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Conceptual Wastewater Disposal Alternatives for the Allan-Deane Development (Exhibit B)

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Exhibit "B"
(AFFIDAVIT of E. James Mur

JOHNS-MANVILLE PROPERTIES CORPORATION

ALLAN-DEANE CORPORATION

RULS - AD - 1977 - 90

CONCEPTUAL WASTEWATER DISPOSAL ALTERNATIVES FOR THE ALLAN-DEANE DEVELOPMENT

$ 8541

CLINTON BOGERT ASSOCIATES

December 1977

CONCEPTUAL WASTEWATER DISPOSAL ALTERNATIVES FOR THE ALLAN-DEANE DEVELOPMENT

CONTENTS

Introduction

It is the aim of this report to introduce to the New Jersey Department of Environmental Protection (NJDEP) and other concerned entities the wastewater disposal concepts studied for the Allan-Deane development. This report has been prepared at the recommendation of the NJDEP to provide public review of these concepts and to obtain responsible comments about them. The public response can then be considered by the NJDEP, together with the technical aspects presented herein, so that a preferred concept is identified.

Background

The Allan-Dean Corporation proposes to develop its property located in the Townships of Bedminster and Bernards in Somerset County, New Jersey.

A summary description and statement of objectives of the proposed residential development is given in "A Proposal For An Open Space Community," prepared by Rahenkamp, Sachs, Wells and Associates, Inc., in February, 1976. A copy of this report, which includes sections that have subsequently been superseded, is enclosed as Appendix "A".

The land use summary for the Allan-Deane development of its property in the Raritan River watershed is in Table I. This table supersedes its counterpart contained in Appendix "A".

Design Basis

The design bases of the alternatives in this report are intentionally different. This is necesary to accurately represent the actual situations under which the alternatives will be built. The differences are the result of different service areas. The service area for each alternative is established in accordance with the arrangements made among participants. Thus for Alternatives I and III the service area is solely the Raritan River basin portion of the Allan-Dean property. For Alternative II, the service area includes the Village of Pluckemin in addition to the aformentioned portion of the Allan-Deane property. This Allan-Deane-Pluckemin service area when connected to Bridgewater's Middlebrook basin, becomes part of a regional system.

The population listed in Table I is the maximum future population of the Raritan River watershed portion of the Allan-Deane development. This population will produce a 0.85 mgd design average daily flow from the Allan-Deane Development. The flow determination is shown in Table I. The per capita sewage flow values listed therein include an allowance for infiltration.

For Alternative II, to the average daily flow of 0.85 mgd from the Allan-Deane development is added the Village of Pluckemin's average daily flow of 30,000 gpd. This latter figure was obtained from the Township of Bedminster's engineer. The resulting total average daily flow is 0.88 mgd, and peak flow is 3.6 mgd.

TABLE I

ALLAN-DEANE PROPERTIES
DEVELOPMENT PLAN AND SEWAGE FLOW

	Dwelling Acres	Population Units	Flow Rate Factor	Total Sewage Population	Flow Rate GPCD	Total Sewage Flow GPD
Lowlands Area: (All Bedminster Township)						
Apartments	29	463	2.28	1,056	75	79,200
Townhouses	70	752	2.83	2,128	100	212,800
Commercial	28	—	—	—		55,000
						347,000
Lowlands Total-	127	1,215		3,184		
Highlands Area: Bedminster-						
Townhouses	57	504	2.83	1,426	100	142,600
Single Family	92	130	3.51	456	100	45,600
	149	634		1,882		188,200
Bernards-						
Apartments	66	830	2.35	1,950	75	146,250
Townhouses	41	327	2.83	925	100	92,500
Single Family	106	212	3.51	744	100	74,400
	213	1,369		3,619		313,150
Development Total	489	3,218		8,685		848,350

TABLE II

EXPECTED RAW WASTEWATER CHARACTERISTICS

FROM ALLAN-DEANE DEVELOPMENT

Constituent	Concentration
5-day Biochemical Oxygen Demand	250 mg/l
Suspended Solids	260 mg/l
Ammonia Nitrogen	24 mg/l
Total Nitrogen	40 mg/l
Total Phosphorous	13 mg/l
pH	6.5 to 8.5

For all alternatives the wastewater is almost totally obtained from residential sources, so typical domestic wastewater characteristics are expected. These are shown in Table II. Therein, the 5-day biochemical oxygen demand (BOD_5) and suspended solids(SS) concentrations conform to New Jersey code requirements for domestic wastewaters. The SS concentration is based on a per-capita contribution of 0.20 pounds of SS per capita per day. Nitrogen concentrations are conservatively estimated after analyzing several studies on residential wastewater characteristics and other references. Phosphorous concentration is based on EPA reported domestic contributions of 3.5 pounds per capita per year. Heavy metals, pesticides, or toxic organics would not be present in deleterious concentrations because of the development's residential nature.

Conceptual Wastewater Disposal Alternatives

The conceptual alternatives considered for wastewater disposal are:

I. On-site advanced treatment with discharge into the North Branch Raritan River;

II. Connection to the Middlebrook Trunk Sewer and treatment at the Somerset-Raritan Valley Sewerage Authority Treatment Plant with discharge into the Raritan River's main stem; and

III. On-site treatment followed by year round spray onto grasslands.

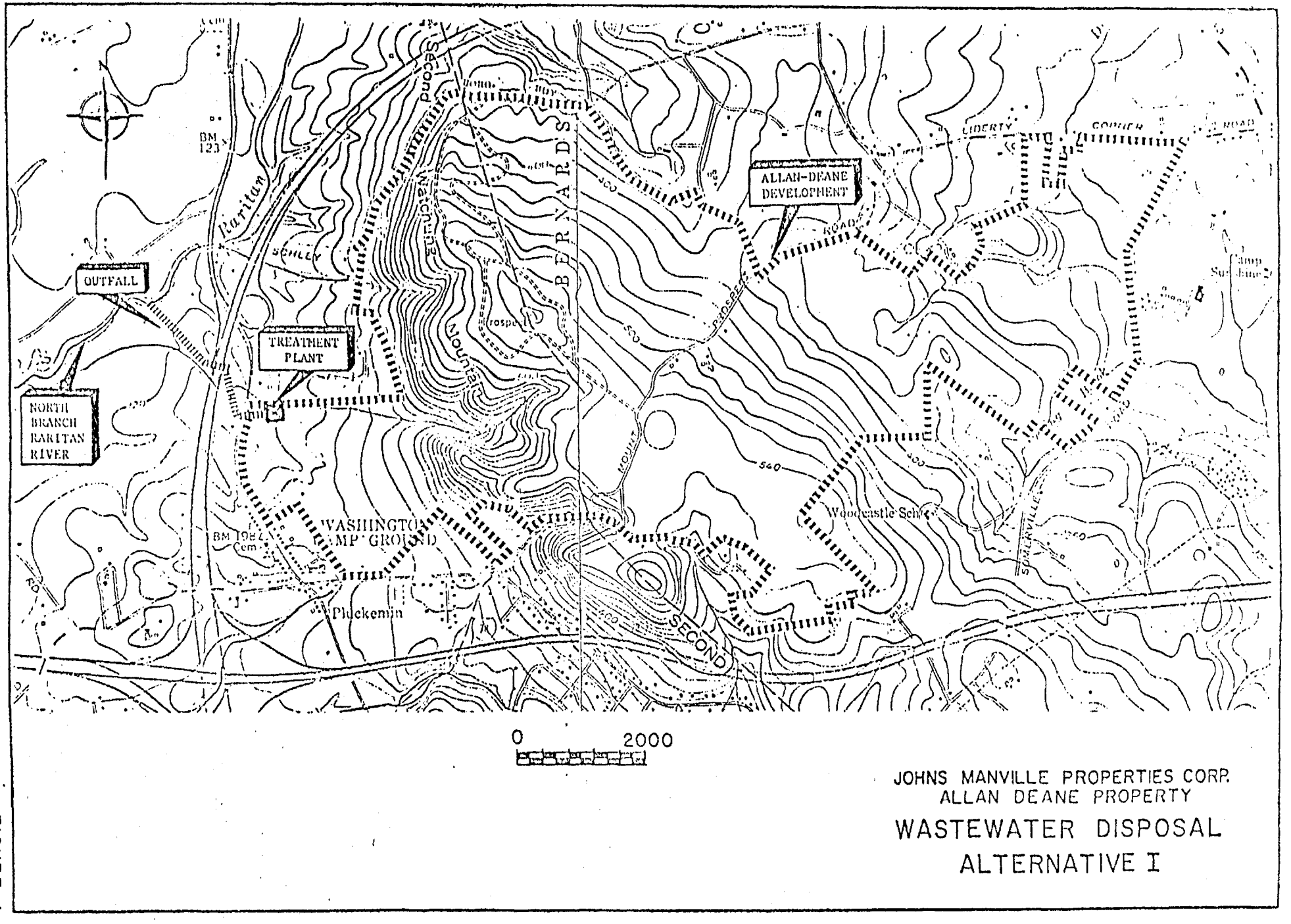
Alternative I

Advanced treatment of wastewater before discharge into the North Branch Raritan River is the concept of this alternative. Figure 1 shows the preliminary location of the facilities.

To determine the specific method of treatment, it is necessary to know raw wastewater characteristics and effluent limits. The raw wastewater characteristics have been previously described. Effluent limits have been established by the Township of Bedminister and guidance has been provided by the NJDEP.

At our specific request, the NJDEP has defined the required level of treatment (effluent limits) in their letter of July 12, 1977. A copy of the correspondence is Appendix "B". In summary, the letter states that level 3 treatment is required for oxygen requirements and the discharge must comply with anti-degradation policy. Additionally, at a subsequent meeting, the NJDEP indicated that a treatment plant equal in performance to the existing AT&T wastewater treatment plant in Bedminster would probably satisfy water quality requirements and anti-degradation policy.

The Township of Bedminster's Effluent Discharge Standards is Appendix "C". These standards can only be interpreted as prescribing the desired resultant river water quality after dispersion and dilution



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ALLAN DEANE PROPERTY

WASTEWATER DISPOSAL
ALTERNATIVE I

CLINTON BOGERT ASSOCIATES

FIGURE 1

of the effluent. This interpretation is based on two points: first, is the extensive use of narrative identical to Federal stream quality criterion; and second, is our analysis which indicates that the Township approved AT&T plant complies with Bedminster standards only after its effluent is dispersed and diluted in the river.

Based on the NJDEP letter and meeting, the Bedminster Effluent Standards (interpreted as in-stream standards) and a review of some existing water quality data; a conservative effluent criteria for the proposed treatment plant has been formulated. This criteria is given in Table III.

TABLE III

NORTH BRANCH RARITAN RIVER EFFLUENT CRITERIA

Constituent	Effluent Limit
BOD_5	16 mg/l
SS	25 mg/l
NH_3-N	1.5 mg/l
NO_3-N	1.0 mg/l
PO_4-P	1.0 mg/l
D.O.	6.0 mg/l
pH	6.5 to 8.5
Fecal Coliforms	200/100 ml.

Before discussing the derivation of the criteria it is pertinent to report that the approximate point of the North Branch that will receive the effluent lies at about Milepoint 12.25 in river segment 7. The milepoint and segment are identified in the 303 Study, i.e. the August, 1976, NJDEP Draft "Phase I Water Quality Management Basin Plan". This segment is a water quality limited, Class FW-2, non-trout waterway.

The tabulated 5-day biochemical oxygen demand (BOD_5) and dissolved oxygen (D.O.) limits are identical with the NJDEP stipulated level 3 treatment limits reported in the 303 Study. The suspended solids (SS) limit is the EPA proposed water quality criteria for excellent fisheries. The pH and fecal coliform limits are in compliance with New Jersey Class FW-2 regulations.

The ammonia nitrogen (NH_3-N) limit must satisfy the D.O. maintenance requirements of the river and avoid toxic distress in the freshwater biota. The NJDEP has defined a limit of 4.0 mg/l of NH_3-N for the oxygen requirements. The toxicity limit can be

established from EPA proposed ammonia criterion. The Township of Bedminster standard is similar to this criterion. This criterion is based on limiting the un-ionized ammonia concentration in the river to 0.020 mg/l. The un-ionized concentration in the river is a function of total ammonia ($NH_3 + NH_4^+$), pH, temperature and river flow. When temperature, pH and total ammonia increase, the toxic un-ionized ammonia concentration also increases. The October, 1973 "Water Quality and Aquatic Biology Report," prepared for AT&T Long Lines, reported maximum river temperatures of 26 C and a pH of 7.4 on September 6, 1973 in river segment 7. The NJDEP 303 Study reports the design river flow (MA7CD10) to be 8.49 mgd for segment 7. Based on the reported pH and temperature, and the conservative assumption that these were coincident with the MA7CD10 flow; the maximum allowable NH_3-N concentration of the effluent would be about 12 mg/l after full dilution in the river.

The above ammonia nitrogen limits of 4.0 mg/l and 12.0 mg/l are significantly higher than the current performance of the existing AT&T plant with its effluent NH_3-N concentration of 0.5 mg/l. Based on this performance it is our opinion that the performance of the AT&T plant under design (full flow and winter) conditions would produce an average effluent NH_3-N concentration of about 1.5 mg/l. We recognize this lowest concentration to be more indicative of NJDEP and Township of Bedminster objectives. Accordingly, the effluent limit is set at 1.5 mg/l., a practical, achievable, yet stringent limit.

The existing NO_3-N concentrations in the North Branch range from 0.8 to 1.8 mg/l according to the 303 Study. The effluent limit for NO_3-N is accordingly set at 1.0 mg/l.

Orthophosphate phosphorous (PO_4-P) levels in the river are 0.5 to 1.0 mg/l. The existing AT&T treatment plant, under partial flow conditions, is attaining effluent concentrations of about 0.8 mg/l of PO_4-P. Accordingly an effluent limit of 1.0 mg/l of PO_4-P is prescribed.

The limits listed in Table III and the raw wastewater characteristics determine the functions the treatment system must perform. Though no single specific treatment system has yet been selected, the selected system will have to achieve high BOD, SS, ammonia, nitrate, orthphosphate and fecal coliform removals, and raise the effluent D.O. to the prescribed level (6.0 mg/l).

Some treatment systems that perform these functions include:

1) primary sedimentation, activated sludge and two-stage chemical precipitation followed by breakpoint chlorination;

2) primary sedimentation, high rate activated sludge with mineral addition, biological nitrification and biological denitrification;

3) extended aeration, biological denitrification, two-stage chemical precipitation and filtration; and

TABLE IV

ESTIMATED COSTS FOR ALTERNATE I

Facility or Operation	Construction Cost	Annual Operating and Maintenance Cost
Raw Sewage Life Station	$ 400,000	$ 8,000
Advanced Treatment Plant	3,800,000	350,000
Outfall Sewer	180,000	500
Sludge Haul to SRVSA	20,000	58,500
TOTAL	$4,400,000	$417,000

4) chemical precipitation, biological nitrification and biological denitrification.

Many other systems are also possible and a variety of equipment is available for each unit process. System (3) is the existing AT&T treatment plant in Bedminster.

The selected treatment system will be preceded by screening and raw sewage pumping. The pumping is needed to compensate for the head losses through the treatment plant. At a suitable point in the treatment system, post aeration will be provided to raise effluent D.O. to the prescribed level. Following treatment, the effluent will be chlorinated for disinfection. A chlorine contact chamber will provide the required detention. The effluent will then flow by gravity to the North Branch Raritan River.

The method of sludge disposal will be shipment to the Somerset-Raritan Valley Sewerage Authority (SRVSA) regional treatment facility. Discussions with SRVSA to receive and dispose of these sludges are in progress. The sludge load used in planning is 6600 dry lbs/day of mixed, organic-chemical sludge. It is expected to have a solids concentration of at least 8%, a pH of 10 to 11, and a volatile solids concentration of about 12%. The major inert fraction would be lime, which is used for the precipitation of organics and phosphorous. This load is the expected sludge production from treatment system (4). If another system is used the sludge load would be less, perhaps as much as 10% lower.

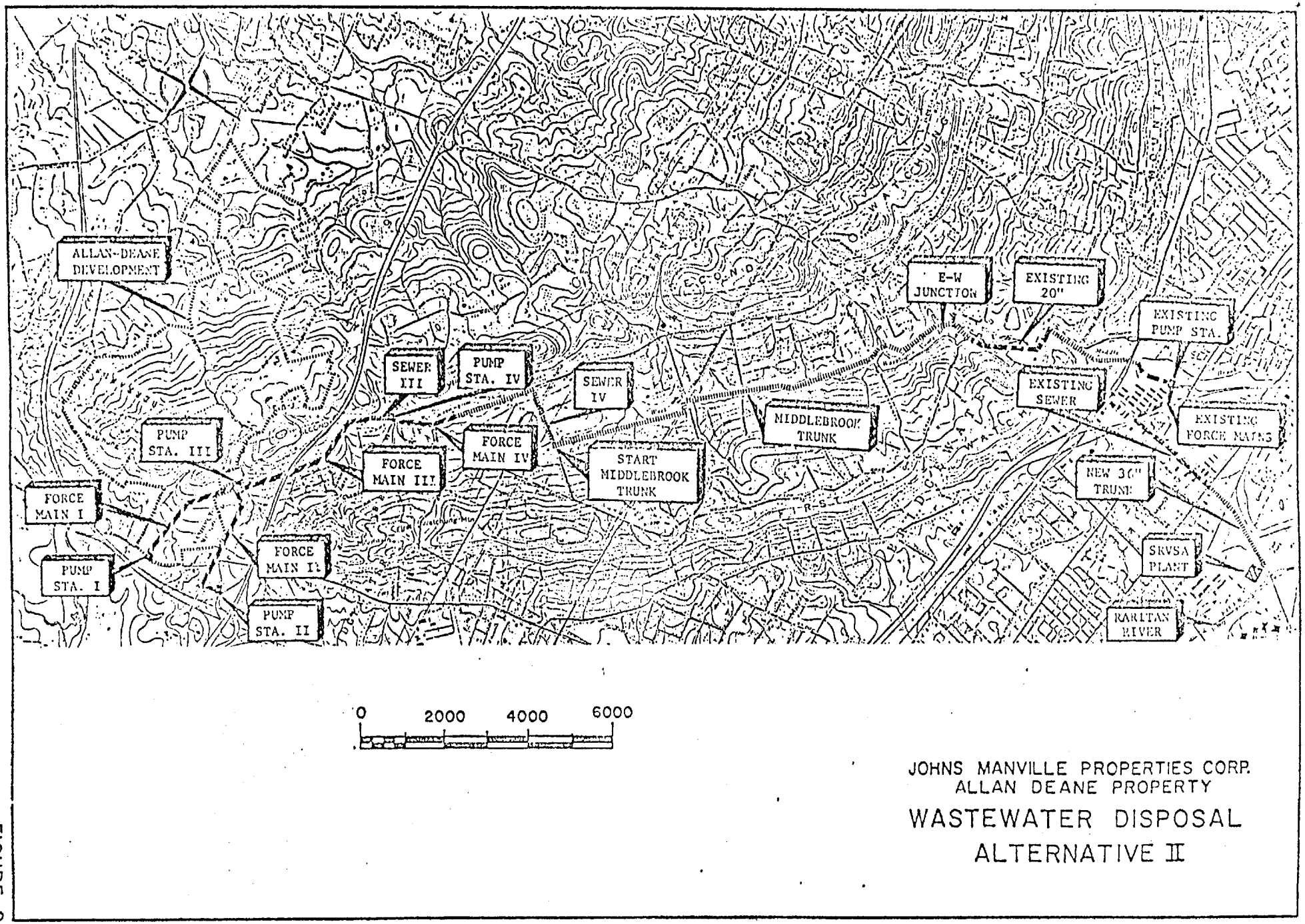
The space (acerage) requirements of the possible treatment systems vary. The required acerage for treatment structures will range from two to four acres. Additionally, a landscaped buffer zone will surround the treatment units so that residences shall be least 200 feet distant from any treatment unit.

For the outfall about 2400 linear feet of right-of-way will be required. Permits to cross Routes 202/206 and Interstate Route 287 will also be needed.

The construction costs, estimated on a January 1978 basis, are presented in Table IV together with operating and maintenance costs. Land, right-of-way, engineering, legal and fiscal costs have not been included.

Alternative II

The transmission of the wastewaters of the Allan-Deane development and Village of Pluckemin to the Somerset-Raritan Valley Sewerage Authority (SRVSA) treatment plant via the Middlebrook Trunk Sewer (a proposed Bridgewater Township Interceptor) is this alternative concept. The wastewater after treatment at the SRVSA plant will be discharged into the main stem of the Raritan River. The SRVSA plant provides secondary treatment in compliance with New Jersey and Federal regulations. Figure 2 shows preliminary alignments and sites.



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WASTEWATER DISPOSAL
ALTERNATIVE II

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FIGURE 2

The design average daily flow from Allan-Deane and the Village of Pluckemin is 0.88 mgd. Peak flow is 3.6 mgd. The determination of flow and the reasons for its difference from the other alternatives, is discussed in the Design Basis section.

The facilities required to convey the flow includes four pump stations (I to IV), with force mains and interceptors located mainly in Washington Valley Road and Mount Vernon Road. Pump Stations I, II and III collect and lift the flow from separate collection districts. Pump Station IV is used to lift the flow out of the Chambers Brook basin into the Middlebrook basin.

At the intersection of Mount Vernon Road and the West Branch Middle Brook the Allan-Deane-Pluckemin flows will enter the upstream terminal manhole of Bridgewater Township's proposed west branch of the Middlebrook Trunk Sewer. The size of the proposed trunk sewer would have to be revised over most of its length to accomodate the increased (Bridgewater, Allan-Deane, Pluckemin) flows. The existing Route 287 Pump Station will be increased in capacity by replacing the existing pumps and motors with new larger pumps and motors. The existing force mains and sewers from the Route 207 Pump Station to the SRVSA treatment plant have sufficient capacity to convey the total flow. Table V lists the flows from each participant within sections of the transmission system.

Other alignments to connect Allan-Deane-Pluckemin with the Somerset-Raritan Valley Treatment Plant may be feasible. The most obvious is to route the Allan-Deane-Pluckemin flows through an upgraded Chambers Brook interceptor. Another is to run mains and sewers through streets of Sunset lake and upstream along Chambers Brook. This route would avoid some high ground and the high-head pumping that is needed for the Washington Valley Road alignment. However for the purposes of this report only the Washington Valley Road alignment is estimated.

The land requirements of the alternative are not large but are diverse. Pump stations I and III are on Allan-Deane property. Sites for Pump Stations II and IV would have to be acquired. A quarter of an acre site would probably suffice for each pump station.

Rights-of-way for the pipelines to the Middlebrook Trunk Sewer will be in local roads. There is over 18,000 linear feet of such pipeline. It is assumed that the rights-of-way for the Middlebrook Trunk Sewer are being obtained by Bridgewater Township.

The Allan-Deane-Pluckemin sludge load becomes an integral part of SRVSA sludge load and is processed through that plants' fluidized bed incinerator for landfill disposal. The Allan-Deane-Pluckemin sludge load should average about 1350 dry lbs/day. This load is the result of the primary and biological secondary treatment to be provided by the SRVSA plant. The sludge load in the year 2000 for the SRVSA plant has been projected to be 22 dry tons per day. Thus the Allan-Deane-Pluckemin load represents only 3% of the future sludge loads.

The estimated costs to Allan-Deane-Pluckemin for this alternative includes payments for the use of existing facilities in addition to costs for new construction. The 'payments for use' represent the

TABLE V
ALTERNATIVE II
TRANSMISSION SYSTEM FLOW

Pipeline	Length Feet	Allan-Deane Pluckemin Flow mgd	Bridgewater Flow mgd	Total Flow mgd	Existing Minimum Capacity mgd
Force Main I	5000	0.74	-	0.74	-
Force Main II	4350	0.78	-	0.78	-
Force Main & Sewer III	6300	3.6	-	3.6	-
Force Main & Sewer IV	7600	3.6	-	3.6	-
Middlebrook Trunk Sewer:*					
Mt. Vernon to Crim Rd.	5150	3.5	1.0	4.6	-
Crim Rd. to Circle Dr.	4130	3.5	1.8	5.4	-
Circle Dr. to Newmans La.	3350	3.5	2.4	6.0	-
Newmans La. to E-W. Jct.	3760	3.5	2.8	6.4	-
E-W Jct. to Existing 20"	930	3.5	7.8	11.4	-
Existing 20"	3035	3.5	7.8	11.4	12.6
Existing 20" to Existing 27"	3810	3.5	7.9	11.5	-
Existing 27"	1990	3.5	8.0	11.6	13.0
Route 287 Pump Station	-	3.5	8.0	11.6	11.5
Existing Force Mains	1700	3.5	8.0	11.6	-
Existing 20" pressure sewer	490	3.5	8.0	11.6	12.5
Existing 24" gravity	1780	3.5	8.0	11.6	16.0
Existing 36" to Main Street	1870	3.5	8.2	11.8	13.8
Main Street to SRVSA	4580	3.6	9.1	12.7	25.8

*Sewer line section nomenclature is descriptive, not exact. Nearest large street name is used to describe terminal points.

TABLE VI
ALTERNATIVE II
ALLOCATION OF CONSTRUCTION COSTS & CURRENT VALUES

Costs in thousands of dollars

Facility	Cost of New Construction	Current Existing Value	Allan-Deane-Pluckemin Share	Bridge-Water Share
Allan-Deane-Pluckemin System:				
Pump Stations	1,290	-	1,290	-
Force Mains	640	-	640	-
Sewers	400	-	400	-
Bridgewater Systems:				
New Sewers	3,360	-	1,560	1,800
Pump Station	230	490	150*	160
Pump Station Modification	230	-	70	160
Existing Sewers and Force Mains	-	1,340	410	-
	5,920	1,830	4,520	1,960

*These are 'payments for use'. See text.

TABLE VII
ALTERNATIVE II
ALLOCATION OF OPERATING AND MAINTENANCE COSTS

Cost in dollars per year

Facility	Annual O & M Cost	Allan Deane-Pluckemin Share	Bridge-Water Share
Allan-Deane-Pluckemin System:			
Pump Stations	32,000	32,000	-
Force Mains1,300	1,300	1,300	-
Sewers	800	800	-
Bridgewater System:			
New Sewers	3,450	1,700	1,700
Existing Pump Station	17,000	5,300	11,700
Existing Sewers and Force mains	1,700	500	1,200
SRVSA Charges:		135,200	
TOTAL		$176,800	

purchase of a part of each existing facility that carries Allan-Deane-Pluckemin flow. A fair payment can be considered to have the same ratio to the facilities current value, as the Allan-Deane-Pluckermin peak flow has to the total peak flow. Current value may be determined by several methods of valuation, but whichever method is used the value finally decided upon will be obtained by negotiation. For this report, current value was made equal to the facilities replacement cost less depreciation. Replacement cost is the estimated January, 1978 construction cost for an approximately identical facility. Depreciaton is equal to the replacement cost times the 'age to service life' ratio of the facility. Service lives were generally taken to be the maximum number of years stipulated in the EPA Cost-Effectiveness guidelines. Salvage values were considered to be zero. The 'current values' and 'payments for use' listed in Table VI were calculated on this basis.

The allocation of new facility construction costs, between Bridgewater and Allan-Deane-Pluckemin, were also made according to peak flow ratios. These allocations are also listed in Table VI. Land, right-of-way, engineering, legal and fiscal costs have not been estimated.

As indicated in Table VI the total cost to Allan-Deane-Pluckemin for this alternative is $4,520,000. The corresponding total annual operating and maintenance cost to Allan-Deane-Pluckemin is $176,800.

The operating and maintenance (O&M) cost breakdown is shown in Table VII. The costs allocated to Allan-Deane-Pluckemin are 100% of the O&M costs for facilities used solely by Allan Dean-Pluckemin. Peak flow percentages were used to determine the O&M allocations for facilities used by all parties (Allan-Deane-Pluckemin-Bridgewater). The annual charges of the SRVSA were computed using their 1977 rate of $421 per million gallons.

Alternative III

This concept is to provide treatment through partial denitrification followed by year-round spray irrigation of grasslands.

Publications by EPA provide guidance for the design of wastewater disposal spray irrigation systems. Guidance was also provided by the NJDEP in their letter of July 12, 1977 (Appendix 'B') and in informal communications.

The pertinent information from the above sources has been complied into the following guidelines for spray irrigation facilities.

1. Minimum of secondary treatment including disinfection.

2. Maximum application rate of 2 inches per acre per week.

3. Storage or alternate subsurface facilities provided for disposal during inclement weather.

4. Buffer zones of 200 feet from property lines and 100 feet from surface waters.

5. Soil permeabilities should be moderately slow to moderately rapid (0.2 to 6.0 inches/hr.).

6. Minimun of six feet of suitable soil should overlie bedrock at year round spray disposal sites.

7. Seasonaly high water table must be 5 feet or more below the surface.

8. Nitrate-nitrogen concentrations in the groundwater beneath the spray site should not exceed 10 mg/l NO_3-N.

EPA has reported that renovated water from spray irrigation systems contained 1 to 2 mg/l BOD, 1 to 2 mg/l SS, 2 to 4 mg/l total nitrogen and 0.1 to 0.5 phosphorous. This quality was rather consistently obtained and was generally independent of original concentrations in the applied wastewater.

Pennsylvania State University (PSU) has operated a harvested, reed canary grass spray site-located on a deep, well-drained clay loam soil-continuously since 1964. During the initial years (1964 to 1970), secondary municipal effluent was applied year round at average annual application rates of 2 inches/week and 480 to 610 lbs nitrogen per acre per year. The renovated effluent generally contained less than 10 mg/l NO_3-N.

Because of the success of the PSU project we have considered year round spraying of reed canary grass as a wastewater disposal alternative.

At the NJDEP's prescribed maximum hydraulic loading rate of 2 inches/week, 110 acres of irrigable land is required to dispose of the 0.85 mgd design flow.

A study of Soil Conservation Service data and the logs of test pits excavated on the Allan-Deane property indicates that the 1532 acre Allan-Deane property has sufficient acerage that could be suitable irrigable land. These areas are mostly forested and are comprised of the Neshaminy, Mount Lucas and Amwell (with underdrains) soil series.

The wastewater treatment system preceding spray irrigation would include secondary treatment, chlorination and partial denitrification. The need for denitrification was determined from a nitrogen balance approximation. This calculation indicated that the allowable winter-time loading rate is about 400 lbs. Nitrogen per acre per year. At design flow, the corresponding concentraton in the wastewater effluent is 17 mg/l of nitrogen. Secondary treatment of the wastewater can not attain this level, so some denitrification is required.

The treatment system does not include facilities for phosphorous removal. They were omitted on the assumption that the phosphorous removal performance of the soil-crop matrix would be satisfactory in

all aspects, which are: rate of removal, ultimate capacity and phosphorous concentration in the renovated water.

This alternative envisions pumping the wastewater collected in the Lowlands in two steps up to a treatment plant located near the ridge of the Second Watching Mountains. The first pump station will contain comminuting and degritting facilities. It will lift the 0.35 mgd lowlands flow (see Table I) about 200 feet to a second pump station. this pump station will lift the flow about another 180 feet into a junction box. It that box, preliminary treated (comminuted and degritted) and pumped (low lift) wastewater flow (0.50 mgd) from the Highlands section will join the Lowlands flow. The combined flow will then receive the aforementioned treatment. The treated effluent will be discharged into a six million gallon, lined basin. This basin would store one week of effluent flow during freezing or wet weather at which times spraying is not done. The basin will also serve as a wet well for the spray pump stations that supply anywhere from three to six spray fields. The number and location of the fields would depend upon the results of detailed site and soil investigations. The spray stations would deliver stored effluent to one section of the field daily. Section applications would be rotated weekly. Dosing would be at 1/4 inch per hour, for 8 hours, on one day, followed by a 6 day rest period. Thus seven sections would be irrigated each week by each pump set. The size of the sections will depend upon the spray field sizes (which need not be uniform), the number of fields, their location, elevation and other factors. The spray pump station details will depend upon similar factors.

The sludge produced by the treatment system will be a typical biological secondary treatment plant sludge. About 1500 dry lbs per day of 5% solids sludge is expected. The planned method of disposal is trucking to the SRVSA regional treatment plant.

The acreage requirements of the entire system is primarily dependent upon the number of spray fields. The 110 acres of irrigable land are to be surrounded by a 200 foot buffer strip. If these 110 acres are divided into three spray fields almost 200 acres of irrigable land and buffer strip is needed. If however there are six spray fields, the comparable land requirement could be 250 acres. The pump stations, treatment plant and storage basin altogether would require another ten acres. The total land needs of the system is therefore between 200 to 260 acres.

Since all facilities are on Allan-Deane property there would be no off-site land or right-of-way acquisitions.

Table VIII presents the estimated January 1978 construction costs and operating and maintenance costs. Engineering, legal and fiscal costs have not been included.

TABLE VIII
ESTIMATED COSTS FOR ALTERNATE III

Facility or Operation	Construction Cost	Annual Operating Maintenance Cost
Lowlands Pump Stations and Force Mains	$ 880,000	12,000
Treatment Plant	2,700,000	270,000
Storage Basin	50,000	500
Spray Disposal Facilities	1,350,000	84,000
Sludge Haul to SRVSA	20,000	8,500
TOTAL	$5,000,000	375,000

Comparison of Alternatives

The alternatives will be directly compared even though the design flow for Alternative II is somewhat greater than for Alternatives I and III. This direct comparison is made because there would not be an Alternative II if the extra flow (the Village of Pluckemin) was not added. There is furthur discussion on this topic in the Design Basis section.

The alternatives may be compared economically through the annualized Allan-Deane costs. These are:

- $899,000 per year, for Alternative I;

- 672,000 per year, for Alternative II;

- $923,000 per year, for Alternative III.

The annualized costs do not include the costs for land, rights-of-way, engineering, legal or fiscal items. The amortization of construction costs was based on a 20-year period at a 9% interest rate. At lower interest rates or longer periods, the annualized differences between the alternatives would be even greater. On an annualized cost basis, Alternative II is the most economical.

The inclusion of land and rights-of-way costs is not expected to change the economic positions of the alternatives. Though Alternative II does have the greatest land and right-of-way needs it is believed that those costs will not override the current differential because most of Alternative II rights-of-way are in streets, waterway easements, or are in existence. The differential between Alternatives I and III will decrease since Alternative III would not incur any land or right-of-way costs. Economically then these alternatives are essentially equal.

A major consideration in the evaluation of the alternatives is their conservation of water, i.e. preserving their discharges for eventual reuse. The preservation of water supply sources is a major necessity in New Jersey. The effluent discharge of Alternative I will add an average daily flow of 0.85 mgd to the North Branch Raritan River, upstream of the planned Raritan Confluence Reservoir. This flow would thereby fractionally increase the dependable water supply yield of the basin. Even if the Confluence Reservoir was not built, several water supply intakes exist downstream of the outfall. Thus, Alternative I preserves water resources.

The effluent of Alternative II will enter the main stem of the Raritan River near Manville. Downstream of that point, the only water resource development being studied is the Crab Island Dam and Reservoir. The prospects of this project are reported to be in jeopardy. The project's purpose is to prevent salt water intrusion into aquifers in Middlesex County. Thus alternative II may also preserve the State's water resources but the possibility is not as positive, nor the quantity as much, as that provided by Alternative I.

Alternative III's effluent will enter the groundwater system. The ultimate destination of those groundwaters are multiple and not positively identifiable. They may however, on an optimistic basis, be assumed a totally available water resource.

Thus Alternatives I and III are about equal in the preservation of the State's water resources, whereas Alternative II is less productive in this aspect.

The impacts of Alternative I upon the North Branch Raritan River will be minimal. The effluent will be of high quality containing little oxygen demanding or nutrient constituents. The discussion on effluent criteria in the Alternative I section explicitly relates effluent quality to the existing river quality. The most adverse impact will be the ammonia addition, yet the added amount will be below concentrations toxic to aquatic life, and considerably below the 4.0 mg/l limit permitted by NJDEP for oxygen depletion effects. It is believed that the bio-stimulation effects of the ammonia would be minimal.

The impact on the main stem of the Raritan River by Alternative II is considered to be insignificant. The SRVSA treatment plant, through which the flow shall pass, is projected to handle about 15 mgd. Ongoing 201 studies for Somerset County may increase that projection. Current flows average about 8 mgd. The Allan-Deane-Pluckemin flows could be readily accommodated.

The impacts of Alternative III upon groundwater quality is expected to be minimal. There will be an increse in groundwater nitrate content, but the level of nitrates, even below the spray sites, will not exceed the potable water standard of 10 mg/l of nitrate-nitrogen. Beyond the spray sites the nitrates will decrease, though the magnitude of the decrease is not calculable, as a result of dilution.

In comparing the water quality impacts of the alternatives, the effects of flow volume must be considered. Alternative I will exert a slight adverse impact in the vicinity of its outfall. However, the increased flow it contributes will aid later in the downstream dilution of pollutants entering the river from non-point sources. Thus, in assessing adverse quality impacts on the receiving waters, Alternative II is the most favorable, but not significantly. Alternatives I and III are considered equal.

The impacts upon the land are most apparent for Alternative III. To construct the spray fields perhaps as much as 95 acres of mixed hardwood forest would have to be permanently cleared. This is esthetically undesirable. Alternative II would be the most disruptive to the local population. The construction of its sewers and force mains in the public roads would inconvenience local traffic and the residents along the alignment. Alternative I would require the clearing of a few acres along its outfall route. Its construction activity will not affect traffic since highway crossings will be done

by jacking pipelines underneath the road bed. Only a few homes lie along the outfall route so only a few people would experience brief construction activity.

Accordingly, the ranking of alternatives in order of increasing adverse land impacts, and judging permanent effects to be more significant than short-term effects, is Alternative I, Alternative II and Alternative III.

The final but, perhaps, most influential factor in comparing the alternatives is implementation. Common to all alternatives are implementation problems associated with the zoning and environmental aspects of the Allan-Deane development. The pertinent issues of these subjects are discussed in other reports.

Alternative I can be readily executed by the Allan-Deane Corporation after the required approvals are obtained. Alternative II, however, requires the participation of the Township of Bridgewater, and the acceptance of the Somerset Valley Regional Sewerage Authority. The latter has informally indicated its acceptance of the Allan-Deane-Pluckemin flow. The Township of Bridgewater has however declined, to date, to meet and negotiate a joint facility. Allegedly, this is because Bridgewater has already completed its contract documents for the Middlebrook Trunk Sewer and may believe it is more expeditious to proceed along. Even though the benefits of lower costs and improved reliability would be available to Bridgewater through a joint venture, our conclusion is that the community will not participate. Additionally, Alternative II has included the Pluckemin area in its concept. This inclusion requires the approval of the Township of Bedminster. The subject has not been presented to them since Bridgewater's acceptance of the concept is a pre-requisite. This alternative therefore can not be considered implementable.

Alternative III can also be readily executed by the Allan-Deane Corporation. However, New Jersey experience with spray disposal is limited and formal State regulations governing such facilities do not exist. It is expected that this absence of formal regulations would adversely affect the progress and implementation of this alternative.

Thus in comparing implementability Alternative I is the most implementable. Alternative III is next, whereas Alternative II must be considered non-implementable.

In weighing the advantages and disadvantages of the alternatives we conclude that Alternative I is most preferred. It is the most readily implementable, costs are favorable in comparison with Alternative III (the only other implementable option), it preserves water resources at slight adverse water quality impact, and is the least disruptive to the land.

APPENDIX 'A"

'A Proposal For an Open Space Community'
by Rahenkamp, Sochs, Wells and Associates
February, 1976

A PROPOSAL FOR AN OPEN SPACE COMMUNI

The Allan-Deane Corporation

A PROPOSAL FOR AN OPEN SPACE COMMUNITY

A Report to the Bedminster Township Committee

February, 1976

The Allan-Deane Corporation
A Subsidiary of Johns-Manville Properties Corporation

Land Planners:

Rahenkamp Sachs Wells and Associates, Inc.
Philadelphia, Pennsylvania

February, 1976

Bedminster Township Committee
Somerset County
New Jersey

Dear Planning Board Members:

We are pleased to submit for your examination our land use plan for the Allan-Dean Corporation's proposed open space community. Throughout the planning effort we ha sought to design a community which will complement the existing natural amenities the Township and which will equitably and logically meet the needs of residents in the area.

To this end, the plan presented here is a carefully considered response to the environmental conditions of the Allan-Deane site. Sensitive areas have been set aside as permanent open space and every effort has been made to integrate the dwellings with the natural landscape, preserving visual and recreational amenities This is achieved by building according to the natural capacities of the land, clus ing dwellings to preserve open space, and planning in terms of neighborhoods with integrated recreation and non-motorized traffic networks.

The plan proposes a variety of dwelling types to meet the diverse needs of young couples, growing families, and retired couples whose children have left home. Because the price of housing in the proposed community will encompass a broader range than the usual subdivision, the proposed development will help meet the township's fair share requirements and do so in a way that encourages community quality. In addition provision has been made for convenience commercial to ensure a balance of land uses necessary to community life.

We look forward to working with you to create a community which will be an asset to Bedminster Township.

John Rahenkamp, President

Rahenkamp Sachs Wells and Associates, Inc.

CONTENTS

COMMUNITY LOCATION

The 1532-acre site of the proposed open space community is located in the Somerset Hills of north central New Jersey, partly in Bernards Township (1071 acres) and partly in the Township of Bedminster (461 acres) at the headwaters of the Passaic River which flows through the Great Swamp National Wildlife Refuge as well as the headwaters of the Raritan River. The site is located less than one mile from the interchange of Interstate Routes 287 and 78 and is approximately 45 minutes from Manhattan. In addition, the Erie Lackawanna Railroad has two stations within Bernards Township providing commuter service to New York. The development pattern adjacent to the site is characterized by large residential lots and three areas of more intensive development - Pluckemin Center and Liberty Corners, which are developed with a mixture of single-family residences on small lots and various business uses, and the built-up residential area of Bridgewater Township south of Route 78. To the north of the site on Route 287 is the new A T & T long-lines facility, providing an additional 3500 jobs to the local economy.


BERNARDSVILLE BORO.
BASKING RIDGE
BERNARDS TWP.
LIBERTY CORNER
WARREN TWP.
LEGEND
MAJOR INTERSTATE
ARTERIAL ROADS
SEWAGE TREATMENT FACILITY
EXISTING DEVELOPMENT
SITE
RSVP
ALLAN DEANE PROPERTY
COMMUNITY CONTEXT
1

THE PROPOSED OPEN SPACE COMMUNITY

The proposed community was planned with several objectives in mind. The first obj tive is to respect the natural environment of the site, preserving the most sensit areas as open space and determining the location and type of development most appr priate to the natural landscape. The second objective is to create a balanced com munity which meets the diverse needs of the regional housing market, included the need for low and moderate income opportunities. Accordingly, there will be a vari of housing types and prices: multi-family and single-family-attached dwellings fo young couples and retired "empty-nesters", larger, single-family-attached and deta dwellings ranging from modest to luxurious to accommodate the full cycle of family growth. Thirdly, the plan seeks to create well-defined neighborhoods, with open space areas in close proximity to housing and convenient access to recreation opportunities as well as a network of bicycle and pedestrian paths.

The Land Use Plan

The environmental conditions of the site suggest a design solution which utilizes clusters of development defined and connected by open space areas. This solution

not only responds to the dictates of the site's natural features but results in d trict, readily identifiable residential neighborhoods.

One neighborhood will be located on the open field between Pluckemin Center and t face of Watchung Mountain. With access to Washington Valley Road and Route 206, uses in this section consist of single-family-attached and multi-family dwellings with two small neighborhood commercial sites near Pluckemin Center. A second nei borhood will be developed along a new north-south collector linking Washington Va Road and Schley Mountain Road. Areas near the western face of the mountain will b devoted to large-lot, single-family dwellings, and the central area will be devote to single-family-attached and multi-family dwellings. Single-family areas will be placed on the perimeter of the site to ensure compatibility with land uses adjacer to the site. At the center of this neighborhood will be a village center with a school site, convenience shops, and a site reserved for such institutional uses as a church or a YM-YWCA.

The third neighborhood of the proposed community will be oriented toward Somervill Road with single-family-attached and multi-family dwellings facing onto a wide ope space corridor along the floodplain of the Dead River. To the west will be single

family lots of low to medium density served by a system of culs-de-sac. A smal hood commercial center has been located at the intersection of Somerville Road a Corner Road to meet convenience needs.

Open Space

The proposed community will have three major open space areas, which will be per preserved. One area will include the face of Watchung Mountain, a significant v feature of the region and will include the 64 acre historic Washington Campgroun The second area, which is located on Mount Prospect Road, will be over a hundred in size and entirely covered with mixed deciduous forest. The third area will i the Dead River floodplain which is also extensively wooded. These major areas w linked with smaller open space areas and corridors appropriate for the construct pedestrian and bicycle paths.

On-Site Circulation

In order to achieve optimum traffic flow and maximum safety, the circulation syst composed of different types of streets which separate traffic according to its fu Collectors accommodate major through-site traffic with local roads providing acce the individual land use parcels. There will be no lotting along collector roads. family residential areas are served by culs-de-sac or loop roads which prevent th traffic and result in a quieter and safer street.

Implementation

It is proposed that the new community be constructed over a ten year building period. Legal implementation will be facilitated by drafting appropriate revisions to the Bedminster zoning ordinance with respect to the area involved

ALLAN-DEANE CORPORATION OPEN SPACE COMMUNITY - TOTAL SITE

LAND USE SUMMARY TABULATIONS

Land Use Category	Acres		% of Site		Number of Dwelling Uni
Residential					
Single-family-detached, low density (0.33 DU/AC)	260.3		17.0		72
Single-family-detached moderate density (2.2 DU/AC)	326.5		21.4		688
Single-family-attached, low density (6 DU/AC)	28.2		1.8		169
Single-family attached, moderate density (8 DU/AC)	125.7		8.2		1,005
Multi-family (14 DU/AC)	193.6		12.6		2,703
Residential - Subtotal		934.3		61.0	
Commercial		28.2		1.8	
Road R.O.W.		74.1		4.8	
Village Center		11.0		0.7	
School		36.6		2.4	
Open Space					
Park	118.0				
Historic Site	64.4				
Other Open Space	103.5				
Open Space - Subtotal		447.5		29.3	
Totals		1,531.7		100.0	4,687

Average Gross Density 3.03 DU/AC

ALLAN-DEANE CORPORATION OPEN SPACE COMMUNITY - BEDMINSTER TOWNSHIP PORTION

LAND USE SUMMARY TABULATIONS

Land Use Category	Acres	% of Site	No. of Dwelling Units
Residential			
Single-family-detached, low density (0.33 DU/AC)	66.5	14.4	14
Single-family-detached, moderate density (2.2 DU/AC)	40.0	8.7	63
Single-family-attached, low density (6 DU/AC)	28.2	6.1	169
Single-family-attached, moderate density (8 DU/AC)	62.9	13.6	503
Multi-family (14 DU/AC)	66.7	14.5	933
Residential - Subtotal	264.3	57.3	
Commercial	17.1	3.7	
Road R.O.W.	11.7	2.6	
Open Space			
Historic Site	64.4		
Other Open Space	103.5		
Open Space - Subtotal	167.9	36.4	
Totals	461.0	100.0	1,682

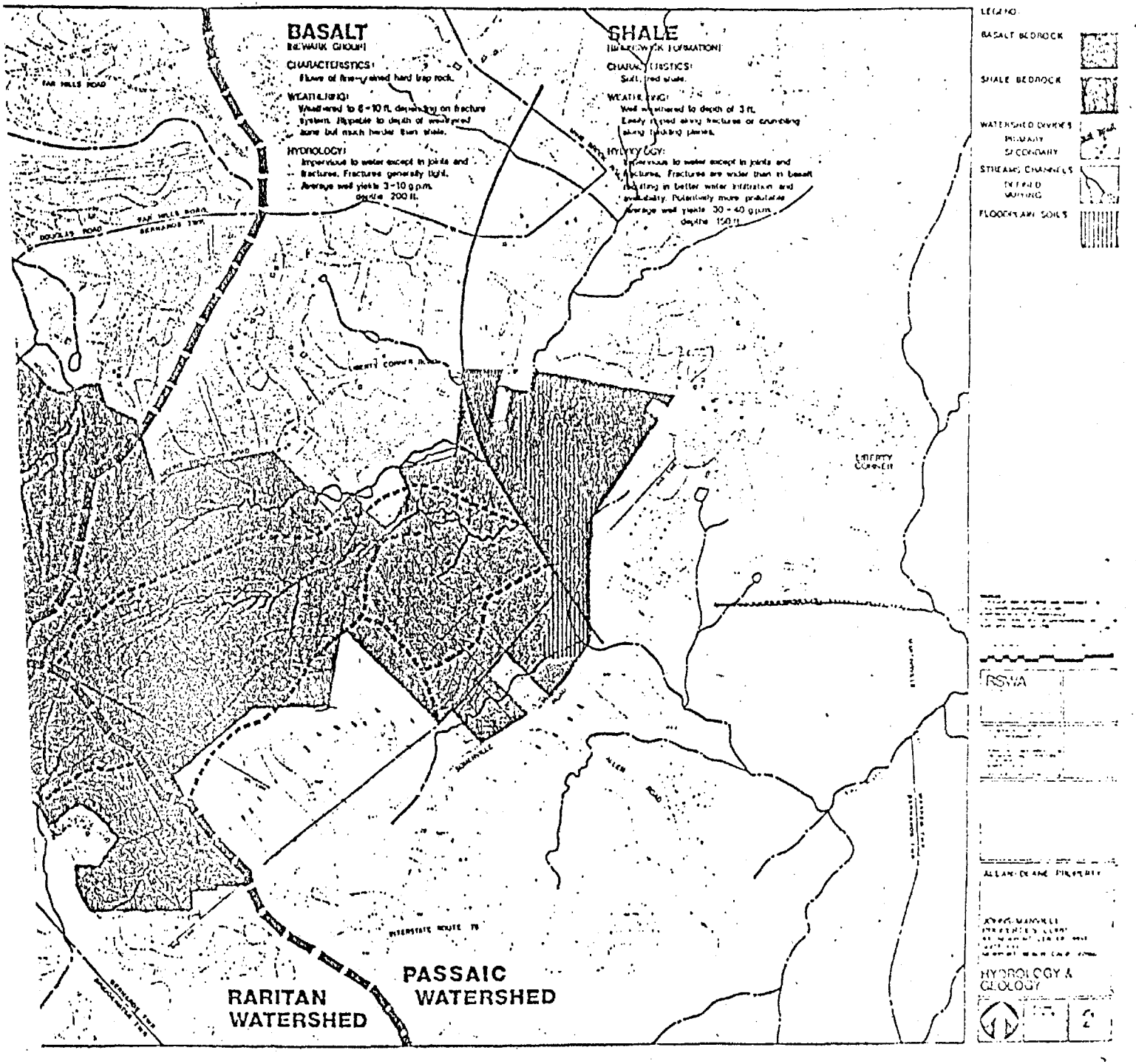
Average Gross Density 3.65 DU/AC

ENVIRONMENTAL ANALYSIS

An analysis of the site's natural environment was undertaken to serve as the bas for planning the proposed open space community. Bedrock, soil, water table, slo and vegetation conditions were examined with the objective of determining the ca for development on each portion of the site. These conditions were mapped at a of 1"=400' and reproductions of these maps are included within this report.

Geology

There are two rock formations on the site: soft red shale with interbedded sand (Brunswick Formation - Triassic), and basalt flows of fine-grained trap rock (Ne Group - Triassic). The latter is characteristic of the Watchung Mountains. App mately 90 percent of the site is underlain with basaltic rock varying in depth f 3½ to 4½ feet and the remaining 10 percent of the site (near Liberty Corners) is underlain with shale varying in depth from 1½ to 3½ feet. The shale is soft and be ripped to depths of 3 feet where it has expanded along fractures or crumbles bedding planes. The basalt bedrock is fractured in places to a depth of about 1


BASALT
(BRUNSWICK GROUP)
CHARACTERISTICS:
Flows of fine-grained hard trap rock.
WEATHERING:
Weathered to 6 - 10 ft. depending on fracture system. Opposite to depth of weathered zone but much harder than shale.
HYDROLOGY:
Impervious to water except in joints and fractures. Fractures generally tight.
Average well yields 3 - 10 g.p.m.
depths 200 ft.
SHALE
(BRUNSWICK FORMATION)
CHARACTERISTICS:
Soft, red shale.
WEATHERING:
Well weathered to depth of 3 ft.
Easily eroded along fractures or bedding along bedding planes.
HYDROLOGY:
Impervious to water except in joints and fractures. Fractures are wider than in basalt resulting in better water infiltration and availability. Potentially more productive.
Average well yields 30 - 40 g.p.m.
depths 150 ft.
LEGEND
BASALT BEDROCK
SHALE BEDROCK
WATERSHED DIVIDES
PRIMARY
SECONDARY
STREAMS, CHANNELS
INTERMITTENT
FLOODPLAIN SOILS
RARITAN WATERSHED
PASSAIC WATERSHED
LIBERTY CORNER
INTERSTATE ROUTE 78
HYDROLOGY & GEOLOGY

feet, which can be worked, but with somewhat greater difficulty. These conditions generally are not suitable for septic systems and for this reason septic systems are not contemplated for this development proposal. The use of a low-pressure waste water collection system, one of the alternatives being studied, would reduce the need for extensive bedrock removal.

Hydrology

The site does not contain any aquifers which would be a significant source of water nor does it have any potential aquifer recharge areas. There are existing wells near the site, but since septic systems are not contemplated, there is little risk of affecting these water sources. We anticipate that water for the proposed commun will be obtained from public water supply.

On-site investigations have identified two types of streams on the site. One type is characterized by well-defined channels (indicated by solid lines on the Geology-Hydrology Map); the second type are underground seeps (indicated by dash lines on t map). Floodplains and wetlands associated with both types of water courses have been identified and are proposed for conservation as open space.

As important topographic as well as hydrologic feature of the site is the boundary between the Raritan River and Passaic River Watersheds, with the site occupying a position in the headwaters of both watersheds. Because the site generally slopes downward in all directions from the center, storm water retention devices are proposed in perimeter locations to prevent increased runoff.

Slope Conditions

The site, which is located in the Second Watchung Mountains contains some steep slopes, primarily along the face of the basaltic outflow on the western portion the site. Slope conditions have been mapped on 2-feet contour intervals with ar of more than 20 percent slope being restricted from development. Limited develo ment can be accommodated on areas with 15 to 20 percent slopes and more intensiv development has been clustered on slopes of less than 15 percent. Initial inves gation and on-site inspection with Soil Conservation Service representatives ind cated that the soils are not particularly erodable, but in some locations sedime catch basins are proposed.

Soils

Several soil types are found on the site with some soil associations exhibiting mixed characteristics. Floodplains and soils subject to frequent flooding occup small areas, largely in the northeast corner of the site. Another category show on the soils map identifies soils subject to moderate-to-slight flooding or sea- sonal high water table from 0 to 1 foot. These areas are unsuitable for constru tion and have been designated as restricted. Other areas of the site exhibit mi

SLOPE
ALUM ROCK PROPERTY
RSWA
LEGEND
0 - 5%
5 - 10%
10 - 15%
15 - 20%
20 - 30%
30 +

LEGEND:

SOIL TYPE	FLOODING POTENTIAL	SEASONAL HIGH WATER TABLE (FT)	HYDROLOGIC SOIL GROUP	DEPTH TO BEDROCK (FT)
Pk = PARSIPPANY Ro = ROWLAND	FREQUENT VERY FREQUENT	0 - 1 1 - 3	D C	4+ 4+
Wc = WATCHUNG	SLIGHT-MODERATE	0 - 1	D	5+
Mu = MOUNT LUCAS WATCHUNG ASSOCIATION	SEE DESCRIPTIONS UNDER Mo AND Wc			
Am/An = AMWELL Lb = LANSDOWNE Mo = MOUNT LUCAS	NONE NONE NONE	1 - 4 1 - 2½ 1 - 4	C C C	3½ - 5+ 3½ - 5+ 4 - 6+
Nk = NESHAMINY MOUNT LUCAS ASSOCIATION	SEE DESCRIPTIONS UNDER Ne AND Mo			
Ne/Nh = NESHAMINY Nn = FLAGPAN VARIANT No = NORTON Pn = PENN (SHALE BEDROCK)	NONE NONE NONE NONE	3+ 2 - 3+ 6+ 6+	B B C C	4 - 10+ 3½ - 4½ 3½ - 5+ 3½ - 3½

soil associations with variable depths to bedrock and seasonal high water table ranging from 1 to 4 feet. Remaining areas have seasonal high water table at depths of 5 feet or more and pose few restrictions for development.

Sources of soil information were the Soil Conservation Service's Soil Survey of Somerset County supplemented by on-site investigations with Soil Conservation Service representatives, and categories of development suitability are those of the Soil Conservation Service.

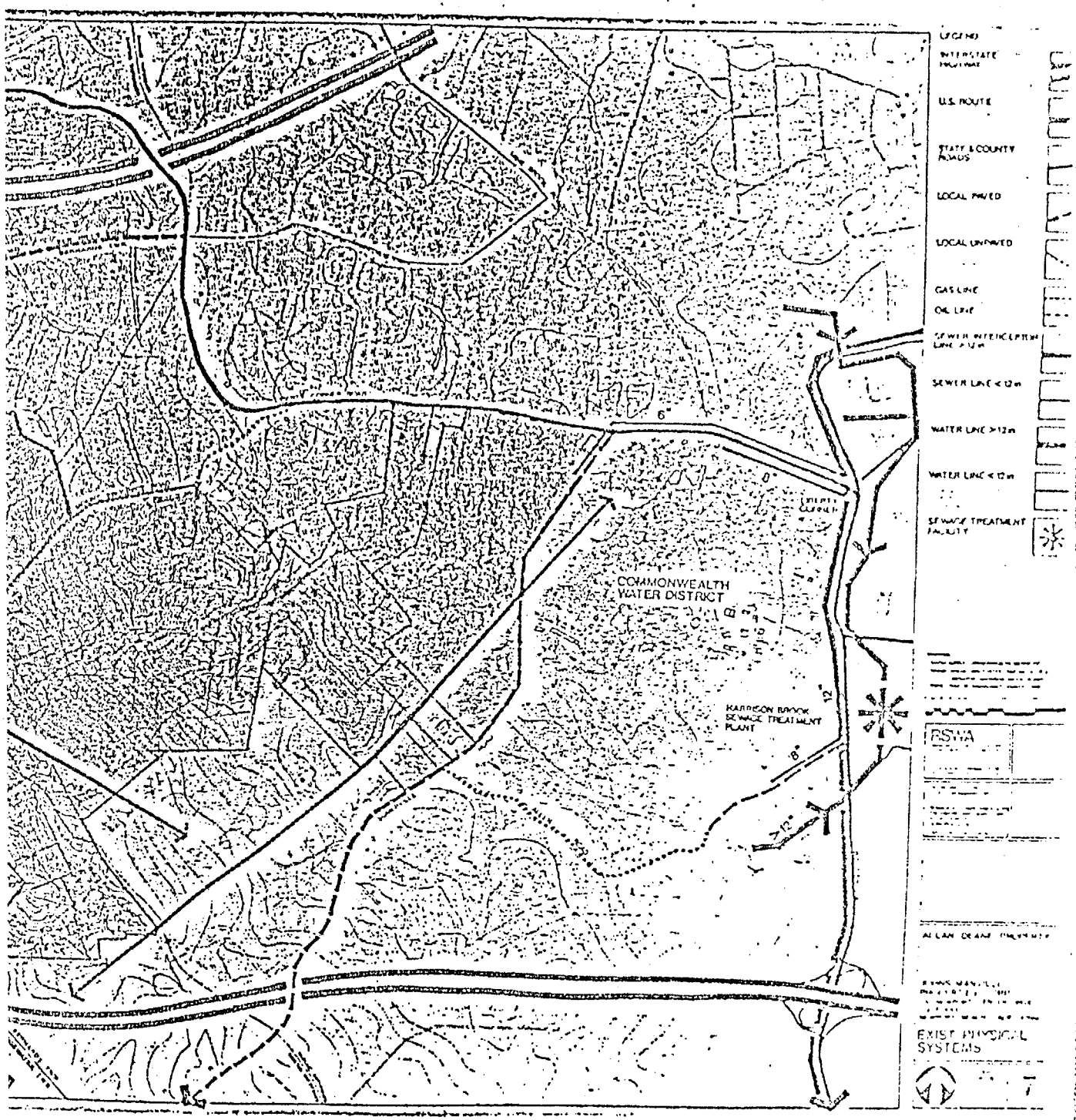
Vegetation

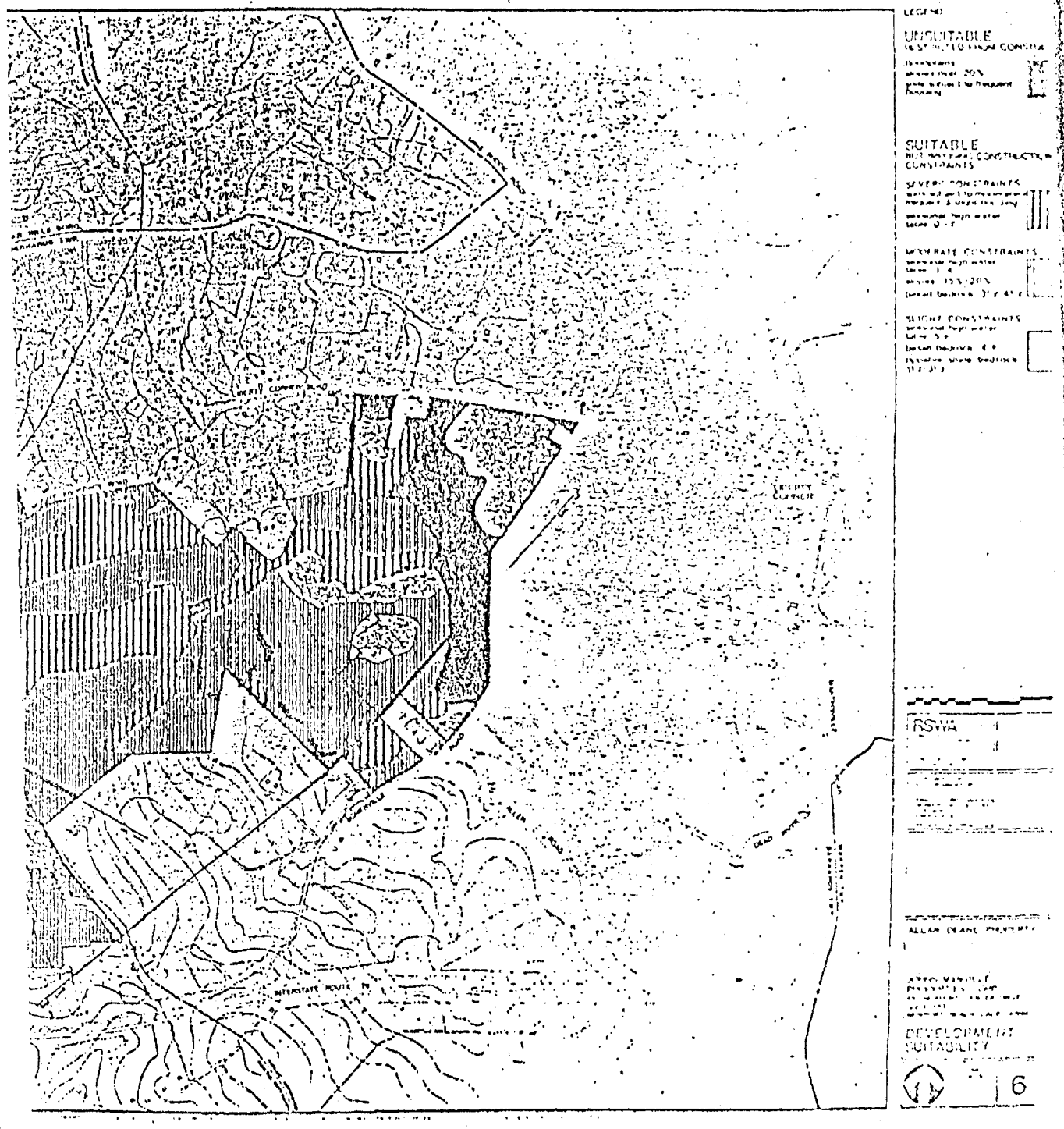
Examination of color aerial photos taken in the spring of 1975 shows the majority of the site is covered with a mixed deciduous forest consisting largely of oak, hickory, maple, beech, and birch. Small areas of the site contain evergreen species - largely juniper. Other vegetation features of the site include old field conditions and hedgerows (sassafras, dogwood, and other species), old field succession (shrubs, juniper and sumac), and open, abandoned fields, formerly pasture and meadow.

LEGEND
FOREST
DECIDUOUS
EVERGREEN
HEDGEROW
OLD FIELD
SUCCESSION
OPEN
ALLEN FARM PROPERTY
VEGETATION
5

Development Suitability

The environmental conditions exhibited by the site have been assessed for their suitability for development and summarized graphically on the Development Suitability Map. One category of the map includes conditions which are environmentally unsuitable for construction: areas of more than 20 percent slope, floodplains, or soils subject to frequent flooding. Three additional categories have been established for varying degrees of environmental suitability. Areas of severe construction constraints include soils subject to moderate-to-frequent flooding and a seasonal high water table of 0 to 1 foot. Moderate construction constraints apply to areas with basaltic bedrock depth ranging from 3½ to 4½ foot, slopes between 15 and 20 percent or seasonal high water table from 1 to 4 feet. The category of Slight Construction Constraints was applied to areas with seasonal high water table greater than 5 feet, basaltic bedrock greater than 4 feet or rippable shale at a depth of 1½ to 3½ feet. The resulting composite map served as the basis for the land use plan which is shown in this report.


LEGEND
INTERSTATE
U.S. ROUTE
STATE & COUNTY ROADS
LOCAL PAVED
LOCAL UNPAVED
GAS LINE
OIL LINE
SEWER LINE < 12 in
WATER LINE >12in
WATER LINE < 12 in
SEWAGE TREATMENT FACILITY
COMMONWEALTH WATER DISTRICT
HARRISON BAYOU SEWAGE TREATMENT PLANT
6"
8"
12"
EXIST PHYSICAL SYSTEMS


LEGEND
UNSUITABLE
SUITABLE
SEVERE CONSTRAINTS
MODERATE CONSTRAINTS
SLIGHT CONSTRAINTS
RSVIA
DEVELOPMENT SUITABILITY
6

PHYSICAL SYSTEMS

Detailed engineering studies have been undertaken of the physical systems which will serve the proposed community - traffic, water supply, wastewater treatment, and storm-water control. The objective of these studies is to identify the project impacts and to propose solutions which will minimize these impacts on the township.

Roads and Traffic

Located at the interchange of Interstate 78 (an east-west route from New York City to northern Pennsylvania) and Interchange 287 (a circumferential highway around the New York Metropolitan Region), the site has excellent access to the region. Furthermore, U.S. Route 206, a north-south highway, provides additional access along the western edge of the site.

Initial traffic engineering studies suggest that in order to effectively facilitate traffic flow between the proposed community and the regional highway network linking employment and shopping centers, it will be necessary to improve certain roads and intersections. Staged intersection improvements will assist in the control of turn-

LEGEND
INTERSTATION
ROAD MAINTENANCE
DIRECTIONAL
ASSIGNMENTS
DIVIDED HIGHWAY
DIVIDED HIGHWAY
ISSUED
ALLAN DEANE PROP.
42%
10.7%
24%
41%

ing movements, particularly left-hand turns, and access improvements to Route 206 and Interstate 287 are also recommended to handle anticipated traffic volumes. Local roads which will require improvements include Schley Mountain Road and Allen Road. All areas of improvement are indicated on the accompanying map.

Water Supply

The western portion of the proposed community will be served by the Commonwealth Water Company which has a 16-inch main along Route 202-206. With purchases of additional water from Bridgewater Township and the Elizabethtown Water Company, there will be an adequate supply. A booster station will be installed on-site to lift water to a storage tank to be built on the ridge. This will insure adequate pressure and sufficient water for fire protection.

The eastern portion of the site will also be served by the Commonwealth Water Company from a system which is connected with the Bridgewater Township water system. At present there is a 12-inch main along Martinsville Road with a 6-inch main reaching the site along Liberty Corner Road and a short 8-inch main along a portion of Allen Road. Neither of these smaller mains will provide sufficient capacity; therefore the developer proposes to contribute to the construction of larger mains to serve the eastern portion of the site.

Waste Water Systems

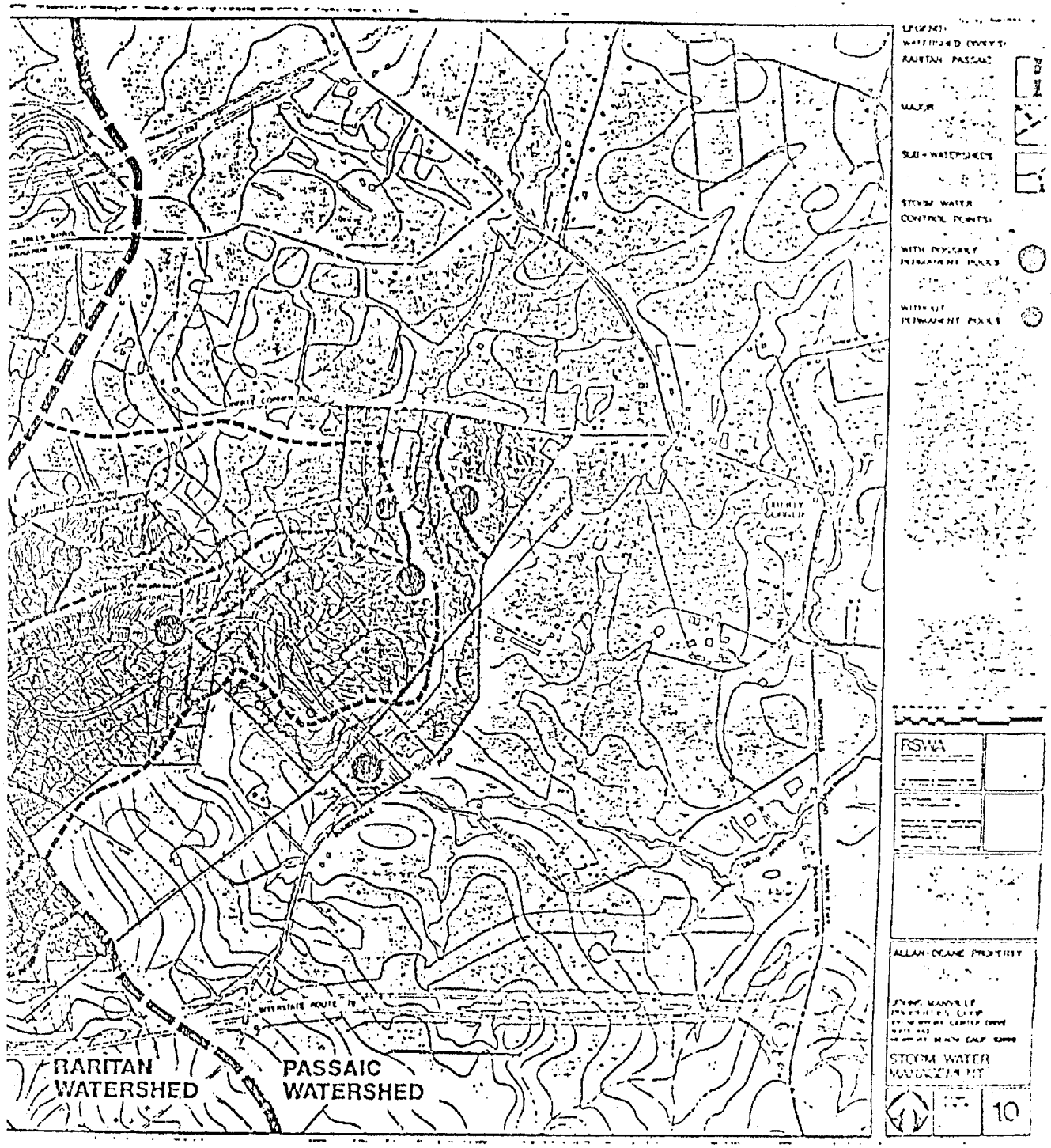
Several feasible alternatives have been and are currently being analyzed to resolve which best satisfies engineering, environmental and economic criteria of both the developer and the region. Throughout the principle focus has concentrated on a regional approach based on watershed areas rather than political boundaries. The use of septic systems is not among the alternatives under consideration. Among those under consideration are:

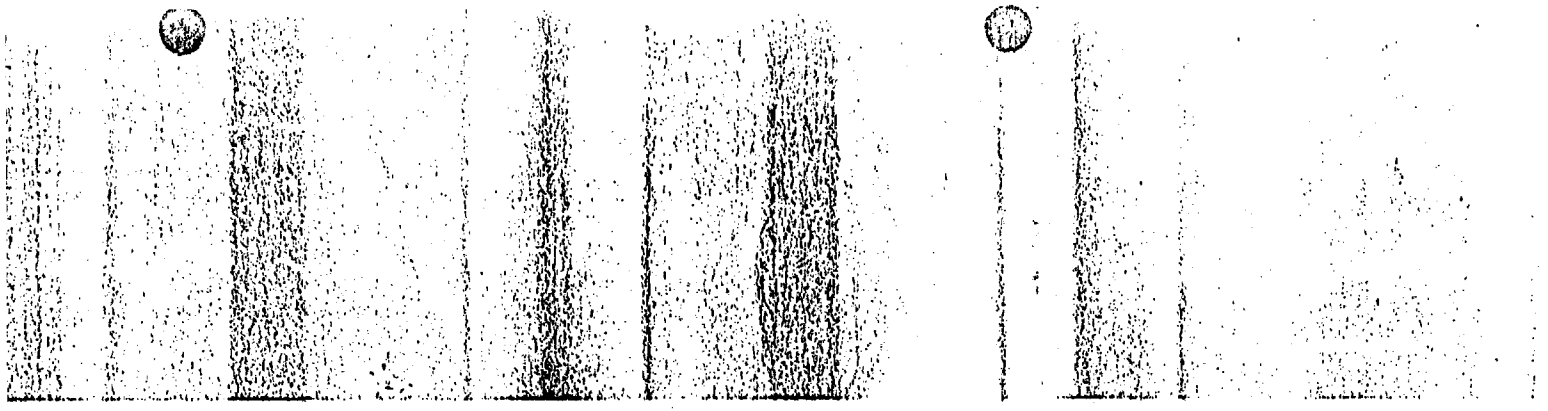
Raritan Watershed:
1. Treatment plant with outfall into the North Branch of the Raritan River.
2. Connection to proposed Middle Brook system in Bridgewater Township.
3. Treatment plant with outfall into Chambers Brook.
4. Connection to Bridgewater's Chambers Brook collection system.
5. Connection to and expansion of A T & T plant.

Passaic Watershed:
1. Connection to Bernards treatment plant - this is the only feasible alternative at this time which permits containment within the watershed.

Storm Water Control

The proposed approach to storm water control is designed to prevent any increase in peak runoff during a 100-year storm. A system of ponds and basins to retain storm water on-site and to control sedimentation and erosion is suggested which will protect downstream water quality as well as help balance water flows into the large Passaic River Watershed.


RARITAN
WATERSHED
PASSAIC
WATERSHED
RSVA
ALLAN-DEANE PROPERTY
STORM WATER
10



CREDITS

Mr. Robert Oberthaler, Raritan Basin, Monitoring Surveillance and Enforcement Element, Division of Water Resources, Dept. of Environmental Protection, Trenton.

Mr. Earl Smith, Secretary, Board of Health, Bedminster Township.

Robert Pederson, Somerset County Soil Conservation Service.

Ray Dyba, Planning and Evaluation Division, Bureau of Air Pollution Control, N.J. Dept. of Environmental Protection.

M. Ahuja, Division of Water Resources, Environmental Protection Agency, Trenton.

SOURCES

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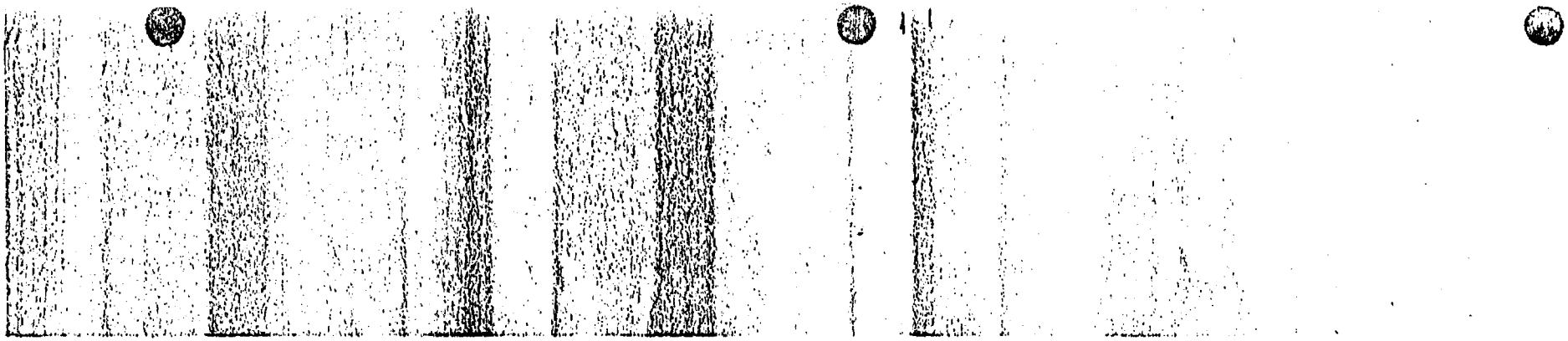

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Regional Development Guide, Technical Perspectives, prepared by the Tri-State Transportation Commission, November 1969.

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Master Plan, Bernards Township, prepared by the Bernards Township Planning Board, December 1975.

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ENGINEERING CONSULTANTS

Traffic: Simpson and Curtin, Consulting Engineers

Wastewater Treatment: Apgar Associates, Consulting Engineers

Stormwater Control: Vincent McKeever, Consulting Engineer

APPENDIX 'B'

NJDEP Letter of July 12, 1977

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES
P. O. BOX 2809
TRENTON, NEW JERSEY 08625

JUL 12 1977

Billing B. Bready
Clinton Bogert Associates
2125 Center Avenue
Fort Lee, New Jersey 07024

Re: Allan-Deane Development
Bedminster Township

Dear Mr. Bready:

We have reviewed our modeling of the North Branch of the Raritan River to determine what effluent requirements would be necessary for a discharge between the Lamington River and Peapack Brook. Based upon oxygen requirements, level 3 treatment would be needed. In addition it would have to be demonstrated in the engineers report that the discharge is in conformance with our antidegradation policy and other requirements of our Water Quality Criteria.

In review of the outline of the proposed engineer report, I have found no deficiencies. It is expected that the report will contain all information and analysis as required by our Rules and Regulations for the Preparation and Submission of Plans for Sewer Systems and Wastewater Treatment Plants.

At the present time the Department has no formal regulations for the design of land applications. The following general guidelines have been used in review of spray irrigation facilities:

1. Minimum of Secondary Treatment including disinfection.
2. Maximum application rate of 2" per acre per week.
3. Storage or alternate subsurface facilities provided for disposal during inclement weather.
4. Buffer zones of 200 feet from property lines and 100 feet from surface waters.

It is suggested that you review land disposal guidelines published by the State of Pennsylvania and the Environmental Protection Agency as these are sources of information we consult when reviewing land application systems.

Very truly yours,

Russell E. Nerlick

Russell E. Nerlick, P.E., Manager
Raritan River and ISC Basins
Public Wastewater Facilities Element

REN:jh

APPENDIX 'C'

Township of Bedminster, N.J.
Effluent Discharge Standards
Revised: December 7, 1973

STANDARDS OF EFFLUENT DISCHARGE

TO BE MET BY WASTEWATER TREATMENT

PLANTS OPERATING WITHIN THE BOUNDARIES

OF THE TOWNSHIP OF BEDMINSTER

SOMERSET COUNTY, NEW JERSEY

Adopted November 8, 1973
BEDMINSTER BOARD OF HEALTH

REVISED December 7, 1973

NOTE: Guidelines will have the force of a standard unless applicant seeks a variance on the grounds that current technology is not able to meet said guideline. The Board of Health will be the sole judge of such a variance. In any case the applicant will be required to meet the standard at a future time when technological improvement make it possible.

PARAMETER	STANDARD	GUIDELINE	COMMENTS
Temperature	Trout Maintenance Streams - No heat may be added which would cause temperatures to exceed 2 F. over the natural temperatures at any time or which would cause temperatures in excess of 68 F.		State of New Jersey FW-2 surface water quality standard.
ph	6.5 - 7.9		pH values in the North Branch of the Raritan River near Bedminster Township on August, 1973 generally range from 6.6 to 7.4[a]. The United States Environmental Protection Agency criteria for pH specifies no pH change greater than 0.5 pH units[b].
Alkalinity	Not less than 30 mg/l	40-90 mg/l as $CaCO_3$	Existing water quality should not be degraded.
Carbon Dioxide		0-15 mg/l	Existing stream quality should not be degraded
Total Gas Pressure		Total dissolved gas pressure should not exceed 110% of existing atmosphere pressure.	United States Environmental Protection Agency criterion[b].

PARAMETER	STANDARD	GUIDELINE	COMMENTS
Dissolved Oxygen	Acceptable limits of dissolved oxygen for all water should be based on seasonal temperatures. For temperatures below 37.4 F, the level of dissolved oxygen should be greater than 9.3 mg/l. For 9.3 mg/l dissolved oxygen, the temperature should be 37.4 degrees Fahrenheit; 9.1 mg/l, 41 degrees F.; 8.9 mg/l, 48 degrees F.; 8.8 mg/l, 50 degrees F.; 8.6 mg/l, 55.4 degrees F.; 8.3 mg/l, 59 degrees F.; 8 mg/l 64 degrees F.; 7.8 mg/l, 68 degrees F.; 7.7 mg/l, 71.6 degrees F.; 7.4 mg/l, 77 degrees F.; 7.2 mg/l, 80.6 degrees F.; 6.9 mg/l, 86 degrees F.; 6.7 mg/l, 89.6 degrees F.; and 6.6 mg/l, 93.2 degrees F. For temperatures not listed, the oxygen level shall not be less than the oxygen level at the closest temperature below the temperature which is not listed. As an exception, under extreme conditions for short periods of time of not more than 24 hours, a minimum limit of four mg/l would be acceptable for waters above 87.8 degrees F.		United States Environmental Protection Agency criterion[b].

PARAMETER	STANDARD	GUIDELINE	COMMENTS
Turbidity and Color		the combined effect of color and turbity not change the compensation point more than 10 per cent from its seasonally established norm. such a change should not place more than 10 percent of the biomass of photosynthetic organisms below the compensation point. Until the compensation point is determined the turbidity standard shall be 0-5 JTU or 0-5 FTU[2]. If a compensation point does not exist, the turbidity standard shall be 0-5 JTU or 0-5 FTU and the color standard shall 0-30 pcu.	The standard for color and turbidity in terms of compensation point is a United States Environmental Protection Agency criterion[b]. The interim standards ensure that existing stream quality will not be degraded[c].
Filtration Residue	0-225 mg/l		State of New Jersey FW-2 surface water quality standard: 500 mg/l or 1/3 above natural characteristic levels, whichever is less. characteristic levels generally appears to be equal to or less than 170 mg/l in the North Branch of the Raritan River.

PARAMETER	STANDARD	GUIDELINE	COMMENTS
Biochemical oxygen demand (BOD)	The BOD level of the discharge should be below the level which would reduce oxygen concentrations in the receiving waters to below the oxygen concentration listed above under proposed discharge standards. A minmum of 90% reduction of BOD must be achieved In no case shall the arithmetic mean of the values for effluent samples collected in a period of 30 consecutive days exceed 30 mg/l nor shall the arithmetic mean of the values for effluent		United Staes Environmental Protection Agency criterion for dissolved oxygen[b].
Residual Chlorine	0-0.003 mg/l. As an exception, concentrations not to exceed 0.05 mg/l for a period of up to 30 minutes in any 24 hour period are permitted.		United States Environmental Protection Agency criterion[b].
Hydrogen Sulfide	0-0.002 mg/l		United States Environmental Protection Agency criterion[b].
Ammonia - N	Levels of un-ionized ammonia in water should not exceed 0.05% of the 96-hour lethal concentration (LC_{50}, median) values. LC_{50} values should be determined using the receiving water and the most sensitive species in the locality. The limit should never exceed 0.02 mg/l.		United States Environmental Protection Agency criterion[b].

PARAMETER	STANDARD	GUIDELINE	COMMENTS
Nonfiltrable Residue	0-80 mg/1	0-10 mg/1	Existing water quality should not be degraded[c].
Total Phosphorus as P	0-0.05 mg/1		United States Environmental Protection Agency criterion[b].
Inorganic Nitrogen	1 mg/1	0-0.3 mg/1	0.3 mg/1 "is considered a first approximation in the establishment of water-quality standards for preventing eutrophication"[d].
Nitrite - Nirogen		0-0.02 mg/1	Existing stream quality should not be degraded[c].
Chloride		0-20 mg/1	Existing stream quality should not be degraded[c].
Total Sulfides	0-0.002 mg/1		United States Environmental Protection Agency criterion[b].
Sulfate	0-250 mg/1 presently existing levels, whichever is lower.		United States Environmental Protection Agency potable water criterion[b]; Existing water quality should not be degraded.
Arensic	0-0.05 mg/1	N.J. Surface Water	United States Environmental Protection Agency potable water criterion[b].
Barium	0-1 mg/1		United States Environmental Protection Agency potable water criterion[b].
Boron	0-1 mg/1		United States Environmental Protection Agency potable water criterion[b].

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Cadmium	0-0.0004 mg/1		United States Environmental Protection Agency criterion for soft water[b].
Chromium	0-0.05 mg/1		United States Environmental Protection Agency criterion[c].
Copper	Copper concentrations should not exceed one-twentieth the 96 hour LC_{50} value. The LC_{50} value should be determined on the most sensitive local species using the receiving water.	Until the LC_{50} value is determined the copper concentration shall not exceed 0.02 mg/1.	United States Environmental Protection Agency criterion[b]. The interim maximum value of 0.02 mg/1 was suggested by Mandia[f].
Iron		0-.05 mg/1	Iron concentrations of 0.3 mg/1 or greater can be hazardous to fresh water biota and wildlife concentrations less than 0.05 seem to present little or no hazard[g].
Sodium		0-10 mg/1	Existing stream quality should not be degraded[c].
Lead	0-0.03 mg/1		United States Environmental Protection Agency criterion[b].
Manganese	0-0.05 mg/1		United States Environmental Protection Agency potable water criterion[b].
Mercury (Inorganic)	0-0.2 ug/1 or .0002 mg		United States Environmental Protection Agency criterion[b].

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Nickel	Nickel levels should not exceed 0.02% of the 96-hour LC_{50} value. The LC_{50} value should be determined using the receiving water and the most sensitive local species.		United States Environmental Protection Agency criterion[b].
Selenium	0-0.01 mg/l		United States Environmental Protection Agency potable water criterion[b].
Silver	0-0.05 mg/l		United States Environmental Protection Agency potable water criterion[b].
Zinc	Concentrations of zinc should not exceed 0.005% of the 96 hour LC_{50} value for most sensitive local organisms. The LC_{50} value should be determined using the receiving water.		United States Environmental Protection Agency criterion[b].
Cyanide	Cyanides in water should not exceed .05 percent of the 96 - hour LC_{50} value determined by using the receiving water in question and the most sensitive species in the area in both static and flow-through bioassays.	Concentrations of cyanide should not exceed 0.005 mg/l at any time.	United States Environmental Protection Agency criterion[b].
Carbon Adsorbable Organics	0-0.3 mg/l carbon - chloroform extract and 0-1.5 mg/l carbon - alcohol extract.		United States Environmental Protection Agency potable water criterion[b].

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Organic	Linear alkylate sulfonates should not exceed .05 per-cent of the 96-hour LC_{50} value determined using the receiving water in question and the most sensitive species in the areas. Concentrations should never exceed 0.2 mg/1. Methylene blue active sub-stances should not exceed 0.5 mg/1. There should be no visible oil on water surfaces, con-centrations of emulsified oils should not exceed .05 per cent of the 96-hour LC_{50} value determined using the receiving water in question and the most sensitive species in the area; and concentrations of hexane extractable substances in air dried sediments should not exceed 1000 mg/kilogram on a dry weight basis. Phthalate esters should not exceed .3 micrograms per liter.		United States Environmental Protection Agency criterion[b]. The maximum value of 0.5 mg/1 for methylene blue active substances is an United States Environmental Protection Agency criterion for potable water[b].
Pesticides	For pesticides on which toxicity data are not available, acceptable concentrations in water should not exceed .01 percent of the 96-hour LC_{50} value determined using the receiving water in question and the most sensitive species in the area. In no instance should the level of organophosphorus and carbamate insecticides exceed 0.1 mg/1.		United States Environmental Protection Agency criterion[b]. The maximum value of 0.1 mg/1 for organophosphorus and carbamate insecticides is a United States Environmental Protection Agency potable water criterion[b,c]. Lethal Concentration per 50 mg of body weight for 96 hours.

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Pesticides (continued)	Recommended permissible limits for organo-chlorines are as follows:		
	Aldrin should not exceed .01 micrograms per liter; DDT, .002 micrograms per liter; TDE, .006 micrograms per liter; Dieldrin, .005 micrograms per liter; Chlordane, .04 micrograms per liter; Endosulfan, .003 micrograms per liter; Endrin, .002 micrograms per liter; Heptachlor, .01 micrograms per liter; Lindane, .02 micrograms per liter; Methoxychlor, .005 micrograms per liter; and Toxaphene, .01 micrograms per liter.		
	EPA's recommended maximum concentrations for organophosphates are as follows:		
	Axinphosmethyl should not exceed .001 micrograms per liter; Diodrin, .1 micrograms per liter; Coumaphos, .001 micrograms per liter; Diazinon, .009 micrograms per liter; Dichorovos, .001 micrograms per liter; Dioxathion, .09 micrograms per liter; Disulfonton, .05 micrograms per liter; and Dursban, .001 micrograms per liter.		
	Ethion, .02 micrograms per liter; EPN, .06 micrograms per liter;		

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Pesticides (continued)	Fenthion, .006 micrograms per liter; Malathion, .008 micrograms per liter; Mevinphos, .002 micrograms per liter; Naled, .004 micrograms per liter; Oxygementon Methyl, .4 micrograms per liter; Phosphamindon, .03 micrograms per liter; Parathion, .001 micrograms per liter; TEPP, .3 micrograms per liter; and Trichlorophon, .002 micrograms per liter.		
	For carbamates, a limit of .02 micrograms per liter for carbaryl and of .1 micrograms per liter for zectran.		
Herbicides, Fungicides, and defoliants	Aminotriazole should not exceed 300 micrograms per liter; Dalapon, 110 micrograms per liter; Dicamba, .2 micrograms per liter; Dichlobenil, 37 micrograms per liter; Dichlone, .7 micrograms per liter; Diquat, .5 micrograms per liter; and Diuron 1.6 micrograms per liter;		United States Environmental Protection Agency criterion[t]
	2-4,D (BBE), 4 micrograms per liter; Fenac (sodium salt),		The standard of 2ug/l for 2, 4, 5, T is a United States Environmental Protection Agency criterion for potable water[b,g].

PARAMETER	STANDARD	GUIDELINE	COMMENTS
	45 micrograms per liter; Silvex (BBE), 2.5 micrograms per liter; Silvex (PGBE), 2 micrograms per liter; and Silvex (potassium salt), 10 micrograms per liter; 2, 4, 5 T, 2 micrograms per liter.		
Polychlorinated Biphenyls (PCB's)	Polychlorinated biphenyls should not exceed 0.002 ug/l.		United States Environmental Protection Agency criterion[b].
Phenols	.005 percent of the 96-hour LC_{50} determined by using most sensitive important species as a test organism. Concentrations should never exceed .1 mg/l.		United States Environmental Protection Agency criterion[b].
Oil and Grease	Zero, must be absent	For purpose of measurement less than .1 mg/l	United States Environmental Protection Agency criterion for oil and grease states that oil and grease should be essentially absent from raw water. A reasonable lowest limit which can be measured precisely and accurately by standard method number 137[n] is 1 mg/l.
Taste and Odor	Fair or good. Odor should never exceed a threshold odor number of 3.		When the threshold odor number exceeds 3, the odor of water is likely to be objectionable to most people[1].
Fecal Coliform	200/100 ml (MPN)		State of New Jersey FW-2 water quality standard.

[a]Joseph R. Loring & Associates. 1973. AT&T long lines headquarters sewage treatment works project report. Prepared for the State of New Jersey Department of Environmental Protection, New York, New York, 18 pp.

[b]Anonymous. 1973. EPA drafts water quality criteria as required under federal water law. Environment Reporter Current Developments 4(16):663-669. Unless otherwise specified the standards refer to aquatic life criteria.

[c]The maximum value in the standard represents the approximate normal flow maximum value observed in the North Branch of the Raritan River near Bedminster Township during August, 1973.

[d]Committee on Nitrate accumulation, National Research Council. 1972. Accumulation of Nitrate. National Academy of Science, Washington, D.C., 106 pp.

[e]Anonymous. 1973. EPA proposes water quality criteria, information on measurement techniques. Environment Reporter Current Developments 4(27):1093-1097.

[f]Mandia, J.W. 1966. Water Quality criteria. In Anon., Chemical analysis for water quality. Federal Water Pollution Control Administration, Cinci-nati, Ohio, pp. 2-1 to 2-10.

[g]Anonymous. 1973. MAS says knowledge of localities essential to application of standards. Environment Reporter Current Developments 4(17):700-703.

[h]American Public Health Association, American Water Works Association, Water Pollution Control Federation. 1971. Standard methods for the examination of water and wastewater. 13th edition. New York, 874 pp.

[i]Santaniello, R.M. 1971. Water quality criteria and standards for industrial effluents. In H.F. Lund, Industrial pollution control handbook. McGraw-Hill Book Company, New York, pp. 4-23 to 4-40.