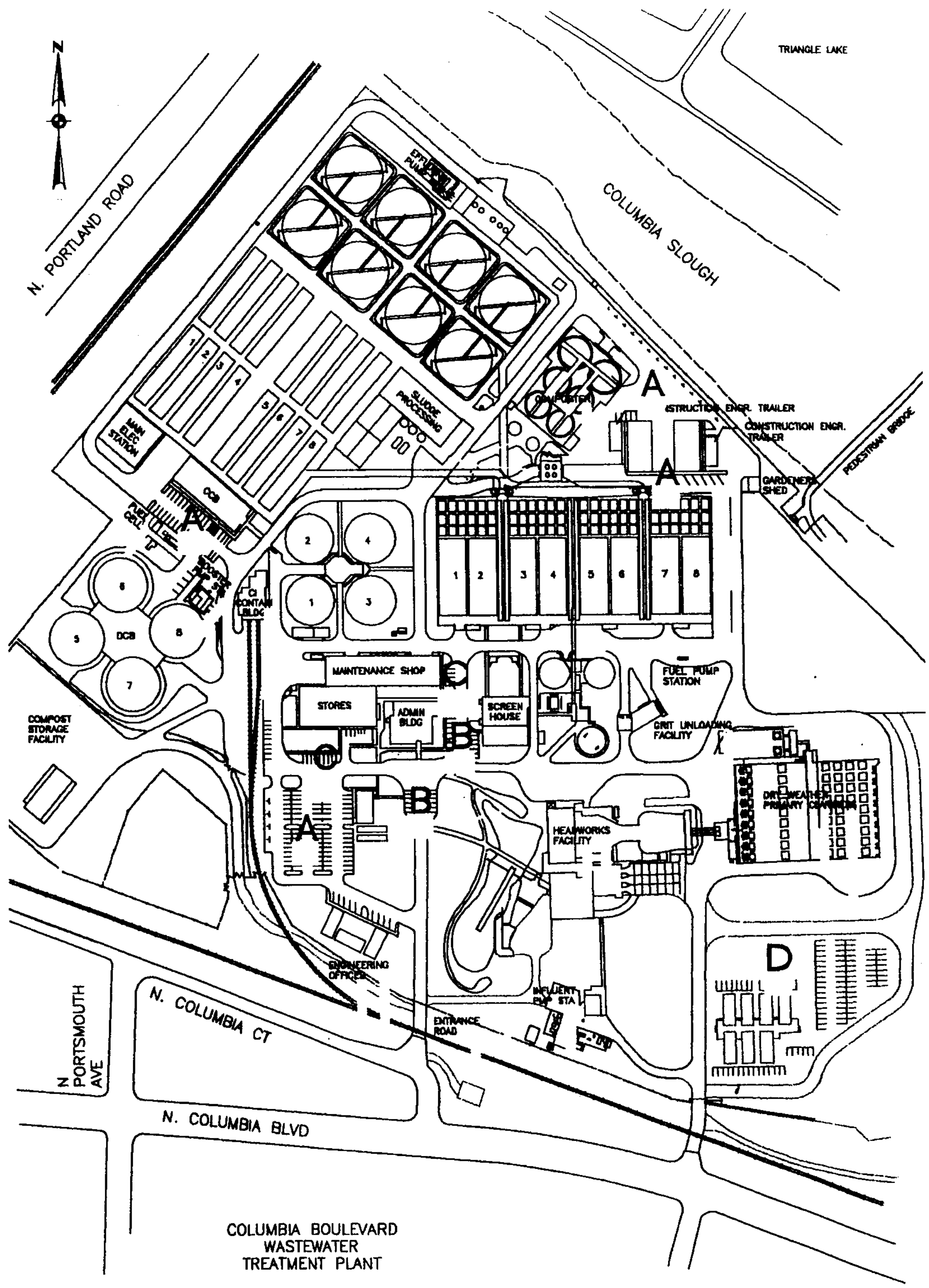
SECTION 5
DESCRIPTION OF FACILITIES AT CBWTP

The CBWTP site is bounded by Columbia Boulevard and the Union Pacific railroad tracks to the south, Burlington Northern main-line railroad tracks to the west and Union Pacific railroad tracks to the north and east. The main mechanical plant is located on 73.5 acres (Figure 5-1). In addition to the main plant, a 22.5-acre tract immediately NW and across North Portland Road from the mechanical plant has been acquired for future treatment facility expansion. Also, the CBWTP complex includes a 51-acre area north of the mechanical plant where the Triangle Lake facultative solids lagoon is located.

Table 5-1. Chronological Development of CBWTP Facilities
• Primary Plant – Placed into service in 1952
• Effluent Chlorination System Construction - 1961
• Major Primary Plant Expansion – 1968 & 1969 – Upgrade included the enlargement of the plant's administrative building and the addition of a digester pump house.
• Solids Lagoon Construction – 1970
• Secondary (Waste Activated) Plant Construction – 1974
• Construction of Four New Anaerobic Digesters – 1983
• Taulman-Weiss Within-Vessel Composter Construction – 1984
• Chlorine Containment Building Construction – 1992
• Outfall Diffuser Construction - 1995
• Reuse Water Reclamation Plant Addition – 1996
• Replacement Headworks (Preliminary Treatment) Construction – 1996 and 1997
• Solids Pump Booster Station Construction – 1998
• Chlorination System Addition – 1999
• 200 kW UTC PC 25 phosphoric acid fuel cell addition-1999
• Columbia Slough Consolidation Conduit Construction – 2000
• Wet Weather Influent Pump Station Construction – 2000
• Primary Clarifier Addition (Dry Weather Flow) – 2000
• Dechlorination Facility Construction – 2000
• Second Wet Weather Outfall Pipeline and Diffuser Construction - 2000
• Wet Weather Primary Clarifier Improvements-2001
• 4-Capstone 30 kW microturbines installed-2003
• Belt Filter Press High Pressure Zone Installations-2003
• Influent and Effluent Pump Capacity Improvements-2004
• Converted to Sodium Hypochlorite for Effluent Disinfection-2005

Figure 5-1. Columbia Boulevard Wastewater Treatment Plant



HISTORY

The first major wastewater treatment plant constructed for the City of Portland was completed at 5001 North Columbia Boulevard in 1952 (Table 5-1). The original plant provided preliminary and primary treatment, with no disinfection. It was designed for an average dry weather capacity (ADWC) of 60 million gallons per day (mgd) and peak wet weather capacity (PWWC) of 155 mgd. Raw solids generated by the original primary plant were stabilized by anaerobic digestion and stored in a sewage stabilization pond located at the northwest corner of the plant immediately south of the Columbia Slough in an area now occupied by the secondary plant. Disinfection of plant effluent by chlorination was added in 1961. A description of various plant modifications that have taken place since then follows.

The first major plant expansion, completed in 1969, increased the capacity of the primary treatment units to 100 mgd ADWC and 300 mgd PWWC. Parshall flumes replaced venturi flumes as flow measuring devices, and cyclonic grit separators replaced mechanically raked grit channels. Primary clarifier tankage was doubled, and two gravity primary sludge thickeners were added. Facultative sludge lagoons were also constructed immediately north of the plant across Columbia Slough in 1970 (Section 9, Figure 9-1).

Secondary treatment by activated sludge was added in the northwest area of the plant during 1974. Plant capacity, after completion of the 1974 expansion, was 100 mgd ADWC, 200 mgd PWWC (secondary), and 300 mgd PWWC (primary).

A coarse grit removal system was added to the headworks in 1975. This modification included a septage dumping station.

Four new anaerobic digesters were added in 1983, tripling the plant's digestion capacity. The new digesters allowed 2 aeration basins, which had been used for aerobic digestion, to resume operation as aeration basins. A third primary sludge gravity thickener was also constructed during this period.

New belt presses replaced vacuum filters for dewatering biosolids in 1982 and a 60 dry ton per day Taulman-Weiss within-vessel composting system was constructed in 1984.

A new maintenance building and crew quarters were constructed in 1991 near the present administration building (Dodd Center).

New chlorination facilities were constructed in 1992 to meet revised Uniform Fire Code requirements for emergency scrubbers. In 1994, modifications to the secondary treatment system were completed. These modifications included reconfiguring the aeration tanks to plug flow selector technology, converting the aeration tanks to fine bubble diffusion, adding additional low-end blower capacity to take advantage of the energy savings of the new diffusers, and modifying secondary clarifiers to improve performance and hydraulic capacity.

A 6.0 mgd peak (expandable to 12.0 mgd) reuse water reclamation plant was constructed immediately north of secondary clarifiers in 1996. The disinfected secondary effluent is processed through Envirex™ microscreens and the system is designed to produce reclaimed water for a variety of CBWTP process uses (e.g., wash down water, spray nozzles, scum cleaning and channel cleaning), and a water feature immediately southwest of the new headworks. Reclaimed water will also be used as an additional water supply for plant grounds green scape irrigation. The wastewater reclamation plant was designed to produce Level III effluent.

For safety and modernization reasons, construction of a new headworks was initiated to replace the existing preliminary treatment building in 1996. The old headworks configuration and its numerous conveyors made maintenance and operations unsafe. Antiquated bar screens required manual cleaning and needed to be replaced with automatic screens. The replacement headworks was completed in 1997.

A new solids pump booster station was placed on line immediately northeast of Digester 8 in September 1998. The booster station: (1) facilitates pumping thickened primary solids from existing gravity thickeners, dry weather primary clarifier solids, and raw thickened waste activated solids and primary digested solids trucked to the CBWTP from the TCWTP to Digesters 5 to 8; (2) enables first-stage digested solids to be transferred from Digesters 5 to 8 via gravity to second-stage Digesters 1 to 3; and (3) promotes increased solids hydraulic detention time in digesters, producing thicker biosolids which are more amenable to dewatering. The pump station is designed to facilitate the transfer of thickened primary solids (5 to 7% total solids) to digesters from a 20,000-gallon wet well via three variable speed progressive cavity (200 to 350 gpm @ 40 psi) pumps.

In 1999, the chlorination system was expanded to increase capacity and provide various improvements to the system. Two new 10,000 pound per day and two-2,000 pound per day chlorinators were added. More flexibility was also added to the controls so that the chlorination system can be operated in compound, flow-paced, or residual mode. The improvements also provide flexibility to separately disinfect the secondary effluent (dry weather flow) and primary effluent (wet weather flow).

In 2000, many new facilities and major modifications were added to the CBWTP to capture and treat the Columbia Slough Combined Sewer Overflows (CSO), as required by the ASFO. The expansions and modifications included: a new Columbia Slough Consolidation Conduit (CSCC), a new Wet Weather Influent Pump Station (WWIP), three new Dry Weather Primary Clarifiers (DWCL), new Dechlorination Facilities at Hayden Island (HIDC), and extension of an existing outfall pipeline and a new outfall diffuser for wet weather flows. In 2004, construction was initiated to further increase influent and effluent pumping capacity in anticipation of increased flows resulting from CSO improvements to be completed in the next few years.

The CSCC is constructed parallel to the main interceptor (along North Columbia Boulevard), stretching from NE 13th Avenue and Lombard to the CBWTP. The CSCC consists of approximately two miles of 6-feet diameter pipeline and two miles of 12-feet diameter piping. It is designed to capture CSO that historically discharged to the Columbia Slough, store and convey wastewater pending treatment at the CBWTP. When there is no storm water to be captured, a small flow of approximately 5 to 10 mgd is diverted from the main interceptor into the CSCC to prevent excess sediment deposition.

The wet weather influent pump station is constructed where the CSCC enters the CBWTP to lift the collected wastewater to the headworks for preliminary treatment. The WWIP consists of three low-flow pumps (10 mgd each) and three high-flow pumps (25 mgd each) which provide a total pumping capacity of 105 mgd. Pumps are equipped with variable frequency drives. Odorous air generated and collected at the WWIP is conveyed to the odor control facility at the headworks for treatment.

Three new 40 mgd rectangular primary clarifiers (DWCL) were constructed in 2000 to receive and treat dry weather flows up to 120 mgd. Flow in excess of 120 mgd is diverted to the existing (wet weather) primary clarifiers. Flow to the DWCL is controlled by magmeters and modulating gates at a flow splitting structure downstream of the headworks. Only flow through the DWCL receives secondary treatment. The primary clarifiers are covered to prevent the escape of odorous air generated during sedimentation inside the clarifiers. Captured air is treated at an odor control facility adjacent to clarifiers.

Dechlorination facilities (HIDC) were constructed at Hayden Island during 2000 to ensure chlorine residuals discharged into the Columbia River remain within permit limits. Liquid sodium bisulfite is injected into plant effluent, by metering pumps, before it is discharged into the Columbia River. Sampling for chlorine residual is performed, prior to and after sodium bisulfite injection, to control the amount of chemical used and to report the final value of the chlorine residual in the effluent. The HIDC has its own emergency generator for backup power.

A second outfall diffuser was added to an extended outfall pipeline in 2000. With the completion of this system, two separate outfall pipelines equipped with outfall diffusers now connect the CBWTP to the Columbia River. Intermediate linkages between outfall pipelines allow flows amid pipelines to be crossed so discharge can occur from either outfall diffuser.

In 2001, conversion of the existing primary clarifiers to wet weather service was completed. The conversion included automation of gates for filling and emptying and the addition of flushing, washdown, and dewatering equipment.

FUTURE GROWTH - CBWTP

In 1995, a long-range facilities plan was completed for the CBWTP.[1] The plan identifies improvements necessary to meet community wastewater treatment needs through the year 2040. The facilities plan also addresses improvements to the Triangle Lake Lagoon and makes long-range recommendations for the plant's biosolids recycling program. In early 2005, a request for proposals was solicited to update the long-range facilities plan. A contract for this work has been awarded. Plan revisions are scheduled to be completed in approximately two years.

In addition to the facilities plan, a CBWTP Master Plan (approved March 24, 2004 and revised November 6, 2004) outlines more than 20 capital improvement projects planned between 2004

[1]Columbia Boulevard Wastewater Treatment Plant Facilities Plan, CH2M Hill, Brown and Caldwell and Associated Firms in partnership with the Columbia Boulevard Wastewater Treatment Plant Facilities Plan Citizens Advisory Committee, September 11, 1995.

and 2013. The projects will be completed in two development phases [Phase I (2004 to 2008) and Phase II (2009 to 2013)]. Improvements will be located in three development sections (at the main mechanical plant; an annex to main mechanical plant immediately NW and across North Portland Road from the main plant; and at the Triangle Lake Lagoon).

UNIT PROCESSES

Design criteria and a description of the capacity of the unit processes used at the CBWTP are summarized in Table 5-2.

HEADWORKS

Flow enters the plant through a box-section-shaped influent line and is split into two equal portions just upstream of influent pumping (Table 5-2). These flow streams can be isolated by two hydraulically operated sluice gates. There are also two emergency bypass gates to allow gravity flow directly to primary treatment in the event that the influent pumping system fails.

PRELIMINARY TREATMENT

The preliminary treatment system is comprised of magnetic meters (one at the discharge of each influent pump) for flow measurement, bar screens that remove objects greater than 5/8" followed by screenings presses, grit basins with grit washer separators, and a septage receiving station (Table 5-2).

PRIMARY TREATMENT

Following preliminary treatment, flow up to 120 mgd is diverted to the dry weather primary clarifiers. Flow in excess of 120 mgd is diverted to the wet weather primary clarifiers. Flow to the dry weather clarifiers is controlled by modulating gates at a flow diversion structure downstream of the headworks. Primary effluent from dry weather clarifiers receives secondary treatment, prior to disinfection and discharge into the Columbia River. Primary effluent from the wet weather clarifiers is disinfected prior to discharge into the Columbia River.

Dry weather clarifiers have deep hoppers for collecting and thickening sludge. Solids which accumulate in the clarifiers are pumped directly to the digester booster pump station. The Wet weather clarifiers lack thickening sludge hoppers. Thin solids accumulating in these clarifiers are continuously pumped from the clarifiers to either the dry weather clarifiers or the gravity thickeners prior to being pumped to the digester booster pump station.

Table 5-2. Design Criteria and Capacity at the CBWTP	
Design Flow	
Average Dry Weather Capacity (ADWC)	100 mgd
Peak Wet Weather Capacity (PWWC)	300 mgd when pumping to Columbia River is required
Design BOD_5 Loading	
Average Dry Weather Month	159,294 lb./d
Maximum Dry Weather Month	241,860 lb./d
Design Effluent Requirements	
Maximum Monthly Average TSS	30 mg/l
Maximum Monthly Average BOD_5	30 mg/l
Influent Pumps (Wet Weather Influent PS)	
Number	9
Type	6 Submersible and 3 dry pit submersible
Speed	6 Variable and 3 fixed (600 rpm) speed
Capacity	3 @ 10 mgd, 3 @ 16 mgd & 3 @25 mgd
Horsepower	3 @ 90 hp, 3 @ 150 hp & 3 @ 250 hp
Influent Pumps (Replacement Headworks)	
Number	6
Type	Centrifugal
Speed	Variable speed rpm
Capacity	4 @ 75 and 2 @ 40 mgd
Horsepower	4 @ 450 and 2 @ 250 hp
Preliminary Treatment	
Trash Racks	
Number	4
Size	Clearance, 6 inch
Bar Screens	
Number	5
Spacing	Clearance, 5/8-inch
Grit Basins	
Number	6
Type	Mechanically induced vortex
Size	24 ft diameter
Efficiency	85 percent at 130 mgd
Primary Treatment	
Primary Clarifiers (Dry Weather)	
Number	3
Size	260 by 60 by 10-14 ft
Overflow Rate	2,564 gpd/sq ft @ 120 mgd

Table 5-2. Design Criteria and Capacity at the CBWTP	
Primary Treatment	
Primary Clarifiers (Wet Weather)	
Number	8
Size	225 by 58 by 10 ft
Overflow Rate	3,065 gpd/sq ft @ 290 mgd with one unit out of service

Aeration Basins	
Number	8
Size	381 by 40 by 17 ft
Volume (each)	1.8225 million gallons
Capacity (each)	20.0 mgd at an SVI of 80 ml/g
Design Organic Loadings	
Instantaneous Peak	120,000 BOD and 17,800 NH_3 lb./d
Diurnal Peak	90,000 BOD and 13,350 NH_3 lb./d
Minimum	20,000 BOD and 3,000 NH_3 lb./d
Detention Time	3.5 hours at ADWC @ 100 mgd & 60% RAS
Aeration Equipment	
Type	Fine bubble diffuser
Mixer	
Type (Anoxic Zone)	Floating mixer
Secondary Clarifiers	
Number	8
Type	Square, peripheral-feed
Size	125 ft
Side Water Depth	12.5 ft
Surface Overflow Rate	800 $gal/d/ft^2$ at ADWC @ 100 mgd
Solids Loading Rate	32.4 $lb/d/ft^2$
Detention Time	2.79 hours at 100 mgd
Sludge Removal	Revolving suction arm
Sludge Recirculation	
Number of Pumps, Each Clarifier	2
Type	1 variable speed, 1 constant speed
Combined Capacity	62.5 mgd
Disinfection	
Type	Sodium hypochlorite
Control	Residual-paced, flow-paced or compound loop
Storage	75,000 gallons
Metering pumps	4 dry weather & 4 wet weather
Reactor	Chlorine contact pipe
Detention Time	22 minutes @ 300 mgd
Effluent Pumping	
Number	5
Speed	Variable speed
Type	Vertical Turbine
Rated Head	43 ft
Rated Capacity	90 mgd each

SECONDARY TREATMENT

Activated sludge unit processes used for secondary treatment were designed for an ADWC of 100 mgd and a PWWC of 200 mgd. The difference between the 300 mgd PWWC for primary treatment and 200 mgd for secondary treatment peak flow was designed to bypass secondary treatment and blend with secondary effluent for subsequent chlorination and discharge. Actual daily capacity of the secondary system was limited to 80-100 mgd before the 1994 modifications. The secondary treatment capacity was increased to 135 mgd sustained peak (four hour) flow. Flow through the secondary treatment system is measured via an open channel contra-ultrasonic flow meter.

Primary effluent receiving secondary treatment is divided among eight aeration basins. Each basin is 381 feet long by 40 feet wide and operates with about 17 feet of water depth. Secondary influent, under plug flow mode of operation, enters the basin with the return activated sludge (RAS) at the head end of the basin. RAS can either be directed to the secondary influent channel or the head end of each basin. Secondary influent under step-feed mode of operation is directed down the length of the basin through any of eight gates per basin. The RAS is directed to the head end of each basin in step-feed mode. The units are designed to provide selector technology at the front end of each basin via mixers which allow regions of basins to be operated in either an aerated or non-aerated mode. Effluent launders run the width of the end of each basin.

Aeration is provided by fine-bubble diffused aeration with full floor coverage of the basin. Aeration air is supplied by two large centrifugal blowers and two medium blowers.

The aeration basins must be operated in pairs. Basin pairs cannot be drained separately except for Basins 7 and 8. Structural design limitations of the center common wall in Basins 1 through 6 dictate that there be no differential head.

Each aeration basin has a dedicated secondary clarifier. The eight secondary clarifiers are 125-feet square tanks with 12.5 feet of side water depth and flat bottoms. The flow path through the clarifiers is peripheral feed and peripheral overflow. Sludge is withdrawn by direct pumping through articulated sludge collector arms. The clarifiers are designed for a surface overflow rate of 100 mgd at 800 gallons gpd/ft^2 and a peak overflow rate of 1,600 gpd/ft^2 at 100 mgd. Operational experience established a peak overflow rate of 640 gpd/ft^2 before 1994. After 1994, modifications increased the overflow rate.

Two RAS pumps, one constant speed and one variable speed, are connected to each clarifier. Both discharge into a common line containing a flowmeter and flow control valve. Under the original design, RAS was returned only to the basin associated with the clarifier from which it was drawn, resulting in eight independent activated sludge plants, side by side. A modification to the system permitted combining RAS from all eight clarifiers and returning the combined flow to the secondary influent channel upstream of the aeration basins. This modification limited RAS capacity and increased hydraulic head losses in the secondary influent channel, but it is now the normal flow path. Modifications have been made to plug flow configurations to redirect RAS to several points at the head end of aeration basins.

EFFLUENT PUMPING, DISINFECTION AND DECHLORINATION

As long as river stages remain normal, under most operating conditions, the 2 two-mile long outfall pipelines can carry 160 to 200 mgd CBWTP effluent by gravity to diffuser structures in the Columbia River. A diffuser consists of a flow diffusion manifold equipped with multiple discharge outlets of regulated rubber duckbills.

Under certain conditions of high river levels or increased plant flow, effluent pumping is required. Five 90-mgd pumps can be actuated to discharge through two outfall pipelines.
There are emergency bypass flow diversion structures at the Oregon Slough and the Columbia Slough. The diversion structure discharging to the Columbia Slough is engaged only in case of an emergency. Rarely used, this outfall was operated for a short time in November 2003 (21 MG) and December 2003 (13.3 MG).

The configuration of the wet well and control gates at the CBWTP effluent pump station permits both mixed primary-secondary and secondary effluents to be pumped by dry weather pumps, while the wet weather pumps can pump secondary effluent, primary effluent, or a combination of the two.

Chlorine disinfection was replaced with sodium hypochlorite disinfection in winter 2005. Sodium hypochlorite solution is metered into plant effluent and retained in chlorine contact lines for sufficient time to enable disinfection to occur. Hypochlorite solution is stored in five tanks (with a combined capacity 75,000gallons) pending being metered into effluent via peristaltic pumps (two variable speed dry weather and two additional variable speed wet weather flow pumps with capacities of 2.4 to 120 and two dry weather and two other wet weather flow pumps with capacities ranging from 10 to 528 gph.

The outfall pipeline system to the Columbia River provides sufficient detention time to meet chlorine contact requirements if flow rates are within design limits. If high chlorine residual is detected in the plant effluent, sodium bisulfite is used to dechlorinate to ensure chlorine residual is below discharge limits.

SOLIDS HANDLING[2]

Unit processes used for solids handling at CBWTP during 2004 included degritting, screening, gravity thickening (primary sludges); two-stage anaerobic digestion, belt press dewatering and land application of primary solids; and gravity belt thickening, two-stage anaerobic digestion, belt press dewatering and land application or lagoon storage of secondary solids. During 2004, digested primary solids and approximately 60 percent of the digested secondary solids were blended with previously digested, lagoon stabilized biosolids, dewatered and land applied at the Madison Farms (Section 13). The remainder of the digested solids (largely digested TWAS) were pumped to the Triangle Lake Lagoon for storage and additional stabilization (Sections 3, 9 & 11).

[2]See Section 8 for additional detail on solids processing at CBWTP.

Solids accumulated at the base of dry weather primary clarifiers are pumped directly to the pump booster station. Solids from wet weather primary clarifiers (approximately 0.5% density) are pumped to dry weather primaries for thickening to approximately 5% total solids. In the event dry weather primary repairs are required, solids removed from dry and wet weather primaries can be diverted to three-55 feet diameter gravity thickeners (Table 5-3). Thickened solids are then passed through in-line grinders and pumped to the solids pump booster station and from there into anaerobic digesters.

Waste activated sludges (WAS) are thickened on one of three-gravity belt thickeners to about 4% total solids (TWAS), and then pumped directly to first-stage anaerobic digesters.

Table 5-3. CBWTP Solids Processes

Item	Value
Primary Treatment and Gravity Thickening	
Primary Clarifiers (Dry Weather)	
Number	3
Size	260 by 60 by 10-4 ft
Overflow Rate	2,564 gpd/sqft @ 120 mgd
Gravity thickening of primary sludge (backup)	
Thickeners	
Number	3
Diameter, each, feet	55
Sidewater depth, feet	10
Gravity Belt thickening of secondary sludge	
Thickeners	
Number	3
Width, each, meters	3
Feed flow rate, each, gpm	900
Anaerobic digesters [1]	
Number	8
Diameter, feet	4 at 90
	4 at 105
Sidewater depth, feet	4 at 25.3
	4 at 37
Effective volume, each, cubic foot	4 at 160,000
	4 at 320,000
Triangle Lake Biosolids Lagoon	
Area, acres	37
Effective Sidewater depth, feet	14
Dredge capacity, gpm	800
Mechanical dewatering[2]	
High solids belt filter presses	
Number	4
Belt width, meters	2
Solids loading rate, lb./hr/meter	750 to 1,000
Composter[3]	
Rated Capacity, dt/d	30

Practical Capacity, dt/d	8-10

[1]Including Digesters 3 & 4, the principal blend tank used to collect newly digested and older lagoon solids prior to dewatering.

[2]In November 2003, Belt filter presses 2, 3 and 4 were retrofitted with six additional rollers and four more feet of belt length to produce a dryer cake (2 to 3%). Belt filter press 1 had been retrofitted in 1999.

[3]The composter was taken out of service in 1999. In 2002, one-half of the composter (western-most two bio and cure reactors) was converted to an odor control system for the solids processing facilities.

Six of eight anaerobic digesters were used to stabilize primary and secondary solids. During 2004, three first-stage digesters (Digesters 5, 6 and 8) were used to process all primary solids generated at the CBWTP; digested primary and raw thickened secondary solids from the TCWTP; and 60 percent of the raw thickened waste activated solids produced at the CBWTP (Figure 5-1). The remaining raw thickened waste activated solids generated at the CBWTP were processed in first-stage Digester 7. Solids exiting Digester 7 were directed to the Triangle Lake storage lagoon for further stabilization.

After first-stage digestion, solids from Digesters 5, 6 and 8 were directed to either Digesters 1 or 2 (mixed second-stage digesters heated to 100°F) pending discharge to Digesters 3 and 4. Digesters 3 and 4 were operated as blend tanks for combining freshly digested solids and older, previously digested solids derived from the Triangle Lake Lagoon. In addition, Digester 4 was used for gas storage. Solids withdrawn from these tanks were mixed with polymer, dewatered via belt filter presses, and transported to the City's Madison Farms biosolids application site.

No supernating takes place from Digesters 1 and 2, nor does any supernating occur from Digesters 5, 6, 7 or 8. Some supernating can occur out of second-stage Digesters 3 and 4. Digesters 5, 6, 7 and 8 facilitate solids pumping to Digesters 1 and 2. Solids from Digesters 1 and 2 discharge to Digesters 3 and 4, respectively, via gravity.

In 2004, Digesters 5, 6 and 8 were automatically batch fed CBWTP raw thickened primary solids on a sequential basis at a rate for approximately 10,000 gallons per dose. Dose volumes and sequencing can be adjusted to accommodate digesting and solids processing needs. Digesters 5, 6, 7 and 8 received batches of TWAS on a rotating basis. During each feed cycle, approximately 6,000 gallons TWAS (2,000 gallons per digester) were fed to Digesters 5, 6 and 8 while roughly 4,000 gallons were directed to Digester 7. As is the case with thickened primary solids, the quantity of TWAS directed to digesters can be adjusted. A flow-totaling meter registered the combined flow fed to each first-stage digester on an on-going basis and volumes wasted to digesters daily were recorded.

Grab samples of raw thickened primary and secondary digester feed sludges were collected separately at two-hour intervals. A composite of the two digester streams feed sludges made from twelve daily subsamples was used to determine the mean total and volatile solids levels entering first-stage digestion.

Anaerobically digested primary and secondary biosolids were dewatered via four belt filter presses yielding a 18.7 to 24.7% cake (21.58% TS – 2004 average). All belt filter presses have been modified to achieve a denser cake (2 to 3% more solids) through the addition of six rollers and four more feet of belt length. Blended dewatered solids from the Triangle Lake Lagoon (≈ 33%)

and freshly digested biosolids (≈ 67%) were trucked to Madison Farms for land application at agronomic rates (2.3 to 4.8 dry tons/acre/year) during 2004 (Section 13).