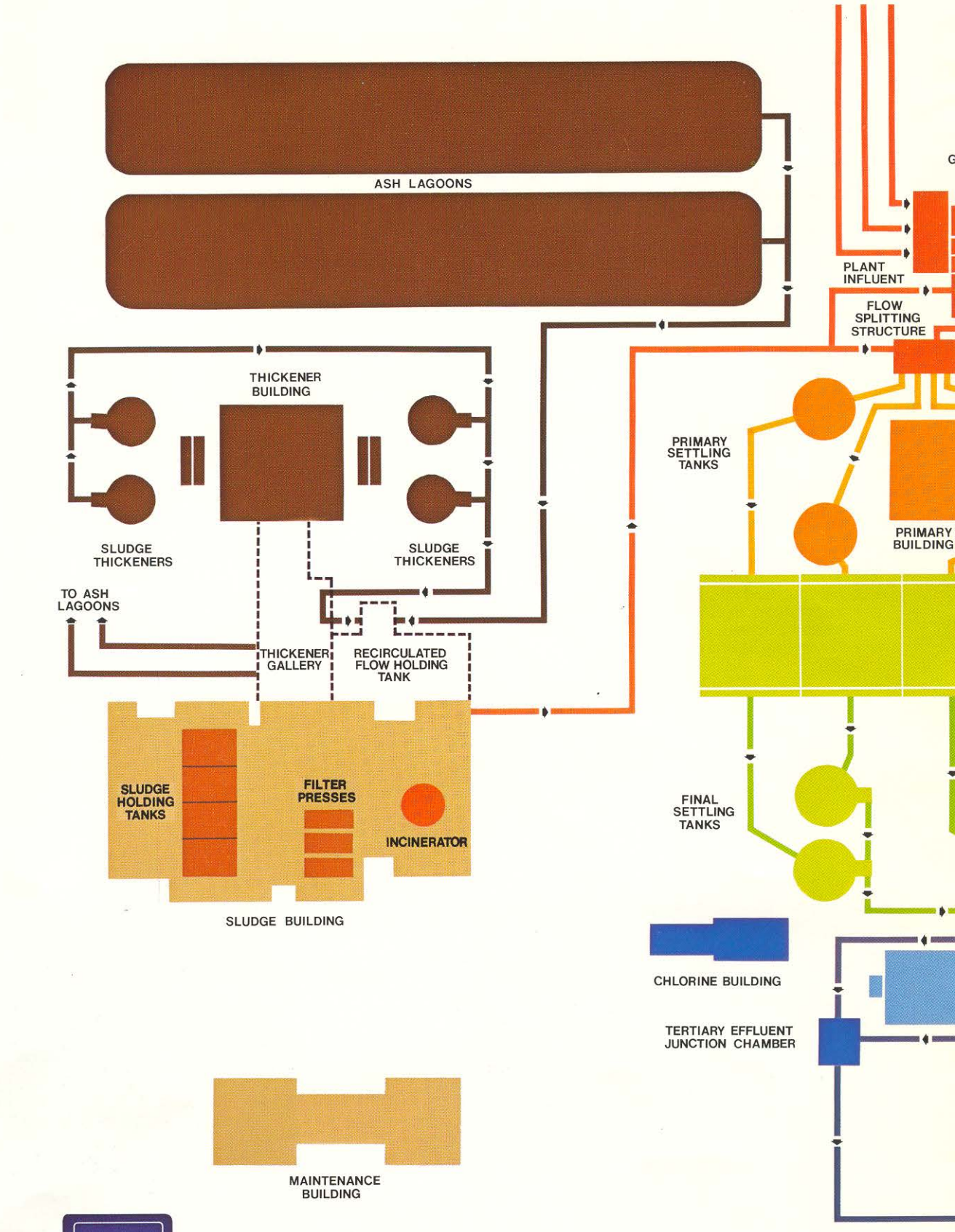
Ypsilanti Community Utilities Authority Wastewater Treatment Plant

The Ypsilanti Community Utilities Authority (YCUA) was formed in 1974 to provide water supply and wastewater treatment. The new advanced wastewater treatment plant has a capacity of 29 mgd average daily flow, and peak instantaneous flow of 72 mgd. It was designed for a projected 1995 population of 147,900. Four new pumping stations pump raw sewage to the wastewater treatment plant. The new plant consists of five distinct levels of treatment:

1. **Pretreatment** — screening, grit removal and diurnal equalization. In addition to the equalization capacity, there is an 11 million gallon retention basin to be used during storm flows.
2. **Primary Treatment** — conventional gravity sedimentation with oil and grease skimming. Provisions for chemical addition to achieve phosphorus removal are also provided in the primary treatment stage.
3. **Secondary Treatment** — combined carbon oxidation-nitrification form of the activated sludge process plus oil skimming on the final clarifiers.
4. **Tertiary Treatment** — advanced waste treatment in the form of gravity rapid sand filtration followed by post aeration.
5. **Disinfection** — post chlorination, at one of two locations.

Sludge handling consists of gravity thickening of primary and waste activated sludge, followed by chemical conditioning with plate and frame filter presses. The press cake then undergoes a volume reduction by incineration and a wet ash handling system to ultimate disposal or landfilling.



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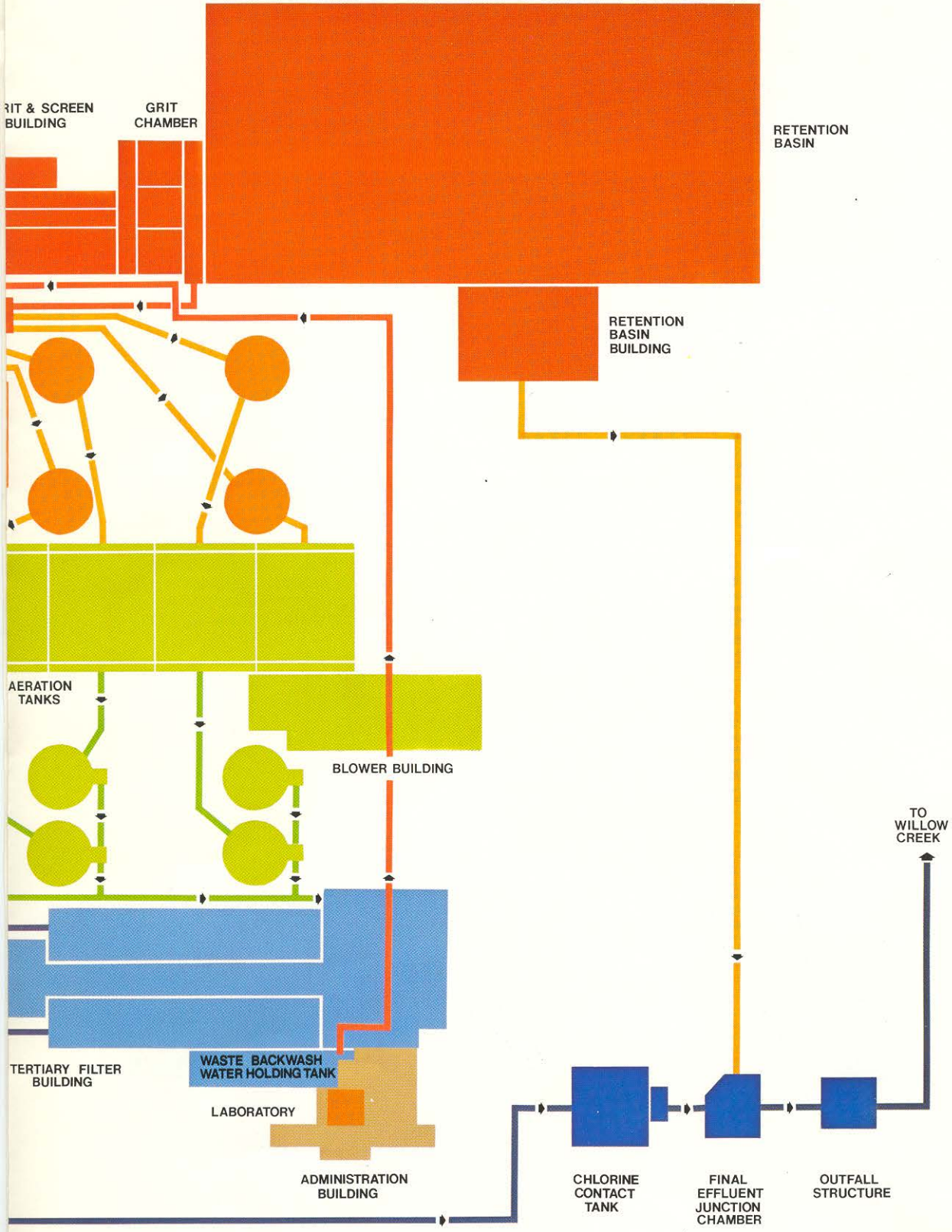
RIT & SCREEN BUILDING
GRIT CHAMBER
RETENTION BASIN
RETENTION BASIN BUILDING
AERATION TANKS
BLOWER BUILDING
TO WILLOW CREEK
TERTIARY FILTER BUILDING
WASTE BACKWASH WATER HOLDING TANK
LABORATORY
ADMINISTRATION BUILDING
CHLORINE CONTACT TANK
FINAL EFFLUENT JUNCTION CHAMBER
OUTFALL STRUCTURE

GRAM

Liquid Handling Process

Grit & Screen Building
- Two 36 MGD Mechanical Bar Screens
- Two 36 MGD Grit Chambers

Primary Splitter
- One 48″ Flow Control Valve
- Six 18″ Parshall Flumes

Primary Clarifiers
- Six 110′ Diameter x 12′ (Side Wall depth)

Aeration Tanks
- Six 200′ x 80′ x 18′ SWD
- Twenty-eight Air Drops Per Tank

Final Clarifiers
- Six 120′ Diameter x 12′ SWD

Secondary Effluent Pumps
- Four 16.4 MGD each @ 32 ft. head

Filter Building
- Twelve Rapid Sand Filters 720 sq. ft. each
- Two Backwash Pumps — 7000 GPM @ 40 ft. head
- Two Clearwells — 160,000 Gal. Each
- One Waste Backwash Tank — 530,000 Gal.
- Three Waste Backwash Pumps — 1500 GPM @ 50 ft. head

Chlorine Contact Tank
- One 1,070,000 Gal. With Cascade Aeration

Phosphorus Removal
- Ferric Chloride or Aluminum Sulfate and Anionic Polymer
- Fed Ahead of Primary Clarifiers or Final Clarifiers

Chlorination
- Chlorine Contact Tank
- Raw Water Influent Well
- Thickener Dilution Water
- Septic Tank Unloading
- Retention Basin Chlorine Contact
- Filter Clearwells
- Filter Backwash Line

Retention Basin
- Three Equalization Tanks — 1.23, 1.54 and 1.23 MG — Air Diffusers in Equalization
- One Retention Tank — 9.00 MG
- One Chlorine Tank — 1.84 MG
- Total Storage Capacity — 14.84 MG

Sludge Handling Process

Scum is collected from:
- Grit Chambers
- Primary Clarifiers
- Final Clarifiers
- Sludge Thickeners

Scum goes to:
- Two Scum Concentration Tanks 15′ x 6′ x 9′ SWD 6000 Gal. or
- Four Sludge Thickeners
- Landfill for final disposal

Sludge is collected from:
- Primary Clarifiers
- Final Clarifiers

Sludge goes to:
- Four 70′ Diameter gravity thickeners
- Four Sludge Holding Tanks 24′ x 24′ x 30′ — 129,000 Gal.
- Six Grinders & Pumps 300 GPM @ 60 ft. head
- Three Reaction Tanks 8′ Diameter x 15′ High (Ferric Chloride & Lime added)
- Three Sludge Blending Tanks 12′ x 14.5′ x 20′ (26,100 Gal., each)
- Three Filter Presses 2 x 1½ Meters — 3200 lbs dry solids/Hr.
- Incinerator, landfill or land application
- Filtrate from presses to press prefill or recirculated flow tank
- One Incinerator, 22.3 ft. outside dia., 7 hearth unit, with a zero hearth for afterburning
- Waste Heat Boiler for Building Heat
- Ash Slurry to Lagoons
- Ash to Landfill, Water to Recirculated Flow Tanks
- Two Recirculated Flow Tanks 73′ x 76′ x 10′ SWD (=250,000 Gal. Each)
- Three Recirculated Flow Pumps 3000 GPM @ 55 ft. head
- To Grit Tanks or Primary Splitter

Performance Criteria of Major Processes

Criteria	Plant Effluent
BOD	10 mg/1 (95% total removal)
Suspended Solids	10 mg/1 (95% total removal)
Phosphorus	1.0 mg/1 (85% total removal)
Ammonia Nitrogen	2.0 mg/1 (91% total removal)

Basis of Design — Wastewater Pump Stations

	Factory St.	Willow Run	Martz Road	Snow Road
Design Peak Flow mgd	20	22	14.3	22
No. of Pumps	4 pumps plus 1 standby	3 pumps plus 1 standby	2 pumps plus 1 standby	4 pumps plus 1 standby
Force Main Length	15,500 L.F.	2,700 L.F.	10,000 L.F. + 3,900 L.F. gravity sewer	9,100 L.F.
Force Main Size	36″	36″	30″	36″

NOTES:
1. Local and remote telemetering at each pump station.
2. Ultrasonic flow meter and circular chart flow recorder at each pump station.
3. Local emergency power generation at each pump station designed for future peak flows.

Special Features

- A complete underground network of galleries connects every building allowing complete access to all major piping and electrical conduits.
- Combined oxidation and nitrification in one set of aeration tanks.
- Grease and oil skimming at four different locations in the plant.
- The Administration Building provides space for the posting and billing operations of YCUA in addition to the administrative and laboratory facilities.
- A waste heat boiler utilizes heat in the incinerator off-gases. This boiler will heat the entire plant during winter months.
- The computerized data storage system will prepare monthly operations reports.
- Four 30,000 cfm single-stage centrifugal compressors, air diffusion equipment and 17 centrifugal pumps in a capacity range of 3,100 to 4,350 gpm (for the pumping stations) were bid on in a cost-effective evaluation to afford YCUA the most energy efficient equipment.

Preventive Maintenance Program

A preventive maintenance data sheet has been prepared for every piece of equipment at the plant which requires preventive maintenance. These data sheets provide a complete description of the equipment and the recommended frequency for performing the preventive maintenance tasks.

This information is entered into the plant's computer. The plant operator receives a weekly printout delineating the preventive maintenance required during any week of the year. The preventive maintenance data sheets are also posted in protective holders at each piece of equipment for ready reference. Corrective maintenance is assigned whenever routine preventive maintenance work turns up a corrective maintenance need. The corrective maintenance orders are entered into the computer which automatically places the orders into sequence by priority. The spare parts inventory of the plant can also be placed on the computer.

Computer System

YCUA will have a computer based datalogger system that will provide system level data processing for communication management, data base (historical) management, high level applications programming, management information processing simulation and modeling. Man-machine interface is provided through the use of color cathode ray tubes, keyboards and printers.

The datalogger system will provide reports generated on a daily, monthly and yearly basis or as requested for plant and State of Michigan use. Reports will monitor the quality of the treated effluent, determine the efficiencies of unit processes, prepare operation costs and provide an effective preventive maintenance program.

The process instrumentation system's prime objective is to control the treatment process automatically, including automatic sensing of operating parameters and the control of all required final elements to maintain the process. The secondary objective is information gathering on all plant process variables to:

- feedback information to the automatic controlling devices
- enable plant personnel to readily identify the condition of the plant
- provide input to the data logging system.

The data logging system is a distributed digital system with four major components:

- field located microprocessors,
- supervisory minicomputer,
- systems operator console, and
- communications network.

Architecture

James P. Wong & Associates provided an architectural design in which the color and smooth-surfaced masonry played a major role. The scale, massing and juxtaposition of the various buildings lend a unity of character and function to the plant. Attention to detail in masonry embellishments provides continuity and beauty unusual in wastewater treatment plant design.