RULS - AD - 1976 - 210

12 / 16 / 1976

- DEFENDANT'S SECOND REQUEST FOR ADMISSIONS

PGS - 68

S-1290

RULS - AD - 1976 - 210

FILED
DEC 16 1976
D-7
[signature]

McCARTER & ENGLISH
550 Broad Street
Newark, NJ 07102
(201) 622-4444
Attorneys for Defendants

SUPERIOR COURT OF NEW JERSEY
LAW DIVISION - SOMERSET COUNTY
DOCKET NO. L-25645-75 P.W.

S-1290

THE ALLAN-DEANE CORPORATION, a Delaware corporation, qualified to do business in the State of New Jersey, Plaintiff -vs- THE TOWNSHIP OF BERNARDS, IN THE COUNTY OF SOMERSET, a municipal corporation of the State of New Jersey, et al. Defendants	Civil Action DEFENDANTS' SECOND REQUEST FOR ADMISSIONS

FILED
JAN 19 10 46 AM 197
SOMERSET COUNTY
L. R. OLSON, CLERK

TO: MASON, GRIFFIN & PIERSON, ESQS.
Attorneys for Plaintiff
201 Nassau Street
Princeton, NJ 08540

SIRS:

Bernards Township defendants hereby request plaintiff to admit, within 30 days of service hereof upon you, in accordance with Rule 4:22, the following:

1. The genuineness of "Magnitude and Frequency of Floods in New Jersey with Effects of Urbanization", Special Report 38, 1974, prepared by U.S. Geological Survey in cooperation with New Jersey Department of Environmental Protection, Division of Water Resources, a copy of which is served herewith upon you.

2. The genuineness of "Upper Raritan Watershed Water Quality Survey, 1972" prepared by Academy of Natural Sciences, Philadelphia, March 1974, a copy of which is served herewith upon you.

3. The genuineness of "Volume 2, Research Report of the Governor's Commission to Evaluate the Capital Needs of New Jersey", April 1975, a copy of which is served herewith upon you.

4. The facts stated in the affidavit of Jack H. King, a copy of which is attached hereto and made a part hereof as Exhibit B.

5. The facts stated in the affidavit of Wendell R. Inhoffer, a copy of which is attached hereto and made a part hereof as Exhibit C.

6. Exhibit D attached hereto and made a part hereof is a genuine copy of a report entitled "Somerset County - Population Ahead" prepared by Somerset County Planning Board and dated January 1971.

7. Exhibit E attached hereto and made a part hereof is a genuine copy of a document entitled "Somerset County - Population Ahead" prepared by Somerset County Planning Board

and dated October 1974.

8. Exhibit F attached hereto and made a part hereof is a genuine copy of a document entitled "Somerset County - Population Ahead" prepared by Somerset County Planning Board and dated December 1975.

9. Exhibit G attached hereto and made a part hereof is a genuine copy of a document entitled "Somerset County: Population Change" prepared by Somerset County Planning Board and dated March 1976.

10. According to Somerset County Planning Board estimates as shown in Exhibit G, the population of Somerset County increased from the time of the 1970 Census to January 1, 1976 from 198,372 to 212,343, or an increase of approximately 7.05%.

11. Exhibit H attached hereto and made a part hereof is a genuine copy of a document entitled "Estimated Net Total Housing - Somerset County" prepared by Somerset County Planning Board and dated March 1976.

12. According to Somerset County Planning Board estimates as shown on Exhibit H, the total housing units in Somerset County increased from the time of the 1970 Census to January 1, 1976 from 58,310 to 64,175, or an increase of approximately 10%.

13. Exhibit I attached hereto and made a part hereof is a genuine copy of a document entitled "Somerset County - Selected Places of Work by Municipality of Residence" (1970) prepared by Somerset County Planning Board and dated 11/75.

14. Exhibit J attached hereto and made a part hereof is a genuine copy of the transcript of the deposition upon oral examination of Arthur C. Smith, taken on November 18, 1971 in the case of The Allan-Deane Corporation v. The Township of Bedminster, Docket No. L-36896-70 P.W.

15. On November 18, 1971, the Arthur C. Smith referred to in Exhibit J was:

(a) The president of the plaintiff corporation.

(b) A vice-president of Johns-Manville Corporation.

(c) A director of Johns-Manville Corporation.

16. Exhibit K attached hereto and made a part hereof is a genuine copy of Chapter II of "A Master Sewerage Plan for the Upper Raritan and Delaware Watersheds within Hunterdon, Morris and Somerset Counties, New Jersey" prepared in October, 1970 by Elson T. Killam Associates, Inc., Hydraulic and Sanitary Engineers, Millburn, New Jersey.

17. Elson T. Killam Associates, Inc. are professionally qualified to present a general review of the state of the art of sewage treatment as of October, 1970.

Respectfully submitted,

McCARTER & ENGLISH
Attorneys for Defendants

NICHOLAS CONOVER ENGLISH

By
Nicholas Conover English
A Member of the Firm

STATE OF NEW JERSEY)
) SS:
COUNTY OF ESSEX)

JOHN BYRON, being duly sworn according to law, upon his oath deposes and says:

1. I am employed by McCarter & English, attorneys for defendants herein.

2. On October 7, 1976, I personally mailed, by certified mail, return receipt requested, postage prepaid, a copy of the within Defendants' Second Request for Admissions to Mason, Griffin & Pierson, Esqs., attorneys for plaintiff, at 201 Nassau Street, Princeton, NJ 08540.

Sworn to and subscribed)
before me this 7th day)
October, 1976.)

/s/ John Byron
John Byron

[illegible]

[illegible]
A NOTARY PUBLIC OF NEW JERSEY
My Commission Expires [illegible] 28 1977

McCarter & English, Esqs.
550 Broad Street
Newark, New Jersey 07102
(201) 622-4444
Attorneys for Defendants

SUPERIOR COURT OF NEW JERSEY
LAW DIVISION
SOMERSET COUNTY
DOCKET NO. L-6237-74

THEODORE C. LORENC, et al,	:	
Plaintiffs,	:	Civil Action
v.	:	AFFIDAVIT OF
THE TOWNSHIP OF BERNARDS, et al.,	:	JACK H. KING
	:	
Defendants.	:	

STATE OF NEW JERSEY)
: SS.
COUNTY OF ESSEX)

JACK H. KING, being duly sworn according to law, upon his oath deposes and says:

1. I, JACK H. KING, am, and have been since 1966 Vice President of Commonwealth Water Company.

EXHIBIT B

2. I am a graduate of the University of Illinois with a B.S. degree in civil engineering. I have 33 years of experience in the water works industry.

3. The Commonwealth Water Company system is comprised of four systems designated as the Commonwealth District, Gravity District, Little Falls District and Bernards District.

4. Commonwealth Water Company has contracts with the State of New Jersey to withdraw up to 80,000,000 gallons of water per day from the Passaic River from October 1 to May 30 each year, provided that Commonwealth only takes the excess of a daily flow of 75 million gallons per day. In addition, Commonwealth Water Company has contracts with the State to remove 40,000,000 gallons of water per day from Canoe Brook at its pumping station in Short Hills. The water taken from these sources constitute approximately twenty-two percent (22%) of the total amount of water used by Commonwealth annually. An additional thirty-two percent (32%) is obtained through purchase from various suppliers. The remaining supply of water (approximately 46%) is obtained from wells.

5. In 1975, the Commonwealth Water Company distributed water obtained from these sources to all or portions of the following municipalities:

<u>Commonwealth District</u>

City of Summit
Township of Millburn
Township of Maplewood
Borough of New Providence
Township of Berkeley Heights
Passaic Township
Chatham Township

Village of South Orange
Township of Livingston
Harding Township
Township of Springfield
Town of Irvington
Borough of Hillside
Union Township
Town of West Orange
Warren Township

Gravity District
Township of Bedminster
Borough of Far Hills

Little Falls District
Township of Little Falls
Borough of West Paterson
Borough of North Caldwell
Township of Cedar Grove

Bernards District
Borough of Bernardsville
Township of Bernards
Township of Warren
Harding Township

6. In the year ending December 31, 1975, Commonwealth Water Company estimated in its 1975 Annual Report to the Board of Public Utilities Commissioners, Department of Public Utilities, State of New Jersey, that it served the following number of persons in each district:

Bernards District		20,018
Commonwealth District (excluding Village of South Orange and Township of Livingston)		244,331
Gravity District		1,102
Little Falls District		16,755
	TOTAL	282,206

7. During the same period, Commonwealth Water Company sold in excess of 9 billion gallons of water, which was distributed among its districts as follows:

Bernards District	461,543,000
Commonwealth District	8,159,067,000
Gravity District	29,351,000
Little Falls District	695,115,000
TOTAL	9,345,976,000

JACK H. KING

Sworn and subscribed to before me this 9th day of July, 1976.

[illegible] OF NEW JERSEY
[illegible]

McCarter & English
550 Broad Street
Newark, New Jersey 07102
(201) 622-4444

SUPERIOR COURT OF NEW JERSEY
LAW DIVISION: SOMERSET COUNTY
DOCKET NO. L-6237-74 P.W.

THEODORE C. LORENC, et al.,	:	
Plaintiffs,	:	Civil Action
-vs-	:	
THE TOWNSHIP OF BERNARDS, et als,	:	AFFIDAVIT OF WENDELL R. INHOFFER
Defendants.	:	
	:	

STATE OF NEW JERSEY)
SS:
COUNTY OF PASSAIC)

WENDELL R. INHOFFER, of full age, being duly sworn according to law, upon his oath deposes and says:

1. I am, and have been, since March 1967, General Superintendent and Chief Engineer of the Passaic Valley Water Commission.

2. I am a graduate of Princeton University with B.S. and M.S. degrees in civil engineering. I have 16 years of professional experience in the waterworks industry.

EXHIBIT C

3. Passaic Valley Water Commission is entitled to divert 75 million gallons of raw water per day from the Passaic River at Little Falls. In addition, Passaic Valley Water Commission diverts approximately 40 million gallons per day from the Wanaque Reservoir in which it has a 37.75% interest. Passaic Valley Water Commission has no wells.

4. In 1975, Passaic Valley Water Commission distributed 24,850,463 gallons of water to a population of 470.205 retail and wholesale to all or portions of the following municipalities:

Retail Service	Population Served by PVCC	Million Gallons Supplied
Paterson		
Clifton		
Passaic		
Prospect Park		
Outside	305,510	17,815.781
100% Wholesale Service		
Harrison		
Nutley		
Elmwood Park		
Totowa		
First Republic Corp.	91,480	4,127.739
(East Newark)		
Verona		
Partial Wholesale		
Lodi		
Garfield		
Fair Lawn		
Wallington		
Hackensack Water Company		
Haledon, North Haledon	73,215	2,906.943
Littl Falls TOTAL	470,205	24,850.463
West Paterson		
Cedar Grove		

Sworn to and Subscribed before me this 27th day of July, 1976.

WENDELL R. INHOFFER

NOTARY PUBLIC OF NEW JERSEY
My Commission Expires ...

SOMERSET COUNTY - POPULATION AHE.

MUNICIPALITY	1960	1970	1980	1990	2000
Bedminster Twp.	2,322	2,597	4,000	6,000	7,000
Bernards Twp.	9,018	13,305	19,000	24,000	30,000
Bernardsville	5,515	6,652	8,000	9,000	10,000
Bound Brook	10,263	10,450	13,000	15,000	16,000
Branchburg Twp.	3,741	5,742	12,000	18,000	25,000
Bridgewater Twp.	15,789	30,235	40,000	45,000	50,000
Far Hills	702	780	1,500	2,000	2,000
Franklin Twp.	19,858	30,389	45,000	55,000	65,000
Green Brook Twp.	3,622	4,302	6,000	8,000	8,000
Hillsborough Twp.	7,584	11,061	22,000	38,000	45,000
Manville	10,995	13,029	15,000	16,000	17,000
Millstone	409	630	1,000	1,500	1,500
Montgomery Twp.	3,851	6,353	12,000	18,000	22,000
North Plainfield	16,993	21,796	25,000	27,000	28,000
Peapack & Gladstone	1,804	1,924	3,000	4,000	5,000
Raritan	6,137	6,691	8,000	9,000	10,000
Rocky Hill	528	917	1,500	1,500	1,500
Somerville	12,458	13,652	16,000	18,000	20,000
South Bound Brook	3,626	4,525	6,000	7,000	7,000
Warren Twp.	5,386	8,592	15,000	20,000	22,000
Watchung	3,312	4,750	7,000	8,000	8,000
COUNTY TOTAL	143,913	198,372	280,000	350,000	400,000

NOTE: Data for 1960 and 1970 are from the Bureau of the Census. The estimates for 1980, 1990 and the year 2000 were prepared by the Somerset County Planning Board. Population forecasts are at best venturous, and are subject to the vicissitudes of war, recession, federal monetary policies, inflation, and population control. These forecasts are, therefore, an extrapolation of present trends.

Prepared by: Somerset County Planning Board
January, 1971

EXHIBIT D

SOMERSET COUNTY - POPULATION AHEAD

MUNICIPALITY	1960	1970	1980	1990	2000
Bedminster Twp.	2,322	2,597	4,000	6,000	7,000
Bernards Twp.	9,018	13,305	16,000	22,000	30,000
Bernardsville Boro.	5,515	6,652	7,500	9,000	10,000
Bound Brook Boro.	10,263	10,450	11,000	13,000	16,000
Branchburg Twp.	3,741	5,742	8,000	15,000	25,000
Bridgewater Twp.	15,789	30,235	36,000	45,000	50,000
Far Hills Boro.	702	780	900	2,000	2,000
Franklin Twp.	19,858	30,389	40,000	53,000	65,000
Green Brook Twp.	3,622	4,302	5,200	7,000	8,000
Hillsborough Twp.	7,584	11,061	22,000	35,000	45,000
Manville Boro.	10,995	13,029	13,500	16,000	17,000
Millstone Boro.	409	630	800	1,500	1,500
Montgomery Twp.	3,851	6,353	10,000	16,000	22,000
North Plainfield Boro.	16,993	21,796	22,000	26,000	28,000
Peapack & Gladstone Boro.	1,804	1,924	2,300	4,000	5,000
Raritan Boro.	6,137	6,691	7,000	9,000	10,000
Rocky Hill Boro.	528	917	1,500	1,500	1,500
Somerville Boro.	12,458	13,652	13,800	17,000	20,000
South Bound Brook Boro.	3,626	4,525	5,500	7,000	7,000
Warren Twp.	5,386	8,592	12,000	18,000	22,000
Watchung Boro.	3,312	4,750	6,000	7,000	8,000
COUNTY TOTALS	143,913	198,372	245,000	330,000	400,000

NOTE: Data for 1960 and 1970 are from the Bureau of the Census. The estimates for 1980, 1990, and the year 2000 were prepared by the Somerset County Planning Board. Population forecasts are at best venturous, and are subject to the vicissitudes of court decisions, war, recession, federal monetary policies, inflation, and population control. These forecasts are, therefore, an extrapolation of present trends.

Prepared by: Somerset County Planning Board
October, 1974

EXHIBIT E

SOMERSET COUNTY - POPULATION AHEAD

MUNICIPALITY	1960	1970	1980	1990	2000
Bedminster Twp.	2,322	2,597	4,000	6,000	7,000
Bernards Twp.	9,018	13,305	15,000	20,000	25,000
Bernardsville Boro.	5,515	6,652	7,200	9,000	10,000
Bound Brook Boro.	10,263	10,450	10,800	12,000	12,000
Branchburg Twp.	3,741	5,742	8,000	13,000	18,000
Bridgewater Twp.	15,789	30,235	35,000	42,000	47,000
Far Hills Boro.	702	780	900	1,500	1,500
Franklin Twp.	19,858	30,389	37,000	48,000	55,000
Green Brook Twp.	3,622	4,302	5,200	6,500	8,000
Hillsborough Twp.	7,584	11,061	19,000	29,000	37,000
Manville Boro.	10,995	13,029	13,200	14,000	14,000
Millstone Boro.	409	630	700	1,000	1,000
Montgomery Twp.	3,851	6,353	9,400	14,000	18,000
North Plainfield Boro.	16,993	21,796	22,000	24,000	26,000
Peapack/Gladstone Boro.	1,804	1,924	2,300	3,000	4,000
Raritan Boro.	6,137	6,691	7,000	8,000	9,000
Rocky Hill Boro.	528	917	1,000	1,500	1,500
Somerville Boro.	12,458	13,652	13,500	16,000	18,000
South Bound Brook Boro.	3,626	4,525	5,100	6,000	6,000
Warren Twp.	5,386	8,592	11,000	16,000	20,000
Watchung Boro.	3,312	4,750	5,700	6,500	7,000
COUNTY TOTALS	143,913	198,372	233,000	297,000	345,000

NOTE: Data for 1960 and 1970 are from the Bureau of the Census. The estimates for 1980, 1990, and the year 2000 were prepared by the Somerset County Planning Board. Population forecasts are at best venturous, and are subject to the vicissitudes of court decisions, war, recession, federal monetary policies, inflation, and population control. For most municipalities these forecasts represent a substantial decrease from prior Somerset County estimates, because of the decline in births and the long-term decline in housing production.

Prepared by: SOMERSET COUNTY PLANNING BOARD

December 1975

EXHIBIT F

#141

SOMERSET COUNTY: POPULATION CHANGE

MUNICIPALITY	1970 CENSUS	COUNTY ESTIMATE 1/1/71	COUNTY ESTIMATE 1/1/72	COUNTY ESTIMATE 1/1/73	COUNTY ESTIMATE 1/1/74	COUNTY ESTIMATE 1/1/75	COUNTY ESTIMATE 1/1/76
Bedminster Twp.	2,597	2,655	2,659	2,678	2,702	2,705	2,700
Bernards Twp.	13,305	13,510	13,708	13,877	13,931	13,932	13,937
Bernardsville Boro.	6,652	6,702	6,770	6,755	6,799	6,806	6,845
Bound Brook Boro.	10,450	10,461	10,465	10,431	10,461	10,480	10,448
Branchburg Twp.	5,742	5,918	6,153	6,456	6,539	6,933	7,243
Bridgewater Twp.	30,235	30,599	31,067	31,336	31,542	31,799	32,034
Far Hills Boro.	780	794	795	790	790	801	823
Franklin Twp.	30,389	30,979	31,240	31,489	31,695	32,765	32,892
Green Brook Twp.	4,302	4,331	4,425	4,560	4,537	4,529	4,541
Hillsborough Twp.	11,061	11,205	11,496	11,779	12,624	14,384*	15,125
Manville Boro.	13,029	13,069	13,089	13,095	13,080	13,096	13,096
Millstone Boro.	630	630	628	625	625	623	621
Montgomery Twp.	6,353	6,493	6,620	6,862	7,170	7,496	7,663
No. Plainfield Boro.	21,796	21,767	21,678	21,478	21,317	21,251	21,206
Peapack/Gladstone Boro.	1,924	1.959	1.977	2,025	2,046	2,103	2,116
Raritan Borough	6,691	6,713	6,709	6,687	6,673*	6,672*	6,665
Rocky Hill Boro.	917	917	914	922	916	913	910
Somerville Boro.	13,652	13,543	13,431	13,278	13,399	13,490	13,469
So. Bound Brook Boro.	4,525	4,557	4,850	4,852	4,880	4,877	4,875
Warren Twp.	8,592	8,772	8,984	9,214	9,523	9,744	9,844
Watchung Boro.	4,750	4,818	4,852	4,921	5,074	5,201	5,290
COUNTY TOTALS	198,372	200,392	202,510	204,110	206,323*	210,600*	212,343

All of the above estimates, except 1970 Census Data, are based on Certificate of Occupancy information received from Municipal Building Inspectors utilizing a household size of 3.5 for new single-family residences and a size of 2.2 for new multiple dwellings. The above estimates for January of each year (1971-1976) are revised, basically because of the decline in family size attendant to a radical decline in births. Indicators utilized in the construct of these estimates include annual records of births for 0-4 age group, school enrollment data for the 5-17 age group, and school graduate class size for projecting age group 18-25. The household size has declined with this estimate from 3.40 in 1970 to 3.30 for January 1, 1976.

*Corrected based on final Certificate of Occupancy reports.

Prepared by: SOMERSET COUNTY PLANNING BOARD

March 1976

EXHIBIT G

ESTIMATED NET TOTAL HOUSING - SOMERSET COUNTY

(Occupied and Vacant)

MUNICIPALITY	Census Total Housing Units 1970	Net Housing Units Added 1970		Net Housing Units Added 1971		Net Housing Units Added 1972		Net Housing Units Added 1973		Net Housing Units Added 1974		Net Housing Units Added 1975		Total Housing Units Jan. 1, 1976		TOTAL
		Multi-ples	Sin-gles	Multi-ples	Sin-gles	Multi-ples	Sin-gles	Multi-ples	Sin-gles	Multi-ples	Sin-gles	Multi-ples	Sin-gles	Multi-ples	Sin-gles	
Bedminster Twp.	840	0	17	0	4	0	10	0	11	2	2	0	2	14	874	888
Bernards Twp.	3,214	0	77	0	61	0	66	0	33	0	9	0	14	12	3,462	3,474
Bernardsville Boro.	2,063	0	19	0	23	0	7	0	24	0	8	0	20	92	2,072	2,164
Bound Brook Boro.	3,490	0	5	3	11	0	10	-1	28	0	15	0	4	778	2,787	3,565
Branchburg Twp.	1,670	0	62	0	70	0	76	0	33	0	117	0	94	6	2,116	2,122
Bridgewater Twp.	8,015	0	137	0	150	0	122	0	104	0	96	0	85	491	8,218	8,709
Far Hills Boro.	249	0	6	0	1	0	0	0	1	0	4	0	7	4	264	268
Franklin Twp.	8,576	187	40	0	96	0	109	11	100	316	131	6	74	1,884	7,762	9,646
Green Brook Twp.	1,198	0	9	0	31	0	45	0	0	0	1	0	6	10	1,280	1,290
Hillsborough Twp.	2,961	0	46	0	95	0	97	230	113	611	127	259	62	1,224	3,377	4,601
Manville Boro.	3,815	0	19	0	13	0	23	0	17	0	15	0	7	199	3,710	3,909
Millstone Boro.	177	0	0	0	0	0	0	0	1	0	0	0	0	8	170	178
Montgomery Twp.	1,445	0	44	0	41	0	77	0	96	0	97	0	51	46	1,805	1,851
No. Plainfield Boro.	7,683	0	-9	-5	-3	-5	-11	-6	1	-2	4	0	7	2,262	5,392	7,654
Peapack/Gladstone Boro.	596	4	8	0	7	0	17	0	9	0	18	0	7	21	645	666
Raritan Boro.	2,171	0	6	0	5	0	6	0	6	0	8	0	6	281	1,927	2,208
Rocky Hill Boro.	268	0	1	0	0	6	0	0	0	0	0	0	0	10	265	275
Somerville Boro.	4,628	-37	-59	4	9	-38	6	81	9	60	1	8	4	1,050	3,612	4,676
So. Bound Brook Boro.	1,421	0	11	116	16	6	5	0	16	0	3	0	5	265	1,334	1,599
Warren Twp.	2,469	0	59	0	67	0	79	0	101	0	70	0	41	40	2,846	2,886
Watchung Boro.	1,361	0	22	0	15	0	27	0	51	0	40	0	30	10	1,536	1,546
COUNTY TOTALS	58,310	154	520	118	712	-31	771	315	754	987	766	273	526	8,717	55,458	64,175

NOTE: The above tabulations integrate census totals and occupancy permit data provided by the Municipal Building Inspectors. Housing units lost during 1970 included 86 singles and 38 multiples; during 1971, 35 singles and 6 multiples; during 1972,45 singles and 55 multiples; during 1973, 14 singles and 15 multiples; during 1974, 31 singles and 2 multiples; and during 1975, 27 singles and 19 multiples; all of which were deleted from the totals. It should be noted that single units also cover two-family dwellings and the multiple category is three or more units per structure.

Prepared By: SOMERSET COUNTY PLANNING BOARD

MARCH, 1976 #120

EXHIBIT H

SOMERSET COUNTY
SELECTED PLACES OF WORK BY MUNICIPALITY OF RESIDENCE (1970)

RESIDENCE \ WORK SITE	Somerset Cty.	Middlesex Cty.	Morris Cty.	Union Cty.	Mercer Cty.	Hunterdon Co.	Monmouth Cty.	Bergen Cty.	Passaic Cty.	Hudson Cty.	Newark CBD	Rest of Newark	Rest of EssexCty	Manhattan	Rest of NYC	Other NY	Phila. SMSA	Total
Bedminster	603	58	42	36		32		8	9			9	23	61	26	9		938
Bernards	1942	192	686	706	21	26	6	18	57	54	173	42	180	271	150	15	6	4,599
Bernardsville	1248	65	402	218		7		46	24	24	74	64	69	127	57			2,425
Bound Brook	2628	845	80	255	24	7	4	55	13	6	20		32	102	35	8		4,114
Branchburg	1368	186	50	180	34	95		26	21	14	48	20	38	24	69			2,173
Bridgewater	7008	1516	160	1169	95	158		64	50	76	111	144	119	221	95	8	20	11,013
Far Hills	254	10	19	24						4				11				322
Franklin	3228	5301	75	434	418	26	19	84	24	143	134	118	140	624	505	38	38	11,330
Green Brook	461	351	19	434	12	6		13	30	78		38	27	7	30	8	7	1,523
Hillsborough	2673	453	32	252	206	106	10	31	17	31	16	44	41	93	27	5	9	4,046
Manville	4308	587	36	134	31	69	8	21	35	18		37	7	16	19		11	5,337
Millstone	168	39		18	17	13					6						6	267
Montgomery	853	128		28	704	58	15	9		6	6	4		62	43	30	14	1,960
North Plainfield	2672	1118	221	3866	31	44	27	92	75	98	135	182	253	254	157	26	7	9,249
Peapack-Gladstone	569	32	107	33	7				5		12		27	30				822
Raritan	2382	205	8	112	13	47	10	26	11	15	23	20	17	17	12			2,918
Rocky Hill	67	58	8		187					6	8			14	24			372
Somerville	4417	372	54	225	25	38	6	52	20	6	25	28	27	113	92	5	7	5,506
So. Bound Brook	1199	409	20	154		21	7		9	20		17	12	6	19	5		1,891
Warren	984	286	216	1027		14	5	53	19	40	88	69	110	131	88		6	3,136
Watchung	622	108	33	694			7	25	13	32	5	38	92	32	34			1,735
TOTAL	39,654	12,319	2,268	9,999	1,899	767	124	623	432	671	884	874	1,214	2,216	1,474	157	131	75,672

EXHIBIT I

Prepared by: Somerset County Planning Board
11/75

Source: Tri-State Regional Planning Commission & New Jersey Department of Labor & Industry

SUPERIOR COURT OF NEW JERSEY
LAW DIVISION: SOMERSET COUNTY
DOCKET NO. L-36896-70 W. P.

THE ALLAN DEANE CORPORATION, :
a Delaware corporation
qualified to do business in
the State of New Jersey, :

Plaintiff, :

vs. :

THE TOWNSHIP OF BEDMINSTER, :
a municipal corporation of
the State of New Jersey and :
the TOWNSHIP OF BEDMINSTER
PLANNING BOARD, :

Defendants. :

DEPOSITION UPON ORAL EXAMINATION OF ARTHUR C. SMITH.

TRANSCRIPT of the deposition of ARTHUR C. SMITH, called for Oral Examination in the above-entitled matter, said deposition being taken pursuant to Superior Court Rules of Civil Practice by and before JOHN DI ORIO, a Notary Public and Certified Shorthand Reporter of the State of New Jersey, at the office of McCarter & English, Esqs., 550 Broad Street, Newark, New Jersey, on Thursday, November 18th, 1971, commencing at 10:00 A.M.

A p p e a r a n c e s:

WILLIAM W. LANIGAN, ESQ.,
Attorney for the Plaintiff.

McCARTER & ENGLISH, ESQS.,
BY: NICHOLAS CONOVER ENGLISH, ESQ.,
Attorneys for the Defendants.

EXHIBIT J

INDEX OF WITNESSES

WITNESS	DIRECT
Arthur C. Smith	
MR. ENGLISH	2

EXHIBIT	DESCRIPTION	PAGE
D-1	Letter of May 24th, 1971, from William W. Lanigan to the Township of Bedminster Planning Board	11
D-2	Copy of letter dated August 23rd, 1971 from William W. Lanigan to the Mayor and Township Committee and the Chairman and Members of the Planning Board of Bedminster	23

A R T H U R   C.   S M I T H,   having been first duly sworn according to law by the Officer, testified as follows:

DIRECT EXAMINATION BY MR. ENGLISH:

Q Where do you live, Mr. Smith?
A 1201 William Street, Denver, Colorado.
Q Are you connected in some way with the plaintiff in this action, The Allan Deane Corporation?
A I am the president of the corporation.
Q Do you have any position with the Johns-Manville Corporation? A Yes, I am director of Johns-Manville and a vice president of the Johns-Manville Corporation.
Q And in just a general way, what is your personal connection with the project of Allan Deane Corporation to develop land in Bedminster and Bernards Township? A I have charge of it.
Q Could you tell me please the names of the other officers of The Allan Deane Corporation?
A Yes. Chester Sulewski is the vice president. Herbert M. Ball is the secretary. Assistant secretary is Parker. Earl Parker.
Basically, that's all.
Q Any treasurer? A Treasurer is

James Spangenberg.

Q Now, is each of the four gentlemen you just mentioned also connected with the Johns-Manville Corporation?

A Yes.

Q Can you tell me please who are the members of the board of directors of the Allan Deane Corporation?

A Yes. I am a member, John McKinney is a board member. R. T. Jones is a board member. Sulewski is a board member. Is that five?

Q Four I have. A Well, let me take a look. H. M. Ball.

Q Are Messrs. McKinney and Jones connected with Johns-Manville? A Mr. McKinney is, Mr. Jones is not.

Q What is Mr. Jones' occupation?

A Mr. Jones is a golf architect.

Q Is Allan Deane Corporation a wholly owned subsidiary of Johns-Manville Corporation?

A Yes.

Q What were the purposes of Johns-Manville in creating the Allan Deane Corporation?

A The purpose of the corporation was to own the property, to develop it.

Q And are the proposed developments connected with the other activities of Johns-Manville Corporation, their manufacturing and selling activities?

A You mean does Johns-Manville have other developments?

Q Let me withdraw the question.

A Yes.

Q How would you describe the business activities of Johns-Manville Corporation?

A Johns-Manville is a manufacturing distributing Company that is in many businesses.

Q Now, is the use to which Allan Deane proposes to devote its property directly related to some of the other activities of Johns-Manville or by contrast, is it simply a profit making venture? A It's an investment for Johns-Manville.

Q And the purpose of the investment is to make some money for Johns-Manville? A Certainly.

Q Now, why did the plaintiff buy land in Bedminster Township in 1969? A The Runne Mead Corporation either owned a small portion or had options on this land. It was offered to us and at a very advantageous price and we bought it.

Q Who is the Runne Mead Corporation?

A I don't know much about the Runne Mead Corporation. It was a corporation, I understand it is still in business and that's it. I know very little about them.

Q Did the plaintiff take the initiative in seeking to purchase land in Bedminster or did Runne Mead take the initiative in offering the land to Allan Deane?

A Runne Meade offered the land to Allan Deane.

Q But at the time the offer was first made was Allan Deane Corporation already organized and doing business? A No, it was not. It was formed for this purpose.

Q I suppose to be literal about it, Runne Meade's additional offer was to Johns-Manville. I'm talking about an informal offer. A Informally it was made to Johns-Manville through me.

Q By the way, what are your particular duties as a vice president of Johns-Manville?

A I am vice president in charge of environmental control of oúr company, internall and externally. That's my title.

Q Now, I understand that Allan Deane actually acquired title to this land in Bedminster Township in 1969? A Yes, I believe that's right.

Q And Allan Deane also owns land in Bernards Township? A Yes.

Q And its land in Bernards Township adjoins its land in Bedminster or in a sense is part of the same tract? A Right, yes.

Q Approximately when did Allan Deane buy the land in Bernards Township? A Approximately the same time.

Q Now, at the time the plaintiff bought its land did it know that the lands in Bedminster which it was buying were located in a five acre minimum lot zone?

A Yes.

Q And what was the zoning in Bernards Township with respect to lands you bought there?

A Three acre.

Q What was the approximate price per acre that you paid for the land in Bedminster? A It varied. I almost would have to get the records to tell you for sure. Some of the properties were part in Bedminster and part in Bernards, so it's almost impossible for me to tell you this without checking the records.

Q Well, without distinguishing between Bernards and Bedminster, can you give me a ballpark figure?

A Yes. $3500 an acre, average.

Q That's the whole works? A Average.

Q Incidentally, if I occasionally use the word you I am referring to the company, not you personally.

A Right. Yes, I understand.

Q In your proposals to develop the lands are you considering the entire tract in both Bedminster and Bernards Township as a single entity for development purposes? A That's something that would have to be answered by the planner who is doing all the technical work. I think so, but I'm not positive. It could be separated or it could be as a single entity. And I am not competent to answer that question.

Q Now, who is your planner? A Name is Catlin.

Q Is there any particular individual in the Catlin organization that you have healt with?

A Yes, Mr. Catlin himself.

Q And his name is Robert? A Robert Catlin.

MR. LANIGAN: Robert Catlin Associates, Denville, New Jersey.

Q Approximately when did the plaintiff retain Catlin Associates? A I am guessing. About April 1970.

Q And are you the individual who acted for the plaintiff corporation in engaging the Catlin firm?

A Yes.

Q What instructions did you give to Catlin?

A We told Mr. Catlin to look at the master plan of Bedminster Township, the one that was made in 1965 to plan according to what we thought the master plan said.

Q Did you have some familiarity with the Bedminster master plan of 1965 at the time you talked to Catlin? A Yes, sir, I had a copy of it.

Q Did the master plan of Bedminster Township provide for an office and research zone on the property which Allan Deane Company had bought? A No. But the master plan said they needed research facilities to help the economics of the township. It also mentioned that since the advent of the new highway, 287 and 78, it had created a buffer or a boundary so that it implied that that was a separation between what they wanted and the residential area. And, well, we just thought from reading the master plan that this was what they were after, this is what they wanted.

Also, the property in Bedmister that we purchased was almost surrounded by commercial and research facilities, according to this master plan. It was sort of an island inside of it.

Q Now, at the time you gave your instructions to Mr. Catlin were you familiar with the zoning ordinance of Bedminster Township? A Yes, sir.

Q And did that make any provision for research or office zones in the land which the plaintiff acquired? A No.

Q Did the zoning ordinance provide for the research and office zone in the vicinity of your tract which you say were referred to in the master plan?

A The reason I hesitate is because the zoning ordinance has been changed a great many times and all I can tell you is that at that time we believe that the zoning ordinance did have research and commercial facilities very close to our property or almost adjacent to it.

Q Did you give any thought to developing the whole area in Bedminster Township that your company acquired in five acre lots? A We left that to our planner.

Q Did you tell the planner specifically to include research and office buildings in a portion of your tract line in Bedminster Township? A No.

Q As of the spring of 1970 or whenever you gave your instructions to Mr. Catlin, was there a master plan in Bernards Township? A There must have been. There usually is.

MR. LANIGAN: If you know?

A Yes.

MR. LANIGAN: If you don't know, you don't know.

A I don't know whether there was or not.

Q Well, do I infer that your degree of familiarity with the Bernards master plan, if any, was not as great as the Bedminster master plan? A That's correct.

Q Was there a zoning ordinance in Bernards Township at this time? A Yes.

Q And I think you told us that that provided for three acre minimum lots in the area you bought?

A Yes.

Q Do you know or do you recall whether the Bernards Township zoning ordinance made any provision for research and office zones? A No, it did not, not as far as I know.

Q Do I understand you correctly, Mr. Smith, that in your instructions to Mr. Catlin you did not specifically mention whether or not to include office and research facilities in the proposed development of the Allan Deane property? A That's correct. We left the planning to him. We are not land planning experts, he is.

Q Now, is it Allan Deane's desire of constructing a research and office facility on its property in Bedminster?

A Are we?

Q Yes. A Yes.

Q And how big a facility do you have in mind?

A Now you are getting in areas where I'd almost have to look at a plan to tell you. Because in dealing with the planner he had a number of plans. So I would have--I probably would not be giving you an accurate figure if I told you the exact square footage or some such plan as that.

Q Do you have the plan here?

A No, I do not.

MR. ENGLISH: May I mark as Exhibit D-1 for identification a photocopy of a letter from William W. Lanigan to the Township of Bedminster Planning Board, dated May 24th, 1971.

(Letter of May 24th, 1971 from William W. Lanigan to the Township of Bedminster Planning Board is received and marked Exhibit D-1 for identification.)

Q Mr. Smith, I show you an exhibit which is marked D-1 for identification which I think Mr. Lanigan would agree is a photocopy of the letter he wrote to the Township of Bedminster Planning Board under date of May 24th, 1971, and ask you if you are familiar with that letter?

A Yes, I am.

Q Have you seen the letter before it was delivered by Mr. Lanigan to the planning board? A Yes.

Q And does the letter D-1 for identification correctly express the position of the Allan Deane Corporation as of May 24th, 1971? A Yes.

Q By reference to the letter D-1 for identification, can you tell us something about the size of the proposed office and research facility?

A Well, this says seven and a half percent of 92 acres. That's about 240,000 square feet.

Q Is it the plaintiff's proposal that this facility would be used by someone other than the Johns-Manville Corporation? A Yes.

Q Have you had any idea about how many people would be employed in a research and office facility of the kind you are proposing? A I can tell you approximately. In a normal building like that, 60 percent of it is useable space. And if you had 15--

MR. LANIGAN: Off the record.

(Discussion off the record.)

Q Well, I take it, Mr. Smith, that you are really not familiar with the answer to the question I put to you? A No, we have left this, the technical aspect of this we left in the hands of the plaintiff.

Q Could you tell me who would have knowledge of the size of the building and the number of people who presumably would be employed therein? A Catlin has the entire study.

Q Nobody else in the Allan Deane Corporation would be apt to know? A No.

Q Has the plaintiff given any thought to where the personnel who would work in this office and research facility might live? A Yes.

Q Where? A In surrounding areas, even in Bedminster.

Q How would the workers commute to the office and research facility? A Usually by car, that's the only transportation in that area.

Q There is no public transportation in Bedminster, is there? A No.

Q Have you had any traffic surveys made in connection with your plans to develop your land in Bedminster and Bernards Township? A Yes, we did. Catlin handled that.

Q Catlan had that made for you?

A He had it made for us. It was handled through him.

Q I think I saw reference in the papers somewhere that Gorman Associates have made these?

A That's the one, right.

Q Do you have a copy of that here?

A No, I do not.

Q Would Mr. Catlin have that?

A Yes.

Q Are you familiar with the intersection of Interstate Route 78 and Interstate Highway 287 in Bedminster Township? A Where the two highways cross?

Q Right. A Yes.

Q We can agree, can we not, Mr. Smith, that there is no way to get from either 287 or 78 onto the ground and on to local streets right at the intersection?

A That's correct, right at where they cross.

Q Right? A Yes.

Q And the only connection between Interstate 287 and the other streets in Bedminster Township is at a jug-handle on where 287 crosses Route 202, 206 north of Pluckerman Village? A Right.

Q And is it not true that there is no way to get from Interstate 78 onto local streets in Bedminster Township except at the western edge of Bedminster?

A 78---

Q That's the east-west highway?

A Yes. You can get off 78. Let me ask you this. You mean at the western end of the township?

Q Yes. A You can get off at 78.

Q At the western end of the township, right?

A You can get off there at other places, too.

Q But other than an interchange between local streets and Route Interstate 78 and the western edge of Bedminster Township, there is no interchange between Route 78 and local streets in any other part of Bedminster Township? A You can go south from 78 to 287 and get off.

Q Yes. But where you get off 287 is outside of Bedminster Township, is it not? A Yes, but it is available to the streets of Bedminster.

Q How far south on 287 do you have to go from 78 before you can get off? A It's about three minutes in a car.

Q It's about three miles then, isn't it?

A Approximately.

Q Directing your attention again, Mr. Smith, to page 7 of Exhibit D-1 for identification.

A Yes.

Q Do I fairly construe that letter as indicating that the office and research facility with the portion of the land directly related to it would approximate 92 acres?

A That's what the letter says, yes.

Q And do you know how much of that 92 acres would be a parking lot? A No, sir, I do not. That would be a question the planner would have to answer.

Q May I direct your attention to page 8 of the letter which is D-1 for identification.

A Yes.

Q There is a reference on that page to a proposed meeting center consisting of 120 transient units?

A Yes, sir.

Q Can you tell me a little more fully what all that is about? A I think that there is a need for a transient unit in this area.

Q Is this essentially a hotel or a motel?

A It would be probably a meeting room, places where people can gather.

Q Do you recall any reference to such a facility in the Bedminster zoning ordinance? A I think there was a reference to one but I am not positive of that. And one of the zoning ordinances.

Q By one of the zoning ordinances you mean what? A It seems to me that I have read a reference some place to a motel or a transient place some place in that area.

Q But, for example, you don't recall whether it was Bedminster or Bernards Township?

A No, it was Bedminster, I think.

Q It was Bedminster? A Yes.

Q Was there anything in the Bedminster master plan about a motel or a hotel or meeting center?

A No.

Q Whose idea was it to construct a meeting center with transient units on your property?

A Oh, I suppose it was mine. The planner agreed that it was a good thing to do. Those of us who have worked in that area think there is a great need for something of that kind.

Q Can you define a little more specifically the need? A Yes. It's difficult for companies and research people to have meetings because it is difficult for them to find a place to stay and to meet.

Q What companies are you referring to specifically? A Companies who are down there. There are several of them. Johnson & Johnson, they have indicated in the past they have difficulties finding places to meet and to have people stay.

Q Johnson & Johnson is not in Bedminster Township, is it? A I understand that.

Q About how far away from your proposed facility is the Johnson & Johnson plant? A Five miles, I would guess.

Q How would you describe the general area within which the industries are located who would in your judgment feel the need for a meeting center in this locality?

A Well, Johns-Manville would be one, Johnson & Johnson, American Radiator.

Q Where is the American Radiator plant located that you speak of? A American Standard. They are just off of 287.

Q In what municipality or near what town?

A They are near Bound Brook.

Q Why in your judgment should this meeting center be located near Pluckerman as opposed to being located closer to the plants you have referred to, such as along Route 22 or in Bridgewater Township? A Well, at the intersection of two major highways is a good place to have a meeting center.

Q Would it be your purpose to operate this facility as a regular hotel to the extent that it is not required for business meetings or other large gatherings?

A Economically it would be necessary to do that.

Q And that is your plan? A Yes.

Q Directing your attention further to page 8 of Exhibit D-1 for identification. I understand your company is proposing to build 52 single family residential dwellings? A Yes, sir.

Q And what would be the average lot size for each of those proposed houses? A Well, I am not so sure I can tell you exactly without having the plan. I think that that is something the planner would have to answer.

Q Well, the letter says that 64 acres would be used to provide for these 52 single family residential dwellings? A Right.

Q So the average lot size would be something less than an acre and a half. Is that correct?

A Yes, mathematically that's correct.

Q Do you regard single family dwellings on lot size of less than one acre and a half to be in compliance with the zoning ordinance which calls for a five acre minimum lot size? A A part of the property in Bedminster is one acre zoning.

Q Well, the one acre zoning is right near Pluckerman Village, is it not? A Right.

Q And isn't that where you are proposing to put the research center and the transient facility?

A Yes, the other is five acres.

Q So that these 52 single family houses would go in the part that is presently zoned for five acres?

A Yes.

Q Do you regard your proposal as complying with the zoning ordinance? A No.

Q Did not the master plan of Bedminster also call for a five acre minimum lot sizes in the spot where you are proposing to put these 52 single family dwellings?

A Yes.

Q So your proposal does not comply with the master plan either, does it? A No.

Q What sort of a sales price do you contemplate for these 52 single family houses? A Well, the letter says they would average around $90,000 apiece.

Q What level income group in society do you contemplate would purchase these houses? A An old rule used to be you can afford a house that was three times your income, two times your income, maybe four times your income, based on what happens. Now, today apparently they are willing to have more debt than they formerly did. So it could be $25,000 or more. Or if people had more money they wouldn't need as much income.

Q People had more money they wouldn't need as much income? A If they had more background income they wouldn't need as great an amount.

Q You mean capital? A Capital, yes.

Q Well, are these 52 single family houses specifically designed to make housing available to lower income groups? A No.

Q Now, further directing your attention to the letter D-1 for identification. A Yes.

Q Can you tell me about how many multi-family dwellings you are proposing to build? A No, sir, I can't, unless it states so in here. I think the planner would have to give you that answer.

Q But I take it you are proposing to devote 33 acres in Bedminster to such a use? A Yes, that's what the letter says.

Q And what would you regard the average sales price of these dwellings? A The letter says they would be $35,000 at an average price.

Q Is it your company's thought that this housing would be particularly available for lower income groups?

A Well, that depends on the definition of lower income. Certainly with lower income could buy these houses at what we would require to buy the single family dwellings.

Q Give me please a description of the sorts of persons that you think would be interested in buying these town houses? A Little management people, some professional people.

Q Have you finished your answer?

A Yes.

Q Well, would your company intend to sell these town houses or rent them? A Sell them.

Q Is it your position that there are presently middle management people who are employed in Bedminster but who cannot find suitable housing in that municipality?

A Yes, sir.

Q Whom do these people work for?

A Some of them work for Johns-Manville.

Q Are they employed in Bedminster?

A No.

Q Well, my question was limited to persons employed in Bedminster? A I don't know as I know offhand anyone who is employed in Bedminster.

Q Well, is it fair to say that your purpose in providing these town houses is to meet the needs of people who are employed outside of Bedminster rather than just those who may be employed within Bedminster?

A Yes.

Q Mr. Smith, have you ever heard of the Regional Plan Association? A There is one in Newark.

Q Are you familiar with the one that has its offices at least in New York City? A No. I think the only one that I know is the one that meets in Newark.

Q What can you tell me about that organization?

A Very little. I just know it exists.

Q Have you ever seen any of their reports or recommendations? A A long time ago I saw some.

Q In giving your instructions to Mr. Catlin did you tell him to conform to the recommendations of the Regional Plan Association to which you have referred?

A No.

Q Have you ever heard of the Tri-state Transportation Commission? A No.

Q Are you aware that Somerset County has a county master plan? A Yes, I am.

Q Have you ever read the county master plan?

A No, sir.

Q Have you seen it? A Don't know whether I have or not.

Q In any event, did the Allan Deane Corporation consider the recommendations of the Somerset County master plan in trying to develop its own plans for the use of its property in Bedminster and Bernards Township?

A We left that to our planner.

Q Did you give him any specific instructions to comply or to disregard the Somerset County master plan?

A No, no instructions.

Q No instructions respecting--

A Regarding the plan.

Q The master plan? A Yes.

MR. ENGLISH: Off the record.

(Discussion off the record.)

MR. ENGLISH: May I mark for identification a photocopy of a letter dated August 23rd, 1971 from William W. Lanigan to the Mayor and Township Committee and the Chairman and Members of the Planning Board of Bedminster.

(Copy of letter dated August 23rd, 1971 from William W. Lanigan to the Mayor and Township Committee and the Chairman and Members of the Planning Board of Bedminster is received and marked Exhibit D-2 for identification.)

Q Mr. Smith, I show youa copy of a letter written by Mr. Lanigan dated August 23rd, 1971 and ask you if you are familiar with that letter? A I don't know whether I am or not.

Q Do you recall having ever seen it before?

A I don't know.

Q Did you authorize Mr. Lanigan to write that letter on behalf of Allan Deane Corporation?

A Yes, sir.

Q Do you associate yourself on behalf of the company with that letter? A Yes. When I say I don't know whether I had seen it, I've been in Denver a great deal, I have been out of town. Mr. Lanigan and I consult by telephone a great deal of the times. This is why I want to be completely honest with you in this situation.

Q Yes. Well, is it fair to say that the letter of August 23rd which is D-2 for identification is an authoritative statement of the position of Allan Deane Corporation as of this date? A Yes, sir, it is.

Q Have you, Mr. Smith, ever met with members of the Bedminster Planning Board? A No.

Q Have you ever met with members of the Bedminster Township Committee? A No.

Q Can you tell me who the persons may be whom Allan Deane Corporation has authorized to meet with those two public bodies on its behalf? A Mr. Lanigan and also Mr. Catlin, if necessary.

Q Would you characterize the reaction of the Bedminster Township to your proposals as enthusiastic or something else? A I think it was a surprise.

Q It was a surprise? A Yes.

Q Have you observed any affirmative enthusiasm on the part of the municipal body for the proposal?

A I have no contact with them.

Q Do you have any reason to believe that Bedminster Township welcomes the proposals of Allan Deane Corporation? A All I can say is that I can't say directly that I know what their reaction is because I have no first-hand relationship with them.

Q Well, this letter of August 23rd, 1971, which is D-2 for identification, suggests in the next to last paragraph that the township does not seem to be reacting favorably to your request? A That's correct.

Q Is it of any concern to your company that Bedminster does not seem enthusiastic about your proposal?

A Concern in what way, Mr. English?

Q Well, does it make any difference to you whether you are welcomed in the community or not?

A That question presumes that the board reflects the feelings of the people in the community.

Q Well, assuming that it does, would that make any difference to your company? A It does make a difference to us, yes.

Q In what respect? A We like to have people have a good opinion of Johns-Manville.

Q Is that your full answer? A Yes.

Q May I direct your attention to the May 24, 1971 letter, page 10? A Yes.

Q That is Exhibit D-1 for identification?

A All right.

Q I direct your attention to the next to last paragraph and particularly the sentence which reads "To reiterate what was said in one of those meetings, it would not be the intention of the owner to simply go away if its request is not approved despite the fact that this has been the experience of the planning board with other owners who have made similar proposals over the last several years."

What do you mean by the words "it will not be the intention of the owner to simply go away if its request is not approved?" A Well, it means that we would continue to do what we were doing today.

Q Which is what? A Create the litigation.

MR. ENGLISH: Off the record for a minute.

(Discussion off the record.)

MR. ENGLISH: That's all for now.

MR. LANIGAN: I have no questions.

****

A MASTER SEWERAGE PLAN
for the
UPPER RARITAN AND DELAWARE WATERSHEDS
within
HUNTERDON, MORRIS AND SOMERSET COUNTIES
NEW JERSEY

for
THE BOARDS OF CHOSEN FREEHOLDERS
of
HUNTERDON, MORRIS AND SOMERSET COUNTIES

COMPRISING

HUNTERDON	MORRIS	SOMERSET
Kenneth V. Meyers Director	Norman J. Griffiths Director	Bjorn E. Firing Director
Vincent Abraitys William W. Winter	Thomas Koclas John C. Korn Henry R. Sperling James P. Vreeland, Jr.	Thomas E. Maggio Deputy Director
		Mrs. Doris W. Dealaman John R. Mullen Joseph C. Pucillo

and
THE DEPARTMENT OF ENVIRONMENTAL PROTECTION
STATE OF NEW JERSEY

Richard J. Sullivan, Commissioner
Ernest Segesser, Chief Engineer
Bureau of Water Pollution Control

October, 1970

ELSON T. KILLAM ASSOCIATES, INC.
Hydraulic and Sanitary Engineers
Millburn, New Jersey

EXHIBIT K

CHAPTER II

GENERAL REVIEW OF THE PRESENT STATE OF THE ART OF SEWAGE TREATMENT

A. INTRODUCTION

Sewage may be defined as the used water of a community which is removed by water carriage in sewers. A sewage treatment plant is a processing plant, in which the impurities in sewage are removed or reduced to an acceptable degree before disposal, usually in a water course.

Sewage is 99.9% water, and the impurities derived in the use of the water by a community is only about 0.1% of the total volume. These impurities consist of such things as color, turbidity, organic and inorganic materials and microorganisms. Some of these microorganisms can cause diseases such as typhoid, dysentery and infectious hepatitis. If raw sewage is discharged directly to a water course without treatment or adequate treatment where adequate dilution and natural self-purification is not available, stream pollution results.

The volume of sewage produced is high and is on an average 80-100 gallons per capita per day. The wastewater of a community is derived from household use, from commercial and industrial establishments and infiltration from ground water.

The stream pollution resulting from the discharge of raw sewage or inadequately treated sewage may be divided into three major categories: physical, chemical and bacterial. It is the objective of sewage treatment to remove impurities to a degree that treated effluent may be discharged into a river and not result in stream pollution.

B. TYPES OF POLLUTION

Physical Pollution

The deposition of sewage solids on the bed or banks of a stream results in a condition which constitutes a nuisance. These nuisances are primarily ones of unsightliness, odor, and the reduction of storage capacity in ponds, lakes and reservoirs. Unsightliness results from floating materials, scum, oils, debris, and dissolved and suspended matter, causing turbidity and color. Odors result from the putrefaction of organic matter and solids which normally settles on the bottom or banks of rivers and ponds. This deposition of solids also, to some degree, can result in reduction of storage capacity in ponds, lakes and reservoirs.

A stream's capacity to absorb and neutralize these physical effects of raw or partially treated sewage discharge is determined by the volume of flow and the velocity and turbulence of stream flow. However, this physical pollution, while very serious, may be considered less important as compared with pollution of other kinds caused by waste discharge. Treatment for the prevention of physical nuisance is relatively simple and usually constitutes the first stage in sewage treatment.

Chemical Pollution

Chemical pollution of a stream results primarily from the biochemical oxidation of organic matter in sewage and from the discharge of industrial wastes. When organic matter is discharged into a stream, the natural oxygen present in the stream is utilized to reduce the organic matter to a more stable condition. Water, when fully saturated with air, can hold about 8 to 10 milligrams per liter (mg/l) of oxygen, dependent upon the water temperature. When the volume of sewage discharged is high in relation to the volume of water in the receiving stream, the oxygen utilization by the organic material in the waste can lower the dissolved oxygen to 4 to 5 mg/l, or less, at which level most fish are affected. With still larger volumes of sewage discharge, the oxygen in the stream can become completely exhausted, especially during summer months. This condition leads to anaerobic and septic conditions and results in foul odors, as well as the destruction of plant and fish life. A stream's capacity to absorb this organic matter is based upon the available oxygen supply, and the measure of the stream's reoxygenation capacity.

The second type of chemical pollution that results from waste discharge is due to the discharge of industrial wastes. These wastes may include toxic materials, inorganic and organic products, and many other substances which may also produce color, odor and nutrients, and may render a waste more difficult to treat, particularly when it is to be reused for potable or other industrial water purposes. Very large stream volume or great dilution is one measure of a stream's capacity to handle this type of pollution following intensive treatment.

Bacterial Pollution

This third type of pollution results from the presence in sewage, and hence potentially in the stream, of pathogenic bacteria or virus capable of causing disease. The significance of this type of pollution is in relation to the reuse of the stream, particularly where the water is reused for domestic water supply purposes or the stream is used for bathing or recreational purposes. The ability of a stream to provide for self-purification with bacterial pollution depends upon the volume of flow and the time of passage to the point of reuse.

The concentration of impurities in sewage is normally expressed in terms of milligrams per liter (mg/l). One thousand milligrams (1000 mg) of any substance per liter is equal to 1/10 of 1%, and is equal to about 0.035 ounces per quart. Treatment of sewage is therefore concerned with about 0.035 ounces of impurities per quart of water. Even with these small amounts, not all of these impurities need be removed, since nearly one-half is generally inert and harmless. The principal impurities of concern, in addition to the bacteria and viruses mentioned above, are the organic fraction, some of which are heavy enough to settle under the force of gravity, while the rest which is in colloidal suspension or dissolved and cannot be removed by plain sedimentation. The particulate matter, consisting of settleable and non-settleable solids, is designated and measured as suspended solids. An average domestic sewage will have a suspended solids concentration of about 200 mg/l, or 1,660 lbs. (almost one ton) per million gallons of water.

The strength of sewage in relation to its demand for oxygen is measured as biochemical oxygen demand (BOD). An average domestic sewage has a BOD of about 200 mg/l, or about 1,660 lbs. per million gallons.

Sewage treatment plants serve as unloading stations, where most of the organic impurities and bacterial pollution are removed. Modern sewage treatment plants can be designed and operated to give a total kill of pathogenic bacteria and remove up to 95% of suspended solids and BOD.

There are many types of sewage treatment plants utilizing different processes and equipment. Generally, however, treatment consists of devices which separate the major particles by straining, skimming, and settling. This type of plant is known as "primary treatment" and provides 60% removal of suspended solids and about 30% of the BOD pollution.

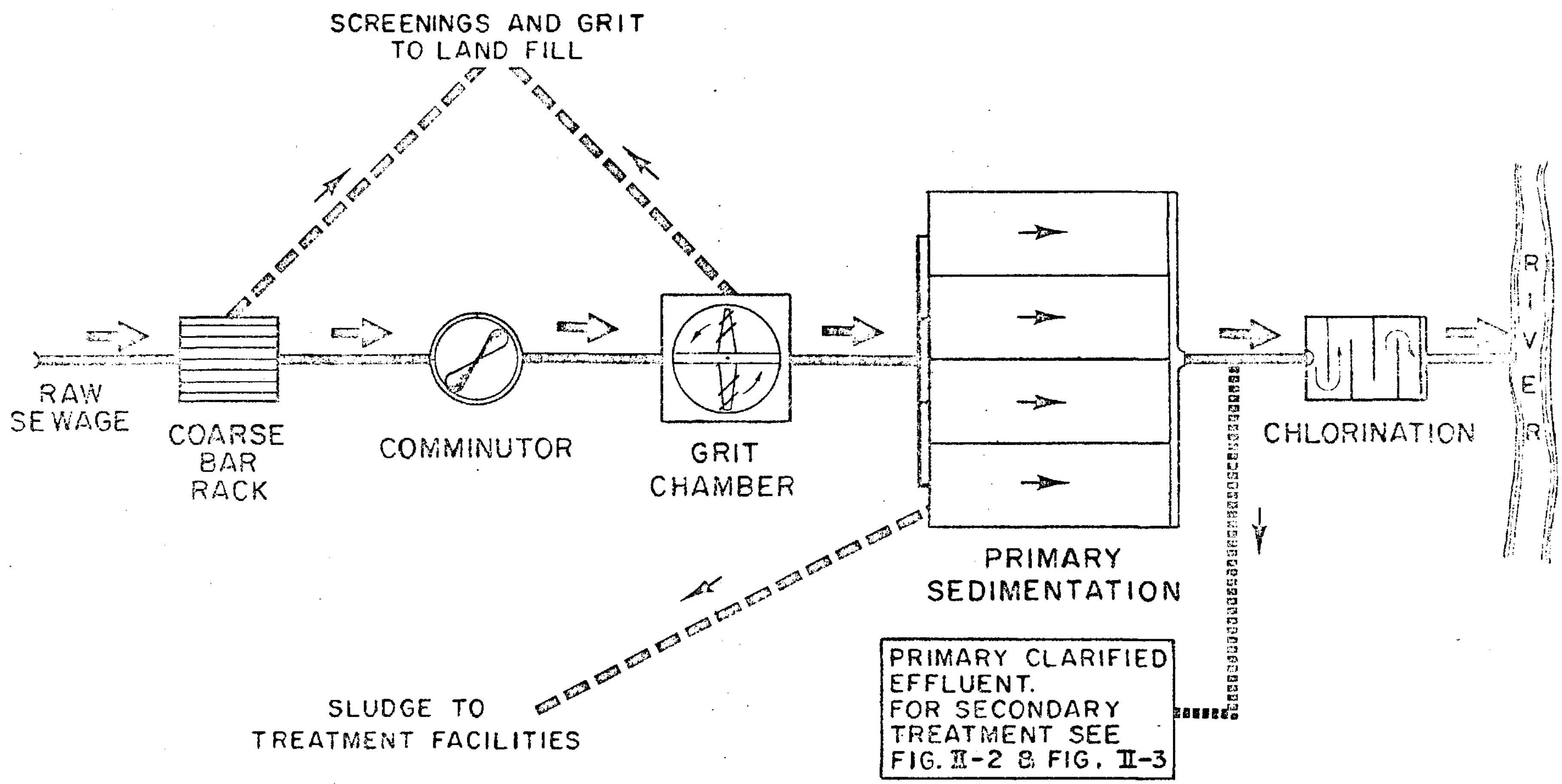
Where treatment is required beyond this degree, the most practical and economical method for the removal of the remaining suspended solids and BOD pollution is by biological means, generally referred to as "secondary treatment". This method can provide up to about 85 to 95% removal of suspended solids and BOD.

C. PRIMARY, SECONDARY AND SLUDGE TREATMENT

Primary Treatment

The flow diagram of a primary treatment facility is shown on Figure II-1. This normally consists of a coarse bar rack or screen to remove large particles, such as logs, children's toys, etc. This is normally followed by a fine screen which will remove such material as rags, leaves, etc., from the flow. Following the fine screens, many plants are provided with grit chambers. The purpose of these structures, as their name implies, is to remove grit or sand which may enter a

TYPICAL PRIMARY TREATMENT PLANT



MASTER SEWERAGE PLAN
UPPER RARITAN AND DELAWARE WATERSHEDS
BOARDS OF CHOSEN FREEHOLDERS
HUNTERDON, MORRIS & SOMERSET COUNTIES
MARCH 1970

ELSON T. KILLAM ASSOCIATES, INC.
Hydraulic and Sanitary Engineers

FIGURE II-1

sewage collection system, primarily through manhole openings. Where the elevation is such that a sewer is very deep entering a plant, pumping of the sewage to the settling tanks is normally required following the grit chambers. The primary settling tanks are normally designed to retain the sewage from one to two hours. The reduction of the velocity of flow results in the deposition of a substantial portion of solids to the bottom of the tank. Modern sedimentation tanks are provided with mechanical sludge removal equipment which by scraping and plowing action transports the sludge or settled material along the bottom into a sump. These mechanisms are also normally provided with means to remove the scum from the surface of the tank.

Following the settling tanks in the primary plant, the sewage passes through a chlorine contact tank where chlorine is added to the sewage to disinfect and kill pathogenic bacteria. A chlorine contact tank provides adequate time to effect the bacterial kill. After chlorination, the effluent is discharged into the receiving body of water. The primary process will generally remove about 60% of the suspended solids and about 30% of the BOD in the raw sewage. Where the receiving body of water is such that primary treatment is not adequate, secondary treatment is provided. In the State of New Jersey, primary treatment plants are not considered adequate, and secondary treatment is required in all instances, even for discharges into the ocean.

Secondary Treatment

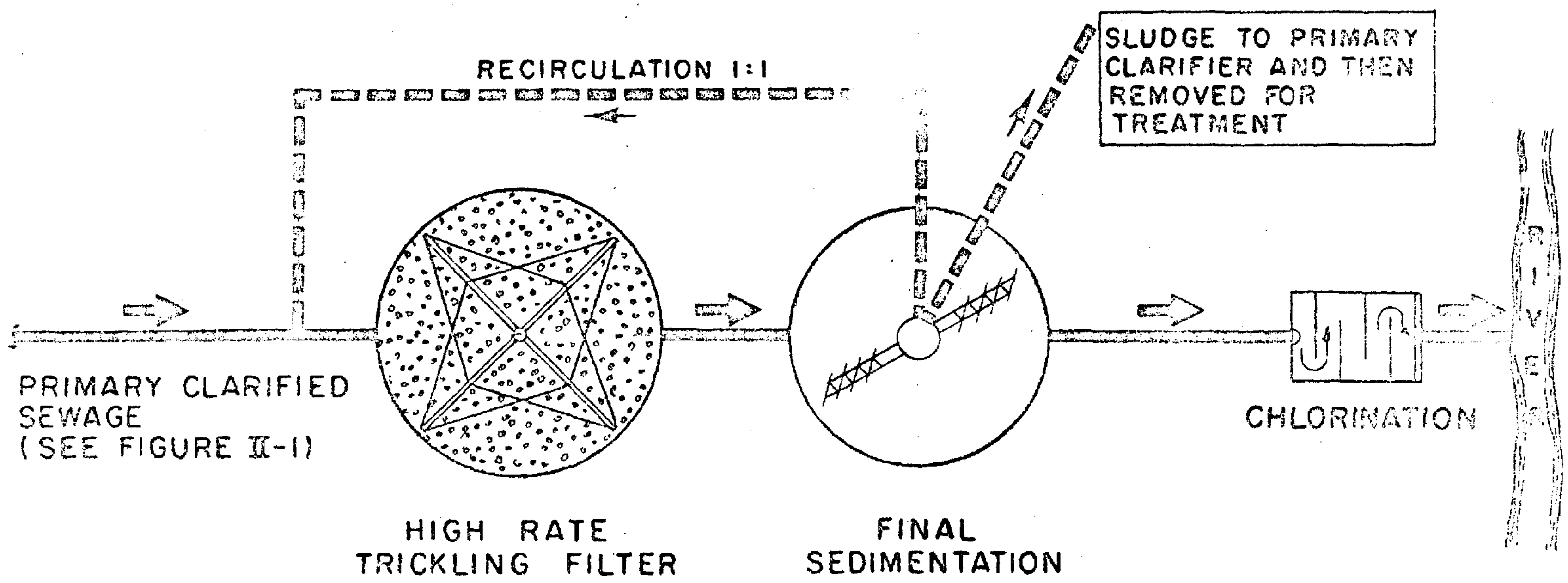
Secondary treatment is normally a biological process in which the microorganisms present in the sewage are utilized to feed upon and thereby reduce the organic substances present in the sewage. The processes presently used generally fall into two categories; namely, trickling filters or the activated sludge systems. There are many modifications to these processes, but for the purposes of this report, the general and conventional types used only will be described. Figure II-2 illustrates a flow diagram for a typical trickling filter plant, and Figure II-3 illustrates a typical flow diagram for an activated sludge plant.

Trickling Filters

Where trickling filters are used in the secondary treatment process, they are normally used to treat the effluent from the primary settling tanks under the primary process. In the trickling filter process, the primary settling tank effluent is sprayed intermittently or continuously over some coarse material such as crushed stone or plastic media. The depth of the filtering material is generally about 6 feet, although shallower and deeper tanks are also used. The effluent "trickles" over biological growths which form on the media and leaves the filter through a system of underdrains at the bottom of the unit. It is essential that air be present in the voids of the filter at all times and that there be free circulation of air from top to bottom of

TYPICAL SECONDARY TREATMENT

(HIGH RATE TRICKLING FILTER)



NOTE:

FOR PRIMARY CLARIFICATION USUALLY IN ADVANCE OF SECONDARY TREATMENT SEE FIGURE II-1

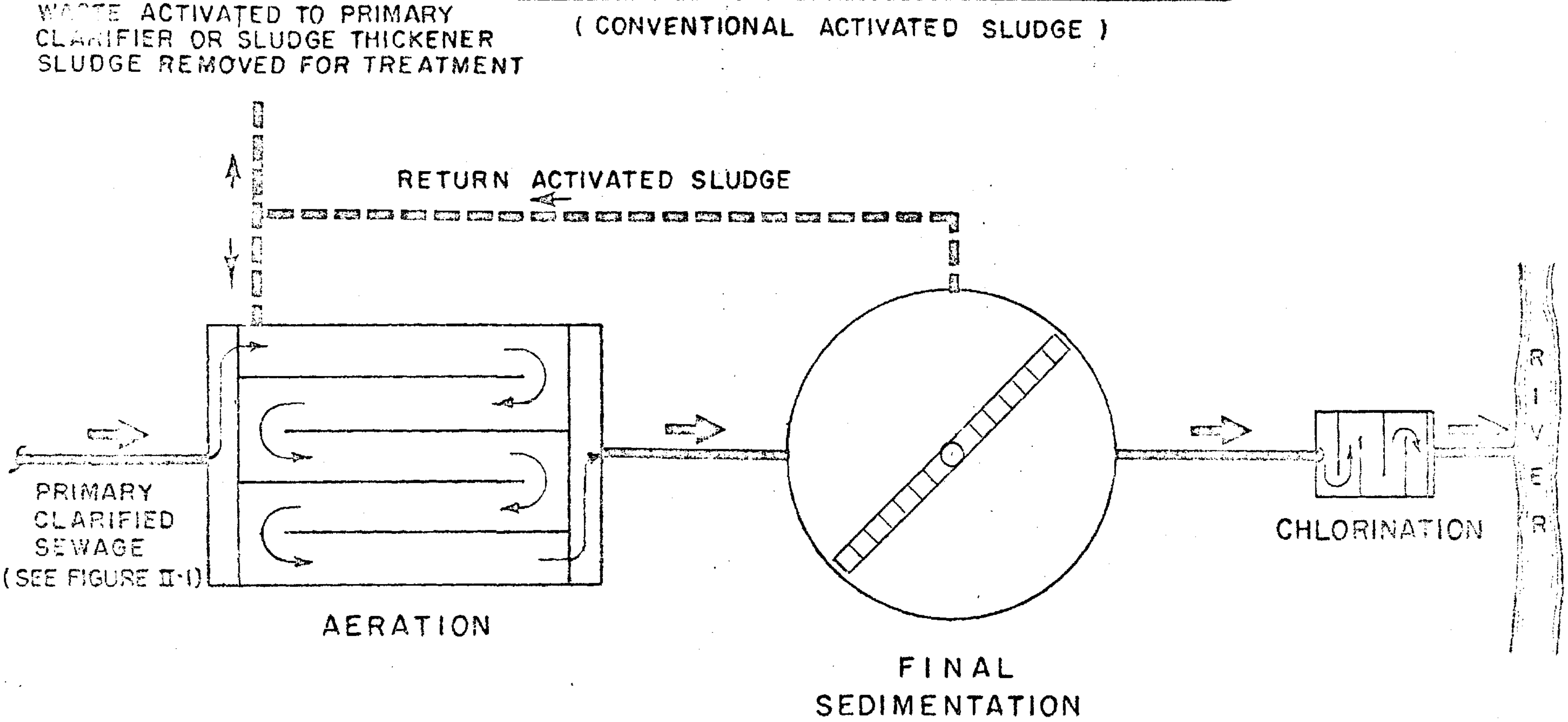
MASTER SEWERAGE PLAN
UPPER RARITAN AND DELAWARE WATERSHEDS
BOARDS OF CHOSEN FREEHOLDERS
HUNTERDON, MORRIS & SOMERSET COUNTIES
MARCH 1970

ELSON T. KILLAM ASSOCIATES, INC
Hydraulic and Sanitary Engineers

FIGURE II-2

TYPICAL SECONDARY TREATMENT

(CONVENTIONAL ACTIVATED SLUDGE)



MASTER SEWERAGE PLAN
UPPER RARITAN AND DELAWARE WATERSHEDS
BOARDS OF CHOSEN FREEHOLDERS
HUNTERDON, MORRIS & SOMERSET COUNTIES
MARCH 1970

ELSON T. KILLAM ASSOCIATES, INC.
Hydraulic and Sanitary Engineers

FIGURE II-3

the filter since the purification process is aerobic.

Conventional low-rate filters are dosed at an application rate of from 2 to 4 million gallons per acre per day, while in high-rate filters, the application rate is from 15 to 30 million gallons per acre per day.

The purification action in the filter is accompanied by the micro-organism growth which attaches itself to the filtering material. The impurities in the applied sewage are removed, oxidized and assimilated by these microorganisms as the liquid trickles over the growths. As a result, the growth accumulates and becomes heavier. In a properly designed filter, the growths detach themselves from the stone either intermittently or continuously as large particles. Trickling filters are always followed by secondary sedimentation tanks to capture the biological solids that are discharged from the filters. These tanks are, in turn, followed by chlorination tanks, as in a primary plant. The overall efficiency of a trickling filter secondary treatment process averages about 75% to 85% removal of both suspended solids and BOD from the raw sewage.

Activated Sludge

In the activated sludge process, the biological growths are kept in suspension in an "aerated" tank through which settled sewage flows. Aeration results in the formation of biological floc which is settled in a secondary sedimentation tank and part of it is returned to the head of the aeration tank and mixed with the incoming raw sewage. The finely-divided suspended and dissolved solids in the sewage are transferred to the surface of the sludge floc, in which large numbers of living micro-organisms have their habitat. These organisms, supplied with air, oxidize the organic material. After the start of operation of a new aeration tank, the quantity of floc formed becomes in excess of that required for optimum operation of the activated sludge process. The "excess" sludge is wasted usually to the influent end of the plant where it is removed as sludge for further treatment.

Oxygen is supplied either from bubbles of air provided by a compressed air system or by the introduction of air from the atmosphere by some method of mechanical agitation of the surface of the aeration tank. The mixture of sewage and activated sludge is aerated generally for a period of about six hours, after which the flow enters the final sedimentation tank. Here the floc settles, leaving a clear, stable effluent with low suspended solids and low BOD in the final effluent (about 20 mg/l for normal domestic sewage). The flow of raw sewage and return of activated sludge to the aeration tanks is on a continuous basis. The efficiency of the process generally provides 90% removal of suspended solids and BOD.

Chlorination

Chlorine or chlorine compounds are generally added to treated effluent to provide disinfection and bacteria kill, particularly the disease-producing microorganisms. This provides for the protection of receiving waters that are used for water supply, recreation (particularly swimming) or for the harvesting of shellfish in estuaries.

Chlorine is a strong disinfectant, ideally suited for treatment of effluents and water supply because of the relatively small concentrations required to achieve the bacteria kill. Most of the applied chlorine eventually dissipates and does not cause a residual which might be toxic to human beings. When used in concentrations higher than that required for disinfection, a taste and odor may be imparted to the water supply. Chlorine is generally purchased as liquid chlorine which has been compressed in cylinders under high pressure. The other forms of chlorine, not widely used for disinfection of sewage or water, are known as hypochlorite, either in liquid form as sodium hypochlorite or in powder form as calcium hypochlorite.

The efficiency of disinfection is a function of the dosage of chlorine and contact time. (The dosage for disinfection depends upon the concentration of impurities in the treated effluent, after the treatment of sewage by the biological methods discussed above.) The addition of a given dosage of chlorine to produce a residual chlorine of about 0.5 mg/l can produce 99.9% kill of most bacteria. Generally, a 20-30 minute contact time is provided. The inactivation of viruses, however, require higher dosages and longer contact time.

Sludge Treatment

Large volumes of sludge are produced by primary and secondary treatment of sewage.

The sludge produced by primary sedimentation is gray and has a very objectionable odor. It generally has a moisture content of about 95% and has a volume of about 2,500 gallons per million gallons of sewage treated.

The additional sludge produced from the treatment of sewage by trickling filter is sometimes referred to as secondary sludge. At a concentration of 3% solids, it amounts to about 2000 gallons per million gallons of sewage.

Excess activated sludge is brown, but rather watery. Seldom does it concentrate to more than 1% solids under the force of gravity. The volume of such a sludge is, therefore, very high (6,540 gallons per million gallons). Disposal of such quantities of sludge comprises a difficult problem.

One of the methods commonly employed for treatment of sludge prior to disposal is sludge digestion. The sludge is kept in covered tanks where, as a result of fermentation process, the putrescible organic materials are stabilized in the absence of air without creating offensive conditions. The two main end-products are digested sludge which is black and has a tarry odor, and gas containing a high percentage of methane. About one cubic foot of gas is produced per capita, 70% of which consists of methane. This gas is utilized for heating the digestion tank to maintain an optimum digestion temperature of 90-95°F. The gas may also be used to produce power for gas engines to pump raw sewage or to provide compressed air.

Sludge collected in the clarifiers is pumped to the digestion tanks daily. The displacement time in the digester is generally about 20 to 30 days. In a single-stage unagitated digestion tank, there is generally a separation of liquor from the sludge which is displaced by the volume of raw sludge added. The displaced liquor is disposed of in the influent end of the treatment plant. Eventually, the tank becomes full of sludge with no space available for the addition of raw sludge. Space is then made available by drawing sludge from the bottom of the tank for disposal. Modern practice generally provides two digesters, operated in series. The first one receives the raw sludge, is heated, and the contents mixed. The overflow from this tank is discharged to an unheated and unmixed tank for compaction of the sludge by separation of the liquor.

In starting up a new digestion tank, raw sludge is added, and the acidity is neutralized with the addition of lime. In heated tanks, it takes about two to three months before well-digested sludge is produced, as indicated by the production of methane and the maintenance of neutral conditions without the addition of lime. During the maturation period, the complex organic compounds in the raw sludge are converted to simpler organic acids which accumulate, necessitating the addition of lime. In the course of time, methane producing organisms are established which utilize the organic acids, converting them to methane and carbon dioxide.

The anaerobic digestion process thus destroys organic matter, converting it into gas and reduces the volume of sludge by separation of sludge and disposal of supernatant liquor.

Sludge Disposal

The digested sludge contains 90-95% moisture. The volume can be further reduced by discharging it to an underdrained sand bed where the gases trapped in the sludge are released, lifting the sludge up, leaving the liquor in contact with the sand for rapid draining. Evaporation of the water from the exposed surface of the sludge results in further drying down to about 60% moisture. Sludge with such a moisture content is a cake which can be lifted with a fork and disposed of by dumping. A well-digested sludge will not create offensive odors when disposed of in this way. Such a sludge can also be used for application to land, as a soil conditioner and a source of humus, even though the fertilizer elements are low.

Raw or digested sludge can also be dewatered mechanically by rotary vacuum filters which convert the sludge to a cake form, containing about 60 to 80% moisture, greatly reducing the volume of sludge to be disposed. The filtrate from this process is returned to the raw sewage. The sludge is conditioned with chemicals prior to filtering. Lime and ferric chloride are commonly used to coagulate the sludge particles and facilitate the separation of water.

The filtered sludge cake when dumped on land can produce an odor nuisance, unless covered with soil or with lime.

An alternative method of disposal of raw or digested sludge is incineration. Vacuum filtered sludge is heat dried and incinerated. In a few instances, heat-dried activated sludge is marketed as a fertilizer because of the higher nitrogen and phosphorus content of this type of sludge, as compared with the nutrients in raw or digested sludges.

For communities located near the sea, an alternative method employed is by barging the wet sludge and dumping at designated areas. Removal of as much water as possible is advisable to reduce the cost of disposal. This method of sludge disposal has come under criticism as a result of ocean studies by the Sandy Hook Marine Laboratory which has designated the ocean sludge dumping grounds as a "dead sea".

D. TERTIARY AND ADVANCED WASTEWATER TREATMENT METHODS

The terms "tertiary" and "advanced wastewater treatment" are sometimes used interchangeably, but it may be helpful to differentiate between the two. It is suggested that the term "tertiary treatment" be restricted to "supplemental" treatment for upgrading the quality of effluents from secondary treatment plants which are unable to meet the requirements for effluent quality based upon the commonly-used parameters of BOD and suspended solids. The use of the term "advanced wastewater treatment" can be restricted to the physical, chemical or biological methods designed to produce an effluent from which the nutrients (nitrogen and phosphorus) are removed to prevent eutrophication or to produce an effluent of such a quality that the wastewater can be reused directly or indirectly for consumptive or recreational use. The distinction made between these two expressions is based on primary objectives and not necessarily on the processes employed which in some instances may be the same.

Conventional secondary treatment plants may fail to produce the required effluent quality in terms of BOD and suspended solids for a number of different reasons. Fundamentally, however, the failure can be traced either to inadequate oxidation of the soluble organic matter or incomplete separation of the suspended solids in the final clarifier. This failure may be attributed to basic characteristics of the raw waste being treated. The processes employed to upgrade the quality of the effluent will depend on the determination as to which of these two is the predominant factor. In some cases, the quality of the effluent may be affected by relatively high dissolved organic matter in addition to high suspended solids content in the effluent.

The unit processes designed primarily to remove suspended solids fall into physical and chemical categories. The former includes settling tanks, microstrainers and rapid sand filters. Settling tanks are generally provided for the removal of solids in activated sludge and trickling filter-type of secondary treatment plants. The failure to remove the settleable solids in these tanks is generally due to either high overflow rates or the nature of the suspended solids which may be too small in size to settle under the existing flow conditions. If it is due to the former cause, the effluent quality can be improved by providing lower overflow rates. However, at times there are suspended solids of such small size that they cannot possibly settle under even very low overflow rates. These are the type of solids that impart a milky turbidity to the effluent. Their removal will require chemical methods.

The removal of suspended solids is important not only from the standpoint of improving the appearance of the effluent but, more importantly, to prevent the formation of sludge deposits in receiving bodies of water. In addition, the removal of suspended solids decreases the BOD. The BOD in the secondary effluents varies from about 0.3 to 0.5 part per part of suspended solids.

I. Tertiary Treatment or Upgrading the Quality of Secondary Effluents

A. Physical Chemical Methods

1. Microstraining

Microstraining is a form of mechanical filtration. It consists of a rotating drum partly submerged and provided with a stainless steel screen with a number of apertures varying from 160,000 to 80,000 per square inch. The wastewater flows continuously through the submerged portion from the inside of the drum outward. The particles caught on the openings during submergence are washed with water jets impinging on the drum surface from above at an exposed position to a trough. The backwash water requirement is about 5% of the volume of effluent treated. The maximum operating head loss across the screen is about 6 inches. The drum speed velocities vary from 25 to 100 feet per minute. The removals vary with the size of openings and size of particles in the effluent being treated. Tests conducted at various installations have indicated removals of suspended solids of about 70% in activated sludge and trickling filter effluents. Accompanying BOD removals have been found to be in the order of 50 to 75%.

2. Filtration Through Granular Media

Filtration through granular media can be used for the increased removal of discrete particles from secondary effluents. A number of different media such as sand and anthracite coal have been used singly or in combination. Effective size of sand is 0.35 to 0.55 mm and of anthracite, 0.75 to 1.80 mm. At times, garnet has also been used in a multi-media system. When used in combination, the depth of anthracite is generally 8 inches; of sand, 6 inches; and of garnet, 1.5 to 3 inches, with anthracite on top and garnet at the bottom. The rate of filtration varies from 2 to 10 gpm per square foot, with a mean of about 3 gpm per square foot. These filters have to be backwashed as the entrapment of solids increases the pressure drop. Filtration can be either of the gravity or pressure type.

Anthracite generally shows roughly the same solid removal efficiency and much lower head loss than smaller size sand media. Head loss is significantly affected by suspended solids concentration because surface cake filtration is the main mechanism. Lower flow rates cause less penetration of floc which, in turn, shows faster head loss development than higher rates at the point where the same amount of filtrate is produced. Filtration through sand does not result in floc breakthrough at 2 to 6 gpm per square foot. The concentration of suspended solids in the influent is the most significant factor affecting filtration performance, and the size of the top layer of the filter media is the second most important factor. Flow rate does not materially change the filtration performance in anthracite-sand bed system due to higher porosity and larger size of anthracite which permits deeper penetration of floc.

In Chicago, rapid sand filters were used successfully with the removal of 76% suspended solids from the activated sludge process effluent when operated at a head of 4.4 inches and a flow rate of 2.5 gpm per square foot. When the head was 11.5 inches and the flow rate was 6 gpm per square foot, the removal of suspended solids was 70%.

Other investigators have reported obtaining effluents containing 4 mg/l of suspended solids by filtration through 0.45 - 0.55 mm sand, and 2 mg/l by filtration through 0.55 - 0.98 mm anthracite treating trickling filter effluent with suspended solids content of 27 mg/l. This is about a 90% reduction.

A modification of filtration through fixed granular media has been developed and is known as moving bed filtration (MBF). It consists of a sand filter in which water moves countercurrent to the sand. A small portion of the sand at the contact surface is continuously removed, washed and returned to the system at the base of the sand column. The bed is moved by means of a hydraulically activated diaphragm moving it slowly to the inlet end. The sludge-sand mixture falls from the face of the bed down to a hopper where it is washed and returned to the front of the diaphragm. This filter has generally been used in conjunction with chemical treatment (alum) for removal of phosphates.

Filtration through granular media is more generally practiced in conjunction with chemical coagulation followed by gravity sedimentation.

3. Diatomaceous Earth Filtration

A layer of powdered diatomaceous earth placed on a septum is used as filtering medium. As the filter and layer become clogged with the deposited solids, more filter aid (body feed) is added continuously so that a porous cake is produced. When the pressure becomes too great, the filter is backwashed and a new precoat is applied. The removal of suspended solids is dependent on the particle size of the filter aid used which varies from 7 microns to 30 microns. Suspended solids concentration of less than 3 mg/l has been produced from filtration of activated-sludge secondary clarifier effluent.

4. Chemical Treatment

Chemical treatment of secondary effluents, containing finely divided solids which cannot be removed by physical or mechanical methods can improve the quality of secondary effluents. The following chemicals have been used: alum, iron salts, lime alone or in combination with alum or iron salts, and polyectrolytes either alone or in conjunction with chemical coagulants.

Chemical treatment usually includes rapid mixing of the chemical with the wastewater, flocculation for 20-30 minutes, sedimentation with or without filtration of the effluent. The floc absorbs and entraps finely divided suspended solids particles in the wastewater. The flocculated solids are then large enough to settle. The more finely divided floc particles which do not settle can be removed by filtration.

Chemical treatment, in Chicago, followed by sand filtration of activated-sludge effluent, has given 77% suspended solids removal, as compared to 76% removal by sand filtration alone, but at a greater loading. With effluents containing finely divided solids, chemical coagulation could increase the removals by filtration as compared with the removals without chemical coagulation.

At Lake Tahoe, chemical treatment followed by sand filtration through multimedia filters resulted in suspended solids removals in excess of 90%.

B. Biological Methods

In situations where the quality of secondary affluents does not meet the requirements due to overloading of the system, it is logical and necessary to expand the plant. Overloaded trickling filter plants may be expanded by providing an additional filter to be operated either in series or in parallel, or may be provided with an aeration tank to treat either a part of the flow from the primary clarifier or the entire flow of the effluent from the trickling filter. The choice of these various alternatives depends upon the quality of the effluent from the existing facilities, the quality of the final effluent required, and a number of other factors. The treatment of secondary clarifier effluent following the trickling filter by aeration provides a means of further oxidizing the soluble BOD and converting the finely divided not-settleable suspended solids to flocculent settleable form.

Activated sludge plant effluents which fail to meet the requirements because of the carryover of suspended solids in the effluent may be upgraded by providing additional sedimentation to lower the overflow rate or by providing tube settlers. If the failure to meet the effluent requirements, on the other hand, is due to organic overloading and incomplete oxidation, then provision should be made for additional aeration capacity.

Another alternative to upgrading the quality of secondary effluents is to provide oxidation ponds with or without provision for artificial aeration. The need for artificial aeration becomes important when the BOD of the effluent to be treated is high and when the pond is deep. The capacity of oxidation ponds to be provided depends upon whether the failure to meet the requirements is primarily due to settleable solids or to soluble solids contained in the effluent. If it is due to the former, then a relatively short period (1 day) or retention in a quiescent pond could serve as an economical means of removing additional solids and thereby reducing the BOD. Removal of soluble BOD by biological oxidation would require longer periods of aeration, depending upon the concentration of the BOD to be removed.

II. Advanced Wastewater Treatment

A. Advanced Wastewater Treatment - Removal of Nutrients

Certain materials in wastewater act as nutrients to algae and other aquatic plants in receiving waters causing excessive growths which can produce undesirable effects such as tastes and odors and deficiency of dissolved oxygen. Nitrogen and phosphorus are the two most important nutrients.

1. Removal of Phosphorus

The phosphorus content of raw sewage is about 8-10 mg/l, about half of which is derived from human wastes and the other half from detergents.

In secondary effluents, phosphorus occurs mainly as inorganic orthophosphate. Conventional secondary treatment by activated sludge or trickling filters removes some of the phosphorus in the wastewater.

a. Chemical Methods

Lime treatment effectively removes phosphate in wastewater by converting it to an insoluble form which can either be settled or filtered through fine-grained granular media. The pH will have to be raised to 10 or higher to effectively reduce the phosphorus content. Lime can be applied either to the raw sewage, primary effluent or the secondary clarifier effluent.

The addition of lime to raise the pH value from about 9.5 to 10 in the primary clarifier results in the removal of the major fraction of phosphorus as insoluble phosphate which will settle. In addition, it will increase the BOD removal from the normally expected value of 30% to as high as 60%, and the suspended solids removal from 60% to as high as 90%. The remaining phosphates can be removed by the activated sludge process.

Iron salts and alum can also be used for the removal of phosphorus. The precipitate formed can be removed by plain sedimentation which may be followed by filtration through fine-grained media for more effective removal of phosphorus.

b. Biological Methods

The assimilation of phosphorus by the biological growths in the activated sludge process has been reported as being effective in removal of phosphorus in San Antonio, Texas, where 80% removal has been reportedly obtained. The mechanism of the removal has been ascribed to luxury consumption of phosphorus by microorganisms for their metabolism or the precipitation of the phosphates on the activated sludge floc. Biological methods for removal, however, are not subject to positive control as are the chemical methods. There is also the problem of leaching of the phosphate from the floc in the secondary clarifier.

2. Removal of Nitrogen

Domestic wastewater contains organic and inorganic sources of nitrogen. Organic nitrogen in raw sewage is about 10 mg/l and is in settleable and non-settleable states consisting primarily of proteins and amino acids. The inorganic nitrogen is in the form or ammonia nitrogen and varies from 20 to 30 mg/l. In primary tanks, the settleable form of organic nitrogen is removed. Secondary treatment results in the removal of a part of the ammonia nitrogen. A part could also be converted to nitrate nitrogen. There is generally a considerable amount of nitrogen compounds left in the effluent from secondary plants primarily in the form of ammonia nitrogen which can serve as nutrient for algae.

a. Nitrifica 'on-denitrification Process

The nitrification-denitrification process relies on the conversion of ammonia nitrogen to nitrate nitrogen by increasing the aeration period and the mixed liquor suspended solids concentration. The nitrates produced in this manner are then reduced to nitrogen gas under anaerobic conditions by the addition of organic matter for the denitrifying bacteria. The success of the process depends on the proper balance between the nitrate concentration and the amount of organic matter added to induce denitrification. Any excess of organic matter added would increase the BOD of the effluent and, on the other hand, less than the quantity required would result in the discharge of nitrate in the effluent.

b. Ammonia Removal by Air Stripping

This process makes use of the fact that at pH values of 10 or above, by the addition of lime, ammonia is in a form that can be volatilized by contacting the effluent with air. The pilot stripping tower at Lake Tahoe is 25 feet high, completely encased, with the air inlet in the bottom and exit through the fan near the top. The tower is furnished with wooden slats in a position which permits the air to be directed almost horizontally. Ninety per cent of ammonia removal is obtained with 250 cubic feet of air per gallon at a pH value of 11.5. The process provides a positive control and a lower effluent nitrogen content, as compared with the nitrification-denitrification process. The raising of the pH value to 11.5 serves the additional purpose of increased phosphate and BOD removal. The disadvantages of air stripping are potential freezing of the water in the air tower and calcium carbonate incrustation.

B. Advanced Wastewater Treatment for Reuse

At the present time, nearly all surface waters have had some previous use since they serve as sources of water supply and, at the same time, are subsequently discharged as wastes. Hence, all water use actually includes some wastewater reuse. Today's conventional water and wastewater treatment processes are not capable of removing all of the contaminants found in wastewater such as, for example, pesticides, non-biodegradable materials, exotic synthetic chemicals which are resistant to treatment, and dissolved salts. As a result, the concentration of the undesirable contaminants increases with each reuse and affects the beneficial uses of water for water supply and recreational purposes. A number of processes based on physical-chemical separation of the contaminants are being studied. The aim of these processes is to return the wastewater to a purity as high as the original water supply source before use. Whether such reclaimed water will be used directly for water supply in the near future will depend on a number of factors, such as the availability of natural sources of water supply. Water-short areas have to consider, even at the present time, the direct reuse of the renovated water as a source of water supply. Irrespective of this, such reclaimed water can have other uses, such as recharge of ground water, creation of artificial recreation lakes, industrial uses and, most importantly, reduction of the pollution of the surface water supply sources. Complete water renovation is technically possible, but presently at a very high cost. The Federal Government has been sponsoring research and development programs for the purpose of increasing the technology and of providing economical methods of treatment. The degree of purification required will be dictated by the specific reuse contemplated. Industrial reuse might require elimination of foam producers and the removal of corrosive or scale-producing inorganic components. Reuse for recreational purposes would require disinfection, removal of color, suspended solids and algal nutrients. Reuse for municipal supplies would require complete removal of suspended solids, color, organic impurities and inorganic salts followed by positive disinfection.

The technology of wastewater renovation is complex and difficult. Below are listed some of the processes that are currently in limited use or are being developed.

1. Adsorption

The use of activated carbon for the removal of soluble organic impurities has been developed on the basis of laboratory and pilot scale work to a point where it has found full-scale application in certain localities. The process requires physical, chemical or biological pretreatment for the effective removal of suspended solids. This treatment might consist of chemical precipitation with lime, alum, iron compounds and polyelectrolytes, removal of the solids by sedimentation and filtration through fine-grained media followed by adsorption on activated carbon. Adsorption on activated carbon can also follow biological treatment methods for the purpose of removing non-biodegradable organic materials. Regeneration of carbon has been proven feasible. Because of the high cost of activated carbon, it is best to use it as a final polishing device for removal of dissolved organic solids which cannot be removed by physical-chemical methods and for the removal of non-biodegradable material in the effluent from biological treatment processes. A number of other materials such as coal, clays, and other materials have been used as adsorbents, but with results not comparable to activated carbon.

2. Foam Separation

This process takes advantage of the foaming properties of wastewater by aeration and causing the surface-active organic impurities such as detergents to concentrate at the bubble surface. The foam is removed for treatment. Despite the introduction of "soft" biodegradable detergents, replacing hard non-biodegradable detergents, foaming and frothing problems still exist, possibly due to the presence of other surface-active agents and other organic materials in municipal and industrial wastewaters.

3. Electrodialysis

When an electric potential is impressed across a cell containing water with a high mineral content, positively charged ions (cations) migrate to the negative electrode and negatively charged ions migrate to the positive electrode. Only partial demineralization is practical, however, because of the higher power requirement as the ion concentration decreases. The concentrated salts must also be disposed of.

4. Reverse Osmosis

Reverse osmosis makes use of the principle that when solutions of two different concentrations are separated by a semipermeable membrane such as cellophane, water passes through the membrane from the more dilute side to the more concentrated side. The dial membrane allows the passage of water, but prevents the passage of dissolved materials. The process is being developed and could be used for complete renovation of municipal wastewater.

5. Distillation

Distillation is capable of removing organic and inorganic dissolved contaminants, suspended solids and microorganisms. One drawback in the process is that volatile contaminants are carried over in the distillate which have to be removed.

6. Freezing

When impure waters are frozen, the ice crystals formed are composed of essentially pure water. The freezing method has been used for desalinization of sea water and is being studied for application to renovation of municipal wastewaters.

7. Ion Exchange

Many solid materials when placed in contact with mineralized water are able to replace mineral ions in the water with ions originally present in the material itself. This process has been used for softening of hard waters. The use of cation and anion exchange resins are being studied for total deionization of municipal waters. The resins have to be regenerated which produces a chemical waste material. Dissolved organics must be removed by pretreatment on activated carbon.

8. Solvent Extraction

The solvent extraction process depends on the principle that water can be separated from its contaminants by a solvent capable of "dissolving" the water, but not the contaminant. Such a solvent is de-isoproplyamine (DIPA). For example, water containing 1% sodium chloride when contacted with DIPA at 32° C would separate into a phase containing 30% water and 70% solvent. The water drawn into the solution leaves the bulk of its contaminants behind. The DIPA-water solution is then separated from the salt solution for recovery of water. This is accomplished by raising the temperature to 55° C as a result of which solubility of the water in the solvent is decreased to 8% causing water to be released from the solvent. The water recovered contains a much lesser concentration of contaminants. The solvent is separated from the water by air blowing.

9. Chemical Oxidation

A number of chemical oxidation processes are being studied for the removal of non-biodegradable organic materials from wastewaters. Some of the chemicals are ozone, potassium permanganate, chlorine, which have in the past been used for disinfection and taste and odor control of municipal water supplies. Cost and other technical considerations are some of the problems which have to be resolved before chemical oxidation can be considered to be practicable.

III. Wastewater Reuse

It will be necessary to consider wastewater reuse to a far greater degree in the future than has been practiced in the past.

There would appear to be at least two, and possibly three, considerations for wastewater reuse. Direct wastewater reuse is extremely costly and generally entails treatment to an extremely high degree and in which the final treated effluent is utilized directly as a potable or industrial supply. Indirect wastewater reuse is generally economically more feasible and is recognized to be advantageous and is commonly practiced.

In this area of indirect wastewater reuse, the return of highly treated effluent into the receiving streams for reuse as a potable water supply source, namely, by diversion from the Raritan River, will comprise the major use of the treated effluents from the proposed regional treatment facilities. Utilization of the treated effluent by industries, whether directly from the source or indirectly by withdrawal from the river, will comprise another method of reuse which could prove to be highly advantageous.

The third method which should be given special consideration, particularly in the agricultural and less developed areas of the counties, is irrigation.

Spray irrigation designed to increase crop growth and forest growth--as well as to avoid the necessity for costly nutrient removal--might prove to be highly beneficial and advantageous in Hunterdon, Somerset, and Morris Counties, where large land areas are available, or where the treated effluents might be conveyed to golf courses, agricultural, or forest areas. Early planning should be considered for the utilization of spray irrigation for disposal of treated effluents.

After approximately four years of testing and experimentation with this method of disposal at Penn State College, it has been demonstrated that this method of disposal is effective and relatively economical but does require extensive land areas. It has, however, been demonstrated that this method can be practiced year round where irrigation is employed in forests. On the other hand, it may be found to be practical to consider spray irrigation during the summer months only for field crops and to utilize the receiving streams for discharge of the effluent during the winter months.

It is necessary to provide about 127 acres for each million gallons daily (or 10,000 people) of treated effluent. Additional land should be required to provide the buffer and to provide some additional land area in the event that percolation or resting may dictate the need for a lesser application within the accepted maximum.

In the selection of sites for spray irrigation, studies must be made of the soil characteristics and capabilities of absorption, as well as ground water levels and ground water quality. During the periods of operation, test wells should be established and ground water characteristics noted, and this information must be cataloged and analyzed to provide adequate control of operations so as to avoid the buildup of nitrates in the ground water table. The assistance of agricultural experts, ground water hydrologists, biologists, geologists, virologists and other qualified experts must be employed to assure proper control and to assure that there would be no adverse effects upon the operations.

Experience of Penn State has indicated that a substantial portion of the nitrates, phosphates and nutrients after absorption in the soil are conveyed to the growing plants, resulting in significant nutrient removals before the residual effluent reaches the ground water table. In addition, it has been found that all bacteria and virus are completely eliminated after a relatively short travel time and distance through the soil.

As a result of the studies at Penn State College--which was initially undertaken with a limited amount of treated effluent from the municipal/college treatment plant--it is now proposed to convey the <u>entire flow</u> from the treatment plant, namely, about 4 MGD, for ultimate disposal by spray irrigation.