Appendix 6

WINNIPEG'S NORTH END WATER POLLUTION CONTROL CENTRE BROCHURE

Winnipeg's North End Water Pollution Control Centre

"Expanding and upgrading for safe, economical and progressive wastewater treatment"

Works and Operations Division
Waterworks, Waste and Disposal Department

Winnipeg's Largest and Most Important Wastewater Treatment Plant

Winnipeg's North End Water Pollution Control Centre is a key component of the city's complex wastewater treatment operations. Not only was the North End Plant the first treatment facility built, today it is by far the city's largest and most self contained plant.

It has a daily capacity to handle a peak flow of 826 million litres per day and average flows of 332 million litres per day. Peak capacity is more than six times that of the other two treatment plants combined.

A History of Steady Progress in Wastewater Treatment

The early days

During Winnipeg's early history, the Red and Assiniboine rivers provided the easiest and cheapest means of sewage disposal. With a population of about 25,000 at the turn of the century, the water volume of the rivers was sufficient to dilute sewage to the point that no apparent problems appeared.

However, as the city grew and generated larger volumes of waste water, the ability of the rivers to dilute the effluent decreased and the effects of waste water disposal became noticeable.

Drought, the thirties and Winnipeg's first treatment facility

A critical situation developed in the drought years of the early 1930s. Water volumes in the rivers dropped considerably, decreasing their dilution abilities. This resulted in the sewage-laden rivers generating noticeable odours which alerted Winnipeggers and city councillors to the problem and a call for action.

Following the creation of the Greater Winnipeg Sanitary District by the provincial government in 1935 to address the problem, $3 million was spent to build 7 1/2 miles of collector sewers, 24 pumping stations and the new North End Sewage Treatment Plant.

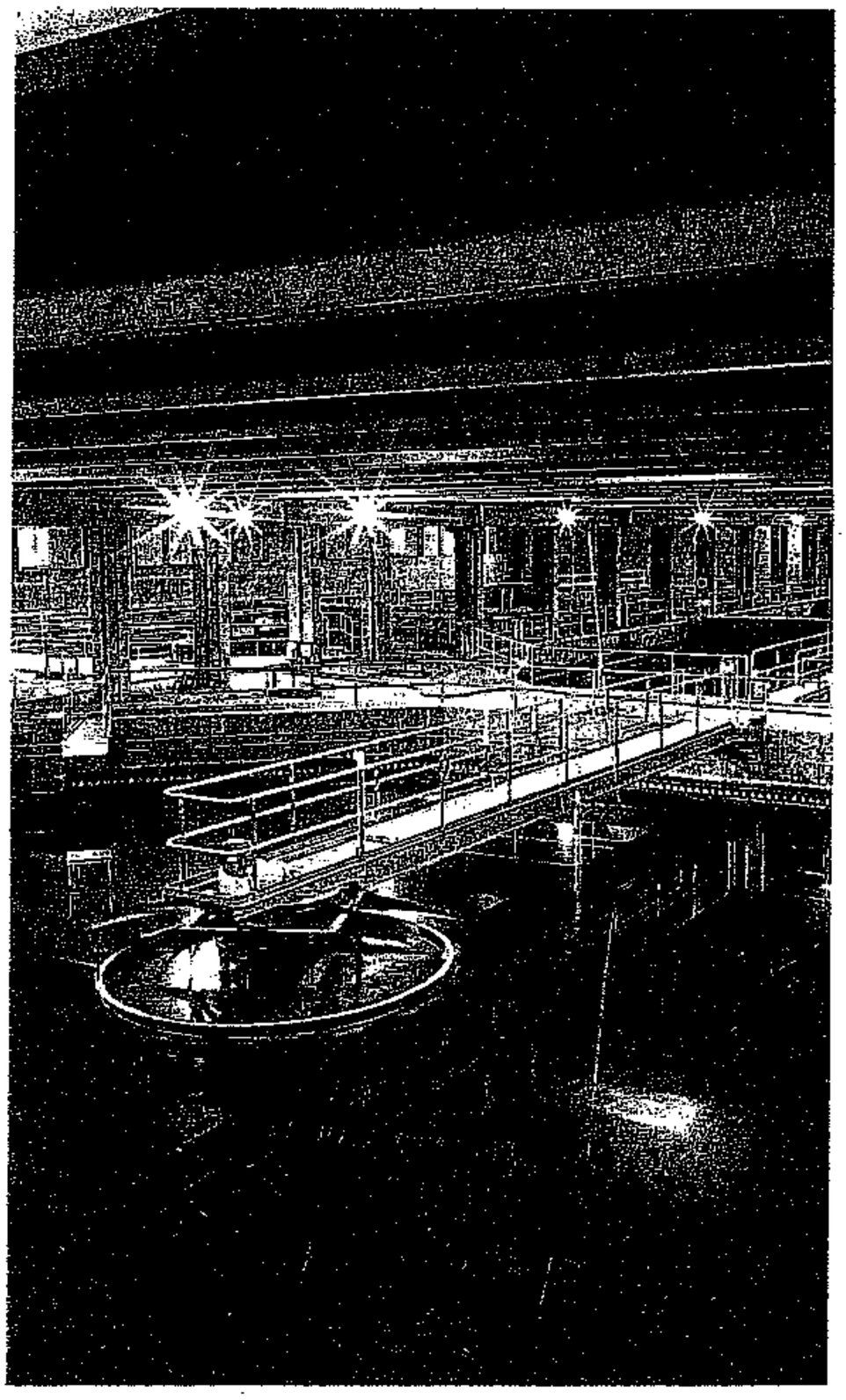
The city continued to grow, soon outstripping the capacity and geographic range of the North End Sewage Treatment Plant. Municipalities in the south and west ends continued to dump raw sewage into the rivers, resulting in ever-increasing demands placed on the rivers.

Initiatives in the sixties and seventies

Civic officials realized further actions were required, and built the Charleswood Sewage Lagoon in 1964 at a cost of $4 million to remove all raw sewage flows into the Assiniboine. At the same time, $14.5 million was invested to upgrade the North End plant.

One year later, an ambitious 10-year project started in south Winnipeg to build sewage interceptor lines as a first step for installing treatment facilities in the last section of the city not serviced. The South End Water Pollution Control Centre opened in 1974, culminating that initiative.

Today's wastewater treatment system encompasses 2,140 kilometres of sewers and interceptors, and 96 pumping stations feeding the three wastewater treatment plants to serve Winnipeg's 620,000 residents.



Secondary clarifiers for settling waste-activated suspended solids.

The Expansion and Upgrading of the North End Plant in the Eighties

Since its construction in 1937, the North End Plant has undergone earlier upgrades to meet expanding need and expectations. The most significant was a $14 million upgrade in 1965 converting the plant from a primary treatment facility to a more thorough operation providing secondary treatment.

This year, 1988, marks the culmination of a decade-long phased upgrade plan for the North End Plant. Since 1978, the City of Winnipeg has spent $77 million on four major upgrade components which touched all treatment areas and processes at the plant: pre-treatment, primary and secondary treatment and sludge digestion.

Expanding treatment capacity and efficiency was a major purpose of the upgrade. Objectives established at the project outset called for an increase in capacity of just under 20 per cent for all sectors of the plant over a time period of 1981 to 1994.

Primary Treatment Upgrade

Upgrading the primary treatment facility was one of the first components undertaken. The $7 million, two-year project which started in 1978, involved expanding the primary clarifiers by adding two rectangular settling tanks. Primary clarifiers are the first area where fine materials suspended in the incoming waste water are allowed to settle for removal.

Secondary Treatment Upgrade

With improvements and expanded capacity to the pre-treatment and primary treatment areas, a parallel upgrading and expansion program was required to allow secondary treatment operations to keep pace. At a cost of $44.7 million, involving 10 individual contracts, this phase was by far the most ambitious component of the entire plant upgrading.

Starting in 1982, secondary treatment upgrading involved installing an "oxygen activated sludge process", similar to the system used at the newer South End Treatment Plant. This called for constructing a covered, three-compartment, in-ground tank installation for injecting high-purity oxygen into the waste water thus providing the needed oxygen for bacteria to remove pollution from wastewater. To supply the needed oxygen, an oxygen production plant was built by a private supplier contracted to supply oxygen under long-term agreement.

Introducing the oxygen-based process replaced the previously used air-based secondary treatment method. This allowed conversion of 16 aeration tanks to secondary clarifiers which supplemented the 10 existing tanks.

Replacement of the aeration system had the added benefit of reducing odour levels generated in those tanks.

Another phase of upgrading involved automating the plant monitoring and control system. This allows centralization of plant operations to make more efficient use of existing manpower levels on the site.

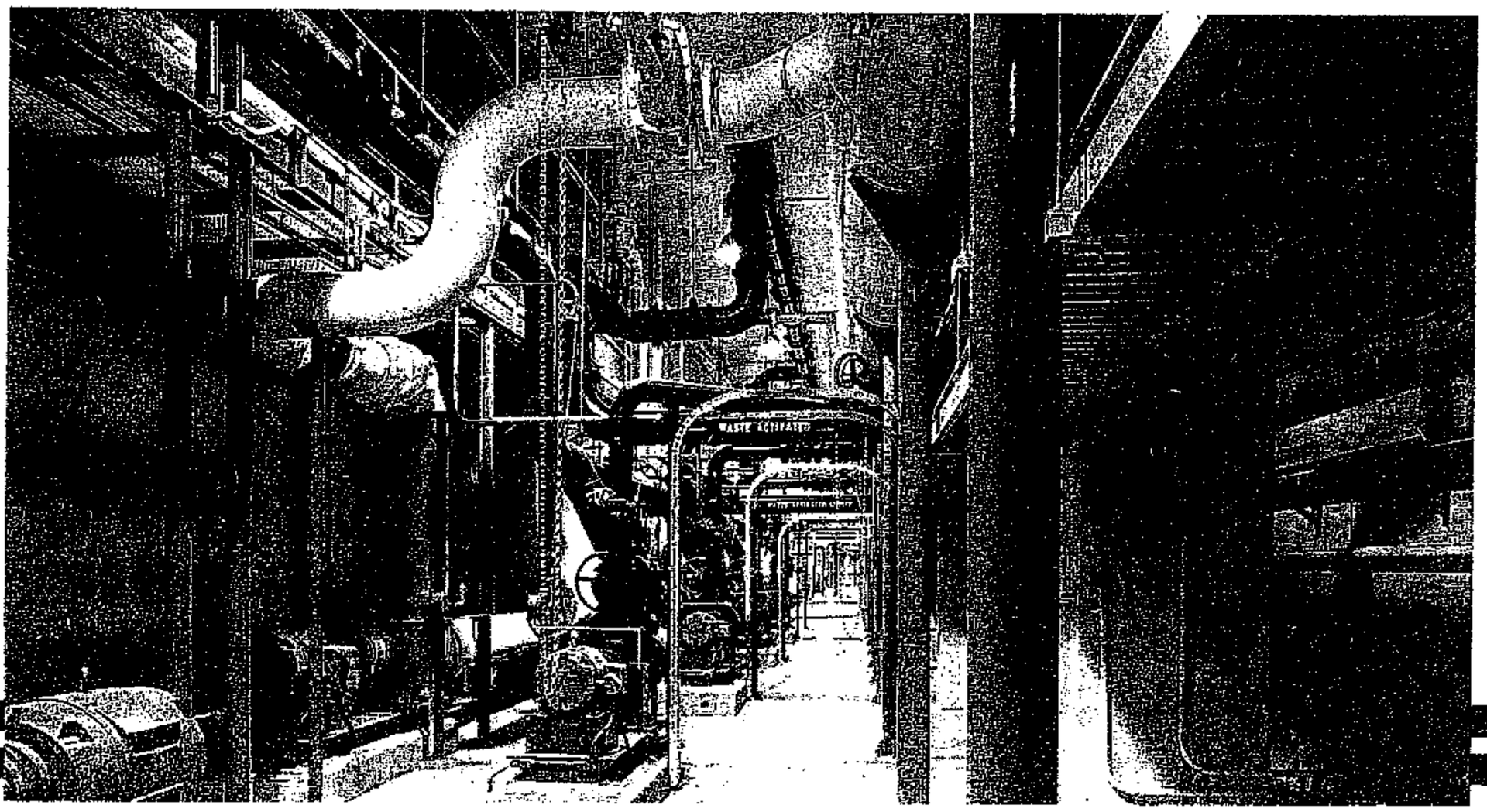
Sludge Digestion Upgrade

Addition of two digesters to the 12 existing tanks at the sludge digestion area of the plant was undertaken at a cost of $18.2 million. At the same time the entire digestion operation was automated. The two-year project was undertaken from the fall of 1985 to the fall of 1987.

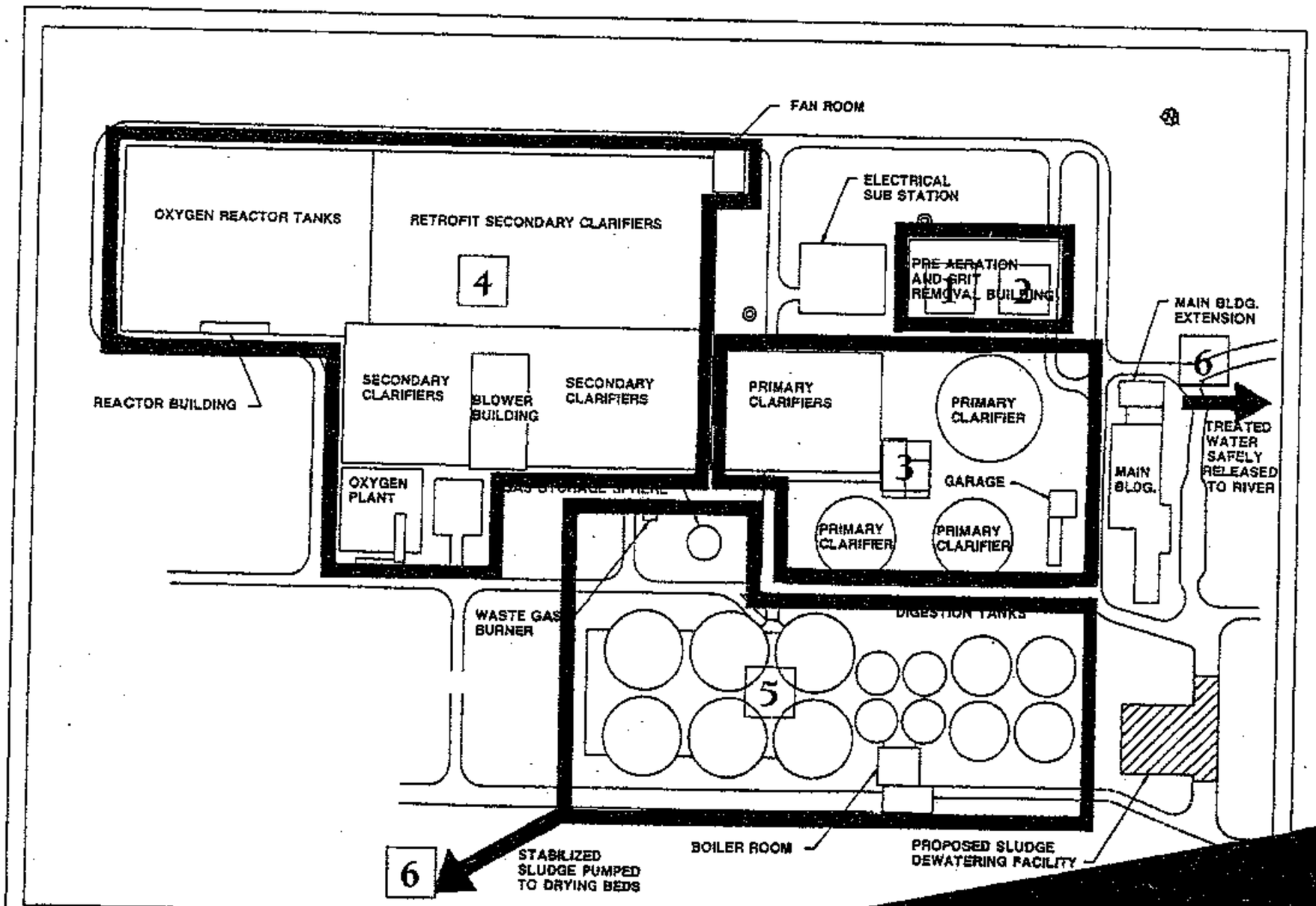
In addition, $7.1 million has been spent on miscellaneous improvements around the plant, making a total investment of $77 million.

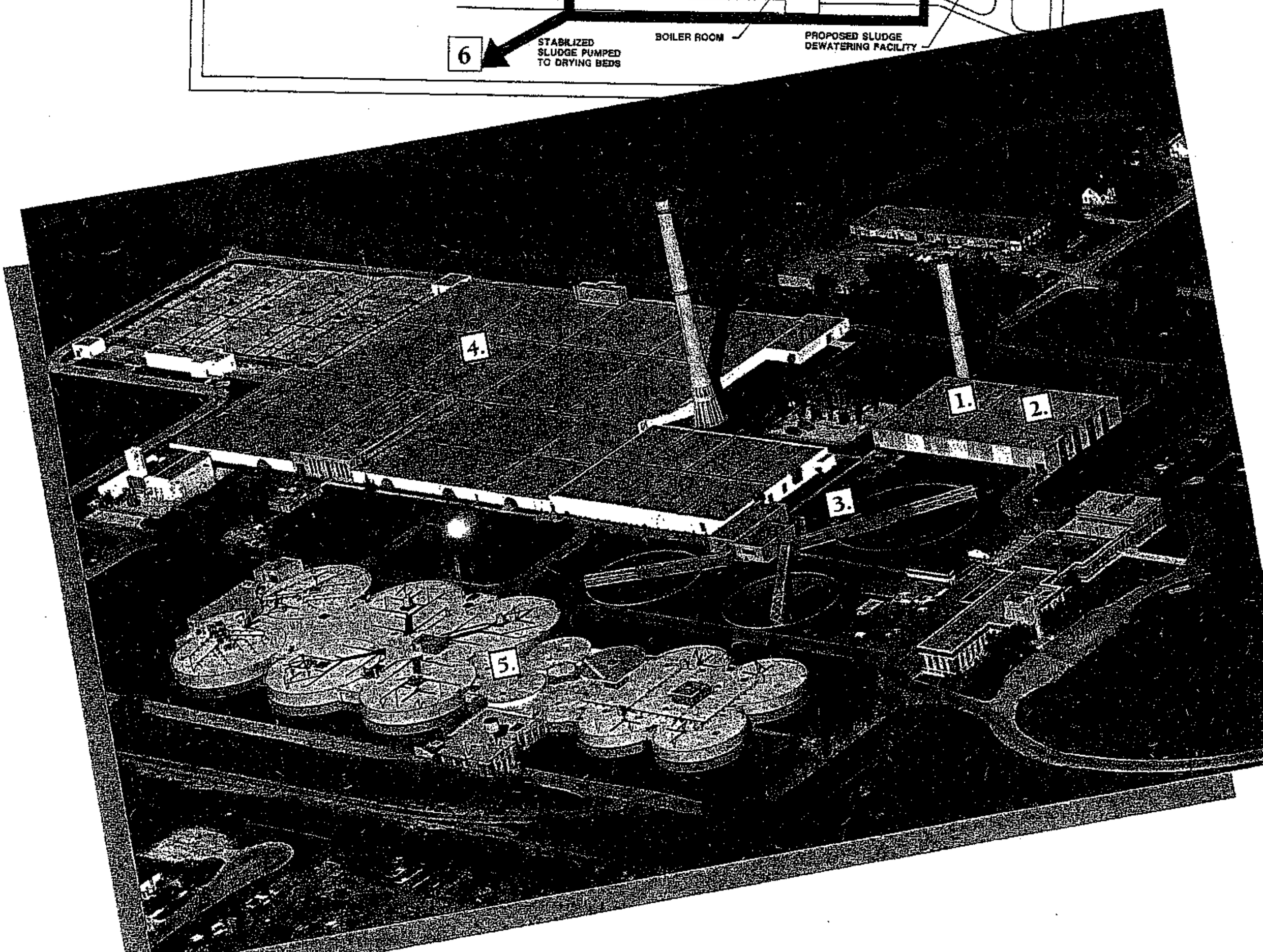
Pre-treatment Upgrade

On top of the above major initiatives, an additional $3.4 million has been allocated to upgrade the pre-treatment operations. This involved automating the pre-treatment function, improving the electrical supply system and covering the pre-treatment tanks to improve the working environment. This two-year phase is one of the most recent components undertaken, starting in 1987 with completion scheduled for mid-1989.



The main pipe gallery connecting secondary treatment facilities.


FAN ROOM
OXYGEN REACTOR TANKS
RETROFIT SECONDARY CLARIFIERS
4
ELECTRICAL SUB STATION
PRE AERATION AND GRIT REMOVAL BUILDING
1
2
MAIN BLDG. EXTENSION
6
REACTOR BUILDING
SECONDARY CLARIFIERS
BLOWER BUILDING
SECONDARY CLARIFIERS
PRIMARY CLARIFIERS
PRIMARY CLARIFIER
TREATED WATER SAFELY RELEASED TO RIVER
3
GARAGE
MAIN BLDG.
OXYGEN PLANT
PRIMARY CLARIFIER
PRIMARY CLARIFIER
WASTE GAS BURNER
DIGESTION TANKS
5
6
STABILIZED SLUDGE PUMPED TO DRYING BEDS
BOILER ROOM
PROPOSED SLUDGE DEWATERING FACILITY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How Winnipeg Treats Its Wastewater

Winnipeg's wastewater sewage system is largely designed to handle domestic wastes which are primarily made up of organic plant and animal material from homes and industry. Added to that is rain and meltwater, since older parts of the city do not have separate storm sewers.

Essentially, the objective of wastewater treatment is to remove inorganic solids (like sand and gravel) and organic materials from the water before it is released into the river. To assist removal of the organic materials, sewage treatment assists them to decompose to their simplest inorganic elements.

Facilitating a natural process

Actual treatment of Winnipeg's wastewater, therefore, borrows heavily from processes in nature, and enhances them to speed up natural decomposition. Just as organic materials like fallen trees and leaves in a forest decompose to their basic elements under activities of oxygen-consuming bacterial action, similar processes occur in treating wastewater.

Six steps to environmentally sound wastewater treatment

Wastewater treatment involves six major steps in the sequence that wastewater moves through the plant.

1. Bar Screening to remove large materials

Wastewater first entering the plant passes through a set of bar screens to remove large materials such as sticks and rags which primarily enter the system through catch basins on the street.

2. Pre-treatment Area to remove insolubles and noxious gases

After large materials are removed, wastewater is agitated with air to settle out heavier insoluble materials like sand and gravel which enter the system from the streets and coffee grounds which enter with household waste. Air is bubbled vigorously through the water (called pre-aeration) to remove noxious gases like hydrogen sulfide (rotten egg smell) generated in the sewers from the initial breakdown of organic materials as they move to the plant.

3. Primary Treatment to remove fine suspended solids

Wastewater then flows into large settling tanks to remain for two hours which allows about 50 per cent of fine suspended solids to settle out. These solids, known as sludge, are gathered regularly with large scrapers which move slowly along the bottoms of the tanks and are then taken to sludge digesters (described later).

4. Secondary Treatment: Using concentrated oxygen and bacteria to speed-up the breakdown of remaining organic solids

The water passes through oxygen reactor tanks. Here the breakdown of remaining organic materials is actively encouraged under natural bacterial action speeded up by vigorously mixing the incoming wastewater with concentrated bacteria-laden sludge and pure oxygen needed by the bacteria to perform. The bacteria feed on the remaining organic solids.

The mixture is again moved into settling tanks known as secondary clarifiers to allow the bacteria-laden sludge to settle to the bottom. Once settling has occurred, the water, which has 90 to 95 percent of polluting materials removed, is suitable for release into the river.

The bacteria-laden sludge is again scraped from the tank bottoms. Some of it is recycled back to the oxygen reactor tanks to supply the necessary bacteria for that part of the process.

5. Sludge Digestion

Excess sludge, along with that settled out during the primary treatment process is diverted to these tanks where other forms of bacteria are introduced and heat applied in an oxygen-free environment. The bacteria feed on the sludge for a minimum of ten days. This reduces the odour and stabilizes the sludge.

The stabilized sludge is pumped to drying beds located in West St. Paul where moisture is allowed to evaporate and the solids settle.

6. Re-cycling water, materials and other by-products back into the environment

The nutrient-rich dried sludge, which looks like top soil is applied to surrounding farmland to condition the soil and enhance productivity. The treated water, that is 90-95% free of pollutants is safely released into the river.

SUPPORT FACILITIES

To aid the whole wastewater treatment process, other support facilities are located on the grounds. These include:

Oxygen Production Plant

A separate plant to produce pure oxygen for the oxygen reactor tanks is operated on the site under long term contract by a private company.

Methane Gas Storage

Decomposition of organic materials at the plant produces methane, a flammable gas similar to natural gas. The methane is recovered and stored for use in providing heat for the plant.

THE IMPORTANCE OF TREATING WASTEWATER

Wastewater dumped directly into Winnipeg rivers would essentially undergo a similar decomposition process as in the treatment plant, but under uncontrolled conditions. The breakdown of organic materials would draw the needed oxygen from the river which would in effect make the river biologically dead and unable to support fish and other aquatic life. The decomposing organic materials would give off noxious fumes which are now intercepted at the treatment plant and vented to the atmosphere harmlessly.

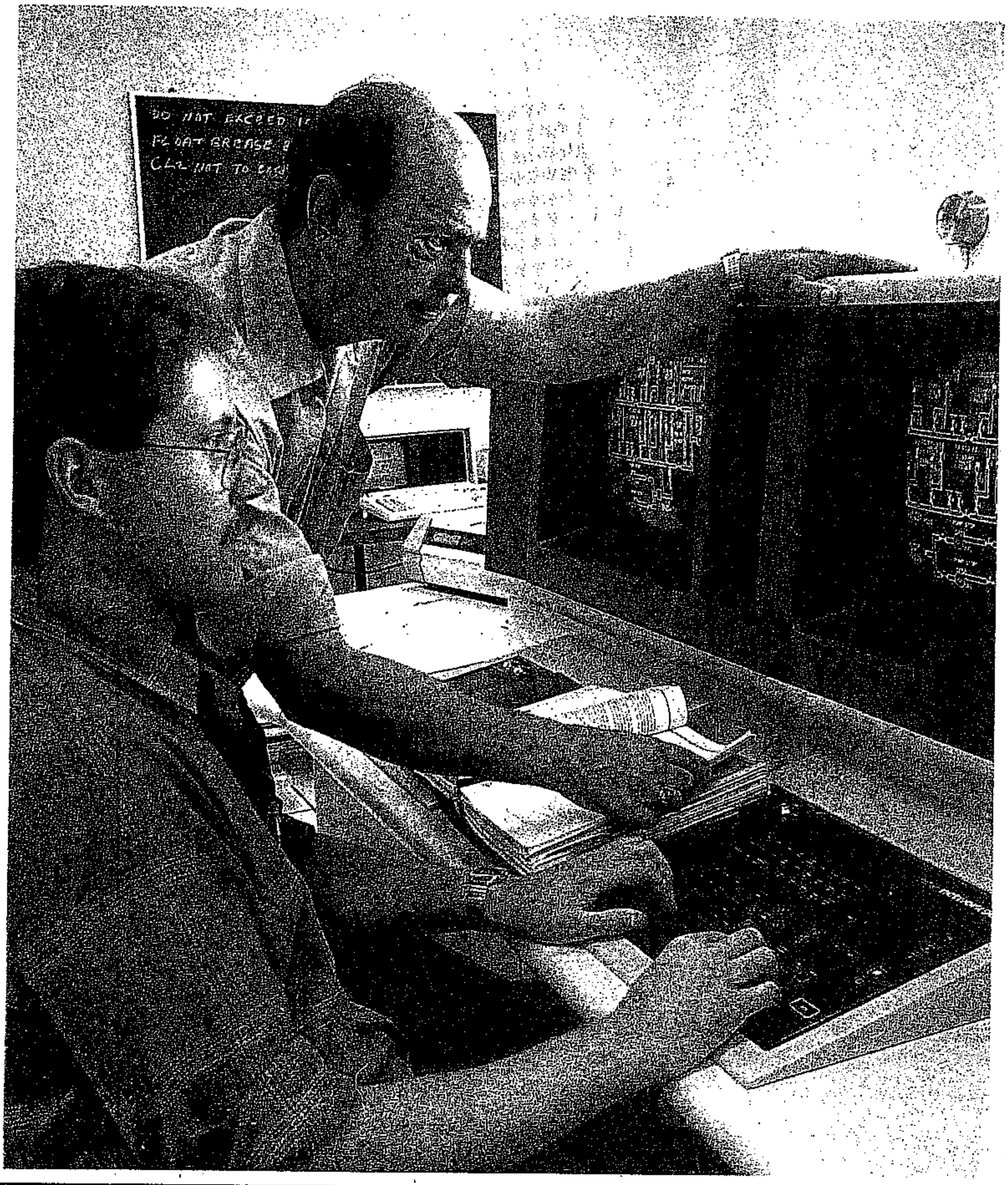
Future Development

The City of Winnipeg's commitment to providing a safe, cost-effective, wastewater treatment facility continues.

With the imminent completion of the present upgrading program, plans are underway to install a mechanized sludge dewatering facility on the North End Water Pollution Control Centre grounds. It will be located to the south of the administration building. This facility will replace the current practice of pumping the sludge away to sludge drying beds located in West St. Paul.

Construction of this operation, at an estimated cost of $23 million, will get underway in early 1989 for scheduled completion in July 1990. The drying operation will have a capacity of 170 tonnes per day.

In addition a final $3 million will be spent to upgrade efficiency of the transportation and land disposal of sludge.



North End computer control and monitoring centre overseeing all plant operations.