

A large teal graphic on the left side of the page, consisting of a triangle at the top and a larger, irregular shape below it, resembling a stylized building or a mountain peak.

Township of Cranford Phase 5 Stormwater Management Project

Park Avenue Stormwater Pumping Station, Penn
Road
Express Sewer and Local Collector System

July 2023

Mott MacDonald
412 Mount Kemble Avenue
Suite G22
Morristown
NJ 07960
United States of America

T +1 (908) 730 6000
mottmac.com

Township of Cranford Phase 5 Stormwater Management Project

Park Avenue Stormwater Pumping Station, Penn
Road
Express Sewer and Local Collector System

July 2023

Issue and revision record

Revision	Date	Originator	Checker	Approver	Description
1	7/31/23	KKN	JKR	KKN	Updated Report for 2023

Document reference: 507351416-008 |

Information class: Standard

This document is issued for the party which commissioned it and for specific purposes connected with the above-captioned project only. It should not be relied upon by any other party or used for any other purpose.

We accept no responsibility for the consequences of this document being relied upon by any other party, or being used for any other purpose, or containing any error or omission which is due to an error or omission in data supplied to us by other parties.

This document contains confidential information and proprietary intellectual property. It should not be shown to other parties without consent from us and from the party which commissioned it.

Contents

1	Introduction	1
1.1	Location	1
1.2	Background	1
2	Project Description	5
2.1	General	5
2.2	Pump Station	5
2.2.1	Alternative A	6
2.2.2	Alternative B	6
2.2.3	Alternative C	7
2.2.4	Alternative D	7
2.3	Express Sewer	9
2.4	Collector Storm Sewers	9
2.4.1	Alternative 1	10
2.4.2	Alternative 2	10
3	Preliminary Estimated Construction Costs	15
4	Summary	17
	Appendix A - Cost Estimates	19

1 Introduction

The Township of Cranford authorized Mott MacDonald to perform a study of the Phase 5 component of the Northeast Quadrant Stormwater Management Project within the Township of Cranford. Mott MacDonald conducted an investigation to determine the limits of the Phase 5 project area and performed a hydrologic and hydraulic analysis to determine the problem areas and to provide proposed stormwater management improvements. The services under this study provide preliminary design of storm drainage improvements, which include a new pumping station, an express sewer system and collector storm sewer systems. Mott MacDonald has considered alternative conceptual designs and layouts for the storm drainage improvements.

1.1 Location

The Township of Cranford is located in Union County, in the Rahway River watershed. The Rahway River winds through the Township over a length of approximately 4.75 miles between Kenilworth Boulevard in the north and the Garden State Parkway at Sperry Dam in the south. Refer to Figure 1.

The Lenape Park detention basin is located on the main stem of the Rahway River in the Borough of Kenilworth just north of Kenilworth Boulevard and has a tributary drainage area of 30.8 square miles at its outlet. The detention effect of this facility reduces the peak flows in the downstream reach of the River in Cranford, where residents have experienced severe flooding over a number of years. Downstream of Kenilworth Boulevard, the Rahway River meanders through Nomahegan Park, extending from Kenilworth Boulevard to Springfield Avenue in Cranford (a length of approximately one mile). Residential areas in the vicinity of the park and the Rahway River continue to experience chronic flooding. Several years ago, Cranford embarked on a comprehensive stormwater and flood management projects to alleviate the flooding to these residential areas. The current project, as described below, is identified as Phase 5 and is one component in this comprehensive program.

1.2 Background

The residential area along the Rahway River in Cranford, between Kenilworth Boulevard and Springfield Avenue, includes three major flood problem areas, identified as follows:

- | | |
|---------|---|
| Area #1 | Riverside Drive, Brookdale Road, Edgewood Road, Venetia Avenue, Kensington Avenue Area, comprising an internal drainage area of approximately 367 acres on the east bank of the river. Refer to Figure 2. |
| Area #2 | Park Drive, Brookside Place, Beech Street, Willow Street Area, comprising an interior drainage area of 94 acres on the west bank of the river. Refer to Figure 2. |

Area #3 Balmiere Parkway, Crescent Place, Hampton Road Area, comprising an interior drainage area of approximately 38 acres on the west bank of the river. Refer to Figure 2.

The flood prone portions of Areas #2 and #3 are served by different storm sewer systems, separated by higher land, and are thus considered individually, although both areas are on the west bank of the river.

The Township, County, State (NJDEP) and federal (Army Corps of Engineers) agencies have undertaken numerous drainage and flood management studies. The findings of these studies were considered in the development of a comprehensive plan for improvements to reduce the frequency of flooding in Cranford. The overall plan includes five (5) Phases as follows:

Phase 1 - Express storm sewer system and interior drainage facilities in Area #1.

Phase 2 – Collector storm sewer along Riverside Drive and permanent stormwater pump station in Area #1.

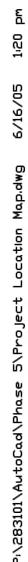
Phase 3 - Extension and modification of existing dikes on the east side of the river. (serving Area #1)

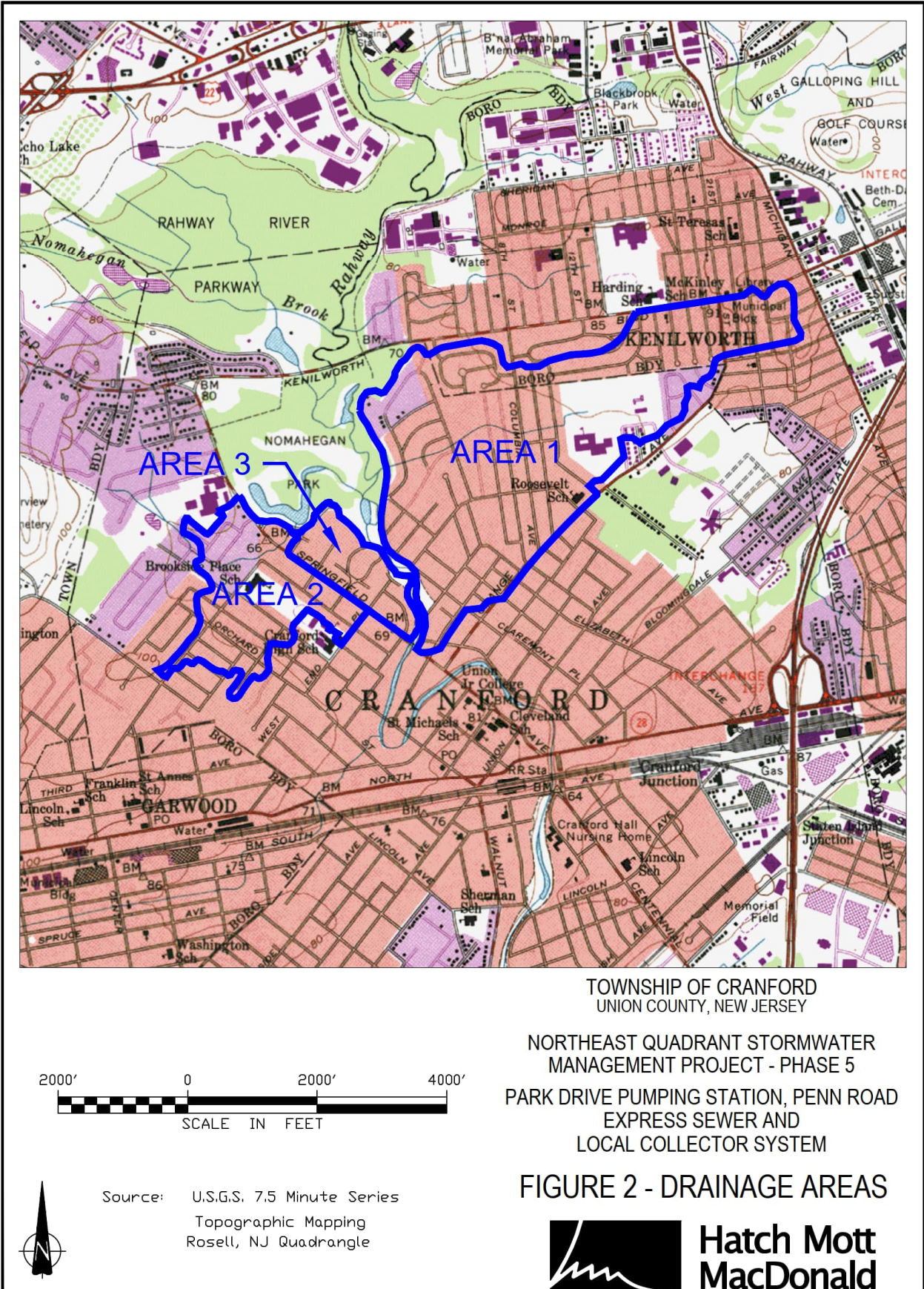
Phase 4 – Extension and modification of dikes on the west side of the river (serving Areas #2 and #3).

Phase 5 – Interior drainage improvements in Areas #2 and #3, including a stormwater pump station, express sewer system and collector storm sewer system.

These five phases are interrelated but yet independent. Each phase provides distinct benefits, which are enhanced by the related phases. For example, Phase 1 improvements will reduce the frequency of flooding in the lower portions of Area #1 due to storm sewer surcharging and excess overland flow from higher elevated areas. However, portable pumps will still be needed to pump water from behind the existing dikes during severe storms. Phase 2 will eliminate the need for portable pumps by providing a permanent pumping facility. Phases 3 and 4 will reduce the frequency of the Rahway River overflowing its banks and overtopping the existing dikes. Phase 5 will reduce the frequency of storm sewer flooding in Areas #2 and #3.

Phase 1 and Phase 2 have been designed and the Township has completed construction to implement these improvements. Phase 5, as described further below, will be the next Phase to be considered and further evaluated by the Township.





P:\283101\AutoCad\Phase 5\Figure 2.dwg 6/16/05 1:07 pm

2 Project Description

2.1 General

Phase 5 of the stormwater management and flood management program for the Township of Cranford includes construction of a permanent stormwater pump station. Four (4) alternative locations are discussed in this report. Refer to Figures 3A and 3B. Phase 5 also considers an express sewer along Brookside Place and Penn Road within flood problem Area #2. Refer to Figure 4. Planning also includes a collector storm sewer system in the vicinity of Balmiere Parkway, Crescent Place and Park Drive. Refer to Figure 5.

There is an existing dike on the west bank of the Rahway River along most of the length of Park Drive, Balmiere Parkway and Crescent Place. Stormwater is discharged from local systems at several locations along the length of the dike. However, when the river level reaches the elevations of the low areas in the local streets, water is unable to drain by gravity to the river and starts ponding in these residential areas adjacent to the river. Also, these low-lying areas, unable to discharge to the river, continue to receive significant volumes of stormwater runoff from the higher portions of Areas #2 and #3. Under existing conditions, the only storm sewer system to provide relief to the low-lying areas is a detention pond (Fable's Pond) and an express sewer in the vicinity of Union County College campus. This system currently collects runoff from an area northwest of Area #2 and discharges via a large express sewer directly to Nomahegan Park. After a thorough analysis of this system, it was determined that the system has a maximum capacity for the 50-year design storm and cannot be utilized for additional stormwater relief without major reconstruction.

The Phase 5 project will connect the several independent storm sewers in Areas #2 and #3 that discharge to the river and will convey the flow to a proposed pump station. Water will be discharged by gravity outlets until the river water level rises to an elevation that inhibits gravity discharge. The permanent stormwater pumps will then start at preset elevations, initially with one pump operating and then with additional pumps coming on line as the water level continues to rise, depending on the river level and interior drainage flow as the storm progresses. The proposed express sewer in Phase 5 will reduce the quantity of water that must be pumped during a given storm (by virtue of the express storm sewer serving the higher areas).

2.2 Pump Station

The Phase 5 pump station will be located in the general vicinity of either Park Drive or Balmiere Parkway. This analysis evaluates four alternative locations. The pump station will have a maximum design capacity of approximately 120 cubic feet per second (cfs).

Approximately 70 cfs will be provided to serve Area #2, and an additional 50 cfs to include Area #3, with one backup pump in case of failure of one of the other pumps. However, during extreme events, all the pumps will be able to operate concurrently and serve the combined needs of Areas #2 and #3. The pump station will also include smaller pumps for dewatering the wet well and a trash rack at the inlet to the station.

The station will operate on commercial electrical power with backup power provided by a standby generator. During final design, further consideration could be given to having a portable generator.

Current planning is for the station to be located on one of four residential lots known as Alternatives A, B, C and D. Refer to Figure 3A and 3B. For each alternative, discharge lines from the pump station would cross Park Drive and/or the existing dike, and discharge at a proposed headwall with a riprap splash pad adjacent to Nomahegan Park or directly to the Rahway River. The inlets to the pump stations would be from the existing brook between Springfield Avenue and Park Drive and the collector sewer along Crescent Place and Balmiere Parkway for all four alternatives.

2.2.1 Alternative A

Under this Alternative, the pump station would reside on Block 197 Lot 9 adjacent to the existing College Brook tributary to the pond in Nomahegan Park. The discharge force mains would run parallel to College Brook, cross Park Drive and ultimately discharge into Nomahegan Park through a proposed headwall that would replace an existing culvert under Park Drive. The advantage of this location is that it is adjacent to the brook that would serve as the inlet to the pump station and it would reside within 200 feet from the proposed outlet structure. This will keep construction costs down due to the reduced length of force mains required for the pump station.

The downside of this location is it will be difficult and costly to connect the collector storm sewers from Balmiere Parkway into the pump station. Also, this location appears to be located within the floodway and flood hazard area of the College Brook and the Rahway River. The floodway will need to be delineated based on an appropriate hydrologic and hydraulic study. The approximate limits of the 100-year flood plain are shown on the NJDEP delineated Flood Hazard Area map for the Rahway River. Accordingly, it appears that the proposed location more likely will be within the floodway. If this is the case, the effort to obtain a Flood Hazard Area Permit will be extensive as any construction within the floodway is a prohibitive use. A waiver of this rule may not be granted in the presence of other alternatives. This will also increase the costs of the permitting process and impose restrictions in construction. Also, at this location, it will be difficult and costly to connect the collector storm sewers from Balmiere Parkway into the pump station.

2.2.2 Alternative B

This location, Block 151 Lot 14, is situated on an existing farm adjacent to Springfield Avenue and College Brook. The discharge force mains would cross Springfield Avenue, continue parallel to College Brook, cross Park Drive and ultimately discharge into Nomahegan Park similar to Alternative A above. Although there is sufficient area with immediate access to construct the pump station, the site would be located approximately 500 feet upstream from the proposed outlet structure. This would increase the costs for the pump station due to the increased length of pipe and easements that would be required to construct the force mains. This alternative may require additional measures, such as lowering the bottom elevation of College Brook near Springfield Avenue, to assure that the low areas of Area #2 drain to the inlet of the pump station. Also, at this location, it may be difficult or impossible to connect the

collector storm sewers under Alternative 2 from Balmiere Parkway into the pump station.

Similar to Alternative A above, it appears that the pump station may reside in the floodway of College Brook. According to the NJDEP delineated Flood Hazard Area map for the Rahway River, the limit of the study ends just downstream of Springfield Avenue where the pump station would reside. Although there is sufficient area to relocate the pump station outside the floodway, the floodway would still need to be delineated based on an appropriate hydrologic and hydraulic study. This would increase the costs and the amount of work required for the permitting process.

2.2.3 Alternative C

Under this Alternative, the pump station would reside on Block 198 Lot 7 adjacent to Romore Place. The pump station would be approximately 250 feet east of College Brook and would require an inlet structure and piping to convey water from the brook to the pump station. The inlet pipes would travel along Park Drive, Romore Place and ultimately to the pump station. The outlet force mains would parallel back to the brook and discharging to the proposed outlet structure at Nomahegan Park. This alternative is similar to Alternative A except that it is situated outside the floodway and would require more linear footage of piping to the inlet and outlet structures. Also, like Alternative A, it will be difficult and costly to connect the collector storm sewers from Balmiere Parkway into the pump station. Since the pump station only resides in the 100-flood plain and not the floodway, the work involved in obtaining the permits would be less than Alternatives A and B.

2.2.4 Alternative D

This location, Block 199 Lot 54, is situated on residential property adjacent to Balmiere Parkway and near the Rahway River. Refer to Figure 3B. This alternative would not use the proposed outfall under Alternative A, B and C. Instead, it would have a proposed outfall directly into the Rahway River just upstream of the Balmeire Parkway footbridge and in the general vicinity of the proposed pump station. With this alternative, the inlet piping would be approximately 1500 feet in length from College Brook and Park Drive area and 900 feet in length from Crescent Place and Balmeire Parkway area. The inlet pipe from the College Brook area would begin at College Brook, continue along Park Drive and ultimately to the proposed pump station. The inlet pipe from the Crescent Place area would begin at Crescent Place and continue towards Balmeire Parkway and ultimately to the proposed pump station.

What is unique with this alternative is its close proximity to the proposed collector system on Balmiere Parkway. However, the downside of this location is it may be difficult and costly to connect the collector storm sewers from Park Drive into the pump station. Obtaining NJDEP permits would be similar to Alternative C as the proposed pump station only resides in the 100-flood plain and not the floodway.

**Township of Cranford
Northeast Quadrant Stormwater Management Program - Phase 5
Stormwater Pumping Station - Preliminary Alternatives Analysis**

TABLE 1 - Pump Station Alternatives

Feature	Alternative A	Alternative B	Alternative C	Alternative D
Location	Block 197, Lot 9	Block 151, Lot 14	Block 198, Lot 7	Block 199, Lot 54
Description	PS to be located at the east end of the residential lot adjacent to College Brook at Park Dr.	PS to be located at the northeast corner of the property (farm land) adjacent to College Brook at Springfield Ave.	PS to be located at the northwest corner of the residential lot.	PS to be located at the southeast corner of the residential lot adjacent to Balmeire Pkwy.
Influent from:	College Brook at Park Dr. and collector system from Balmiere Pkwy.	College Brook at Springfield Ave. and collector system from Balmiere Pkwy.	College Brook at Park Dr. and collector system from Balmiere Pkwy.	College Brook at Park Dr. and collector system from Balmiere Pkwy.
Discharge to river via:	Via Park Dr.	Via Springfield Ave. & Park Dr.	Via Romore Pl. & Park Dr.	Via Balmeire Pkwy. area.
Permit Issues:				
Flood Hazard Area	Major permit for work in flood plain and floodway	Major permit for work in flood plain	Major permit for work in flood plain	Major permit for work in flood plain
Wetlands:	General Permit	General Permit	General Permit	General Permit
Transition Areas:	General Permit	General Permit	General Permit	General Permit
Wetland mitigation required?	No	No	No	No
Green Acres:	PS not in Green Acres, pipelines not objectionable	PS not in Green Acres, pipelines not objectionable	PS not in Green Acres, pipelines not objectionable	PS not in Green Acres, pipelines not objectionable
Green Acres Mitigation required	Yes-for outfall	Yes-for outfall	Yes-for outfall	Yes-for outfall
Difficulty in obtaining permits	High will need hardship wavier with alt analysis	Medium Needs to be evaluated. Floodway will need to be delineated at this location	Low	Low
Land Costs:				
Primary site*	Est. \$60,000	Est. \$75,000	Est. \$40,000	Est. \$115,000
Green Acres replacement at 2:1 ratio*	0.05 ac x 2 = 0.1ac Est. \$75,000	0.05 ac x 2 = 0.1ac Est. \$75,000	0.11 ac x 2 = 0.22ac Est. \$165,000	0.05 ac x 2 = 0.1ac Est. \$75,000
Wetlands mitigation*	None	None	None	None
Total Land Cost:	Est. \$135,000	Est. \$150,000	Est. \$205,000	Est. \$190,000
Approximate Construction Cost:	Est. \$4,825,000	Est. \$4,900,000	Est. \$4,900,000	Est. \$4,780,000
Cost Order:	Least (\$4,960,000)	3rd (\$5,050,000)	4th (\$5,105,000)	2nd (\$4,970,000)
Timing	Will not be granted if there is a feasible alternative	Will require additional preparation to delineate the floodway	General permits require less preparation & review time	Similar to Alt C

* Replacement land cost estimated at \$750,000 per acre.

2.3 Express Sewer

The Phase 5 express sewer system would begin at the intersection of Beech Street and Brookside Place as a 48-inch diameter reinforced concrete pipe. The express sewer system would continue northeast along Brookside Place for approximately 500 feet before turning northwest onto Harvard Road. The system would continue along Harvard Road for an additional 500 feet before turning northeast onto Penn Road. The system would continue along Penn Road for approximately 950 feet to the intersection of Penn Road and Springfield Avenue. At this point, the express system would change to a 54-inch diameter reinforced concrete pipe and continue along Springfield Avenue for approximately 330 feet before connecting into an existing 66-inch diameter express sewer and ultimately discharging to an existing outfall in Nomahegan Park. Refer to Figure 4. The proposed express sewer system would be capable of conveying a 50-year storm flow of approximately 60 cubic feet per second from the higher elevated region of Area #2 directly to the Rahway River in Nomahegan Park. This will prevent significant volumes of stormwater runoff from flooding the low-lying portions of Areas #2 and #3 and considerably reduce the required capacity of the pump station for the lower regions of these areas.

Construction of the express sewer would not require any easements from Green Acres or local residents. Only a Flood Hazard Area Individual Permit and Fresh Water Wetlands General Permit would be required for tying into the existing outfall at Nomahegan Park. Since a portion of the express sewer alignment will be on Springfield Avenue, a major thoroughfare, any major utilities and traffic control measures would be evaluated during the final design phase.

2.4 Collector Storm Sewers

Under existing conditions, local storm sewers discharge to the Rahway River at several locations along Park Drive, Balmiere Parkway, Crescent Place and general vicinity. Local discharge sewers along Balmiere Parkway, Crescent Place, Park Drive and vicinity will be connected to a proposed collector sewer that will run adjacent along the existing dike alignment from the south and along Park Drive from the north. Refer to Figure 5. The collector sewers will connect to the proposed Phase 5 pump station at one of the four alternative pump station locations. The local discharges will continue to discharge to the river by gravity when river levels permit. When the river levels are high, water will be conveyed to the pump station when gravity discharge is inhibited. Each of the gravity outlets have or will be fitted with back flow prevention devices to keep the river water out of the storm sewer system. As indicated above, when the water level in the storm sewer system reaches predetermined levels, the pumps in the proposed Phase 5 pump station will be activated.

Currently there are sections along the west bank of the Rahway River within Area #3 that do not have any dikes. Without dikes, the level of protection provided by the proposed collector sewers would be reduced. Therefore, construction of the collector sewers without modifications to portions of the dike may not be practical.

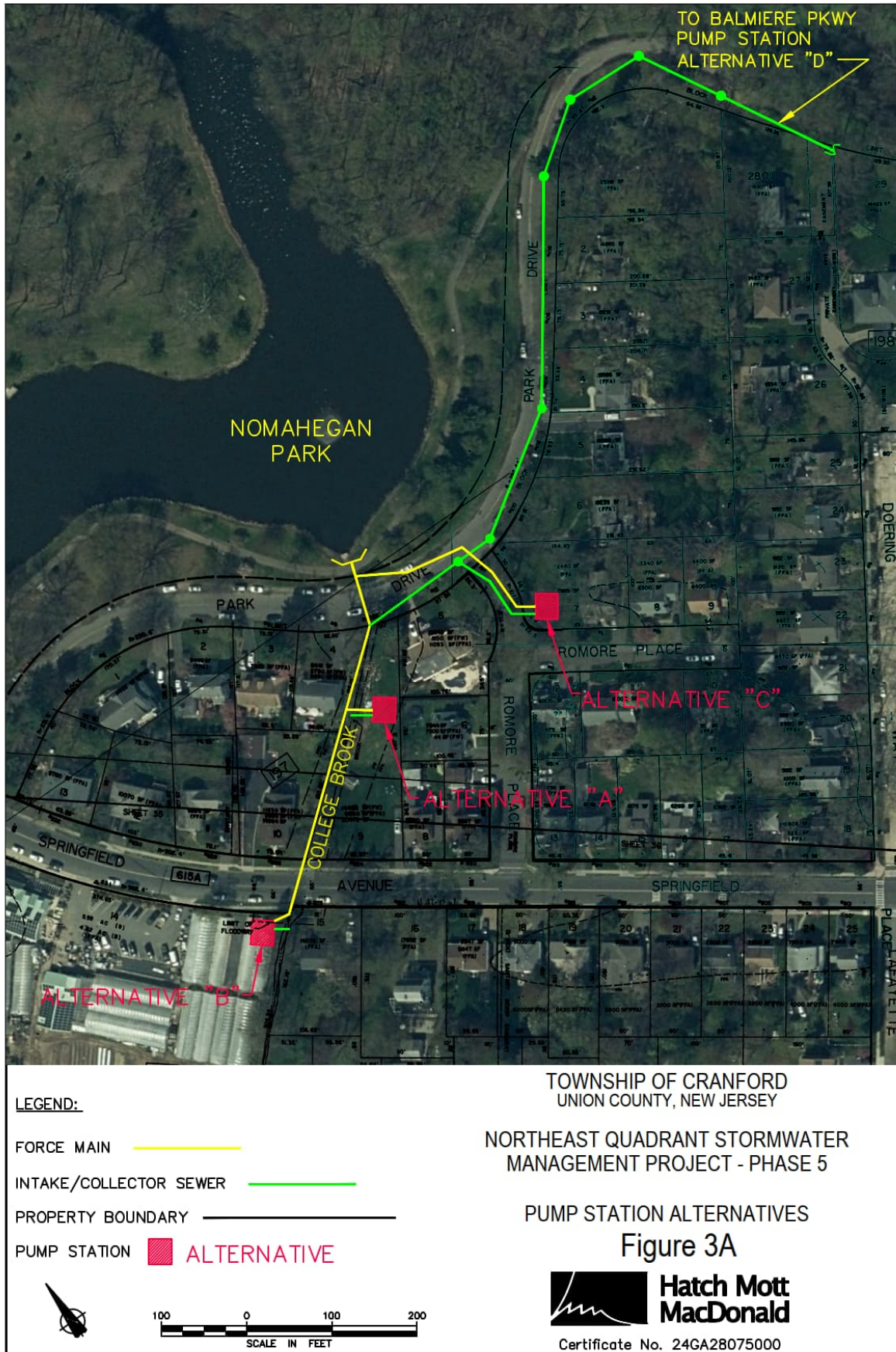
There are two alternatives for the proposed collector sewer systems depending on the proposed location of the Phase 5 pump station. The alternatives are as follows:

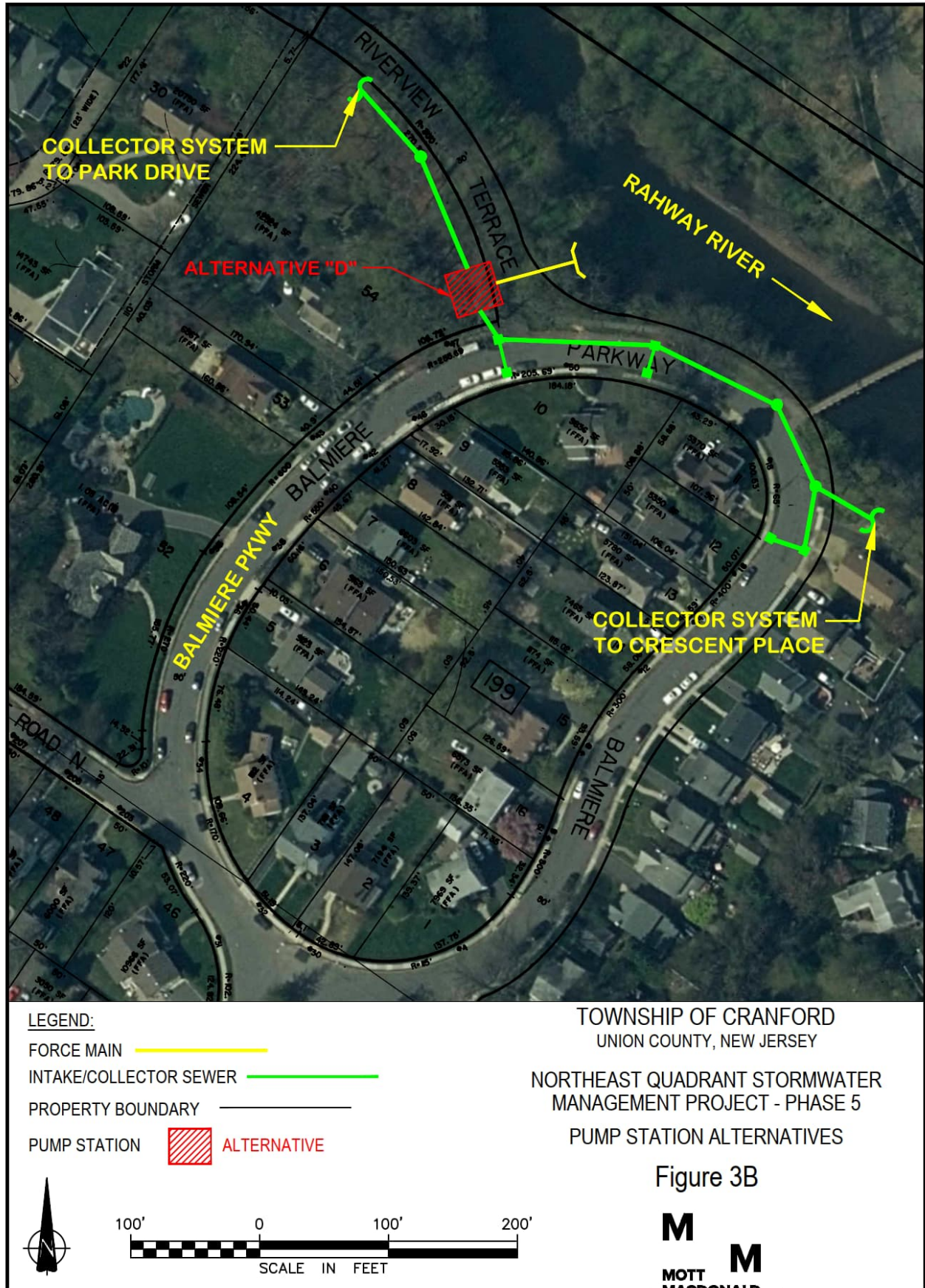
2.4.1 Alternative 1

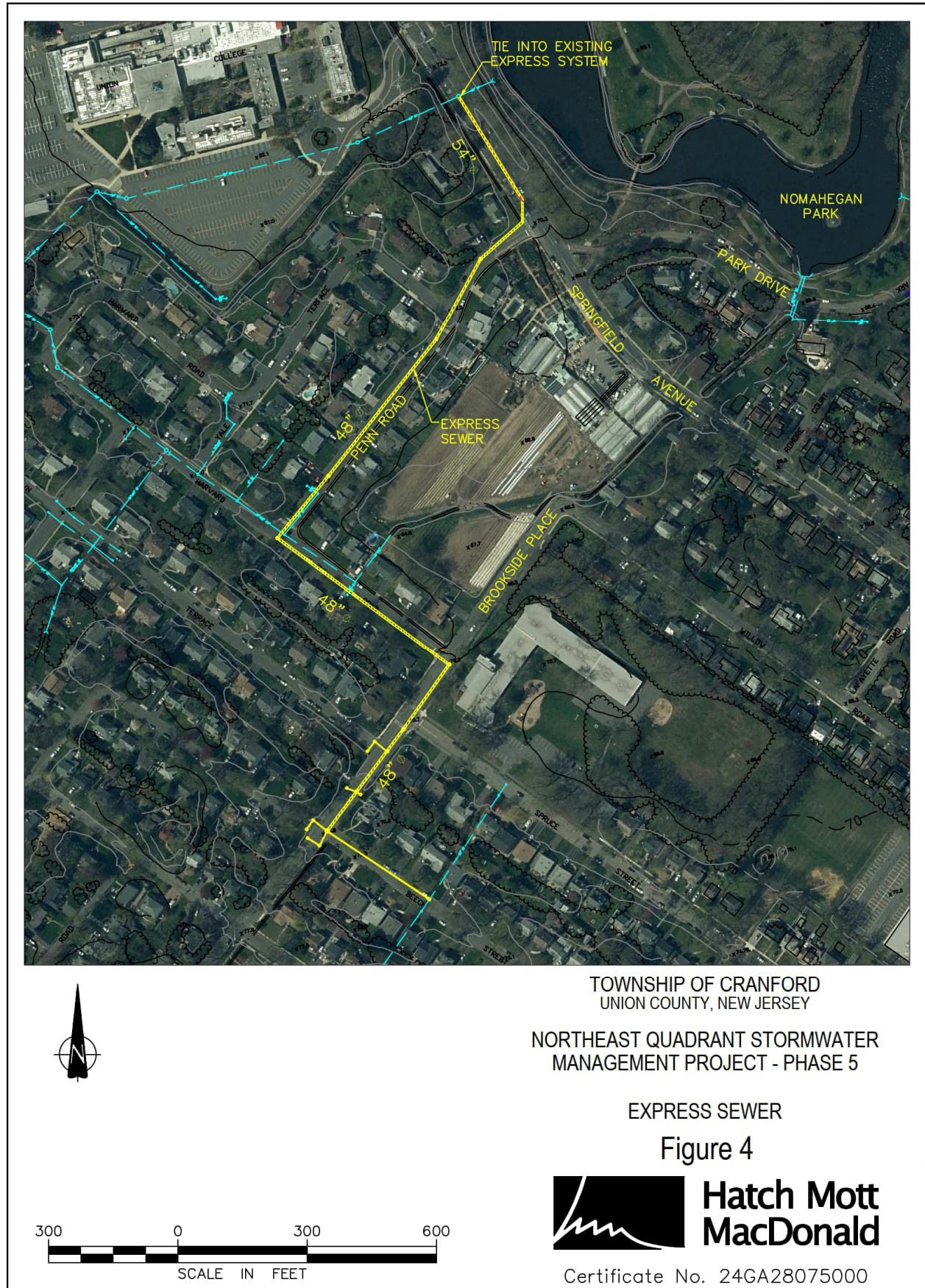
The collector sewer system for this alternative will serve pump station locations A, B and C. The collector sewer will follow the alignment of the existing dike. Pipe sizes of the collector system will range from 36-inch diameter to 54-inch diameter and will start from Crescent Place and extend to the vicinity of Remore Place and Park Drive where it would tie into one of the three pump station locations. Refer to Figure 5.

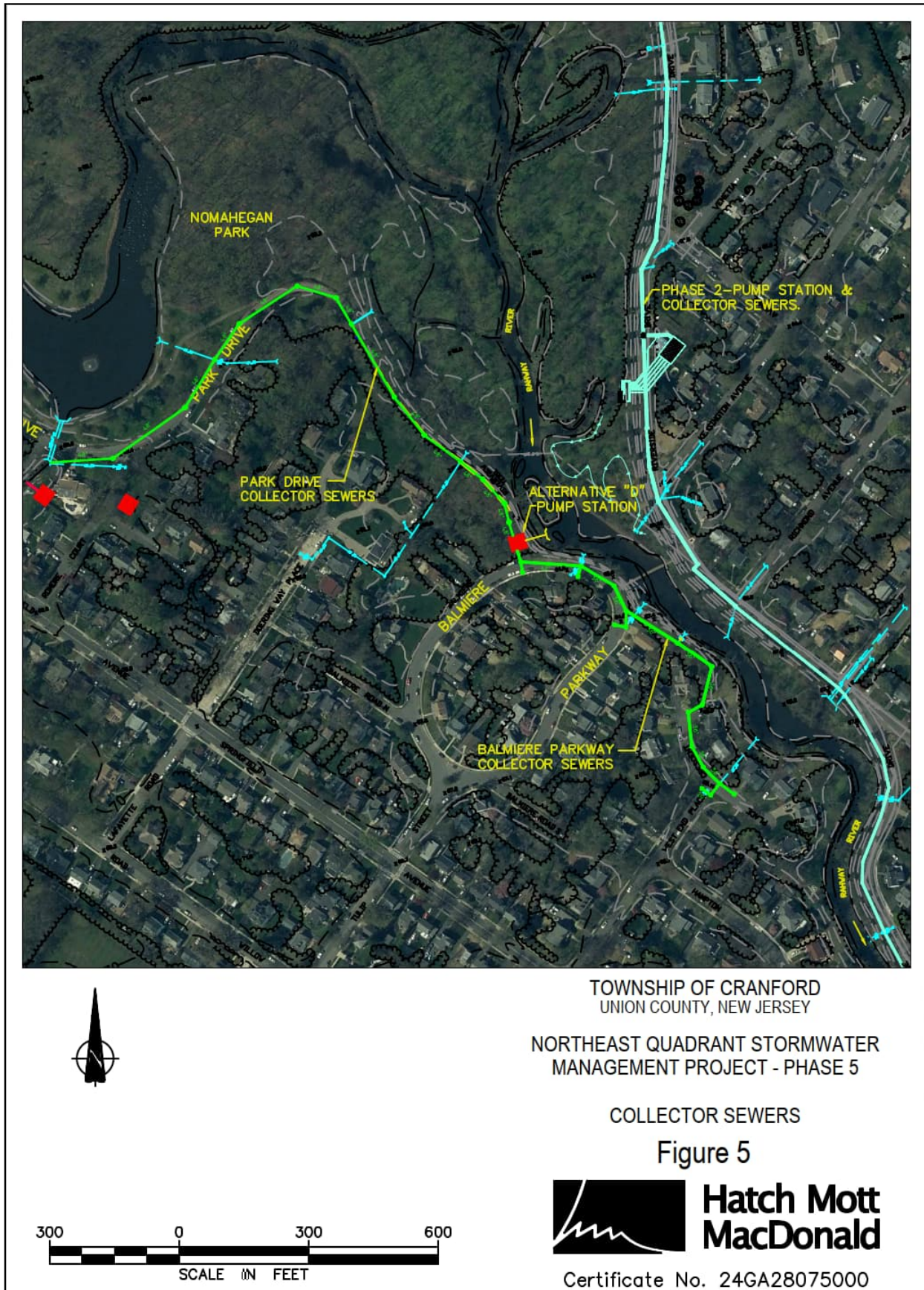
2.4.2 Alternative 2

The collector sewer system for this alternative will be similar in alignment to Alternative 1 above except that it will connect to the proposed pump station on Block 199, Lot 54 as described under Alternative D above. The collector system will extend approximately 800 feet south along Crescent Place and Balmiere Parkway and approximately 1,500 feet north along the existing dike and Park Drive. Pipe sizes of the collector system will range from 36-inch diameter to 48-inch diameter. This Alternative 2 is specific with pump station Alternative D. Refer to Figure 5.









3 Preliminary Estimated Construction Costs

The preliminary estimated construction costs for the various alternatives presented above are listed in Table 2 on the following page. Note that the costs are preliminary estimates and serve to provide a basis for the relative evaluation of the alternative for project selection only. The actual capital improvement costs will be dependent on other factors such as additional engineering and administrative costs, land easement costs and major utility conflicts which are beyond the scope of this investigation and would be determined at the time of final design.

**Township of Cranford
Northeast Quadrant Stormwater Management Project - Phase 5**

TABLE 2 - Preliminary Estimated Construction Costs

PROJECT WORK	DESCRIPTION	PRELIMINARY ESTIMATED CONSTRUCTION COST
Pump Station Alternative A	The pump station (PS) is to be located at the east end of Block 197, Lot 9 adjacent to the brook near Park Dr. PS will have a 120 cfs capacity and will serve Area #2 and Area #3.	\$5,295,000
Pump Station Alternative B	The pump station is to be located at the northeast corner of Block 151, Lot 14 (farmland) adjacent to the brook near Springfield Ave. PS will have a 120 cfs capacity and will serve Area #2 and Area #3.	\$5,389,000
Pump Station Alternative C	The pump station is to be located at the northwest corner of Block 198, Lot 7 adjacent to Romore Court. PS will have a 120 cfs capacity and will serve Area #2 and Area #3.	\$5,389,000
Pump Station Alternative D	The pump station is to be located at the southeast corner of Block 199, Lot 54 adjacent to Balmiere Parkway and will have a 120 cfs capacity and will serve Area #2 and Area #3.	\$5,248,000
Express Sewer	Express sewer alignment will be along Brookside Pl., Harvard Rd, Penn Rd. & Springfield Ave. Pipe size will range from 15" dia. To 54" dia.	\$1,709,000
Collector Sewer Alternative 1	The collector sewer system for Alternative 1 will serve pump station locations A, B and C. Pipe sizes of the collector system will range from 36-inch diameter to 54-inch diameter and will start from Crescent Place and extend to the vicinity of Remore Place and Park Drive.	\$1,723,000
Collector Sewer Alternative 2	The collector sewer system for Alternative 2 will serve pump station location D. The collector system will extend approximately 800 feet south along Crescent Place and Balmiere Parkway and approximately 1,500 feet north along the existing dike and Park Drive. Pipe sizes of the collector system will range from 36-inch diameter to 48-inch diameter.	\$1,606,000
TOTAL A		\$8,727,000
TOTAL B		\$8,821,000
TOTAL C		\$8,821,000
TOTAL D		\$8,563,000

Notes: 1) All preliminary estimated construction costs have a 10% contingency

2) Estimates do not include costs associated with acquisition of easements.

4 Summary

Mott MacDonald has completed an investigation of storm drainage problems in flood problem Areas #2 and #3 described above. These investigations have included site visits, review of topographic maps, aerial photographs and readily available utility plans, development of estimated flows for the various drainage areas, evaluation of the capacity of the existing storm sewer systems and development of Alternatives for storm drainage improvements.

The investigation indicated that flooding at the low areas of Balmiere Parkway, Park Drive and general vicinity is affected by overflow from upstream areas and a high water surface elevation at the river. Thus, implementation of all the recommended improvements above will ultimately benefit the low-lying areas west of the Rahway River.

Suggested improvements have been described for each of the identified problem areas, as summarized below:

Park Drive area pump station – Consideration of three (3) alternatives. Alternatives A, B and C provide flood relief for the low-lying areas of flood problem Area #2 and Area #3 with the inclusion of a collector sewer system extending to Balmiere Parkway and vicinity. The pump station will have a capacity of approximately 120 cubic feet per second which will provide a level of protection for approximately the 50-year storm event.

The Balmeire Parkway pump station – Consideration of one pump station (1) alternative. Alternatives D will provide flood relief for the low-lying areas of flood problem Area #3 and Area #2 with the inclusion of a collector sewer system extending to Park Drive and vicinity. The pump station will have a capacity of approximately 120 cubic feet per second which will provide a level of protection for approximately the 50-year storm event.

Penn Road express sewer – Construction of the express sewer will convey a 50-year storm flow of approximately 60 cubic feet per second from the higher elevated region of Area #2 directly to the Rahway River in Nomahegan Park. This will significantly reduce stormwater runoff from the upper portions of drainage Area #2 from flooding the low-lying portions of Areas #2 and #3. Also construction of the express sewer will considerably reduce the required capacity of the pump station for the lower regions of these areas.

Balmiere Parkway and Parkway Drive collector storm sewers – Consideration of two (2) alternatives. Alternative 1 is a collector system that will serve pump station alternatives A, B, and C and provides relief for the low-lying areas of Areas #2 and Area #3. This collector system will start from Crescent Place and extend to the vicinity of Remore Place and Park Drive where it would tie into the selected pump station. Alternative 2 is a collector system that will serve pump station alternatives D and provides relief for the low-lying areas of Areas #2 and Area #3. This collector system will extend approximately 800 feet south from the Alternative D pump station along

Balmiere Parkway and Crescent Place and extend approximately 1500 feet north from the Alternative D pump station along the existing dikes and Park Drives. In order for the proposed collector systems, Alternative 1 or 2, to provide a significant level of flood protection, modifications may need to be made to the inadequate dikes along the west bank of the Rahway River in the vicinity of Area #3. The estimated costs for the collector systems proposed in this report do not reflect any costs associated with any modifications to the existing dikes.

Preliminary estimated construction costs, as presented in Table 2 above, indicate that the total for each of the alternatives presented are within 5 percent or less of each other. This is exclusive of costs associated with legal and engineering as well as costs associated with the acquisition of easements. Also, these total estimates are based upon all the work being undertaken as one project. The proposed individual components of the Phase 5 project can be constructed in separate projects. The estimated construction costs for each individual component is also presented in Table 2 above. Whether constructed as one project or independently, each component will provide numerous benefits to the overall Northeast Quadrant Stormwater Management Project within the Township of Cranford.

Appendix A - Cost Estimates

PRELIMINARY ENGINEERS CONSTRUCTION COST ESTIMATE
for the
TOWNSHIP OF CRANFORD
UNION COUNTY, NEW JERSEY
NORTHEAST QUADRANT STORMWATER MANAGEMENT PROJECT
STORMWATER PUMPING STATION AND EXPRESS SEWER
IN THE VICINITY OF PARK DRIVE AND SPRINGFIELD AVENUE
PHASE 5 - ALTERNATIVE A - PUMP STATION

ITEM #	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	COST
ITEM 1	FOR MOBILIZATION	Lump Sum	1	\$150,000	\$150,000
ITEM 2	FOR SOIL EROSION AND SEDIMENT CONTROL MEASURE	Lump Sum	1	\$15,000	\$15,000
ITEM 3	FOR CLEARING SITE AND COORDINATION WITH UTILITY COMPANIES	Lump Sum	1	\$50,000	\$50,000
ITEM 4	FOR CONTROL OF WORK/CONSTRUCTION LAYOUT	Lump Sum	1	\$45,000	\$45,000
ITEM 5	FOR TEST PITS	CY	75	\$150	\$11,250
ITEM 6	FOR CONSTRUCTION OF REINFORCED CONCRETE STRUCTURES, COMPLETE				
Item 6a	For pump station chamber	EACH	1	\$2,450,000	\$2,450,000
Item 6b	For pump station outlet headwall	EACH	1	\$200,000	\$200,000
ITEM 7	FOR FURNISHING AND INSTALLING REINFORCED CONCRETE PIPE, COMPLETE				
Item 7a	For 36" Diameter RCP intake pipe	LF	100	\$425	\$42,500
ITEM 8	FOR PUMPING EQUIPMENT, COMPLETE	Lump Sum	1	\$1,850,000	\$1,850,000
TOTAL ESTIMATED CONSTRUCTION COST					<u>\$4,813,750</u>

PRELIMINARY ENGINEERS CONSTRUCTION COST ESTIMATE
for the
TOWNSHIP OF CRANFORD
UNION COUNTY, NEW JERSEY
NORTHEAST QUADRANT STORMWATER MANAGEMENT PROJECT
STORMWATER PUMPING STATION AND EXPRESS SEWER
IN THE VICINITY OF PARK DRIVE AND SPRINGFIELD AVENUE
PHASE 5 - ALTERNATIVE B - PUMP STATION

ITEM #	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	COST
ITEM 1	FOR MOBILIZATION	Lump Sum	1	\$150,000	\$150,000
ITEM 2	FOR SOIL EROSION AND SEDIMENT CONTROL MEASURES	Lump Sum	1	\$15,000	\$15,000
ITEM 3	FOR CLEARING SITE AND COORDINATION WITH UTILITY COMPANIES	Lump Sum	1	\$50,000	\$50,000
ITEM 4	FOR CONTROL OF WORK/CONSTRUCTION LAYOUT	Lump Sum	1	\$45,000	\$45,000
ITEM 5	FOR TEST PITS	CY	75	\$150	\$11,250
ITEM 6	FOR CONSTRUCTION OF REINFORCED CONCRETE STRUCTURES, COMPLETE				
Item 6a	For pump station chamber	EACH	1	\$2,450,000	\$2,450,000
Item 6b	For pump station outlet headwall	EACH	1	\$200,000	\$200,000
ITEM 7	FOR FURNISHING AND INSTALLING REINFORCED CONCRETE PIPE, COMPLETE				
Item 7a	For 36" Diameter RCP intake pipe	LF	300	\$425	\$127,500
ITEM 8	FOR PUMPING EQUIPMENT, COMPLETE	Lump Sum	1	\$1,850,000	\$1,850,000
TOTAL ESTIMATED CONSTRUCTION COST					<u>\$4,898,750</u>

PRELIMINARY ENGINEERS CONSTRUCTION COST ESTIMATE
for the
TOWNSHIP OF CRANFORD
UNION COUNTY, NEW JERSEY
NORTHEAST QUADRANT STORMWATER MANAGEMENT PROJECT
STORMWATER PUMPING STATION AND EXPRESS SEWER
IN THE VICINITY OF PARK DRIVE AND SPRINGFIELD AVENUE
PHASE 5 - ALTERNATIVE C - PUMP STATION

ITEM #	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	COST
ITEM 1	FOR MOBILIZATION	Lump Sum	1	\$150,000	\$150,000
ITEM 2	FOR SOIL EROSION AND SEDIMENT CONTROL MEASURES	Lump Sum	1	\$15,000	\$15,000
ITEM 3	FOR CLEARING SITE AND COORDINATION WITH UTILITY COMPANIES	Lump Sum	1	\$50,000	\$50,000
ITEM 4	FOR CONTROL OF WORK/CONSTRUCTION LAYOUT	Lump Sum	1	\$45,000	\$45,000
ITEM 5	FOR TEST PITS	CY	75	\$150	\$11,250
ITEM 6	FOR CONSTRUCTION OF REINFORCED CONCRETE STRUCTURES, COMPLETE				
Item 6a	For pump station chamber	EACH	1	\$2,450,000	\$2,450,000
Item 6b	For pump station outlet headwall	EACH	1	\$200,000	\$200,000
ITEM 7	FOR FURNISHING AND INSTALLING REINFORCED CONCRETE PIPE, COMPLETE				
Item 7a	For 36" Diameter RCP intake pipe	LF	300	\$425	\$127,500
ITEM 8	FOR PUMPING EQUIPMENT, COMPLETE	Lump Sum	1	\$1,850,000	\$1,850,000
TOTAL ESTIMATED CONSTRUCTION COST					<u>\$4,898,750</u>

PRELIMINARY ENGINEERS CONSTRUCTION COST ESTIMATE
for the
TOWNSHIP OF CRANFORD
UNION COUNTY, NEW JERSEY
NORTHEAST QUADRANT STORMWATER MANAGEMENT PROJECT
STORMWATER PUMPING STATION AND EXPRESS SEWER
IN THE VICINITY OF PARK DRIVE AND SPRINGFIELD AVENUE
PHASE 5 - ALTERNATIVE D - PUMP STATION

ITEM #	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	COST
ITEM 1	FOR MOBILIZATION	Lump Sum	1	\$150,000	\$150,000
ITEM 2	FOR SOIL EROSION AND SEDIMENT CONTROL MEASURES	Lump Sum	1	\$15,000	\$15,000
ITEM 3	FOR CLEARING SITE AND COORDINATION WITH UTILITY COMPANIES	Lump Sum	1	\$50,000	\$50,000
ITEM 4	FOR CONTROL OF WORK/CONSTRUCTION LAYOUT	Lump Sum	1	\$45,000	\$45,000
ITEM 5	FOR TEST PITS	CY	75	\$150	\$11,250
ITEM 6	FOR CONSTRUCTION OF REINFORCED CONCRETE STRUCTURES, COMPLETE				
Item 6a	For pump station chamber	EACH	1	\$2,450,000	\$2,450,000
Item 6b	For pump station outlet headwall	EACH	1	\$200,000	\$200,000
ITEM 7	FOR FURNISHING AND INSTALLING REINFORCED CONCRETE PIPE, COMPLETE				
Item 7a	For 36" Diameter RCP intake pipe	LF	0	\$425	\$0
ITEM 8	FOR PUMPING EQUIPMENT, COMPLETE	Lump Sum	1	\$1,850,000	\$1,850,000
TOTAL ESTIMATED CONSTRUCTION COST					<u>\$4,771,250</u>

PRELIMINARY ENGINEERS CONSTRUCTION COST ESTIMATE
for the
TOWNSHIP OF CRANFORD
UNION COUNTY, NEW JERSEY
NORTHEAST QUADRANT STORMWATER MANAGEMENT PROJECT
STORMWATER PUMPING STATION AND EXPRESS SEWER
IN THE VICINITY OF PARK DRIVE AND SPRINGFIELD AVENUE
PHASE 5 - EXPRESS SEWER

ITEM #	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	COST
ITEM 1	FOR MOBILIZATION	Lump Sum	1	\$90,000	\$90,000
ITEM 2	FOR SOIL EROSION AND SEDIMENT CONTROL MEASURES	Lump Sum	1	\$15,000	\$15,000
ITEM 3	FOR CONTROL OF WORK/CONSTRUCTION LAYOUT	Lump Sum	1	\$75,000	\$75,000
ITEM 4	FOR TEST PITS	CY	200	\$150	\$30,000
ITEM 5	FOR FURNISHING AND INSTALLING REINFORCED CONCRETE PIPE, COMPLETE				
Item 5a	For 15" Diameter RCP	LF	225	\$200	\$45,000
Item 5b	For 24" Diameter RCP	LF	285	\$275	\$78,375
Item 5c	For 48" Diameter RCP	LF	1930	\$450	\$868,500
Item 5d	For 54" Diameter RCP	LF	320	\$500	\$160,000
ITEM 6	FOR CONSTRUCTION OF STORM SEWER MANHOLES, COMPLETE				
Item 6a	For 6 foot diameter manholes	EACH	7	\$9,500	\$66,500
Item 6b	For 8 foot diameter manholes	EACH	4	\$15,000	\$60,000
ITEM 7	FOR CONSTRUCTION OF DRAIN INLETS, COMPLETE				
Item 7a	For Type B Drain Inlet	EACH	10	\$6,500	\$65,000
TOTAL ESTIMATED CONSTRUCTION COST					<u>\$1,553,375</u>

PRELIMINARY ENGINEERS CONSTRUCTION COST ESTIMATE
for the
TOWNSHIP OF CRANFORD
UNION COUNTY, NEW JERSEY
NORTHEAST QUADRANT STORMWATER MANAGEMENT PROJECT
STORMWATER PUMPING STATION AND EXPRESS SEWER
IN THE VICINITY OF PARK DRIVE AND SPRINGFIELD AVENUE
PHASE 5 - ALTERNATIVE 1 - COLLECTOR SEWER

ITEM #	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	COST
ITEM 1	FOR MOBILIZATION	Lump Sum	1	\$90,000	\$90,000
ITEM 2	FOR SOIL EROSION AND SEDIMENT CONTROL MEASURES	Lump Sum	1	\$20,000	\$20,000
ITEM 3	FOR CONTROL OF WORK/CONSTRUCTION LAYOUT	Lump Sum	1	\$50,000	\$50,000
ITEM 4	FOR FURNISHING AND INSTALLING REINFORCED CONCRETE PIPE, COMPLETE				
Item 4a	For 15" Diameter RCP	LF	200	\$200	\$40,000
Item 4b	For 36" Diameter RCP	LF	310	\$300	\$93,000
Item 4c	For 42" Diameter RCP	LF	210	\$400	\$84,000
Item 4d	For 48" Diameter RCP	LF	1650	\$450	\$742,500
Item 4e	For 54" Diameter RCP	LF	260	\$500	\$130,000
ITEM 5	FOR CONSTRUCTION OF STORM SEWER MANHOLES, COMPLETE				
Item 5a	For 5 foot diameter manhole	EACH	11	\$7,500	\$82,500
Item 5b	For 6 foot diameter manholes	EACH	13	\$9,500	\$123,500
ITEM 6	FOR CONSTRUCTION OF DRAIN INLETS, COMPLETE				
Item 6a	For Type B Drain Inlet	EACH	15	\$6,500	\$97,500
Item 6b	For Type E Drain Inlet	EACH	2	\$6,500	\$13,000
TOTAL ESTIMATED CONSTRUCTION COST					<u>\$1,566,000</u>

PRELIMINARY ENGINEERS CONSTRUCTION COST ESTIMATE
for the
TOWNSHIP OF CRANFORD
UNION COUNTY, NEW JERSEY
NORTHEAST QUADRANT STORMWATER MANAGEMENT PROJECT
STORMWATER PUMPING STATION AND EXPRESS SEWER
IN THE VICINITY OF PARK DRIVE AND SPRINGFIELD AVENUE
PHASE 5 - ALTERNATIVE 2 - COLLECTOR SEWER

ITEM #	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	COST
ITEM 1	FOR MOBILIZATION	Lump Sum	1	\$90,000	\$90,000
ITEM 2	FOR SOIL EROSION AND SEDIMENT CONTROL MEASURES	Lump Sum	1	\$20,000	\$20,000
ITEM 3	FOR CONTROL OF WORK/CONSTRUCTION LAYOUT	Lump Sum	1	\$50,000	\$50,000
ITEM 4	FOR FURNISHING AND INSTALLING REINFORCED CONCRETE PIPE, COMPLETE				
Item 4a	For 15" Diameter RCP	LF	200	\$200	\$40,000
Item 4b	For 36" Diameter RCP	LF	600	\$300	\$180,000
Item 4c	For 42" Diameter RCP	LF	210	\$400	\$84,000
Item 4d	For 48" Diameter RCP	LF	1510	\$450	\$679,500
ITEM 5	FOR CONSTRUCTION OF STORM SEWER MANHOLES, COMPLETE				
Item 5a	For 5 foot diameter manhole	EACH	11	\$7,500	\$82,500
Item 5b	For 6 foot diameter manholes	EACH	13	\$9,500	\$123,500
ITEM 6	FOR CONSTRUCTION OF DRAIN INLETS, COMPLETE				
Item 6a	For Type B Drain Inlet	EACH	15	\$6,500	\$97,500
Item 6b	For Type E Drain Inlet	EACH	2	\$6,500	\$13,000
TOTAL ESTIMATED CONSTRUCTION COST					<u>\$1,460,000</u>