pumps or FP series (chopper) pumps from Flygt if they are available for the head and flow conditions. More important, they

Infrastructure Group
230 South Franklin, Suite 212, Juneau, Alaska 99801
Tel 907.586.6400 Fax 907.463.3677 www.tetratech.com

would like the pumps to be sized so they can handle increases in flow without major change (i.e., only changing impellers and pumps as the service area grows, without major electrical changes).

5. Most other details will remain the same as those used at Falls Creek and Bonnie Brae (attached Drawing 30).

6. The CBJ would like to see a pump selection from us as soon as possible so they can review it before we get too far into const docs. We will use the preliminary layout shown on the attached drawing for that analysis.

PUMP SELECTION

Based on the design flows in our memo of 12/3/07 and the additional information described above, our office has reviewed available pumps for the Tower Lift Station and developed the following pump selection alternatives.

1. Use of 6-inch force main with Flygt N-Series pumps or use of Flygt FP Series ("chopper") pumps.

2. Use of 8-inch force main with Flygt N-Series pumps or use of Flygt FP Series ("chopper") pumps.

3. Use of 8-inch force main with Vaughn chopper pump.

The third item was evaluated because Flygt has previously not had a chopper pump available to reach the design flow and head conditions. Approximately 400 gpm has been the highest flow available in Flgyt FP pumps for the head conditions at Tower. Recently, Flygt replaced the their FP3152 series with higher flow FP3153 and FP3171 pumps which can produce about 600 gpm if an 8-inch force main is used.

Because of the short but steep configuration of the force main, we recommend that the system be designed to provide a combination of higher than minimum velocities and at least 2 force main volumes each pumping cycle. By re-suspending solids and pumping more than one force main volume each cycle, the accumulation of heavy solids of grit in the force main and wet well will be minimized. A minimum velocity of approximately 3 fps is recommended to prevent accumulation of solids in the force main, this corresponds to a flow or approximately 215 gpm for a 6-inch HDPE force main and approximately 360 gpm for an 8-inch HDPE force main.

Figure 1 shows the system curve and pumps curves for a 6-inch force main. Figure 2 shows the curves for an 8-inch force main. Based on this information, the options available at Tower are:

1. Install a 6-inch force main with Flygt N3153 pumps. If the pumps are installed with 20 hp motors, then a single pump operating at 1750 rpm would be capable of conveying about 410 to 510 gpm by changing impellers from 464 to 462. A 463 impeller is also available that provides performance between the 464 and 462 but has not been shown for clarity. If flows above 510 gpm are needed in the future, it appears that the only Flygt pumps that could produce that flow with the head conditions at Tower would be Type SH pumps operating at 3510 rpm and requiring 25 to 30 hp motors. An N3153SH with a 176mm impeller could provide about 570 gpm in the 6-inch force main. The maximum flow that a Flygt chopper pump could convey is about 460 gpm using a model FP3153 with a 273 mm impeller.

2. Install an 8-inch force main with Flygt N3153 pumps. If the pumps are installed with 20 hp motors they should be capable of pumping at rates of about 490 to 610 gpm by changing impellers from 464 to 462. The maximum flow that a Flygt chopper pump (Model FP3153 with 273 mm impeller) could provide is about 550 gpm.

3. Install an 8-inch force main with Vaughn E Series chopper pumps. If the pumps are installed with 25 hp motors they should be capable of pumping at rates of about 420 to 690 gpm by changing speeds from about 1750 rpm to 2000 rpm. A variable frequency drive (VFD) would be required to accomplish the speed adjustment. Although the CBJ desires to maintain uniformity of pumping equipment, it is our understanding that Vaughn pumps have been generally well-received by municipalities in the Northwest.

FIGURE 1: TOWER LIFT STATION
System Head Curve - 6-inch Force Main

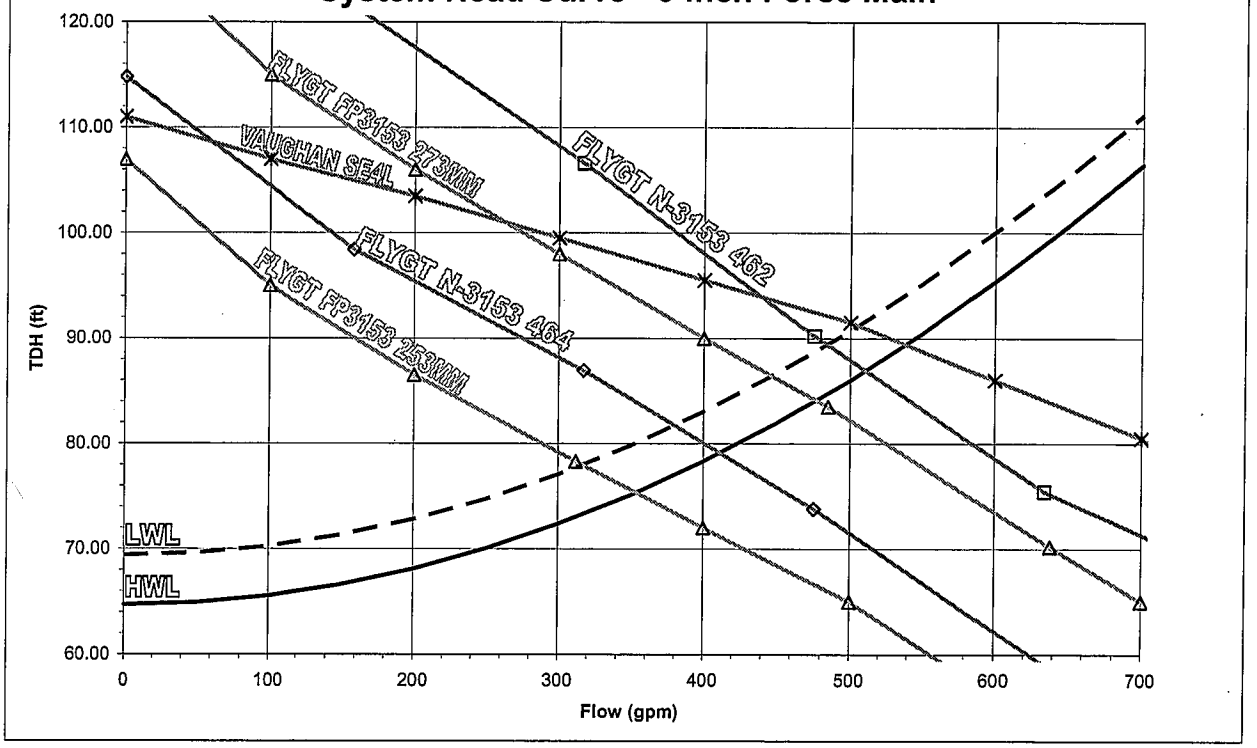
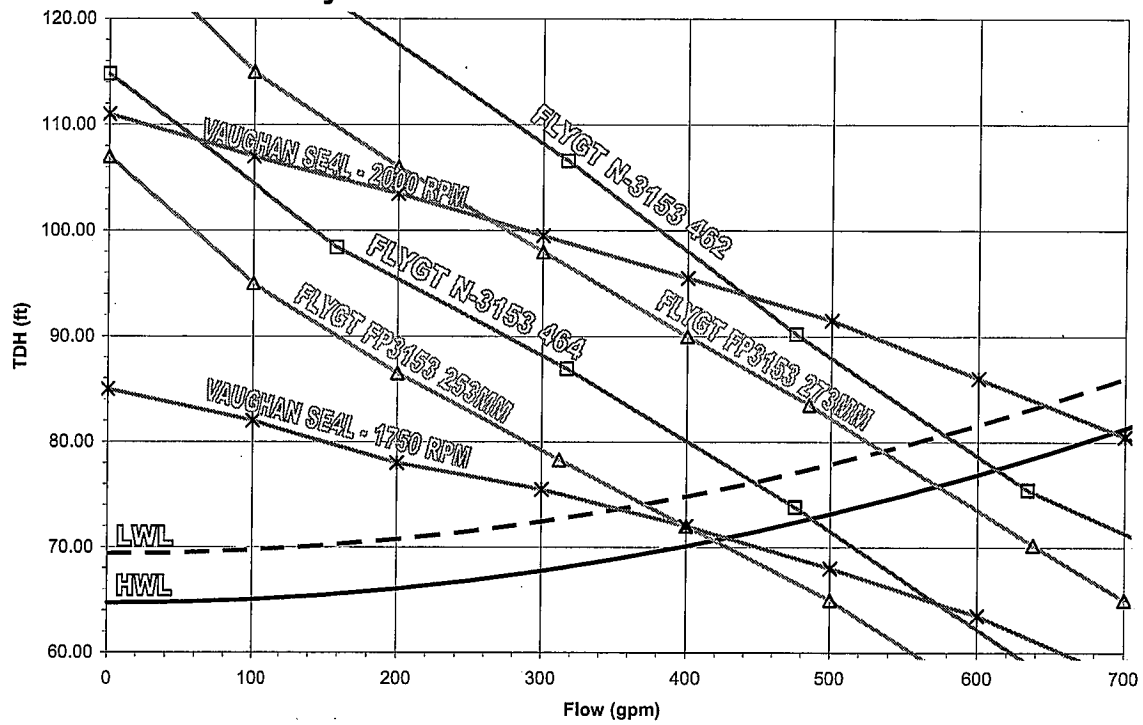


Figure 2: TOWER LIFT STATION
System Head Curve - 8-inch Force Main



Based on information we've received from Public Works staff, we understand that the CBJ has used Flygt's N series and FP series pumps in the past. The recessed impeller N series pumps have performed adequately in most locations, but they have been problematic at the Lemon A station which receives high volumes of rags or other clogging debris. At Lemon A, FP3127 series chopper pumps have proved effective in reducing the operations problems caused by rags and other debris.

The Tower lift station will have mostly residential waste and will probably have relatively low flows for several years. Unless unusual waste flows develop, it appears that either recessed impeller or chopper pumps could perform adequately for some time at the station. If recessed impeller pumps are used and unusually high volumes of rags or other clogging debris appear, the incoming bar screen may need to be maintained more frequently than desired or the pumps will clog.

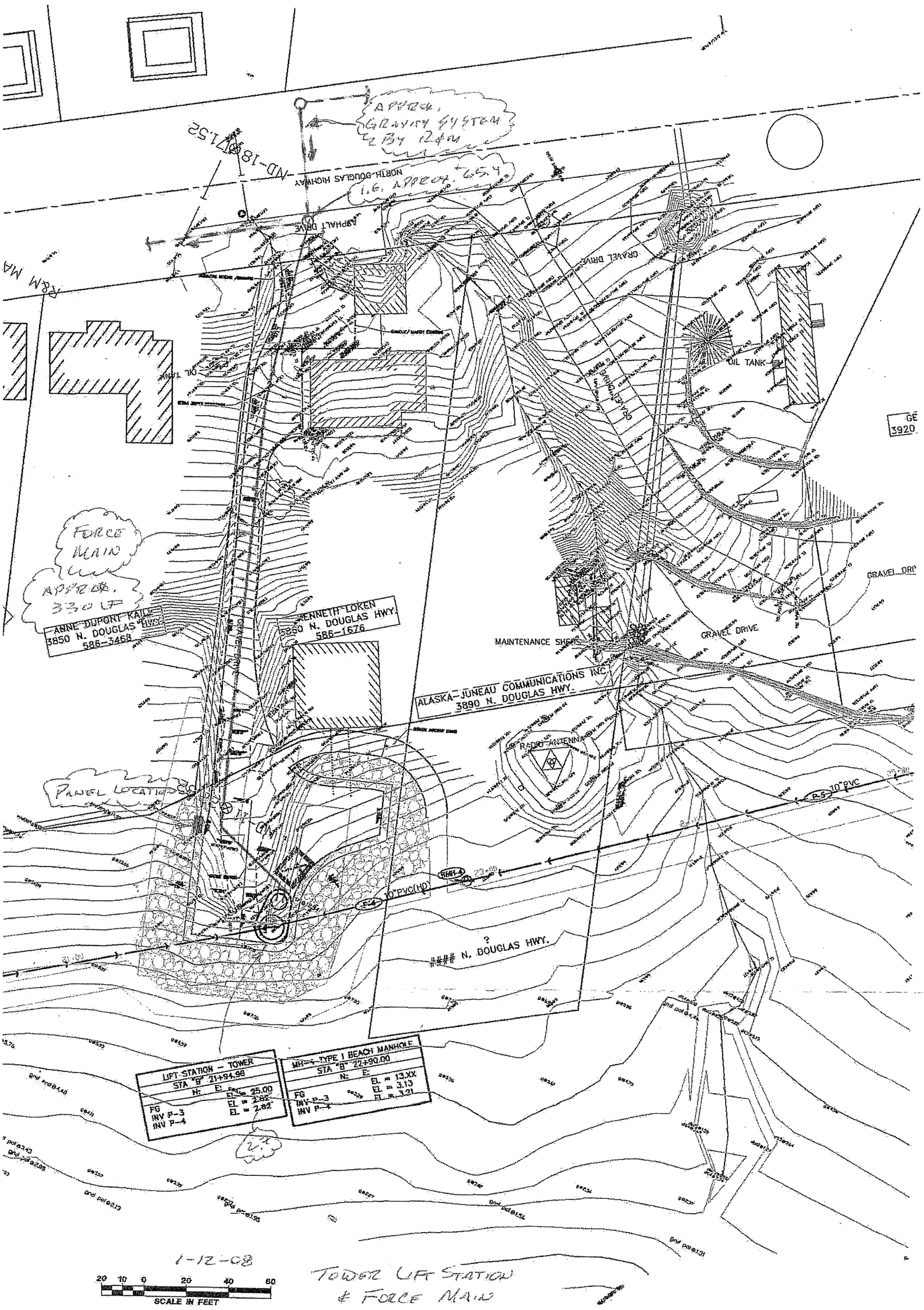
RECOMMENDATIONS

1. Because of the lower energy requirements and the uncertainty of future population growth in the service areas of the Tower lift station, we recommend that an 8-inch force main be installed.

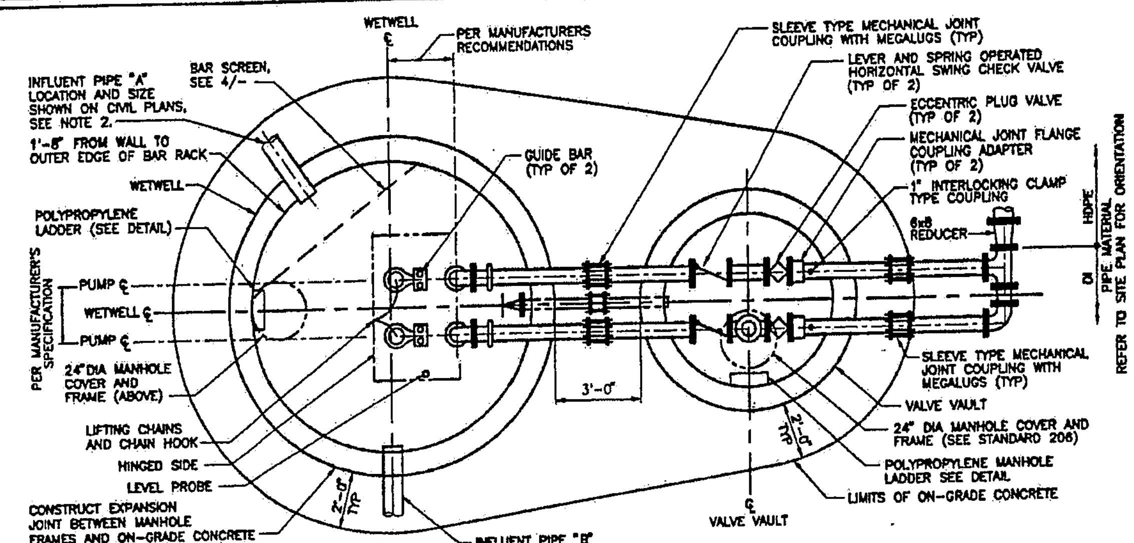
2. Based on the CBJ desires to maintain uniformity of equipment to facilitate repair and replacement, we would recommend that Flgyt N3153 pumps with 464 impellers and 20 hp motors be installed initially. Because of the possibility of future flow increases and to allow for future use of a chopper pump should ragging become an issue as a result of development, the station electrical service should allow for 30 hp motors without major changes to the power supply and control systems.

3. If the CBJ desires to use chopper pumps at Tower, we would recommend that it consider either the recently introduced Flgyt FP3153 or FP3171 models, or the Vaughn E Series pumps which can be operated at a variety of flows with a variable frequency drive. It appears that either pump could produce the desired 400 to 600 gpm flows.

After review of this information, the CBJ Engineering and Public Works staff have determined that they prefer to design the Tower lift station with an 8-inch force main and Flygt N series pumps. The station with designed with Flygt N3153 pumps.


APPROX. GRAVITY SYSTEM 2 BY 12FM
I.E. APPROX. +65.4
NORTH-DOUGLAS HIGHWAY
ASPHALT DRIVE
GRAVEL DRIVE
OIL TANK
FORCE MAIN APPROX. 330 LF
ANNE DUPONT KAILS
3850 N. DOUGLAS HWY.
586-3468
KENNETH LOKEN
3850 N. DOUGLAS HWY.
586-1676
MAINTENANCE SHED
GRAVEL DRIVE
ALASKA-JUNEAU COMMUNICATIONS INC.
3890 N. DOUGLAS HWY.
RADIO ANTENNA
PANEL LOCATION
10" PVC
10" PVC(HP)
N. DOUGLAS HWY.
LIFT STATION - TOWER
STA "B" 21+94.96
N: E:
EL = 25.00
FG EL = 2.82
INV P-3 EL = 2.82
INV P-4
MH-3 TYPE I BEACH MANHOLE
STA "B" 22+90.00
N: E:
EL = 13.XX
FG EL = 3.13
INV P-3 EL = 3.31
INV P-4
1-12-08
20 10 0 20 40 60
SCALE IN FEET
TOWER LIFT STATION & FORCE MAIN

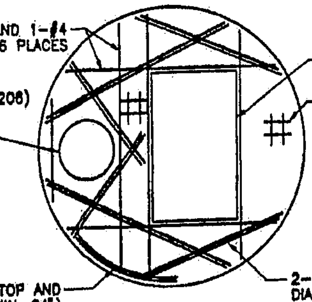
APPENDIX - F



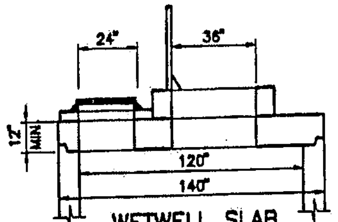
NOTES:
1. CONTROL PANEL SHALL BE LOCATED IN GENERATOR BUILDING.
2. COORDINATE LOCATION OF BAR SCREEN WITH INFLUENT PIPE "A". FOR THE FALLS CREEK/BONNIE BRAE LIFT STATIONS.
3. NO BAR SCREEN SHALL BE REQUIRED ON INFLUENT PIPE "B"; P-31 AT BONNIE BRAY LIFT STATION AND PIPE P-45 AT FALLS CREEK LIFT STATION.

LIFT STATION

PLAN (1)
NO SCALE



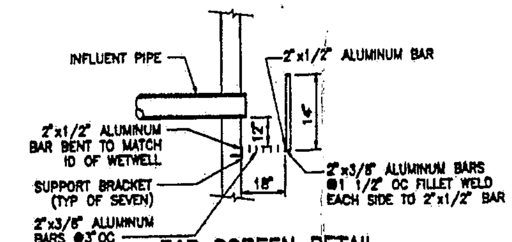
WETWELL SLAB PLAN VIEW



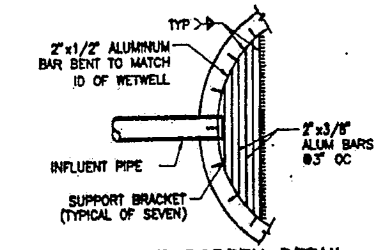
WETWELL SLAB ELEVATION VIEW

NOTES:
1. SLAB SHALL BE REINFORCED WITH #6@5 BOTTOM AND #4@7 TOP. PROVIDE A MINIMUM OF #4@12" TOP AND BOTTOM PERPENDICULAR TO MAIN REINFORCEMENT.
2. REINFORCING COVER SHALL BE 2-INCHES CLEAR AT TOP AND BOTTOM SURFACES, WITH 3" CLEAR.

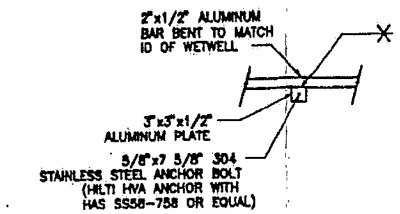
DETAIL (3)
NO SCALE



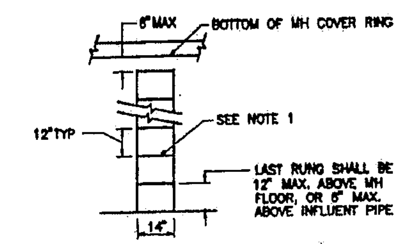
BAR SCREEN DETAIL ELEVATION VIEW



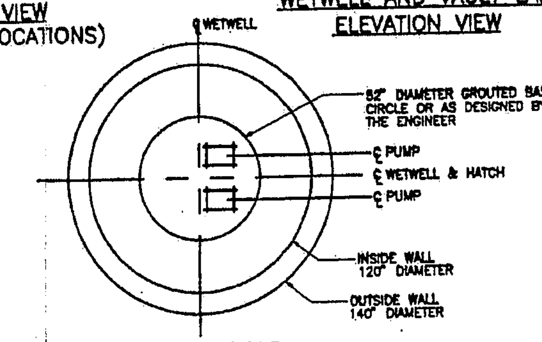
BAR SCREEN DETAIL PLAN VIEW



SUPPORT BRACKET DETAIL ELEVATION VIEW (TYPICAL OF 7 LOCATIONS)



WETWELL AND VAULT LADDERS ELEVATION VIEW

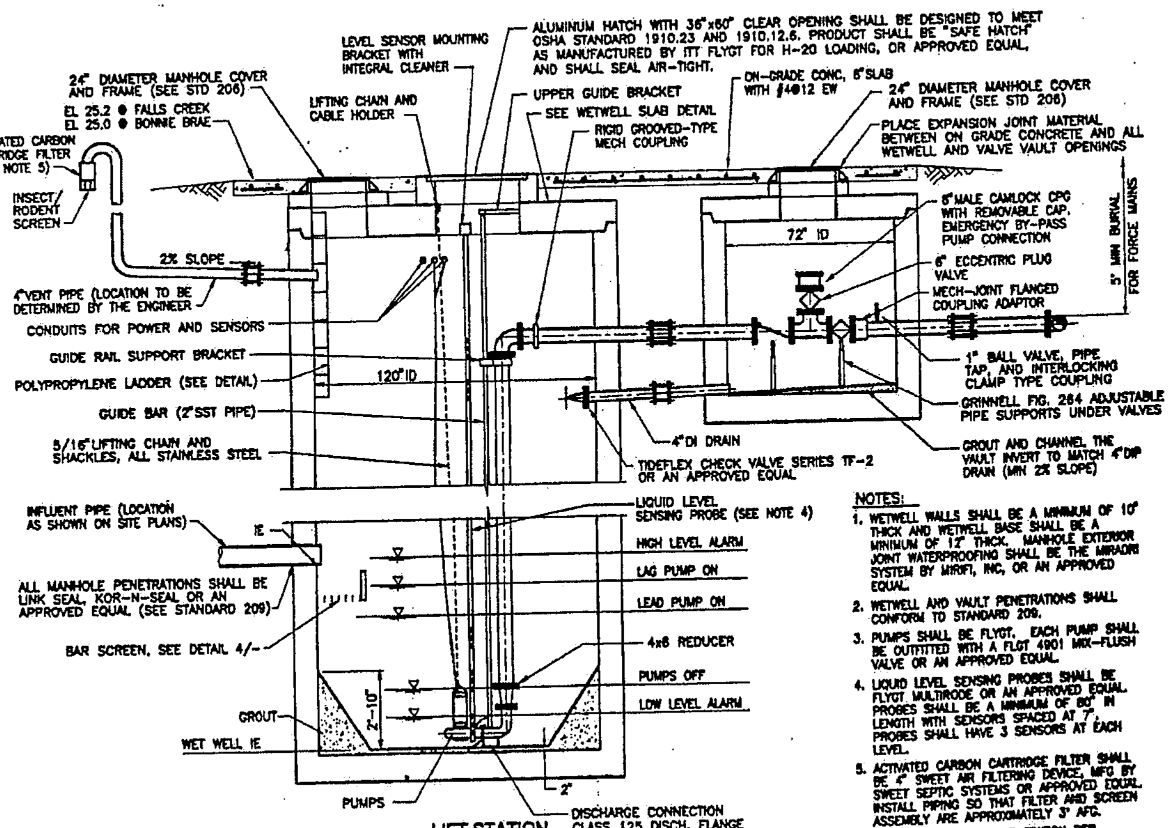


WETWELL BASE PLAN VIEW

NOTES:
1. RUNGS AND RAILS OF LADDER SHALL BE CONSTRUCTED OF POLYPROPYLENE CONFORMING TO ASTM ASTM D-4101 WITH STEEL 1/2" GRADE 60 REINFORCING BAR CORES IN THE RUNGS AND 9/16" COLD DRAWN STEEL BAR CORES IN THE RAILS.

PUMP STATION

DETAILS (4)
NO SCALE



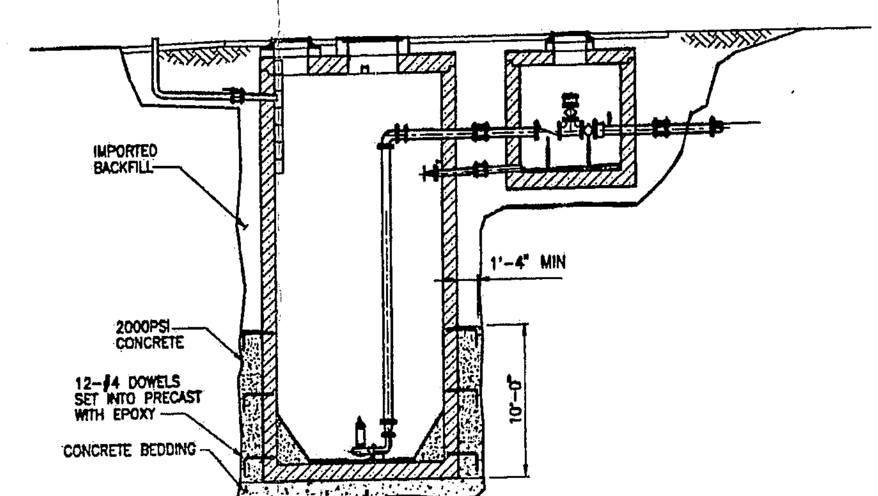
LIFT STATION

NOTES:
1. WETWELL WALLS SHALL BE A MINIMUM OF 10" THICK AND WETWELL BASE SHALL BE A MINIMUM OF 12" THICK. MANHOLE EXTERIOR JOINT WATERPROOFING SHALL BE THE MIRADRI SYSTEM BY MIRIFI, INC, OR AN APPROVED EQUAL.
2. WETWELL AND VAULT PENETRATIONS SHALL CONFORM TO STANDARD 209.
3. PUMPS SHALL BE FLYGT. EACH PUMP SHALL BE OUTFITTED WITH A FLGT 4901 MIX-FLUSH VALVE OR AN APPROVED EQUAL.
4. LIQUID LEVEL SENSING PROBES SHALL BE FLYGT MULTIRODE OR AN APPROVED EQUAL. PROBES SHALL BE A MINIMUM OF 80" IN LENGTH WITH SENSORS SPACED AT 7". PROBES SHALL HAVE 3 SENSORS AT EACH LEVEL.
5. ACTIVATED CARBON CARTRIDGE FILTER SHALL BE 4" SWEET AIR FILTERING DEVICE, MFG BY SWEET SEPTIC SYSTEMS OR APPROVED EQUAL. INSTALL PIPING SO THAT FILTER AND SCREEN ASSEMBLY ARE APPROXIMATELY 3' AFG.
6. BACKFILL AROUND PUMP STATION PER DETAIL 6/-.

ELEVATION (2)
NO SCALE

CONTROL FUNCTION	FALLS CREEK LIFT STATION	BONNIE BRAE LIFT STATION
INFLUENT PIPE "A" INVERT ELEVATION	5.09	5.43
INFLUENT PIPE "B" INVERT ELEVATION	20.38	20.00
TOP OF BAR SCREEN	4.09	4.43
HIGH LEVEL ALARM	5.09	5.43
LAG PUMP ON	4.09	4.43
LEAD PUMP ON	3.59	3.93
PUMPS OFF	1.59	1.93
LOW LEVEL ALARM	1.0	1.35
WET WELL INVERT ELEVATION	0.0	0.35

CONTROL ELEVATIONS (5)
NO SCALE



DETAILS (6)
NO SCALE

Tetra Tech/KCM, Inc.
230 South Franklin, Suite 204
Juneau, Alaska 99801-1364
907-586-8400 Fax: 907-463-3677

DESIGNED BY: VAM
DRAWN BY: CAD
CHECKED BY: OEP
DATE: AUGUST, 2000

CITY/BOROUGH OF JUNEAU
ALASKA'S CAPITAL CITY
DEPARTMENT OF ENGINEERING

NORTH DOUGLAS SEWER - PHASE I
L.I.D. 86
CONTRACT NO. E01-045

LIFT STATION PLAN, ELEVATION AND DETAILS

DRAWING M-01
SHEET NO. 30 of 51

TETRA TECH/KCM
230 South Franklin, Suite #212
Juneau, Alaska 99801-1364

Memorandum

City and Borough of Juneau
NORTH DOUGLAS SEWER, PHASE II (SUB-AREAS E AND F)
EVALUATION OF EXISTING LIFT STATIONS

November 7, 2007

INTRODUCTION

In our 10/1/07 memorandum on the design of the new lift stations for the subject project, a brief review of the Falls Creek, Channel Drive and Channel Vista lift stations was presented. This information is summarized here in Tables 1 and 2. The basic conclusion of that review was that the Channel Drive and Channel Vista stations will need larger pumps within the near future if the Eagle Creek Lift Station flows are directed northerly toward Falls Creek.

It now appears that most or all of the wastewater flows from the new lift stations in Sub-Areas E and F will be directed to West Juneau. Therefore, this memorandum will briefly evaluate the capacity of the West Juneau station and provide more detailed information on the Falls Creek, Channel Drive and Channel Vista stations.

EXISTING STATION DESIGNS AND POSSIBLE UPGRADES

Table 3 summarizes existing conditions at each station and possible upgrades to increase the capacity of each. The existing conditions at each station are based on discussions with employees of the Wastewater Collections division of the Public Works Department and review of recent records in their files. The electrical needs and costs of electrical upgrades were provided by Morris Engineering Group.

The cost estimates in Tables 3 and 4 are for construction costs only without additional allowances for design, construction administration and contingencies. Because some of the upgrades (such as changing pumps and impellers) can be done by CBJ staff and other more elaborate upgrades would require use of outside contractors, the additional allowances would vary for each option. Nevertheless, these estimates should provide adequate budget level information for comparing options and planning for the upgrades.

West Juneau

The West Juneau was constructed in 1973 with two variable speed 60-hp pumps rated at about 1180 gpm. The electrical system was upgraded in 2002 installing 75 hp pumps with improved variable frequency drives. Typically, flows at West Juneau vary from about 300,000 to 500,000 gpd with wet weather, and possibly tidally-influenced, flows occasionally exceeding 1,500,000 gpd. Normally, one pump operates at about 15% of its nominal capacity. Even at high flows, only one pump operates at an average rate of about 60% of its nominal capacity.

If all the sub-areas currently under design (A through F) were to be directed to the West Juneau station, the initial flow addition would be as low as 19,100 gpd from Sub-Area F only, increasing to a maximum design year flow 238,900 gpd from all the sub-areas. Collections staff feels that the West Juneau station

can accommodate these increases without modifications. Further reducing the effects of the added flows is the plan by Collections staff to locate and reduce tidally-influenced inflows.

It appears that there would be no need to increase the capacity of this station, so no upgrades are considered at this time.

Falls Creek

Falls creek was constructed in 2001 with the design intent to carry initial flows from the Bonnie Brae to Falls Creek sub-areas and possibly increase its capacity if additional service areas are added. The station has two 10-hp pumps rated at about 390 gpm. These are constant-speed Flygt submersibles, Model NP3127-439. The motors are oversized to allow use of 438 impellers, which would increase the pump capacity to about 500 gpm. The pumps could be changed to 20-hp CP3152-434 Flygts, which would produce about 600 gpm. The electrical system includes an emergency generator and was designed to accommodate up to 20 hp pumps.

Because this station is currently only pumping about 3.4 hours per day on even very wet days, it appears that it could probably accommodate most of the additional design flows from Sub-Areas A through F. If additional service areas are connected to this system along other portions of North Douglas Highway, the station could be upgraded to 500 gpm or 600 gpm as planned in the original design by changing impellers or pumps. Options 1 and 2 in Table 3 illustrate the costs of the upgrades.

- Option 1: 500 gpm, $3,400
- Option 2: 600 gpm, $26,000

Channel Drive

The Channel Drive wet well was installed by DOTPF in the early to mid-1970's when Egan Drive was constructed. It was not operated as a lift station until 1993 when the Channel Drive Sewer Extension was constructed. The station has two 5-hp Hydromatic pumps rated at about 220 gpm. The station has a relatively short, 150-foot, 6-inch force main. The electrical system does not have an on-site generator and was installed to accommodate up to 10-hp pumps with minimal changes. One reason this station has been able to operate without an emergency generator is its location on Channel Drive is within the area served by the hospital sub-station, which has a high priority for re-energizing during a power outage.

Because this station is pumping over 10 hours per day on very wet days and the additional design year flows from Sub-Areas A through F would increase total daily flows by almost 300%, this station would need to be upgraded if substantial portions of the proposed sub-areas were directed to this system. Option 1 on Table 3 illustrates the most obvious upgrade – replacing the existing 5 hp pumps with 10 hp pumps. Flow rates from 10 hp pumps would easily accommodate maximum anticipated flows. If a generator and building were added to this station, upgrade costs would be substantially higher.

- Option 1: 550 gpm, $31,000

Channel Vista

The Channel Vista station was also installed in 1993 when the Channel Drive Sewer Extension was constructed. The station has two 10-hp Hydromatic pumps rated at about 205 gpm. The station has a 4000-foot, 6-inch force main along the Old Glacier Highway. The electrical system includes an

emergency generator and cannot support pumps larger than 10-hp pumps without replacing the pump control panel and generator.

This station also has a 6-ft diameter wet well. Flygt representatives have indicated that up to two 35-hp pumps can be installed in this size wet well, but the installation would be relatively restricted and Collections staff would prefer a larger wet well. For purposes of this analysis, the existing wet well is used for pump sizes up to 20-hp. A new 8-ft wet well is proposed for pumps larger than 20-hp.

If the pumps are increased to 15 HP, the pump control panel and main circuit breaker to the station will have to be replaced. The existing generator will not be able to start the pumps, so it will either have to be replaced, or removed to allow the station to be fed from a portable generator if necessary. If the generator is replaced, it will require an addition to the building to relocate the electrical equipment to the addition. This will allow the proper clearance in the building for the new generator.

If the pumps are increased above 20 HP, the entire electrical distribution system in the pump station will have to be replaced as well as the pump control panel as well as the generator. The Channel Vista station is also fed from the same power utility line that feeds the hospital. The power company's target for restoring power to this line during an outage is under 30 minutes. Therefore, the CBJ may elect not to provide standby generation at this lift station if the pumps are replaced with larger ones.

Because of limited electrical capacity at this station and its lengthy force main (which requires substantial increases in pumping horsepower to carry increased flows), upgrading this station is the most difficult of any evaluated. Three options are shown in Table 3. Their pumping capacities and costs are:

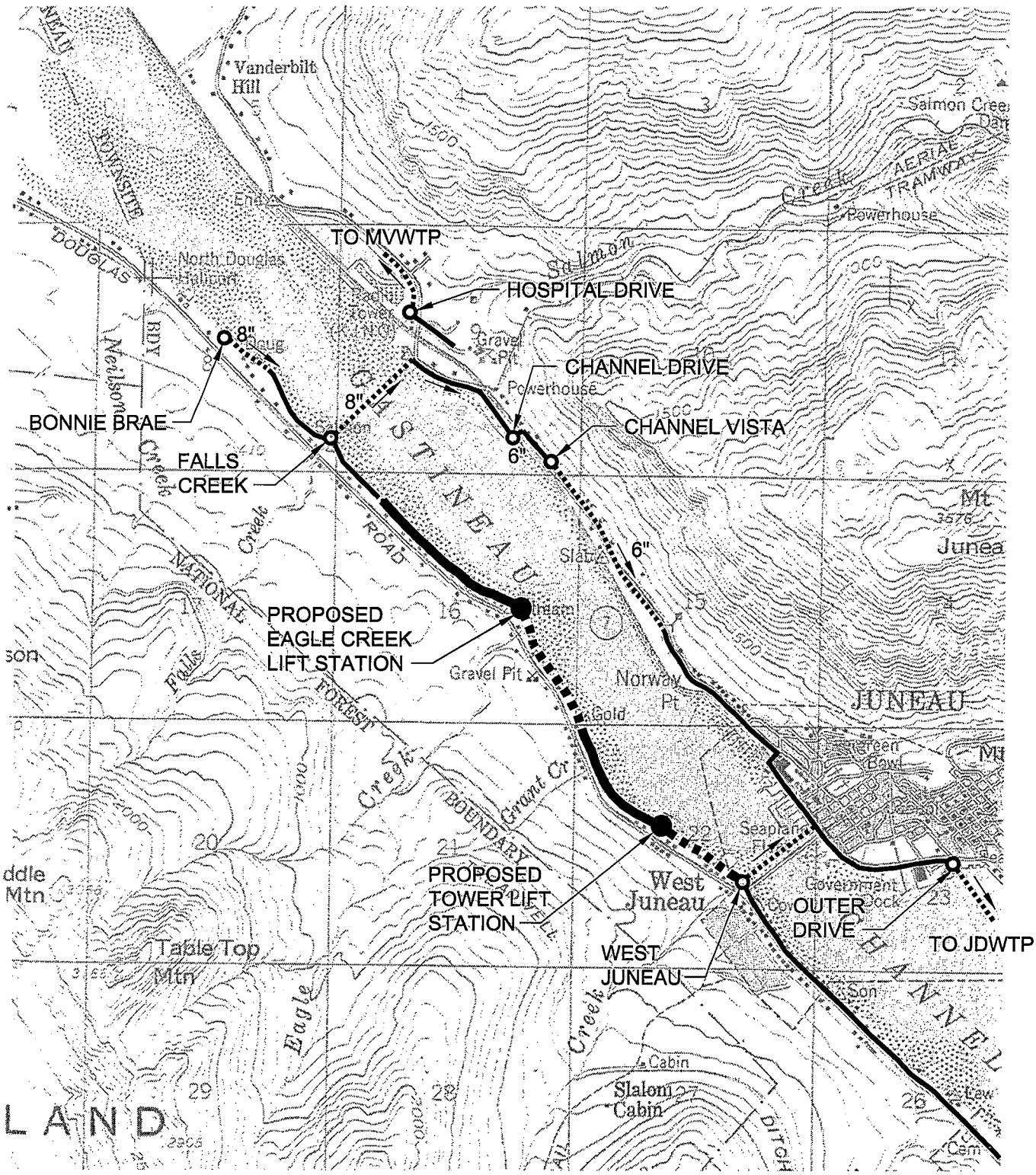
- Option 1: 265 gpm, $309,000 with new generator, $84,000 without new generator
- Option 2: 300 gpm, $314,000 with new generator, $84,000 without new generator
- Option 3: 410 gpm, $412,400 with new generator, $172,400 without new generator

SUMMARY

It appears that directing some portion of the sub-areas proposed for connection to the North Douglas sewer system toward Falls Creek will probably require upgrades to the Falls Creek, Channel Drive and Channel Vista lift stations within a few years of the connection. The costs of upgrading Falls Creek and Channel Drive are relatively modest, but he cost of upgrading Channel Vista could be high.

Directing some portion or all of the proposed system additions to West Juneau will not require any significant upgrades to that station in the foreseeable future.

We recommend that the Engineering Department and Public Works Department staff review this memo, verify the descriptions of existing facilities and projected flows, and make any policy decisions necessary before proceeding on any of the upgrade options.



LEGEND

- Existing Lift Station
- Existing Gravity Sewer
- Existing Force Main
- Proposed Lift Station
- Proposed Gravity Sewer
- Proposed Force Main

LIFT STATION LOCATIONS AND SYSTEM SCHEMATIC

FIGURE 1

TETRA TECH
www.tetratech.com
230 South Franklin, Suite 212
Juneau, Alaska 99801
Phone: 907-586-6400 Fax: 907-463-3677

City and Borough of Juneau
North Douglas Sewer Extension

Path: S:\CADD\3690026 Juneau Lift Sta\Figure1.dwg Plot date: Nov 06, 2007-06:44:23am CAD User: Jeff.Wicke.
Xref Filenames:

Eagle Creek Lift Station
Table 1. Summary of Existing Lift Stations
11/2/2007

	Bonnie Brae	Falls Creek	Channel Drive	Channel Vista	Hospital Drive (Salmon Creek)	Salmon Creek [1] (Hospital Drive)
Pumps						
Spec'd flow at duty point (gpm)	400	420	220	200	n/a	n/a
Flow observed at startup (gpm)	275 to 350	390	200	320	185	490
Flow used in CBJ records (gpm)	425	680	220	200	80	490
Horsepower	7.5	10	5	10	n/a	n/a
Equipment spec	Flygt CP3127-434	Flygt NP3127-439	Hydro S4NX500JC	Hydro S4MX1000JC	old pumps	new pumps
Force Main						
Size	8" SDR 17	8" SDR 17	6" DIP	6" DIP	6"	6"
Length (ft)	1100	2700	150	4000	20 (+/-)	20 (+/-)
Static Head (ft)	18	18	26	42	15	15
Estimate of Approx Existing Daily Flows						
Pumping rate used for flow estimate (gpm)	300	390	220	205	80	490
Typ dry day (Dec 2005)						
Total pump running time/day (hr)	1.6	2	4.2	5	6	1.0
Flow (gpd)	28,800	46,800	55,440	61,500	28,800	28,800
Typ wet day (Dec 2005)						
Total pump running time/day (hr)	2.4	3.2	8	9	7	1.1
Flow (gpd)	43,200	74,880	105,600	110,700	33,600	33,600
Very wet day (11/19/05, Hospital using 11/21/05)						
Total pump running time/day (hr)	2.9	3.4	10.2	11.9	16.5	2.7
Flow (gpd)	52,200	79,560	134,640	146,370	79,200	79,200

[1] Estimated running time of new station using same total flow and new pump capacity

Table 2.
Channel Vista Flow Observations
Feb - Mar, 2007

	10-inch flow gpd	8-inch flow gpd	Total flow gpd	Pump #1 hours	Pump #2 hours	Total pump hours	Flow Rate gpm	Flow Rate gpm
21-Feb	30,845	7,797	38,642	2.3	2.2	4.5	143	143
22-Feb	40,299	9,430	49,729	2.2	2.3	4.5	184	184
23-Feb	39,917	7,197	47,114	2.0	1.9	3.9	201	201
24-Feb	42,746	7,109	49,855	2.1	1.9	4.0	208	208
25-Feb	49,700	14,658	64,358	2.5	2.2	4.7	228	
26-Feb	35,882	4,590	40,472	3.4	2.9	6.3	107	
27-Feb	33,248	8,150	41,398	2.0	1.8	3.8	182	182
28-Feb	35,073	24,313	59,386	2.0	1.9	3.9	254	
1-Mar	33,552	4,490	38,042	2.4	2.2	4.6	138	
2-Mar	38,057	5,728	43,785	2.5	2.4	4.9	149	
3-Mar	34,856	8,241	43,097	2.1	2.0	4.1	175	175
4-Mar	43,181	8,515	51,696	2.4	2.2	4.6	187	187
5-Mar	41,363	2,790	44,153	3.0	2.7	5.7	129	
6-Mar	40,328	2,339	42,667	2.4	2.1	4.5	158	
7-Mar	38,703	5,792	44,495	2.3	2.0	4.3	172	172
8-Mar	36,325	1,154	37,479	2.3	1.9	4.2	149	
9-Mar	21,996	1,349	23,345	2.2	1.9	4.1	95	
Average	37,416	7,273	44,689	2.4	2.1	4.5	168	182

Table 3.
Existing System Upgrades

	West Juneau	Falls Creek	Channel Drive	Channel Vista	
Existing Conditions					
Approx pump size (gpm)	1840	390	220	205	
Approx pump horsepower (HP)	75	7.5	5	10	
Approx dry weather flow					
Daily Flow (gpd)	400,000	46,800	55,440	61,500	
Pumping required (hr/day or %)	15%	2	4.2	5	
Approx very wet weather flow					
Daily Flow (gpd)	1,600,000	79,560	134,640	146,370	
Pumping required (hr/day or %)	60%	3.4	10.2	11.9	
Possible Flow Addition from N. Douglas					
Minimum (present flows, smallest service area)					
Daily Flow (gpd)	19,700	28,100	28,100	28,100	
Peak Flow (gpm)	51	73	73	73	
Maximum (design flows, largest service area)					
Daily Flow (gpd)	238,700	148,500	148,500	148,500	
Peak Flow (gpm)	514	320	320	320	
				w/ New Generator	w/o New Generator
Upgrade Option 1					
Approx pump size (gpm)		500	550	265	265
Approx pump horsepower (HP)		10	10	15	15
Pump upgrade		New 438 impellers for NP 3127's	New NP 3127-438 pumps	New NP3153-464 pumps	New NP3153-464 pumps
Cost of pump and piping upgrades		$3,400	$28,000	$29,000	$29,000
Electrical Upgrades		None	Minor	New Panel New Generator & Bldg.	New Panel New Generator & Bldg.
Cost of Electrical Upgrades			$3,000	$280,000	$55,000
Total Pump and Electrical Costs		**$3,400**	**$31,000**	**$309,000**	**$84,000**
Upgrade Option 2					
Approx pump size (gpm)		600		300	300
Approx pump horsepower (HP)		20		20	20
Pump upgrade		New CP3152-434 pumps		New NP3153-462 pumps	New NP3153-462 pumps
Cost of pump and piping upgrades		$26,000		$29,000	$29,000
Electrical Upgrades		None		New Panel New Generator and Bldg	New Panel New Generator and Bldg
Cost of Electrical Upgrades				$285,000	$55,000
Total Pump and Electrical Costs		**$26,000**		**$314,000**	**$84,000**
Upgrade Option 3					
Approx pump size (gpm)				410	410
Approx pump horsepower (HP)				35	35
Pump upgrade				New NP3171-277 pumps	New NP3171-277 pumps
Cost of pump and piping upgrades				$92,400	$92,400
Electrical Upgrades				New Panel New Generator and Bldg	New Panel New Generator and Bldg
Cost of Electrical Upgrades				$320,000	$80,000
Total Pump and Electrical Costs				**$412,400**	**$172,400**

Table 4.
Preliminary Construction Cost Estimates of Upgrades

	West Juneau	Falls Creek	Channel Drive	Channel Vista
Option 1				
New pumps or impellers		$2,400	$23,000	$24,000
Installation		$1,000	$5,000	$5,000
Mechanical		$3,400	$28,000	$29,000
New pump panel, main c/b			$3,000	$55,000
New generator *				$125,000
Building Addition *				$100,000
Electrical			$3,000	$280,000
Option 2				
New pumps or impellers		$25,000		$24,000
Installation		$1,000		$5,000
Mechanical		$26,000		$29,000
New pump panel, main c/b				$55,000
New generator *				$130,000
Building Addition *				$100,000
Electrical				$285,000
Option 3				
New pumps or impellers				$37,400
New piping and valves				$5,000
New wet well				$10,000
Wet well installation				$10,000
Bypass during construction				$20,000
Pump and piping installation				$10,000
Mechanical				$92,400
New Elec. System, pump panel				$80,000
New generator *				$140,000
Building Addition *				$100,000
Electrical				$320,000

* This is not needed if the CBJ does not desire a standby generator at the Channel Vista station

MORRIS
ENGINEERING GROUP
LLC

November 07, 2007

Don Beard, P.E.
Tetra Tech KCM
Juneau, Alaska 99801

Re: Channel Drive and Channel Vista Lift Station Electrical Systems

Don:

I have inspected the Channel Drive and Channel Vista Lift Station electrical systems to determine what electrical work is necessary for these lift stations to operate larger pumps. Here is what I found:

Channel Drive – This lift station has a 480 volt, three phase, 100 amp meter disconnect with a 60 amp main circuit breaker that feeds a pump control panel through a three way switch that allows the station to be operated by a portable generator. The pump control panel has two NEMA 1 starters fed from 10 amp fuses. The starters feed the pumps. The starters are rated for up to 10 HP motors, so if the fuses were replaced, and the overload relay heaters in the starters were replaced, up to a 10 HP pump could be fed from the panel. Budget $3,000 for this work. This lift station is powered from AELPs 12,470V line through a step down transformer. This is the same line that feeds the hospital. During a power outage, AELP gives the hospital priority in restoring power. Outages to the hospital typically are less than 30 minutes. They try to keep them less than 20 minutes.

Channel Vista – This lift station has a 100 amp meter disconnect with a 60 amp main circuit breaker. This feeds a 100 amp three way switch, then a 100 amp automatic transfer switch, then a 125 amp main panel, all at 480 volt, three phase. The main panel feeds a pump control panel which feeds two pumps through 17 amp fuses, 20 amp rated contactors and reduced voltage starters. The starters are rated for 10HP. The starters feed 10 HP motors. The lift station has a 35 KW standby generator.

This lift station can not power a pump larger than 10 HP without replacing the reduced voltage starters and the contactors in the panel. This is not possible without the panel being returned to it's manufacturer as the UL listing of the panel would be lost if a contractor simply replaced the equipment. The new equipment would be larger requiring more room in the panel and possibly require the panel enclosure to be replaced to accommodate the larger equipment. Thus a new panel should be budgeted for any increase in HP in the pumps.

For new 15 HP pumps, the main circuit breaker would have to be replaced along with providing a new panel and a new feeder from the main panel to the pump control panel. Budget $55,000 for this work. The generator also would have to be replaced with a 45KW min. generator. Budget $125,000 for the new generator and it associated louvers, exhaust, etc. The new generator would take up more space and thus the electrical equipment that is mounted on the walls next to the generator would be have to be moved. This would require an addition on the west end of the building. Budget $100,000 for the building addition.

8429 Livingston Way, Juneau, AK 99801
(907)789-3350 FAX(907)789-3360

For new 20 HP pumps, the same work would be required except the generator would be sized at 60 KW min. The cost for the generator and associated equipment should be budgeted at $130,000.

For new 35 HP pumps, the main electrical service, three way switch, automatic transfer switch, main panel, pump control panel, and associated wiring would have to be replaced. Budget $80,000 for this work. The new generator would be a 75KW min. at $140,000. The building addition would be the same at $100,000.

Channel Vista is on the same 12.47KV line as the hospital, so it benefits from the same outage response time as the hospital. If the CBJ chooses not to have a standby generator at this lift station, then the cost for the new generator and building addition can be removed from the above estimates.

Please contact me if you have any questions.

Sincerely,

Mark Morris, P.E.

For All of your Electrical Engineering Needs
5636 Glacier Highway, Juneau, AK 99801
(907)780-6520 FAX(907)790-6552