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Environmental Protection Agency
Division of Water Pollution Control
Permit Section-Springfield
State of Illinois

HANOVER PARK WATER RECLAMATION PLANT

General

The Hanover Park Water Reclamation Plant (WRP) is located near the intersection of Barrington Road and Irving Park Road (Route 19) in the Village of Hanover Park, Illinois. The plant treats the wastewater from a 12-square-mile area which includes portions of 4 villages in the Northwest part of Cook County.

The Hanover Park Water Reclamation Plant originally consisted of biological oxidation ponds placed in service in July, 1963. The plant was then upgraded to a 2 MGD activated sludge plant in November, 1964. In March, 1968, the plant was upgraded again by the inclusion of rapid sand filters to become the nation's first major tertiary sewage treatment facility. The plant capacity was increased to 6 MGD in 1972 and then to 12 MGD in 1978. In order to make the Hanover Park Plant a totally independent treatment facility, a 120-acre farm was constructed in 1978 to receive the total digested sludge of the Hanover Park Plant.

Sewage is conveyed into the Hanover Park WRP via two 42 inch diameter intercepting sewers. Final discharge, after treatment, is to the West Branch of the DuPage River.

Sewage Treatment Operations During 1981

A total of 2,955 million gallons of raw sewage was pumped through the Plant. This represents an average flow of 8.10 MGD, a 0.11 MGD increase from the average flow of 7.99 MGD in 1980.

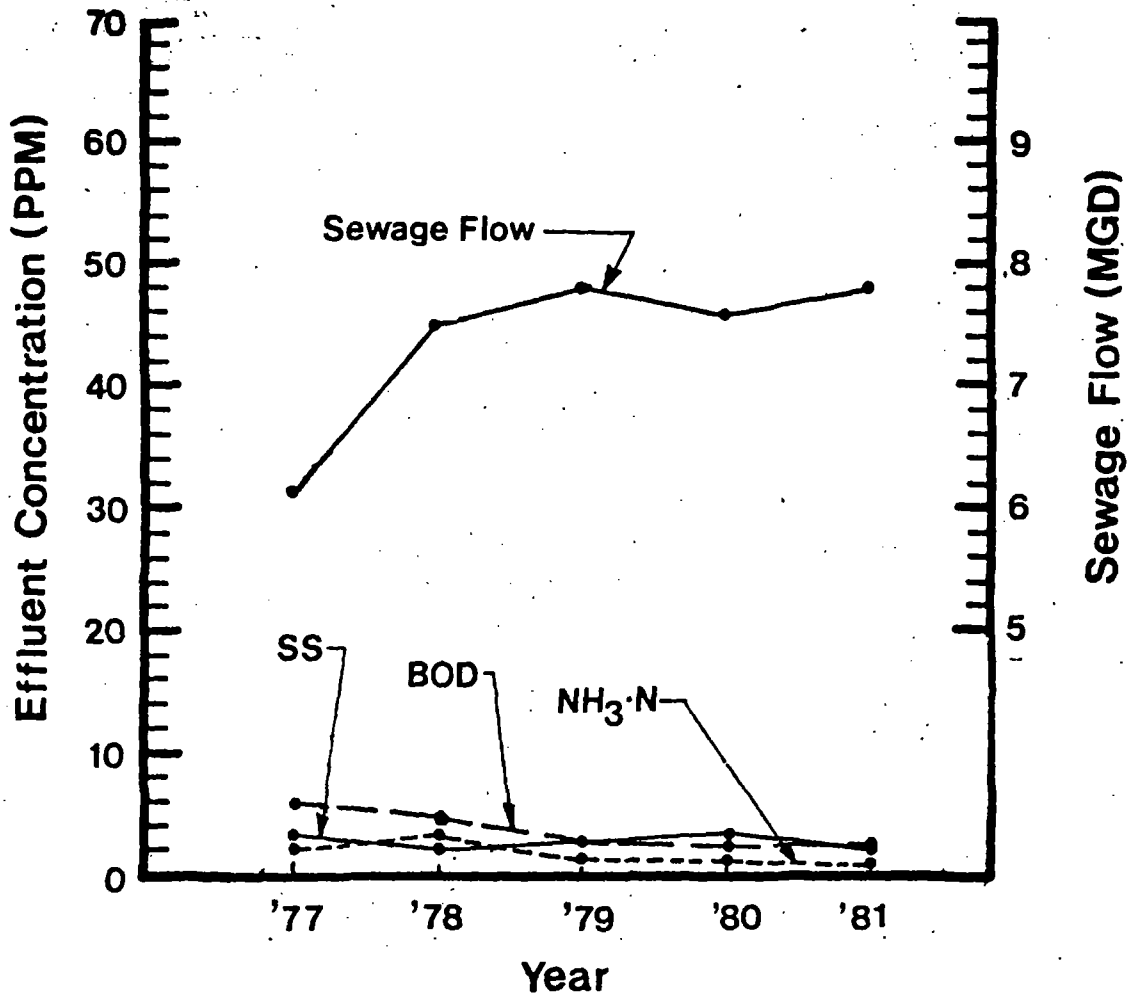
A total of 2,843 million gallons received complete secondary and tertiary treatment for an average of 7.79 MGD. The remaining sewage was pumped to the oxidation ponds for storage after primary treatment. The total sewage stored in the oxidation ponds was given complete treatment during periods of low flow.

The Hanover Park WRP was chosen as the best operated Class A Wastewater Treatment Plant in the State of Illinois for the year 1980. The award was presented in April of 1981 at the Illinois Association of Pollution Control Operators Conference in Springfield, Illinois. Also received in April of 1981 was the I.E.P.A.'s Certificate of Excellency Award in wastewater safety.

The Metropolitan Sanitary District of Greater Chicago
Maintenance & Operations Department

HANOVER PARK WATER RECLAMATION PLANT

FLOW AND EFFLUENT DATA



		Flow (MGD)	BOD_5 (PPM)	SS (PPM)	NH_3·N (PPM)
N.P.D.E.S. Permit Conditions (Monthly)		12	4	5	1.5
Year Average		8	2	2	<1
Monthly Average	Max.	10	3	3	<1
	Min.	7	2	1	<1
Single Day	Max.	25	6	8	2
	Min.	6	1	1	<1

1981 Data Summary

Figure 19

Following tertiary treatment, the final effluent contained an average BOD of 2 mg/l and an average suspended solids of 2 mg/l. Raw sewage entering the plant contained an average BOD of 153 mg/l and an average suspended solids of 138 mg/l. These figures represent an overall treatment efficiency of 98.5 percent for BOD removal and 98.7 percent for suspended solids removal.

The average ammonia nitrogen content in the final effluent was 0.2 mg/l. The average ammonia nitrogen content of the raw sewage was 16.9 mg/l. These figures represent an overall ammonia nitrogen removal efficiency of 98.8 percent.

Tertiary effluent was chlorinated on a year-round basis at an average dosage rate of 1.9 mg/l with an average chlorine residual of 0.34 mg/l.

Figure 19 contains a summary of annual operating parameters. The total cost of sewage collection and treatment at this facility for 1981 was $1,065,588 for an average cost of $360.61 per million gallons treated.

Description of the Sewage Treatment Facilities

During dry weather all sewage entering the plant is fully treated. However, under wet weather flow conditions incoming storm water can be pumped at a rate of up to 42 MGD into open storage ponds where it is temporarily stored until it can be returned to the plant for complete treatment during lower dry weather flow conditions.

After entering the plant, sewage flows through three sets of coarse screens. These vertical bar screens are 3 feet wide and are set 10 feet deep into the influent channel. Two screens have 2 inch openings and one has 3/4 inch openings. The screenings are collected by power-driven rakes which move across the bars and are discharged to hoppers. Screenings are removed by a scavenger service and taken to an approved landfill for disposal.

Raw sewage pumps lift the incoming sewage to the fine screens where the sewage then flows by gravity through the remaining treatment processes. There are 7 vertical raw sewage pumps having a total pumping capacity of 42 MGD @ 49 ft. TDH with 590 total installed horsepower.

Following pumping, the raw sewage is passed through two fine screens to remove solid materials larger than 5/8 inch. This operation removes solid material that would decrease efficiency in the aerated grit chambers and the treatment processes which follow fine screening. Description and operation of the fine screens is identical to that of the coarse screens. Screenings are removed by a scavenger service and taken to an approved landfill for disposal.

The sewage then flows to two aerated grit chambers with flight-type grit removal units. The purpose of grit removal is to eliminate inorganic materials from the sewage flow which may accumulate in subsequent process units and which are harmful to pipes and mechanical equipment due to their abrasive nature.

Each grit chamber is rectangular in shape, approximately 10'-5" wide by 34'-8" long with bottoms sloping toward a collection trough which runs the entire length of the chamber. The water depth is approximately 11'-2". Low pressure air is distributed within each tank by air headers along the length of the tank. Horizontal velocity through each grit chamber is 0.08 ft./sec. at plant design capacity. Grit which settles to the bottom of the chamber is carried by a flight-type grit collector to a collection pit at the influent end of the tank. From this point, the grit is pumped to a grit washer which dewaters the grit and is then conveyed to a hopper. Grit is removed by a scavenger service and taken to an approved landfill for disposal.

"Primary Treatment"

Effluent from the grit chambers flows by gravity to eight circular primary settling tanks which physically settle out approximately 40% of the solids remaining in the sewage. Each tank is equipped with an automatic overflow weir discharging excess flow to the open storage ponds. Influent enters the tank through the center influent well and flows radially outward to the tank periphery. At the tank periphery the effluent flows over fixed weirs. Solids settling to the floor of the tank are scraped by mechanically driven plows at the bottom of the tank to a sump located near the influent pier. The primary sludge which settles out is fed to the sludge digesters. Scum which floats to the surface is collected by skimmers for pumping to the scum concentration tank in the Pretreatment Building.

The primary settling tanks consist of two 45' and six 50' diameter tanks having a depth of 12'. They are designed for flows between 1 and 2 MGD each and 2.1 to 3.4 hour detention times.

"Secondary Treatment"

Effluent from the eight primary settling tanks flows to eight aeration tanks where aerobic bacteria are given the required amounts of air necessary for efficient assimilation of organic material. The primary tank effluent is mixed with adjustable portions of return-activated sludge in the aeration tanks. The required air flow rate is automatically controlled by dissolved oxygen sensors.

All eight aeration units consist of two rectangular tanks in series. The rectangular tanks of six aeration units are each 13' deep, 25' wide and 105' long and the rectangular tanks of two of the aeration units are each 13' deep, 21' wide and 70' long.

Four aeration units are designed for a maximum primary influent flow of 1.5 MGD each with an 8-hour detention time. Two aeration units are each designed for a maximum primary influent flow of 2.0 MGD with a 6-hour detention time, and two aeration units each are designed for a maximum flow of 1.0 MGD with a 7-hour detention time.

The effluent from each aeration tank (mixed liquor) then flows to its respective circular final settling tank. There are a total of 8 tanks designed to separate settled solids (sludge) from the mixed liquor. There are six 65' and two 40' diameter tanks with depths of approximately 12'. They are designed for maximum flows of between 1 and 2 MGD with surface settling rates of 452 to 769 gal/ft^2/day. Scum collection is identical to that in the primary tanks. Solids settling to the floor of the tank are removed by scraper mechanisms and then are either returned to the aeration tanks to be mixed with primary tank effluent or are wasted to concentration tanks. Effluent from the final settling tanks flows over fixed weirs at the tank periphery and is 90% purified at this point.

"Tertiary Treatment"

Clarified effluent from the final settling tanks flows by gravity to a total of six rapid sand filters. The sand filters literally filter out the last of the suspended solids and impurities before discharging the final effluent to stream. At this point, the effluent is now 98% purified. All filters have a sand bed depth of 11 inches, below which are porous plates that hold the sand in place but allow the filtered effluent to pass through. The sand filters automatically backwash and clean themselves.

Four sand filters are each 70' long, 16' wide, and 4'-9" deep having a filter surface area of 1,120 sq. ft. and are each designed for an average flow of 1.5 MGD and a peak flow of 3 MGD, and the other two sand filters are each 50' long, 12.5' wide and 4'-9" deep having a filter surface area of 625 sq. ft. and are designed for an average flow of 0.9 MGD and a peak flow of 1.8 MGD.

"Chlorination"

Final effluent is chlorinated with an aqueous solution of sodium hypochlorite at the influent end of each sand filter. This inhibits biological growth in the filters and also disinfects the final effluent. After the sand filters, a portion of the effluent goes through a post aeration tank to add dissolved oxygen to the final effluent. The chlorine contact time was 23 minutes at average plant discharge flow of 7.79 MGD.

Solids Processing Operations and Disposal During 1981

Digester output during 1981 totaled 864.9 dry tons or 2.37 dry tons per day. During the year a total of 7,315,000 gallons (614 dry tons) of digested sludge @ 2.0% solids and 4,577,000 gallons (296 dry tons) of lagoon sludge @ 1.6% solids were applied to the sludge application corn and grass fields. Additionally, a total of 9,080,000 gallons (4416 dry tons) of lagoon solids @ 12% solids were removed by a contractor from the two sludge storage lagoons and trucked to sludge drying cells on the farm.

A corn crop was planted on 48 acres of the 129.5 acre sludge application farm. Forty-three acres were cleared of vegetation and converted to sludge drying cells. The remaining 37.5 acres were left as a grass stand of rye and fescue.

During 1981, 573 cubic yards (486 tons) of scum, screenings, and grit were removed by scavenger service contract.

Description of Solids Processing and Disposal Facilities

"Digestion"

Primary tank sludge and final tank waste activated sludge is pumped to four circular digestion tanks. In these tanks the sludge is heated to be between 85° and 95° F and continuously mixed and recirculated for a period of 20 to 25 days. The sludge is heated using methane gas produced from the sludge digestion process. Digester gas is also used for building heat during winter.

The digestion tanks are 40' in diameter and have a variable sludge storage depth between 14.5' and 19.5'. The sludge depth varies because the covers of the digestion tanks float on top of the liquid sludge.

"Sludge Storage Basins"

Digested sludge is pumped to two diked earth storage basins which have a total storage capacity of approximately 50,000 yd^3. The digested sludge is stored in these basins for several years to further stabilize and dewater the sludge.

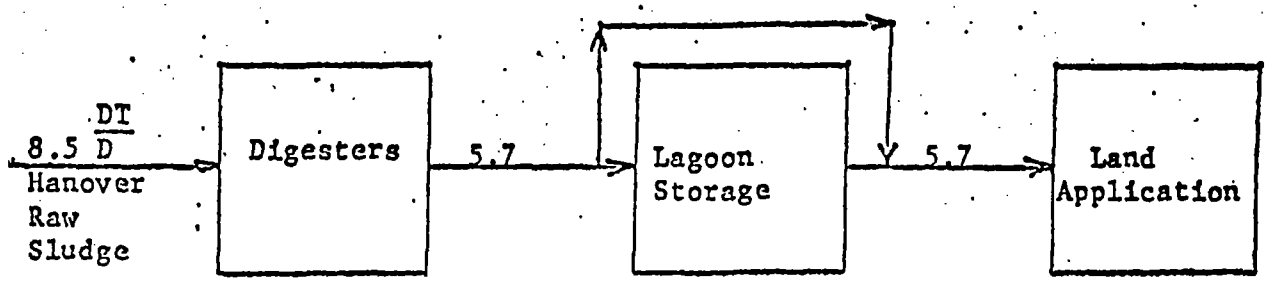
Solids Disposal

"Liquid Fertilizer Application Farm"

Digested sludge from the Hanover Park Plant is applied to an adjacent 129.5 acre farm. The sludge is pumped to the farm area and into a slotted irrigation pipe system for application. Both corn and grasses are grown. A field drainage system has also been installed on the farm to collect ground water runoff. The runoff is recycled back through the plant's treatment facilities. Eight monitoring wells are utilized to monitor ground water quality.

Experimentation of long term effects of continued sludge application on 6.5 acres of the farm was discontinued.

HANOVER PARK WRP
SOLIDS HANDLING SYSTEMS
FOR YEAR 2000



HANOVER-FISCHER FARM OPERATING PLAN

The Hanover Park Water Reclamation Plant includes a 205 acre operating recycle farm. This farm is composed of 124 acres of farm field application areas as appended on Exhibit 1.

The MSD is requesting a 5-year operating permit for this property. The District is further requesting an average annual application rate of 20 dry tons per acre per year. The District is considering the establishment of a diversified plant materials nursery. It is, therefore, requesting that the application rates be tied to the growing cycle of each of the plant types. It is now projected that shade and ornamental trees will have a 5-year plant to harvest cycle. Woody deciduous shrubs shall have a 3-year cycle and sod a 2-year cycle. The District is requesting the flexibility to apply each plant cycle's nutrients in the most advantageous way for the growth cycle period. For example, for the 5-year tree program, 5X20 dry tons per acre per year would be applied during that 5-year growing program, but not necessarily at a rate of 20 dry tons per acre per year.
It is expected that the seedling plants will require more nutrients and irrigation than the about- to-be-moved mature plants in the fifth year. The total application rate will not be exceeded but the incremental applications may not match the average annual 20 dry tons per acre per year application rate.

The above mentioned plant material will be grown within the bermed, under drained and recyclable field areas. The growth of annual crops will be continued during the start-up phases of the nursery or in those fields where woody plant material is not planted. The 20 dry ton per acre per year application rate will be used on annual crops.

SUMMARY OF SLUDGE APPLICATION HISTORY
UPPER DUPAGE RESERVOIR & SITE DEVELOPMENT (FISCHER FARM)
HANOVER PARK WRP

Year 1979

Date of initial land application:	July 10, 1979
Date of last application:	November 24, 1979
Total application:	1,066,675 gallons (140 dry tons) at an average concentration of 3.1% solids
Type of sludge applied:	Heat anaerobically digested and lagooned sludge
Vegetation fertilized:	Grass stand of rye and fescue.

Year 1980

Date land application resumed:	May 19, 1980
Date of last application:	December 8, 1980
Total application:	9,790,000 gallons (607 dry tons) at an average concentration of 1.5% solids
Type of sludge applied:	Heat anaerobically digested and lagooned sludge
Vegetation fertilized:	Corn crop on 65 acres and grass stand of rye and fescue on 58 acres.

Year 1981

Date land application resumed:	March 24, 1981
Date of last application:	December 8, 1981
Total application:	11,900,000 gallons (910 dry tons) at an average concentration of 1.8% solids
Type of sludge applied:	Heat anaerobically digested and lagooned sludge
Vegetation fertilized:	Corn crop and grass stand of rye and fescue.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE 1

HANOVER PARK FARM AVERAGE ANNUAL WELL WATER ANALYSES FOR 1979, 1980 AND 1981. WELLS SAMPLED WEEKLY APRIL-OCTOBER 1979 AND 1980, AND MAY-AUGUST 1981

Constituent*	Well 5**			Well 7**			Well 8**		
	1979	1980	1981	1979	1980	1981	1979	1980	1981
pH	7.6	8.2	7.9	7.2	7.8	7.6	6.4	8.3	8.0
Tot. P	0.2	0.3	0.1	0.3	0.3	0.4	0.2	0.3	0.1
Cl^-	37	5	4	43	41	66	56	10	6
$SO_4^=$	75	99	46	56	100	194	207	41	66
TKN	4.9	1.0	0.8	4.0	1.3	2.0	8.2	1.3	1.7
$N\text{-}NH_3$	0.8	0.8	0.5	0.4	0.8	1.3	1.5	1.0	1.1
$N\text{-}NO_2+NO_3$	0.1	0.2	0.3	0.2	0.6	0.3	0.6	2.9	0.2
Alk. as $CaCO_3$	319	155	110	178	326	279	592	229	228
E.C.	893	510	315	502	878	988	1,305	550	538
Zn	0.4	0.0	0.0	0.4	0.1	0.0	0.1	0.0	0.0
Cd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cu	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cr	0.02	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
Ni	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mn	0.31	0.12	0.06	0.22	0.13	0.22	1.88	0.16	0.05
Fe	25.5	5.8	3.1	14.2	11.8	11.2	308	7.1	3.6

* mg/l except for pH and E.C. (μmhos/cm).
** Well depths: No. 5, 65 ft; No. 7, 25 ft; No. 8, 100 ft.

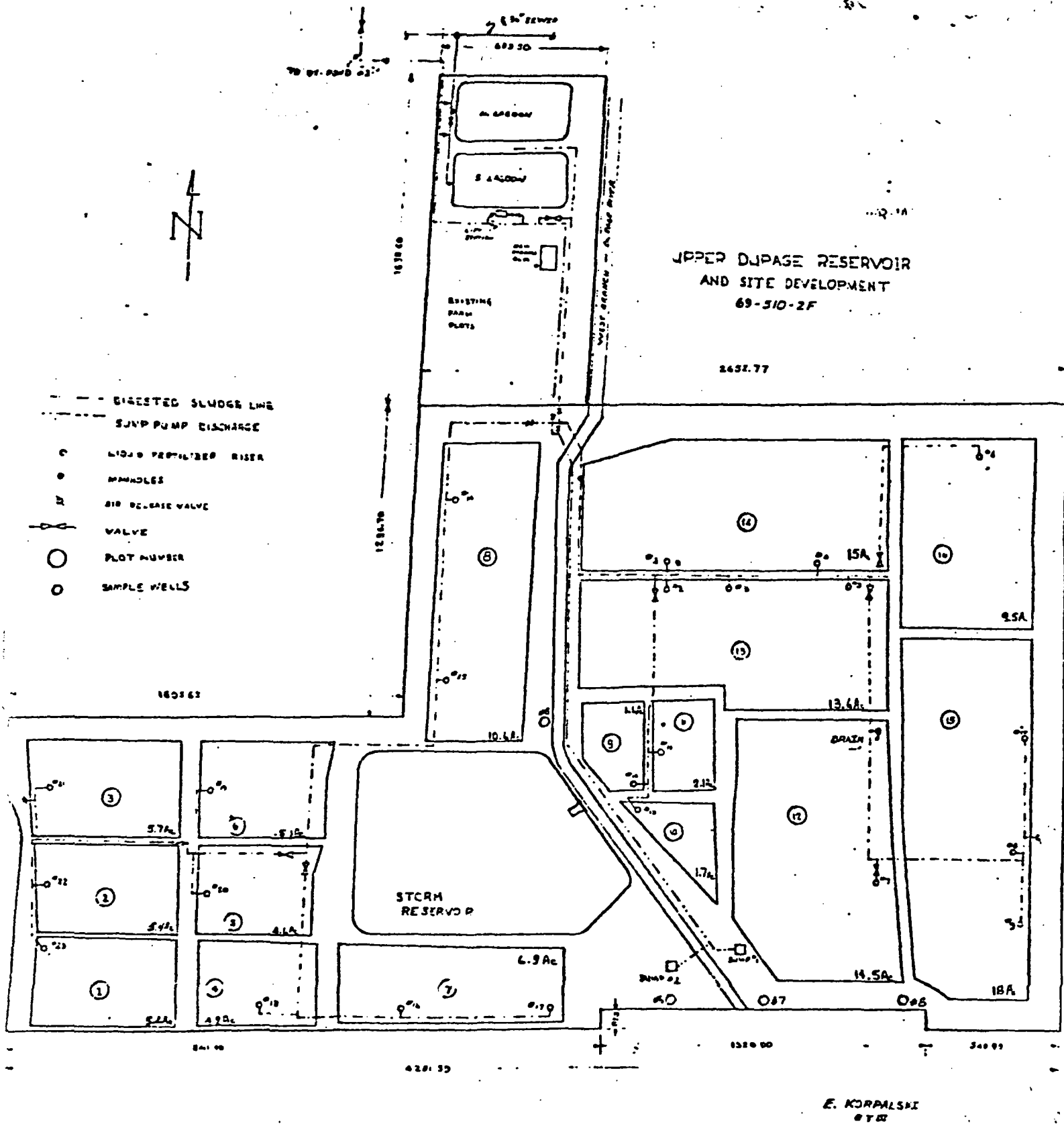

UPPER DUPAGE RESERVOIR
AND SITE DEVELOPMENT
69-510-2F
DIGESTED SLUDGE LINE
SUMP PUMP DISCHARGE
MANHOLES
VALVE
PLOT NUMBER
SAMPLE WELLS
STORM
RESERVOIR
6.9 Ac
10.6A
15A
9.5A
13.6A
14.5A
18A
5.7A
4.1A
1.7A
DRAIN
E. KORPALSKI

EXHIBIT 1