

APPENDIX D

**PRELIMINARY SIZING DATA FOR WASTEWATER
TREATMENT AND DISPOSAL ELEMENTS OF
RECOMMENDED PLAN**

**TOWN OF ORLEANS, MASSACHUSETTS
 ADVANCED WASTEWATER TREATMENT FACILITIES
 BASIC DESIGN DATA**

REV. 9-8-2008, E.J.L.

INFLUENT

Design Flows & Loads (excluding Recycles) - CORE PLAN

		Phase 1 Annual Average	Phase 4 Annual Average	Phase 4 Maximum Month	Phase 4 Maximum Day	Phase 4 Peak Hour
Flow	mgd	0.32	0.64	1.09	1.44	2.23
Biochemical Oxygen Demand	lbs/day	1,240	2,480	4,580	5,950	-
Total Suspended Solids	lbs/day	1,615	3,230	5,870	7,750	-
Total Kjeldahl Nitrogen	lbs/day	200	400	750	960	-
Total Phosphorus-P	lbs/day	30	60	110	140	-

Design Flows & Loads (excluding Recycles) - EXTENDED PLAN/ TOWN-WIDE SEWERS (EXC. EASTHAM)

		Annual Average	Annual Average	Maximum Month	Maximum Day	Peak Hour
Flow	mgd		1.14	1.94	2.85	4.13
Biochemical Oxygen Demand	lbs/day		3,890	6,610	9,330	-
Total Suspended Solids	lbs/day		4,780	8,120	11,460	-
Total Kjeldahl Nitrogen	lbs/day		660	1,130	1,590	-
Total Phosphorus-P	lbs/day		100	150	240	-

EFFLUENT LIMITS

		Annual Average	Weekly Average	Maximum Day
Effluent Limits (All Flow)				
Flow	mgd		-	-
Biochemical Oxygen Demand	mg/l	30	45	50
Total Suspended Solids	mg/l	30	45	50
Total Nitrogen	mg/l	5	-	10
Total Phosphorus-P	mg/l			
Fecal Coliform (Geo. Mean)	#/100ml	200	400	-

Effluent Limits (Reuse Fraction)

		Annual Average	Weekly Average	Maximum Day
Flow	mgd		-	-
Biochemical Oxygen Demand	mg/l	10		
Total Suspended Solids	mg/l	10		
Total Nitrogen	mg/l	5	-	10
Total Phosphorus-P	mg/l			
Fecal Coliform (Geo. Mean)	#/100ml	0	-	14

**TOWN OF ORLEANS, MASSACHUSETTS
ADVANCED WASTEWATER TREATMENT FACILITIES
DESIGN DATA SUMMARY - ALL FLOW**

REV. 9-11-2008, E.J.L.
No. Installed
During Phase
1 4/5 EXT

Mechanical Screening

Type	Fine, 1/4-inch			
Number of Units	1	1	0	0
Screenings Washing Compactor	Yes	1	0	0
Bypass	Manual, 1-inch	1	0	0

Grit Removal

Grit Chamber				
Type	Vortex			
Number of Units	1	1	0	1
Diameter, ft	6			
Grit Pumping				
Type	Centrifugal, Recessed Impeller			
Number of Units	1	1	0	0
Unit Capacity, gpm	250			
Grit Classifier				
Type	Inclined Conveyor			
Number of Units	1	1	0	0
Unit Capacity, gpm	250			

Septage Receiving

Screening				
Type	Fine, 1/4-inch			
Number of Units	2	1	1	0
Screenings Washing Compactor	Yes	1	0	0
Bypass	Manual, 1-inch	1	0	0
Screened Septage Storage Tanks				
Number of Units	3	2	1	0
Design Receiving Volume, gpd (during Max Month)	50,000			
Design Storage Duration, days	3			
Volume, Total, gal	150,000			
Unit Volume, gal	50,000			
Screened Septage Pumps				
Type	Positive Displacement			
Number of Units	3	3	0	0
Unit Capacity, gpm	100			

Primary Clarifiers

Number of Units	2	1	1	0
Diameter, ft	30			
Side water depth, ft	12			

Activated Sludge - Biological Nutrient Removal

Process	Four-Stage Bardenpho			
Number of Trains	4	2	2	2
Width per Train, ft	18			
Length per Train, ft	72			
Depth, ft	15			
Total Volume, cf.	78,000			
Total Volume, gal.	585,000			880,000
Design MLSS, mg/l	3,000			3,500
Mixers (Anoxic, Deoxygenation Zones)				
Type	Submersible, Horizontal, Propeller			
Number of Units per Train	6			
Total Number of Units	24	12	12	12
Nominal speed, rpm	200			
Unit Capacity, HP per 1,000 CF	0.4			

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Internal Recycle Pumps				
Type	Submersible, Propeller			
Number of Units per Train	1			
Total Number of Units	4	2	2	2
Unit Capacity, mgd	3.4			
Total Capacity, mgd	13.6			
Aeration Equipment				
Type	Positive Displacement			
Number of Units	4	3	1	Replace blowers
Unit Capacity, CFM	1,900			
System Capacity, CFM	5,700			
Diffuser Type	Fine Bubble, 9" dia. Membrane			
Secondary Clarifiers				
Type	Rapid Sludge, Suction Header Type			
Number of Units	3	2	1	1
Diameter, ft	30			
Side water depth, ft	12			
Supplemental Alkalinity System				
Type	Magnesium Hydroxide (Liquid)			
Storage Tank				
Number of Units	1	1	0	0
Volume, gallons	6,500			
Design Dosage, mg/l as CaCO ₃	150			
Chemical Usage, gallons per day	10 - 50			
Pumps				
Type	Positive Displacement, Tubing Pump			
Number of Units	2	2	0	0
Unit Capacity, gallons per hour	0.1 - 10			
Supplemental Carbon System				
Type	Methanol, MicroC, or equal			
Storage Tank				
Number of Units	1	1	0	0
Volume, gallons	1,000			
Design Dosage, mg/l as COD	40 - 100			
Chemical Usage, gallons per day	5 - 40			
Pumps				
Type	Positive Displacement, Tubing Pump			
Number of Units	2	2	0	0
Unit Capacity, gallons per hour	0.1 - 10			
Disinfection Systems - Ultraviolet Light				
Type	Low Pressure - High Output			
Number of Banks	3	2	1	1
Design Peak Intensity (End of Lamp Life), μ W-s/cm ²	30,000			
End of Lamp Life Output, % of New Lamp	65%			
Design Transmissivity	65%			
Cleaning Method	Chemical/ Mechanical			
Effluent Pumping				
Type	Centrifugal			
Number of Units	4	3	1	1
System Capacity (mgd), Peak Hour	2.23			
Unit Capacity (gpm)	530			

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Effluent Disposal

Type	Rapid Infiltration Basins			
Design Maximum Day Flow Rate, mgd	1,440,000			
Design Application Rate (gpd/sf for Max Day flow)	7.7	50%	50%	Partial
Total Area Required (sf)	187,000	93,500	93,500	Partial
Number of Units	13	7	6	Partial

Scum Pumping

Primary Scum				
Type	Vertical Wetwell, Chopper			
Number of Units	1	1	0	0
Unit Capacity, gpm	150			
Secondary Scum				
Type	Vertical Wetwell, Chopper			
Number of Units	1	1	0	0
Unit Capacity, gpm	150			

Primary Sludge Pumping (PSL)

Type	Positive Displacement			
Number of Units	2	2	0	0
Unit Capacity, gpm	250			

Return Sludge Pumping (RSL)

Type	Centrifugal, Screw Impeller			
Number of Units	4	3	1	1
Design Return Rate (% of Q Max Month)	100%			
System Capacity, mgd	1.09			
Unit Capacity, gpm	250			

Waste Sludge Pumping (WSL)

Type	Centrifugal, Screw Impeller			
Number of Units	2	2	0	0
Unit Capacity, gpm	150			

Plant Water (PW)

Type	Multi-stage centrifugal			
Number of Units	2	2	0	0
Unit Capacity, gpm	200			
Service Pressure, psi	100			
Hydropneumatic Tank	Yes			

On-Site Pump Station (Sanitary & Recycle)

Type	Centrifugal, non-clog			
Number of Units	2	2	0	0
Unit Capacity, gpm	250			

Sludge Storage Tanks (Waste Sludge)

Number of Units	2	1	1	0
Length, ft	45			
Width, ft	10			
Side Water Depth, ft	15			
Total Volume, cf.	13,500			
Total Volume, gal.	101,000			
Design Waste Sludge Volume (Max. Month), gpd	22,000			
Design Waste Sludge Solids (Max. Month), %	0.75			
Storage, days	4.6			

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Aeration System				
Type	Positive Displacement/ Diffused Aeration			
Number of units	2			
Aeration, cfm/1000cf	40			
Unit Capacity, cfm	540			
Sludge Storage Tanks (Primary Sludge)				
Number of Units	1	1	0	0
Length, ft	45			
Width, ft	10			
Side Water Depth, ft	15			
Total Volume, cf.	6,800			
Total Volume, gal.	51,000			
Design Primary Sludge Volume (Max. Month), gpd	20,000			
Design Primary Sludge Solids (Max. Month), %	2.5			
Storage, days	2.6			
Mixing	Pump Mix			
Sludge Storage Tanks (Dewatering Blend Tank)				
Number of Units	1	1	0	0
Length, ft	45			
Width, ft	10			
Side Water Depth, ft	15			
Total Volume, cf.	6,800			
Total Volume, gal.	51,000			
Total Weekly Waste Sludge during Max Month	154,000			
Total Weekly Primary Sludge during Max Month	140,000			
Total Weekly Sludge during Max Month	294,000			
Dewatering, days per week during Max Month	5			
Dewatering, gallons per day during Max Month	58,800			
Storage, days during Max Month	0.9			
Dewatering System				
Sludge Pumping (Blend, Waste, Primary)				
Number of Units	3	3	0	0
Type	Positive Displacement Duplex Plunger			
Unit Capacity, gpm	150			
Sludge Dewatering System				
Number of Units	2	2	0	0
Type	Belt Filter Press			
Size	1.5-Meter			
Capacity, lb/hr	1,000			
Belt Alignment/ Tensioning System	Hydraulic			
Sludge Conditioning System	In-Line Venturi Mixing Valve			
Sludge Conveyors	Shaftless Screw Conveyor			
Polymer System				
Number of Units	2	2	0	0
Type	Liquid Emulsion, Mechanical Mixing			
Odor Control System				
System No. 1 (Headworks/ Sludge Storage)				
Type	Chemical Scrubber			
Capacity, cfm	To be determined			
System No. 2 (Dewatering)				
Type	Activated Carbon			
Capacity, cfm	To be determined			