

Appendix 3C: List of Unit Processes of Each Sewage Treatment Plant

Table 3C.1: Unit Processes of Agat-Santa Rita STP

Description	Design ¹
1) Influent flow meter (mgd) (1 unit)	
Flow rate (mgd)	0.0 - 3.5
2) Influent pumps (2 units)	
Capacity (gpm)	1,068
Head (ft)	31.2
3) Effluent pumps (3 units)	
Capacity (gpm)	2,000
Head (ft)	160
4) Hand-cleaned bar screen (1 unit)	
Bar screen width	N/A ²
Bar Spacing (inch)	1
Screening capacity	N/A
5) Comminutor (1 unit)	
HP	N/A
6) Distribution chamber inlet box (1 unit)	
7) Contact aeration basin (1 unit)	
Water depth (ft)	14
Total volume (ft ³)	14,300
Flow (mgd)	0.75
Sewage detention time (hrs)	3.4
BOD ₅ loading (lb/day/1,000 ft ³)	101
Type of diffusers - Galvanized steel air diffusion	
8) Reaeration basin (1 unit)	
Water depth (ft)	14
Volume (ft ³)	28,500
Hydraulic detention time at 100% return (hrs)	6.8
Type of diffusers - Galvanized steel air diffusion	
9) Aerobic digestion (1 unit)	
Water depth (ft)	14
Volume (ft ³)	24,500
Type of aeration - diffused	
Supernatant capability - Airlift pump to re-aeration zone	
Type of diffusers - Galvanized steel air diffusion	
10) Blowers for contact aeration and reaeration basins (3 units)	
Name - Spencer (Leeson motor)	
Model - C365T34FB5C	
Horse power HP (each)	75
Air capacity (ft ³ /min)	1,580
Oxygen transfer capacity (lb/day)	183,220
11) Secondary Clarifier (1 unit)	
Water Depth (ft)	15

Description	Design ¹
Weir Location – Peripheral	
Weir Length (ft) (Circumference)	113
Surface Area (ft ²)	908
Volume (ft ³)	13,250
Flow (mgd)	0.75
Weir Overflow Rate (gpd/ft)	6,631
Surface Settling Rate (gpd/ft ²)	565
Hydraulic Detention Time (hrs)	3.2
Return Sludge Collector Mechanism Type - Airlift Pump	
12) Scum Collection and Removal	
Type - Surface Skimmer	
Manufacturer – Leeson	
Model - 0182T17FB29D	
HP	3
13) Sludge Airlift Pump (from Clarifier to Reaeration Basin or to Aerobic Digestion Basin)	
14) Contact Basin for Disinfection (1 unit)	
Water Depth (ft)	14
Total Volume (ft ³)	5,495
Detention Time (min)	79
15) Chlorinator (1 unit)	
Name - Capital Controls	
Capacity (lb/day)	500
Type of Injection – Vacuum	
16) Aerobic Digestion (1 unit)	
Water Depth (ft)	14
Volume (ft ³)	24,500
Type of Aeration – Diffused	
Supernatant Capability - Airlift Pump to Re-aeration Zone	
Type of Diffusers - Galvanized Steel Air Diffusion	
17) Sludge Drying Beds (2 units)	
18) Drying Bed Underdrains	
19) Ball Gear Drive	
20) Standby Power	
Caterpillar Diesel Generator - 1,250 KVA, 1,000 KW, 60 Hz, Model SR-4B	
Generator Motor - 1,105 HP, 8.9 full load/full torque, AR No. 7C1300	
Automatic Activation - Capacity for all Plant Electrical Systems	

Note: 1 – Data from Winzler & Kelly Consulting Engineers (2004). Comprehensive Performance Evaluation Agat-Santa Rita Sewage Treatment Plant
2 – Not available

Table 3C.2: Unit Processes of Hagatna STP

Description	Design ¹
1) Comminutor (1 unit)	
2) Grit removal (1 unit)	
3) Stand-by bar screen (1 unit)	
4) Perchlorination (1 unit)	
Name - Wallace and Tiernan V-Notch Gas Chlorinators	
5) Ozonation units (2 units)	
6) Diversion structure (1 unit)	
7) Influent pumps (4 units)	
Capacity (gpm)	5,500
Head (ft)	24
8) Influent flow meter - Parshall flume (1 unit)	
9) Primary clarifiers (3 units)	
Surface dimensions (ft x ft) (each)	34 x 120
Water depth (ft) (shallowest)	11.16
Water depth (ft) (Deepest)	12
Weir location - both sides of the effluent trough	
Weir length (ft) (total)	204
Total surface area (ft ²)	12,240
Total volume (ft ³)	122,400
Total design flow (mgd)	12
Design weir overflow rate (gpd/ft ²)	58,824
Design surface settling rate (gpd/ft)	980
Collector mechanism name: N/A ²	
Model: Foote-Jones-Dressor LSC-743-143 TABC	
HP (each)	0.5
10) Effluent booster pumps (2 units)	
Capacity (gpm)	8,200
Head (ft)	22
11) Cavity scum pump with grinder (1 unit)	
Capacity (gpm)	105
Head (psi)	50
12) Primary sludge chopper pumps (4 units)	
Capacity (gpm)	220
Head (ft)	22
13) Pipe gallery sump pumps (2 units)	
Capacity (gpm)	N/A ²
Head (ft)	N/A
14) Aerobic digesters (4 units)	
Surface dimensions (ft x ft) (each)	32 x 32
Water depth (ft)	18
Active sludge waste depth (ft)	15
Total volume (sludge waste) (ft ³)	61,440
15) Aerators/Mixers (4 units)	
16) Sludge decant tank (1 unit)	
17) Tank dewatering pumps (2 units)	
Capacity (gpm)	700

Description	Design ¹
Head (ft) (each)	25
18) Centrifuge feed pumps from thickener to centrifuges (2 units)	
Capacity (gpm) (each)	80
Head (psi) (each)	50
19) Centrifuges (2 units)	
Manufacturer – Bird	
HP	100
20) Standby Power	

Note: 1 - Data from Duenas & Associates, Inc. and Boyle Engineering Corporation (2002). Comprehensive Performance Evaluation Hagatna Sewage Treatment Plant
2 – Not available

Table 3C.3: Unit Processes of Baza Gardens STP

Description	Design ¹
1) Influent flow meter (1 unit)	
Type - V-notch weir	
2) Influent pumps	
Capacity (gpm)	N/A ²
Head (ft)	N/A
3) Effluent pumps	
Capacity (gpm)	N/A
Head (ft)	N/A
4) Hand-cleaned bar screen (1 unit)	
Bar screen width (inch)	27
Bar spacing (inch)	1
Screening capacity	N/A
5) Aerated grit removal (1 unit)	
Disposal - Landfill	
Removal capacity	N/A
6) Comminutor (1 unit)	
Name - Chicago Pump Co., (Jones & Atwood Model 10R)	
HP	0.75
7) Extended aeration tank (1 unit)	
Water depth (ft)	15.25
Total volume (ft ³)	78,000
Flow (mgd)	0.6
Sewage detention time (hrs)	23.3
BOD ₅ loading (lb/day/1,000 ft ³)	15
BOD ₅ (mg/L)	200
Type of diffusers - Ceramic plate	
8) Aerobic digestion (1 unit)	
Water depth (ft)	15.25
Volume (ft ³)	N/A
Type of aeration - Diffused	
Supernatant capability - Airlift pump to re-aeration zone	
Type of diffusers - Galvanized steel air diffusion	
9) Blowers for extended aeration tank and aerobic digestion tank (1 unit)	
Name - Hoffman	
Model - C365T34FB5C	
HP	75
Air capacity (ft ³ /min)	1,250
Oxygen transfer capacity (lb/day)	N/A
10) Secondary Clarifier (1 unit)	
Water Depth (ft)	15.25
Weir Location	N/A
Weir Length (ft)	110
Surface Area (ft ²)	1,020
Volume (ft ³)	15,600
Flow (mgd)	0.6

Description	Design ¹
Weir Overflow Rate (gpd/ft)	5,455
Surface Settling Rate (gpd/ft ²)	600
Hydraulic Detention Time (hrs)	4.7
Return Sludge Collector Mechanism Type - Airlift Pump	
11) Scum Collection and Removal	
Type - Surface Skimmer	
Manufacturer - Leeson	
Model - 0182T17FB29D	
HP	N/A
12) Sludge Airlifted Pump (from Clarifier to Extended Aeration Tank or to Aerobic Digestion Tank)	
13) Contact Basin for Disinfection (1 unit)	
Water Depth (ft)	13.75
Total Volume (ft ³)	1,650
Detention Time (min)	30
14) Chlorinator (1 unit)	
Name - Capital Controls	
Capacity (lb/day)	500
Type of Injection - Vacuum	
15) Standby Power	
International Newage Ltd. Type HC 434 E (250 kW)	
Generator - out of service	

Note: 1 - Data from Winzler & Kelly Consulting Engineers (2004). Comprehensive Performance Evaluation Baza Gardens Sewage Treatment Plant
2 - Not available

Table 3C.4: Unit Processes of Umatac-Merizo STP

Description	Design ¹
Influent flow meter (Parshall Flume) (1 unit)	
Size (inch)	6
Influent Pumps (Raw water is sent to facultative lagoon.) (2 units)	
Capacity (gpm) (unit to be confirmed)	1,150
Head (ft) (unit to be confirmed)	35
Effluent Pumps (Treated WW from facultative lagoon) (2 units)	
Capacity (gpm) (unit to be confirmed)	350
Head (ft) (unit to be confirmed)	190
Recirculation pump (1 unit)	
Capacity (gpm) (unit to be confirmed)	200
Head (ft) (unit to be confirmed)	73
Hand bar screen (1 unit)	
Bar screen width (inch)	N/A ²
Bar spacing (inch)	1
Screening capacity	N/A
Aerated Facultative Lagoon (1 unit)	
Water Depth (ft)	12.5
Total Volume (ft ³)	436,000
Design flow (mgd)	0.45
Design mean cell retention time (d)	7
BOD ₅ loading (lb/day/1,000 ft ³)	N/A
Aerators (2 units)	
Type of Aeration - Aspirator	
Name - Reliance Electronic	
Model - P28G5067A	
HP	25
Overland Flow Treatment System (8 units)	
Recirculation Pond (1 unit)	
Standby Power (1 unit)	
Generator - Generac Corp., Model: 93A01405 S	
Alternator - 277/480 volts, 120 amps, 3 phase, 60 z, 1,800 RPM	
Motor - Caterpillar, 86 hp, 1,890 RPM	

Note: 1 - Data from Winzler & Kelly Consulting Engineers (2004). Comprehensive Performance Evaluation Umatac-Merizo Sewage Treatment Plant
 2 - Not available

Table 3C.5: Unit Processes of Northern District STP

Description	Design ¹
Comminutor (1 unit)	
Name - Chicago pump	
HP	3
Back-up hand-cleaned bar screen (1 unit)	
Bar screen width (inch)	72
Bar spacing (inch)	2
Parshall flume – Influent (1 unit)	
Size (inch)	36
Preaeration tanks (2 units)	
Size	N/A ²
Air blowers for preaeration and aerated grit chambers (2 units)	
(One is run and another one is stand-by.)	
Capacity (cfm)	800
Head (psig)	6
Ozonation units for preaeration tank	
Aerated grit chamber and grit classifier systems (2 units)	
Dimensions	N/A
Settled grit airlift pumps	
Flow divider box (1 unit)	
Primary clarifiers (2 units)	
Surface diameter (ft) (each)	130
Water depth (Shallowest) (ft)	7
Water depth (Deepest) (ft)	13
Weir location - About 18 inch outer circumference of the concrete walls	
Weir length (ft)	471
Total surface area (ft ²)	13,266
Total volume (CF)	108,267
Overflow rate at avg. flow (gal/SF/day)	14,700
Parshall flume – Effluent (1 unit)	
Chlorine contact tanks (2 units)	
Surface dimensions (ft x ft)	70 x 40
Total volume (ft ³)	39,572
Design detention time at peak flow (minutes)	16
Submersible pumps to send scum and sludge from chlorine contact tank to primary digester (2 units)	
Type - Centrifugal pump	
Capacity (gpm)	N/A
Head (ft)	N/A
Primary clarifier sludge pumps equipped with upstream grinders (4 units)	
Type - Air operated diaphragm pump	
Capacity (gpm)	N/A
Head (ft)	N/A
Sludge recirculation pumps (2 units)	
Type - Centrifugal pump	
Capacity (gpm)	450
Head (ft)	10

Description	Design ¹
Primary scum pumps (2 units)	
Type - Centrifugal pump	
Capacity (gpm)	450
Head (ft)	10
Primary anaerobic digester (1 unit)	
Type - coated concrete tank with floating steel cover	
Diameter (ft)	80
Sidewall depth (ft)	21
Center depth (ft)	18
Total active volume (ft ³)	287,327
Detention time, Solids (days)	19
Design flow (mgd)	12
Design volatile solid loading (lb/ft ³)	0.13
Secondary anaerobic digester (1 unit)	
Diameter (ft)	80
Sidewall depth (ft)	21
Center depth (ft)	18
Total active volume (ft ³)	287,327
Detention time, Solids (days)	19
Design flow (mgd)	12
Design volatile solid loading (lb/ft ³)	0.13
Heater	
Manufacturer – Cyclotherm	
Capacity (Btu/hr)	500,000
Digester sludge recirculation pump (1 unit)	
Type - Centrifugal pump	
Capacity (gpm)	100
Head (ft)	22
Digester sludge transfer pumps (2 units)	
Type - progressive cavity	
Capacity (gpm)	232
Head (ft)	10
Centrate return pump	
Centrifuges (2 units)	
Design loading rate (lb/hr)	2,100
HP	75
Centrifuge feed pumps (2 units)	
Type - progressive cavity	
Capacity (gpm)	110
Head (psi)	10
Centrifuge polymer feed pumps (2 units)	
Capacity (gpm)	N/A
Head (psi)	N/A
Sludge drying beds (8 units)	
Dimensions (ft x ft) (each)	30 x 105

Note: 1 - Data from Duenas & Associates, Inc. and Boyle Engineering Corporation (2002). Comprehensive Performance Evaluation Northern District Sewage Treatment Plant
2 - Not available

Table 3C.6: Unit Processes of Inarajan STP

Description	Design
Influent pumps (2 units)	
Aerated lagoons (4 units)	
Dimensions (ft)	N/A ¹
Volume (CF)	N/A
Detention time at avg. flow (hrs)	N/A
Weir box (1 unit)	
Dosing chamber (1 unit)	
Percolation basins (3 units)	
Sludge pump	
Sludge drying beds (6 units)	

Note: 1 – Not available