Highland Municipal Water Treatment Plant

Equipment Specification & Process Variables

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1. Plant Overview

Highland Municipal Water Treatment Plant is a conventional surface water treatment facility serving approximately 18,000 residents. The plant treats raw water from Highland Reservoir with a design capacity of 5 MGD (million gallons per day) and an average daily production of 3.2 MGD.

Area	Name	Description
Area 100	Raw Water Intake	Reservoir intake structure with raw water pumping
Area 200	Chemical Feed	Coagulant, chlorine, and fluoride chemical storage and dosing
Area 500	Filtration	Four dual-media gravity filters with automated backwash
Area 600	Disinfection & Clearwell	Chlorine contact basin and 0.5 MG clearwell

2. Control System Architecture

The treatment plant is controlled by an Allen-Bradley ControlLogix L83E processor in the main plant MCC room.

Parameter	Value
Processor	1756-L83E CompactLogix
IP Address	192.168.1.10
Slot	0
I/O Chassis	1756-A13 (13-slot)
Program File	Highland_WTP_Main.L5K

All treatment plant process variables are available as Controller Tags in the ControlLogix program. The attached L5K file contains the complete tag database.

3. Equipment List by Process Area

Area 100 — Raw Water Intake

Tag	Equipment	Description
P-101	Raw Water Pump 1	100 HP VFD centrifugal, 2500 GPM

Tag	Equipment	Description
P-102	Raw Water Pump 2	100 HP VFD centrifugal, 2500 GPM (standby)
FT-101	Flow Transmitter	Magnetic flow meter, raw water header
AIT-101	Turbidity Analyzer	Raw water turbidity, Hach 1720E
AIT-102	pH Analyzer	Raw water pH, Hach pHD sc
LT-101	Level Transmitter	Intake wet well level

Area 200 — Chemical Feed

Tag	Equipment	Description
P-201	Coagulant Pump	Metering pump, aluminum sulfate (alum)
P-202	Pre-Chlorine Pump	Metering pump, sodium hypochlorite
P-203	Fluoride Pump	Metering pump, hydrofluosilicic acid
LT-201	Coagulant Tank Level	2,500 gallon poly tank
LT-202	Hypochlorite Tank Level	5,000 gallon poly tank
LT-203	Fluoride Tank Level	1,500 gallon poly tank

Area 500 — Filtration

Four identical dual-media (anthracite/sand) gravity filters:

Tag Pattern	Description	Type
FILT{n}_HeadLoss	Filter differential pressure	Analog, 0–10 PSI
FILT{n}_Turbidity	Filtered effluent turbidity	Analog, 0–5 NTU
FILT{n}_InService	Filter in-service status	Digital
FILT{n}_Backwashing	Backwash in progress	Digital
FILT{n}_Valve	Effluent valve position	Analog, 0–100%

Where {n} = 1, 2, 3, 4. Backwash trigger: HeadLoss > 8.0 PSI or operator-initiated. Cycle: ~15 min. Only one filter may backwash at a time.

Area 600 — Disinfection & Clearwell

Tag	Equipment	Description
AIT-601	Free Chlorine Analyzer	Post-chlorination residual, Hach CL17sc
AIT-602	pH Analyzer	Finished water pH, Hach pHD sc
AIT-603	Turbidity Analyzer	Finished water turbidity, Hach TU5400sc
LT-601	Clearwell Level	0.5 MG clearwell, ultrasonic level

4. Water Quality Compliance Limits

Per TCEQ and EPA Surface Water Treatment Rule:

Parameter	Tag	Warn Lo	Warn Hi	Crit Lo	Crit Hi	Unit
Finished Water Turbidity	AIT-603	—	0.3	—	1.0	NTU
Filter Turbidity (each)	FILT{n}	—	0.15	—	0.5	NTU
Free Chlorine Residual	AIT-601	0.2	3.5	0.1	4.0	mg/L
Finished Water pH	AIT-602	6.5	8.5	6.0	9.0	—
Clearwell Level	LT-601	25%	95%	15%	98%	%
Chemical Tank Levels	LT-201,2,3	15%	—	10%	—	%

5. Process Notes for SCADA Configuration

1. **Chemical Dosing:** Coagulant (alum) dose rate is flow-paced from FT-101. Pre-chlorination is operator-adjusted. Fluoride is flow-paced with manual trim.

2. **Filter Backwash:** Only one filter may backwash at a time. Sequence takes ~15 minutes. Remaining three filters handle full plant flow.

3. **ML Opportunity:** Filter headloss rate and post-sedimentation turbidity are early indicators of raw water quality changes. Predictive monitoring could enable proactive chemical dose adjustment.

4. **Historian Requirements:** All analog process variables historized with appropriate deadband. Digital status on-change. Minimum 1-year retention for regulatory compliance.

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