SELECTION AND IMPLEMENTATION OF ALTERNATIVES FOR LONG TERM CONTROL PLANNING FOR COMBINED SEWER SYSTEMS - REGIONAL REPORT

Submitted on behalf of the following participating Permittees By the Passaic Valley Sewerage Commission:

Passaic Valley Sewerage Commission (NJ0021016)
City of Bayonne (NJ0109240)
Borough of East Newark (NJ0117846)
Town of Harrison (NJ0108871)
Jersey City Municipal Utilities Authority (JCMUA) (NJ0108723)
Town of Kearny (NJ0111244)
City of Newark (NJ0108758)
North Bergen Municipal Utilities Authority (NBMUA) (NJ0108898)
City of Paterson (NJ0108880)

Passaic Valley Sewerage Commission
Essex County
600 Wilson Avenue
Newark, New Jersey

"Protecting Public Health and the Environment"

October 2020

GREELEY AND HANSEN
CDM Smith

EXECUTIVE SUMMARY

ES-1 Purpose of report

This Passaic Valley Sewerage Commission (**PVSC**) and the entities who own and operate contributing combined sewer collection systems have jointly prepared this Long Term Control Plan (LTCP) plan for controlling Combined Sewer Overflows (CSOs) in the PVSC Treatment District. This Regional LTCP compiles the results of the nine individual Selection and Implementation of Alternative Reports (SIARs) into a regional CSO control alternative for the PVSC Treatment District.

ES-2 Background of PVSC system

PVSC serves 1.5 million people in 48 municipalities in parts of Bergen, Essex, Hudson, Passaic and Union counties. Eight of the municipalities in the treatment district have combined sewer systems (CSS). The CSS municipalities within the PVSC District include Bayonne, East Newark, Harrison, Jersey City, Kearny, Newark, North Bergen and Paterson.

The New Jersey Department of Environmental Protection (NJDEP) issued PVSC and the eight CSS municipalities with New Jersey Pollutant Discharge Elimination System (NJPDES) permits requiring the development of CSO LTCPs. The CSO LTCP will identify cost effective infrastructure improvements to reduce pollution from the CSO discharges. The permit also requires extensive community outreach and public participation during the development of the CSO LTCP including the creation of a Supplemental CSO Team.

This report constitutes the Regional LTCP encouraged by the Permits. The individual SIARs for each municipality and PVSC, included as **Appendices F** through **N** to this report, fulfill the SIAR submittal required under each Permit submittal schedule. To date, all required reports scheduled by the Permit have been submitted and approved by the New Jersey Department of Environmental Protection (NJDEP).

ES-3 Approach

The approach to the PVSC Regional LTCP was formed in accordance the municipalities' NJDPES Permits and the guidelines of the US EPA's CSO Policy. The CSO Policy establishes a framework for the coordination, planning, selection, and implementation of CSO controls required for Permittee compliance with the Clean Water Act (CWA). The CSO Policy describes three major steps in the overall LTCP approach: system characterization, development and evaluation of alternatives, and selection and implementation of controls.

The CSO Policy also states that "In addition to considering sensitive areas, the long-term control plan should adopt either the Presumption Approach or the Demonstration Approach." Each of the municipalities have selected the Presumption Approach. Under this approach, CSO controls are presumed to protect the water quality based requirements of the CWA if at least 85% of the combined sewage collected in the CSS during precipitation events is captured or treated, provided the permitting authority determines that such presumption is reasonable.

The proposed LTCP meets the presumptive 85% level of control, based on hydrologic and hydraulic (H&H) modeling of a typical year per EPA guidelines. 2004 was selected as the typical year based on analysis of a 46-year period from 1970 to 2015 as detailed in the Typical Hydrologic Year Report included in **Appendix B** of this report.

ES-4 Screening of CSO Control Technologies

In order to determine the appropriate CSO control technologies, a screening was completed to determine those technologies that have the greatest potential to meet the requirements of the NJPDES Permit. This screening did not consider cost, and only excluded CSO control technologies not technically or physically appropriate for the Permittees within the PVSC Treatment District. After screening, the following technologies were advanced for further consideration:

- STP Treatment Capacity Upgrade
- Disinfection
- Green Infrastructure (GI)
- Sewer Separation
- Storage Tanks
- Storage Tunnels
- Combination of the above technologies

The CSO Control Technologies screening process is further detailed in the PVSC Regional Development and Evaluation Alternatives Report (DEAR) for the PVSC Treatment District included in **Appendix D** and in Section D of this report.

ES-5 Development and Evaluation of CSO Control Alternatives

The development and evaluation of CSO control alternatives was based on several factors both monetary and non-monetary for future selection of the CSO control alternative that would constitute the final Long Term Control Plan. The factors used to evaluate the alternatives were as follows:

- Remaining Overflow Volume and Frequency
- Ability to Meet Water Quality Standards
- Siting/Land Availability
- Institutional Issues
- Public Receptiveness
- Cost

The Regional DEAR and Section E of this report provide further detail on the alternative development and evaluation process.

ES-6 Public Participation

During the development of the LTCP, the CSO municipalities within the PVSC Treatment District jointly conducted various public outreach activities in order to implement a process that actively involves the public, which includes communities within the PVSC Treatment District

and the Woodcliff-Guttenberg Service Area. The diverse set of public activities included creation of a Supplemental CSO team to serve "as an informal work group [to act] as a liaison between the general public and the decision makers for the Permittee," as required by NJPDES Permit Part IV.G.2.C. The Supplemental CSO Team comprises invited members of the impacted and interested public, such as rate payers, industrial users, residents in proximity of CSO, and residents who use and enjoy the downstream waters.

Other public measures included regular interest group meetings, direct solicitation for input from non-CSO Permittees, formation of a Model Evaluation Group (MEG), social media outreach, briefings for elected and appointed officials, and participation in water resource and utility management conferences.

ES-7 Recommended Long Term Control Plan

The Long Term Control Plan recommendations are based upon information and evaluations performed during the earlier phases of the planning process, including the characterization of the receiving waters, hydraulic and water quality modeling, screening of CSO control technologies, and development and evaluation of alternatives, public participation, and the nine minimum controls. Following completion of these permit requirements, the selection and implementation of alternatives for regional implementation took place and is further discussed in this report in Section H.

Since the submission of the Regional DEAR, PVSC and the eight other Permittees have conducted several meetings to discuss the decided upon two options for the recommended LTCP. The first is the Municipal Alternative, where each Permittee independently implements CSO control technologies to achieve no less than 85% capture by volume of wet weather flow within their geographic boundary's combined sewer system. Secondly, there is the Regional Alternative where the 85% capture criterion is achieved across the PVSC District as a combined effort of all the Permittees. Not all Permittees will reach 85% capture individually in the Regional Alternative, but the combination of CSO control technologies used across the entire region will meet this criterion. This alternative primarily consists of two major improvements: 1) construction of a parallel interceptor to the main interceptor, and 2) construction of a secondary bypass at the PVSC Water Resources Recover Facility ("WRRF") which increases wet weather flow treatment capacity to 720 MGD. These improvements will then be coupled with local CSO control technologies in order to constitute the entire Regional Alternative.

The SIARs developed by each of the Permittees (included as Appendices to this LTCP) discuss selection of alternatives to be implemented by each Permittee independently from the other CSO Communities, if the Municipal Alternative is selected by the individual Permittee (in lieu of the Regional Alternative). This report discusses selection of a Regional Alternative to be implemented at the regional level, and the adjustments of the CSO control technologies proposed in these SIARs. Section H of this report highlights the differences and similarities between the Municipal and Regional Alternative CSO control technologies selected.

Table ES-1 summarizes the alternative (either the Municipal Alternative or the Regional Alternative) that each Permittee has selected. For those Permittees that have selected the Regional Alternative, those Permittees are committing to working towards a negotiated cost

allocation/sharing Agreement for the Regional Alternative (prior to beginning the implementation of the Regional Alternative). If these cost allocation/sharing negotiations are not successful, each of these Permittees would then implement the Municipal Alternative as discussed in each of the Permittees' individual Selection and Implementation of Alternatives Reports included in **Appendices F** through **N**.

Table ES-1: Permittee Alternative Selection

Permittee	NJPDES #	Selected Alternative
Bayonne	NJ0109240	Regional
East Newark	NJ0117846	Regional
Harrison	NJ0108871	Regional
JCMUA	NJ0108723	Regional
Kearny	NJ0111244	Municipal
Newark	NJ0108758	Regional
NBMUA	NJ0108898	Regional
Paterson	NJ0108880	Regional

Table ES-2 summarizes the CSO control technologies to be implemented under the Regional Alternative CSO LTCP, for those Permittees that have selected the Regional Alternative. The CSO control technologies to be implemented under the Municipal Alternative, for those Permittees that have selected the Municipal Alternative, is shown in each Permittee's individual SIARs. Implementation of the Regional plan, or Regional Alternative, is subject to cost allocation agreements across the various Permittees. Should regional implementation not be feasible due to a cost allocation agreement not being achieved within a specified time frame, each permittee will implement the LTCP delineated in the individual SIARs, and referred to as the Municipal Alternative, upon NJDEP approval.

Additionally, each project will be optimized using adaptive management as the LTCP implementation proceeds. To that end, included in the plan is adaptive management, which provides an opportunity for PVSC and the Permittees to conduct post construction monitoring, after partially implementing strategic projects of the plan to re-assess the implementation schedule. These projects will be monitored to determine if they are operating as intended, and 85% percent capture is achieved. PVSC and the Permittees are committed to the projects necessary to achieve the goals set forth in the NJPDES Permit. However, if this post construction monitoring indicates a modification to the investment or actions are needed, those investments and actions will be evaluated, and an adaptive management plan, will be developed for review and approval by the NJDEP. If necessary, this adaptive management plan will also incorporate any new technologies or group similar projects to reduce costs, pending regulatory approval and other anticipated factors. Minimizing community impacts is one of the cornerstones and key benefits of the Regional Alternative; however, construction and implementation activities are anticipated to include some public and private impacts. Some re-purposing of public land will likely be required, as well as a need for rights of way, and potentially the acquisition of land now in private or public ownership.

Table ES-2: Regional PVSC Treatment District LTCP CSO Control Technologies

Permittee	CSO Control Technology	Quantity/Size	Unit
Bayonne	Storage Tank at BA001/002	10.5	MG
Bayonne	Storage Tank at BA007	3.2	MG
Bayonne	Storage Tank at BA021	2.0	MG
Bayonne	Forcemain Upgrade (pipe sizes increased to 36" Pipe)	6019	LF
Bayonne	Increased wastewater conveyance of wet-weather flows to PVSC for treatment to 27.8 MGD	10.2	MGD
East Newark	Sewer Separation	20.0	Acres
Harrison	Green Infrastructure Program (Fixed Investment)	750,000	$
Harrison	Sewer Separation at 004 (11 ac completed) and 005 (87.1 ac; 37.6 completed, 49.5 remaining)	49.5	Acres
Jersey City	I/I Source Control Piping Rehabilitation, 12"-96"	87,890	LF
Jersey City	Sewer Separation at Bates	28.9	Acres
Jersey City	Green Infrastructure for 7% impervious area	188.0	Acres
Jersey City	Storage Tank at JC001, JC002	6.2	MG
Jersey City	Storage Tank at JC003, JC004, JC005	7.1	MG
Kearny	Sewer Separation at Outfall KE010	34	Acres
Kearny	Sewer Separation at KE006	199	Acres
Newark	Regulator Modifications on Main Interceptor	N/A	N/A
Newark	Increasing Flow from South Interceptor through Peddie St. Regulator Modifications	N/A	N/A
Newark	Green Infrastructure	212.7	Acres
Newark	Water Conservation Program	N/A	N/A
NBMUA	Storage Tank at School (NB003)	5.0	MG
NBMUA	Closure of outfall NB014	N/A	N/A
NBMUA	Green infrastructure	1.0	Acres
Paterson	Sewer Separation Projects Completed Since 2006	47.5	Acres
Paterson	Planned Sewer Separation for PT023	29.8	Acres
Paterson	19th Ave. Relief Sewer for PT030	7706	LF
Paterson	Green Infrastructure for 2.5% Impervious Area	75.0	Acres
Paterson	15' Dia. 1600 LF Storage Tunnel at PT025, 85% Capture	2.1	MG
PVSC	PVSC WRRF Secondary Bypass to 720 MGD WWF	720.0	MGD
All	Parallel Interceptor to Main Interceptor	29296	LF

ES-8 Budgeting and Funding

The total capital cost associated with the Recommended Regional Alternative is $1,220 million, with an annual O&M cost projected at $3.55 million and total Life Cycle Cost of $1,274 million. PVSC will bear the $45 million capital cost for the PVSC WRRF secondary bypass alone, which reduces the total capital cost that must be allocated to $1,175 million. The specific cost allocation of these costs by municipality will need to be finalized during negotiations between participating Permittees. As discussed previously, the total costs borne by each municipality will be less than or equal to the Municipal Alternative for each Permittee as the capital cost for the Recommended Regional Alternative is approximately $545 million lower than the total cost for the Municipal Alternative. The negotiations between participating Permittees on how to allocate these cost savings and regional plan facilities is ongoing.

The financial impacts and Financial Capability Assessment associated with the Recommended Regional Plan for each Permittee cannot be finalized until the cost allocation negotiations associated with this plan are completed as this will dictate the share of the total $1,175 million capital cost each municipality will pay. It can be stated that the financial impacts of the Regional Plan will be less than or equal to that presented for the Municipal Plan for each Permittee given the significant cost savings available. The Financial Capability Assessment for each Permittee under the Municipal Plan is presented in the individual SIARs for each municipality appended to this report.

ES-9 Implementation Schedule

The following **Table ES-3** presents the proposed schedule and associated capital cost opinion for implementation of the Recommended Regional CSO LTCP. This schedule assumes that a regional cost-sharing approach is negotiated by the participating municipalities. The implementation schedule for those Permittees that have selected the Municipal Alternative is included in the individual SIAR of that respective Permittee. In addition to the capital improvements presented in **Table ES-3**, it is anticipated that negotiations for regional cost sharing between participating Permittees will span a 6-month period. The negotiations are not expected to affect the overall implementation schedule for the program as design and implementation of projects, particularly Green Infrastructure, sewer separation, and I/I reduction projects, common to both the Regional and Municipal Plans can proceed while negotiations are underway.

Table ES-3: Regional LTCP Implementation Schedule

Year[1]	Permittee	Milestone	Capital Cost ($M)
2021 - 2025	Bayonne	Increase Wet Weather Pump Station Capacity to 27.8 MGD	$12.0
	Bayonne	Force Main Upgrade	$23.0
	East Newark	Water Front Sewer Separation	$2.1
	Harrison	Green Infrastructure Program	$0.4
	Jersey City MUA	I/I Source Control Piping Rehabilitation	$36.8
	Jersey City MUA	Sewer Separation at Bates St.	$10.8
	Kearny	Sewer Separation for KE010	$10.2
	Newark	Regulator Modifications on Main Interceptor	$0.0
	North Bergen MUA	Storage Tank	$26.5
	Paterson	Planned Sewer Separation for PT023	$8.9
2026 - 2030	East Newark	Thread Mill Sewer Separation	$3.9
	Harrison	Green Infrastructure Program	$0.8
	North Bergen MUA	Closure of Outfall NB014	$0.1
	North Bergen MUA	Green Infrastructure	$0.4
	PVSC	WRRF Secondary Bypass to 720 MGD	$45.2
2031 - 2035	Newark	Green Infrastructure	$90.2
	All	Parallel Interceptor to Main Interceptor	$219.0
2036 - 2040	Bayonne	Storage Tank at BA007	$47.5
	Harrison	Sewer Separation at HR005	$15.3
	Jersey City MUA	Green Infrastructure	$92.1
	Jersey City MUA	Storage Tank for JC001/JC002	$104.8
	Newark	Increasing Flow from South Interceptor (Paddie St. Regulator Modifications)	$0.4
	Newark	Water Conservation Program	$1.5
	Paterson	19th Avenue Relief Sewer	$49.9
2041 - 2045	Bayonne	Storage Tank for BA021	$32.2
	Jersey City MUA	Storage Tank for JC003/JC004/JC005	$116.7
2046 - 2050	Bayonne	Storage Tank for BA001/BA002	$131.6
	Bayonne	Green Infrastructure Phases 1, 2, & 3	$15.6
	Kearny	Sewer Separation for KE006	$59.7
2051 - 2055	Paterson	Storage Tunnel	$33.7
2056 - 2060	Paterson	Green Infrastructure	$29.3

[1] Date ranges given refer to the anticipated periods of time that a project milestone will be placed into operation.

SECTION A - INTRODUCTION AND BACKGROUND

A.1 SUMMARY OF CHANGES

This is the Regional LTCP for PVSC and the entities who own and operate contributing combined sewer collection systems within the PVSC Treatment District. This LTCP compiles the results of the nine individual Selection and Implementation of Alternatives Reports for the PVSC Treatment District. In future versions of this report, this section will include summaries of changes and when they were incorporated as appropriate.

A.2 TITLE OF PLAN AND APPROVAL

Title: PVSC Regional Long Term Control Plan Report

Preparer:

Project Officer: _____ 9/25/2020
Michael J. Hope, PE, Greeley and Hansen LLC — Date

QA Officer: _____ 9/25/2020
Timothy J. Dupuis, PE, CDM Smith — Date

Passaic Valley Sewerage Commission:

PVSC
Program Manager: _____ 9/15/2020
Thomas Laustsen, PE, Chief Operating Officer, PVSC — Date

PVSC
QA Officer: Marques Eley 9/15/2020
Marques Eley, PE, Senior Engineer, PVSC — Date

New Jersey Department of Environmental Protection

DEP Permits: _____
Joseph Mannick, CSO Coordinator — Date

DEP QA: _____
Marc Ferko, Office of Quality Assurance — Date

Selection and Implementation of Alternatives Regional Report

Submitted by
Passaic Valley Sewerage Commission:

NJPDES Number NJ0021016 (Passaic Valley Sewerage Commission)

Approval of this submittal:

Permittee: _____ 9/25/2020

Thomas Laustsen, PE — Date
Chief Operating Officer, Passaic Valley Sewage Commission

NJPDES Certification:

Without prejudice to any objections timely made to permit conditions, I certify under penalty of law that this document and all attachments were prepared either: (a) under my direction or supervision; or (b) as part of a cooperative performed by members of the NJ CSO group effort in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for purposely, knowingly, recklessly, or negligently submitting false information

Permittee: _____ 9/25/2020

Thomas Laustsen, PE — Date
Chief Operating Officer, Passaic Valley Sewage Commission

Selection and Implementation of Alternatives Regional Report

Submitted on behalf of the following participating Permittee by Passaic Valley Sewerage Commission:

NJPDES Number NJ0109240 (Bayonne City)

Approval of this submittal:

Permittee: _____ 9.29.20

Timothy Boyle Date
Exec. Director, MUA, Bayonne City

NJPDES Certification:

Without prejudice to any objections timely made to permit conditions, I certify under penalty of law that this document and all attachments were prepared either: (a) under my direction or supervision; or (b) as part of a cooperative performed by members of the NJ CSO group effort in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for purposely, knowingly, recklessly, or negligently submitting false information

Permittee: _____ 9.29.20

Timothy Boyle Date
Exec. Director, MUA, Bayonne City

Selection and Implementation of Alternatives Regional Report

Submitted on behalf of the following participating Permittee by Passaic Valley Sewerage Commission:

NJPDES Number NJ0117486 (East Newark)

Approval of this submittal:

Permittee: _____ 9/25/20

Frank Pestana — Date
Licensed Operator, Borough of East Newark

NJPDES Certification:

Without prejudice to any objections timely made to permit conditions, I certify under penalty of law that this document and all attachments were prepared either: (a) under my direction or supervision; or (b) as part of a cooperative performed by members of the NJ CSO group effort in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for purposely, knowingly, recklessly, or negligently submitting false information

Permittee: _____ 9/25/20

Frank Pestana — Date
Licensed Operator, Borough of East Newark

Selection and implementation of Alternatives Regional Report

Submitted on behalf of the following participating Permittee by Passaic Valley Sewerage Commission:

NJPDES Number NJ0108871 (Harrison)

Approval of this submittal:

Permittee: _____ 9/15/2020

Rocco Russomano — Date
Town Engineer, Town of Harrison

NJPDES Certification:

Without prejudice to any objections timely made to permit conditions, I certify under penalty of law that this document and all attachments were prepared either: (a) under my direction or supervision; or (b) as part of a cooperative performed by members of the NJ CSO group effort in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for purposely, knowingly, recklessly, or negligently submitting false information

Permittee: _____ 9/15/2020

Rocco Russomano — Date
Town Engineer, Town of Harrison

Selection and Implementation of Alternatives Regional Report

Submitted on behalf of the following participating Permittee by Passaic Valley Sewerage Commission on behalf of the NJ CSO Group

NJPDES Number NJ0108723 (Jersey City MUA)

Approval of Report:

Permittee: Jose R. Cunha RJW 9/30/20

Jose R. Cunha — Date
Executive Director, Jersey City MUA

NJPDES Certification:

Without prejudice to any objections timely made to permit conditions, I certify under penalty of law that this document and all attachments were prepared either: (a) under my direction or supervision; or (b) as part of a cooperation performed by members of the NJ CSO group effort in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for purposely, knowingly, recklessly, or negligently submitting false information

Permittee: Jose R. Cunha RJW 9/30/20

Jose R. Cunha — Date
Executive Director, Jersey City MUA

Selection and Implementation of Alternatives Regional Report

Submitted on behalf of the following participating Permittee by Passaic Valley Sewerage Commission:

NJPDES Number NJ0111244 (Kearny)

Approval of this submittal:

Permittee: Michael J Neglia 9/29/2020

Michael J, Neglia, PE, PLS, CME — Date
Town Engineer, Town of Kearny

NJPDES Certification:

Without prejudice to any objections timely made to permit conditions, I certify under penalty of law that this document and all attachments were prepared either: (a) under my direction or supervision; or (b) as part of a cooperative performed by members of the NJ CSO group effort in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for purposely, knowingly, recklessly, or negligently submitting false information

Permittee: Michael J Neglia 9/29/2020

Michael J, Neglia, PE, PLS, CME — Date
Town Engineer, Town of Kearny

CERTIFICATION ADDENDUM: SUBMISSION OF THIS NJPDES CERTIFICATION ALSO INCLUDES THE ATTACHED RESOLUTION, ADOPTED BY THE KEARNY MAYOR AND COUNCIL AT THE SEPTEMBER 22, 2020 MAYOR AND COUNCIL MEETING. IN ADDITION, IT IS NOTED HERE FOR CLARITY THAT THE TOWN OF KEARNY, AT THIS TIME, WILL NOT BE PARTICIPATING IN THE REGIONAL SOLUTION. AS IS INDICATED IN THE TOWN OF KEARNY'S INDIVIDUAL SELECTION AND IMPLEMENTATION OF ALTERNATIVES REPORT, THE TOWN OF KEARNY WILL BE PURSING AN INDIVIDUAL MUNICIPAL ALTERNATIVE.

Meeting: 09/22/20 07:00 PM

Kearny Town Council
402 Kearny Avenue
Kearny, NJ 07032

ADOPTED

RESOLUTION 2020-436

DOC ID: 11795

Resolution Authorizing Neglia Engineering Associates to Submit a Long-Term Control Plan ("LTCP") Addressing Combined Sewer Overflows to the New Jersey Department of Environmental Protection ("NJDEP") on Behalf of the Town of Kearny.

WHEREAS, the Town of Kearny is a "Combined Sewer Overflow" (CSO) municipality; and

WHEREAS, all CSO municipalities are authorized to use CSOs by the United States Environmental Protection Agency ("USEPA") pursuant to its National Pollutant Discharge Elimination System permitting program; and

WHEREAS, it is the national policy of USEPA and the state policy of the New Jersey Department of Environmental Protection ("NJDEP") to reduce and/or completely eliminate the volume of wastewater that flows out of CSOs and into local waterbodies without any treatment; and

WHEREAS, in accordance with its national CSO policy, USEPA has required all permitted entities to create "long term control plans," pursuant to which each permitted entity must identify all actions that the entity will implement to achieve the goals and level of CSO control that USEPA sets forth in its national CSO policy; and

WHEREAS, in 2015, the NJDEP required all New Jersey CSO Municipalities to develop a CSO Long Term Control Plan ("LTCP") in order to comply with USEPA's national CSO policy, which must be submitted to USEPA and NJDEP for review and approval on October 1, 2020; and

WHEREAS, Neglia Engineering Associates was previously authorized to prepare the required LTCP to ensure that the Town of Kearny achieves the goals and level of CSO control that USEPA sets forth in its national CSO policy; and

WHEREAS, Neglia Engineering Associates has developed a LTCP which calls for sewer separation within portions of the Town, along with implementation of green infrastructure by way of ordinance revisions; and

WHEREAS, the cost of the aforementioned sewer separation, which will achieve the goals and level of CSO control that USEPA sets forth in its national CSO policy, is projected to cost $69,900,000.00, and would be completed over a period of thirty (30) years following approval of the LTCP; and

WHEREAS, the Town of Kearny previously passed a resolution calling on the Governor as well as the members of our United States Congressional Delegation to provide economic relief for the purpose of facilitating the implementation and construction of a LTCP for the control of the Town's combined sewer overflow points (Resolution 2020-406); and

Resolution 2020-436 Meeting of September 22, 2020

WHEREAS, the developed LTCP is subject to review and approval by NJDEP as well as USEPA; now, therefore, be it

RESOLVED, by the Mayor and Town Council of the Town of Kearny that the Mayor and Council be and is hereby authorized that Neglia Engineering Associates is permitted to submit the developed LTCP to NJDEP on October 1, 2020.

RESOLVED, that the Town Clerk shall publish notice of this resolution according to law.

NEA FILE: KEARMUN18.013

Michael Neglia
ADOPTED: September 22, 2020

I hereby certify that the foregoing resolution was adopted by the Council on **September 22, 2020**.

PATRICIA CARPENTER
TOWN CLERK

RESULT:	**ADOPTED [UNANIMOUS]**
MOVER:	Carol Jean Doyle, Council Member
SECONDER:	Alberto G. Santos, Mayor
AYES:	Doyle, McCurrie, Eckel, Cardoso, Konopka, DeCastro, Santana, Ficeto, Santos

SEP 28, 2020
Neglia Eng.

Selection and Implementation of Alternatives Regional Report

Submitted on behalf of the following participating Permittee by Passaic Valley Sewerage Commission:

NJPDES Number NJ0108758 (Newark)

Approval of this submittal:

Permittee: _____ 9/25/20

Ras J. Baraka — Date
Mayor, City of Newark

NJPDES Certification:

Without prejudice to any objections timely made to permit conditions, I certify under penalty of law that this document and all attachments were prepared either: (a) under my direction or supervision; or (b) as part of a cooperative performed by members of the NJ CSO group effort in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for purposely, knowingly, recklessly, or negligently submitting false information

Permittee: _____ 9/25/20

Ras J. Baraka — Date
Mayor, City of Newark

Selection and Implementation of Alternatives Regional Report

Submitted on behalf of the following participating Permittee by Passaic Valley Sewerage Commission:

NJPDES Number NJ0108988 (North Bergen Municipal Utilities Authority)

Approval of this submittal:

Permittee: _____ 9/25/20

Frank Pestana Date
Executive Director, North Bergen Municipal Utilities Authority

NJPDES Certification:

Without prejudice to any objections timely made to permit conditions, I certify under penalty of law that this document and all attachments were prepared either: (a) under my direction or supervision; or (b) as part of a cooperative performed by members of the NJ CSO group effort in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for purposely, knowingly, recklessly, or negligently submitting false information

Permittee: _____ 9/25/20

Frank Pestana Date
Executive Director, North Bergen Municipal Utilities Authority

Selection and Implementation of Alternatives Regional Report

Submitted on behalf of the following participating Permittee by Passaic Valley Sewerage Commission:

NJPDES Number NJ0108880 (Paterson)

Approval of this submittal:

Permittee: _____ 9/15/2020

William Rodriguez — Date
Director of Public Works, City of Paterson

NJPDES Certification:

Without prejudice to any objections timely made to permit conditions, I certify under penalty of law that this document and all attachments were prepared either: (a) under my direction or supervision; or (b) as part of a cooperative performed by members of the NJ CSO group effort in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for purposely, knowingly, recklessly, or negligently submitting false information

Permittee: _____ 9/15/20

William Rodriquez — Date
Director of Public Works, City of Paterson

A.3 DISTRIBUTION LIST

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Thomas Laustsen, PE, Chief Operating Officer
Patricia Lopes, Director of Process Control Engineering and Regulatory Compliance
Marques Eley, PE, Senior Engineer

Participating Permittees:

Bayonne:	Timothy Boyle, Superintendent of Public Works
East Newark:	Frank Pestana, Licensed Operator
Harrison:	Rocco Russomano, Town Engineer
Jersey City:	Rich Haytas, Senior Engineer
Kearny:	Michael J. Neglia, Town Engineer
Newark:	Ras J. Baraka, Mayor of Newark
North Bergen:	Frank Pestana, Executive Director
Paterson:	Manny Ojeda, Director of Public Works

New Jersey Department of Environmental Protection
Dwayne Kobesky, Surface Water Permitting
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A.5 INTRODUCTION AND BACKGROUND

The PVSC provides wastewater treatment service to 48 municipalities within Bergen, Hudson, Essex, Union and Passaic counties in the PVSC Treatment District located in Northeast New Jersey. In total, PVSC services approximately 1.5 million people, 198 significant industrial users and 5,000 commercial customers. The PVSC Treatment District covers approximately 150 square miles from Newark Bay to regions of the Passaic River Basin upstream of the Great Falls in Paterson. PVSC's main interceptor sewer begins at Prospect Street in Paterson and generally follows the alignment of the Passaic River to the PVSC Water Resource Recovery Facility ("WRRF") in the City of Newark. The WRRF receives flow from three sources: the Main Interceptor Sewer, the South Side Interceptor, and the Hudson County Force Main ("HCFM").

PVSC does not own or operate any of the CSO outfalls but has assumed a lead role in coordinating the Regional LTCP Report on behalf of the Permittees within the PVSC Treatment District. However, each of the eight individual CSO Permittees and PVSC have performed an analysis and prepared their own Selection and Implementation of Alternatives Reports ("SIARs"), which have been included as **Appendices F** through **N** of this report. The extent of the PVSC Treatment District and the combined sewer areas within the study area are illustrated in **Figure A-1**.

Eight of the municipalities within the PVSC Treatment District have combined sewer systems ("CSSs") and have received authorization to discharge under their respective NJPDES Permits for combined sewer management. The eight PVSC CSO Permittees are listed below:

- City of Paterson
- City of Newark
- Town of Kearny
- Town of Harrison
- Borough of East Newark
- City of Bayonne (Bayonne Municipal Utilities Authority was dissolved in 2016 and the City of Bayonne now owns the CSS)
- Jersey City Municipal Utilities Authority ("JCMUA")
- North Bergen Municipal Utilities Authority ("NBMUA")

A general flow schematic of the PVSC Treatment District is included in **Figure A-2**.

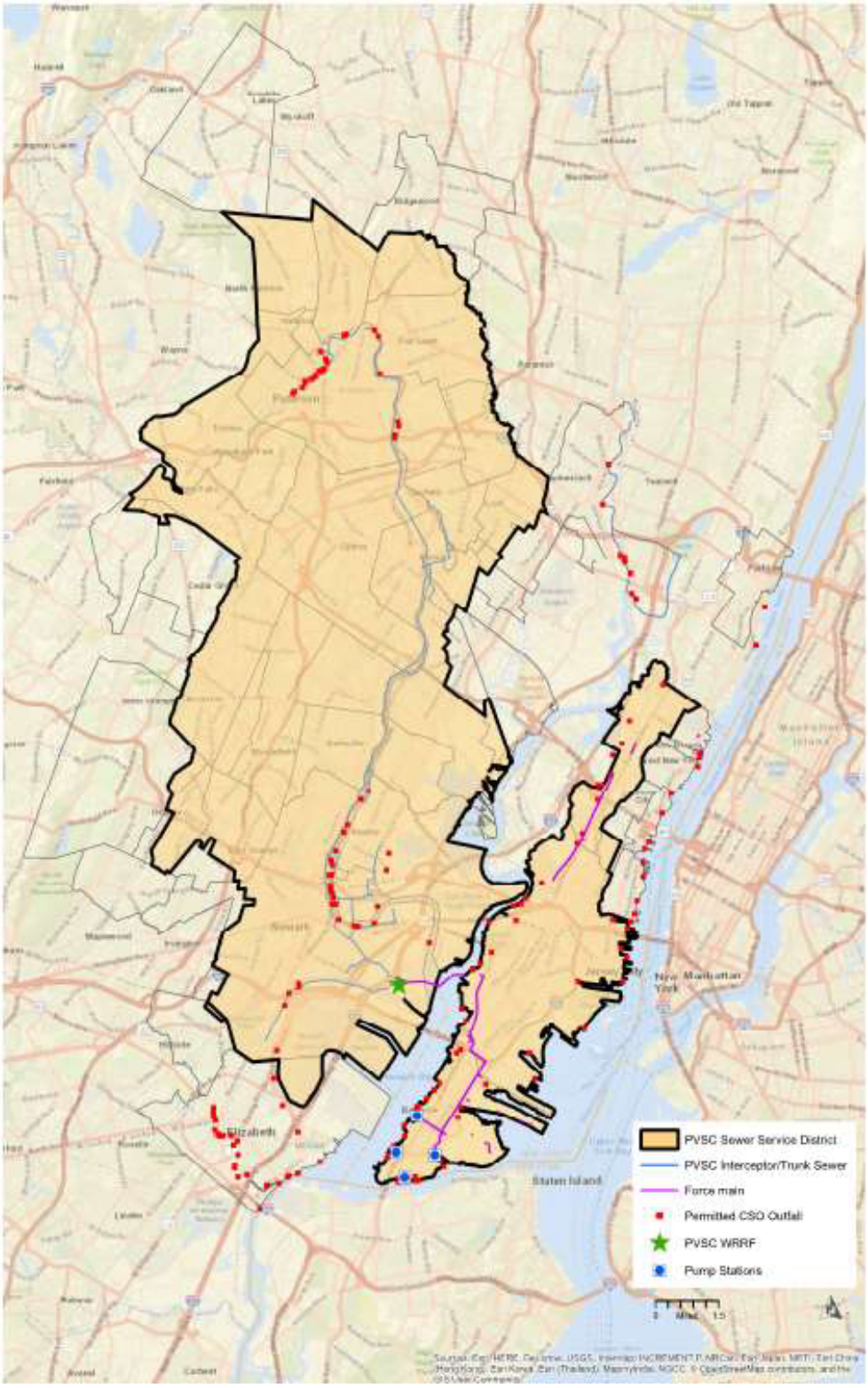

Figure A-1: The PVSC Treatment District

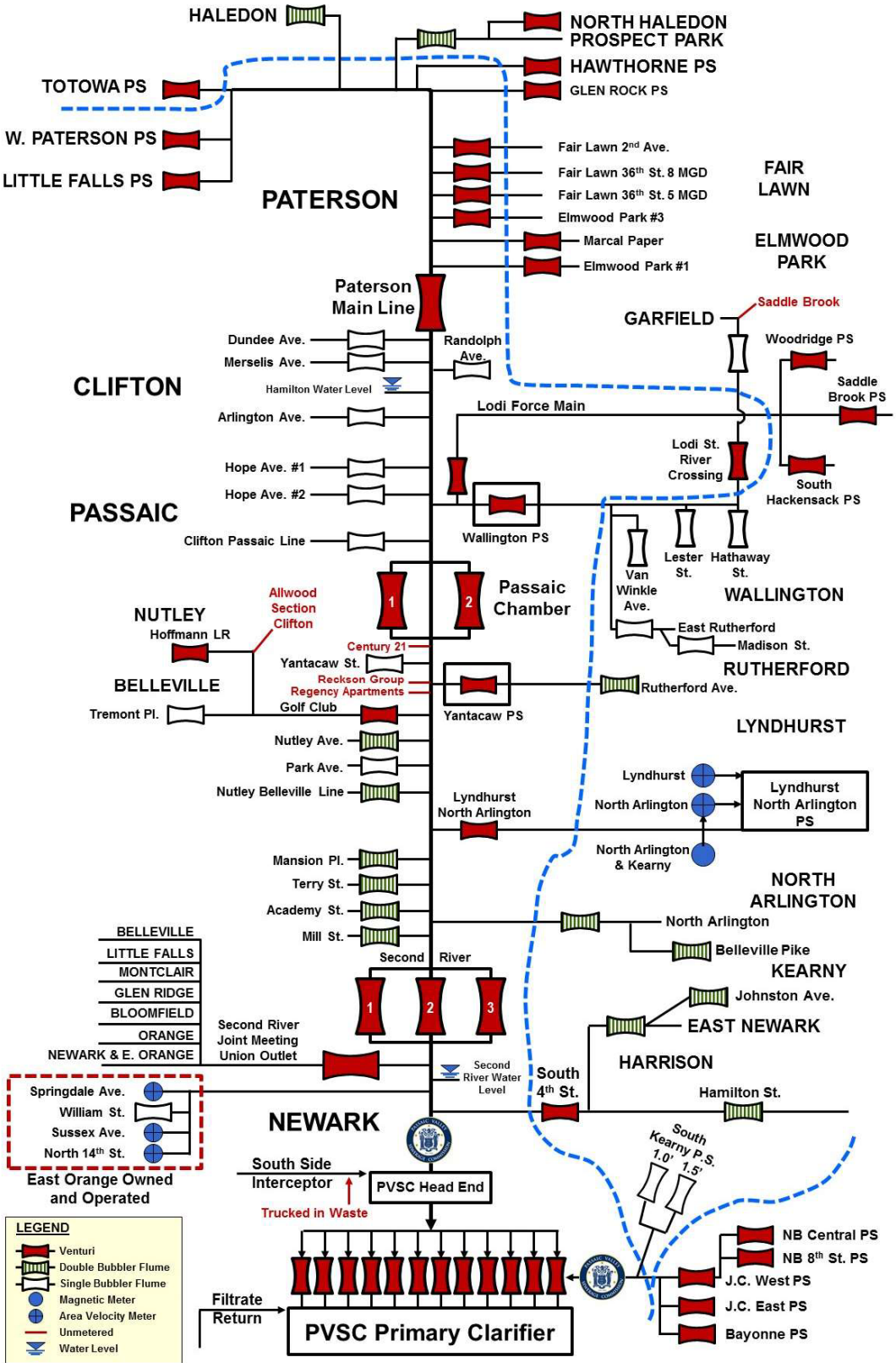

Figure A-2: The PVSC Treatment District Flow Schematic

A.6 PURPOSE OF REPORT

In accordance with the NJPDES Permits of each of the Permittees, a Final LTCP including a SIAR for each of the Permittees is required by June 1, 2020; however, due to the impacts of the SARS-CoV-2 virus Global Pandemic, the NJDEP has granted an extension for submittal of the LTCP report to October 1, 2020.

The NJPDES Permits for the PVSC Treatment District Permittees encourage collaboration among permittees within a hydraulically connected sewer system for the development of a Regional LTCP. This Regional LTCP compiles and summarizes the results of the nine individual SIARs by the Permittees in order to provide a singular, comprehensive LTCP for the PVSC Treatment District and satisfy the requirements of the NJPDES Permits.

A.7 LTCP PLANNING APPROACH

A LTCP planning approach was developed by the Permittees to ensure the individual SIARs and Regional LTCP adequately address all requirements enumerated under their NJPDES permits. The adopted LTCP Planning Approach features the following aspects, in alignment with the Permit requirements:

1. **Characterization, Monitoring, and Modeling of the CSS**
   Completed a comprehensive characterization study of the CSS including sampling, monitoring, analysis of historical data and modeling to establish baseline conditions and evaluate the efficacy of CSO control technologies selected for implementation.

   a. **Water Quality Modeling (WQM)**
      Completed the Water Quality Model (WQM) simulations to determine the impact of the CSOs on the quality of the water bodies
   b. **Hydrologic and Hydraulic (H&H) Model Development**
      Created a combined H&H model of the entire district including the preferred alternative. Ran the model and compared to individual models from each Permittee.

2. **Public Participation Process**
   Engaged and invited affected/interested public to participate, provide input, and form a Supplemental CSO Team to work with the Permittees on the LTCP development. Public participation meetings have been scheduled quarterly.

3. **Consideration of Sensitive Areas**
   A study of the Sensitive Areas within the service area and a report were submitted in accordance with the Permit CSO Reports Submittal Schedule.

4. **Evaluation of Alternatives and Maximizing Treatment at the WRRF**
   A reasonable range of CSO control alternatives were developed and evaluated and submitted individually by each Permittee as well as regionally and were submitted in accordance with the Permit CSO Reports Submittal Schedule through the Regional Development and Evaluation of Alternatives Report (DEAR). Maximizing Treatment at

the WRRF was included as part of the evaluation in observance of the Permit LTCP requirements.

5. **Cost/Performance Considerations**
   Based on the H&H and WQM results of the DEAR CSO Control Alternatives, the Permittees refined the alternatives and developed costs for each while evaluating performance considerations such as impacts to water quality and CSO volume capture (reduction) to evaluate the appropriate level of control.

Subsequent to the submittal of the DEAR, the following steps were conducted to finalize the LTCP discussed in this report:

1. **District Meetings**
   The PVSC Treatment District Permittees conducted bi-weekly meetings to further develop regional alternatives evaluated during the DEAR. The regional alternatives were moved forward for further review and evaluation.

2. **Financial Capability Assessment (FCA)**
   Developed a preliminary financial capability assessment (FCA) for each of the Permittees to determine affordability.

3. **WQM Results Validation & LTCP Expert Evaluation**
   PVSC led the development of a Pathogens Water Quality Model ("PWQM") on behalf of the NJ CSO Group to determine the impact of the CSOs on the quality of the water bodies.

   Progress of the PWQM was shared with the public and NJ CSO group at meetings, as further described in Section G. Additional workshop meetings between PVSC and their consultants, the Model Evaluation Group (MEG) and NJDEP were held to discuss the development and use of each of the models, as well as to receive feedback and input regarding the monitoring and modeling work. These meetings were held on the following dates:

   - February 5, 2016;
   - March 17, 2017;
   - September 15, 2017;
   - December 5, 2018; and
   - November 21, 2019.

   During these meetings, PVSC met with the MEG to validate the results of the WQM, submitted a report for review and comment, and met with NJDEP to review the WQM results. NJDEP comments were addressed and responded to in a December 9, 2019 memorandum, which is included in **Appendix A**.

The MEG is composed of recognized experts in hydrologic, hydraulic, hydrodynamic, and water quality monitoring and modeling, formed to provide technical review and guidance. The following individuals are part of the MEG:

- Dr. Alan Blumberg, Stevens Institute of Technology;
- Dr. Steve Chapra, Tufts University; and
- Dr. Wayne Huber, PE, D.WRE, Oregon State University, emeritus.

The MEG's stated mission was as follows:
"The Model Evaluation Group (MEG) will review all significant technical aspects of the PVSC Long Term Control Plan model development. Model development will consist of three distinct components: Landside, Hydrodynamic, and Water Quality. The goal is to ensure that these model components are technically viable for use by the engineering team in the assessment of engineering alternatives and withstand regulatory and public scrutiny. The MEG will provide guidance, where appropriate, to improve or enhance the approaches and methodologies that lead to model development. The MEG will judge, individually and jointly, the technical acceptability of the major model components. If a component is deemed unacceptable, the MEG will outline steps to improve the technical acceptability of the model components."

4. **Incorporate Feedback From LTCP Experts**
   Based on experts' feedback and coordination with the Permittees, identifying the most cost-effective regional solution and where localized solutions would have the greatest localized impact, the alternatives were further developed, H&H model re-run, and costs analyzed.

5. **Update To FCA**
   An update to the FCA was performed based on the updated alternatives costs.

6. **NJDEP Meeting To Confirm Acceptability Of Alternatives**
   Upon further development of alternatives, a meeting with NJDEP was held to determine the acceptability of alternatives in terms of CSO reduction.

7. **Mayoral Meetings To Present Alternatives**
   Alternatives determined acceptable by NJ DEP were presented to the Mayors from the treatment district for consideration of a regional agreement.

8. **Implementation Schedule**
   Upon agreement by the Permittees and the municipalities on the selected alternatives that will comprise the LTCP, an implementation schedule was developed for each of the projects selected.

9. **LTCP Finalization**
   Upon selection of the alternatives, updates to the FCA, and development of an implementation schedule, the individual SIARs and Final LTCP were completed and are presented in this report.

In accordance with each Permittees' NJPDES Permit, a Post-Construction Compliance Monitoring Program Plan and Operation and Maintenance Plan have been included in Section K and Section L of this Report, respectively.

SECTION B - REGULATORY REQUIREMENTS

B.1 INTRODUCTION

This section discusses the regulatory requirements governing the LTCP for the PVSC Treatment District Permittees. The Permittees and their associated NPDES permit numbers are listed below in **Table B-1.**

Table B-1: Permittees Covered Under this Regional Selection and Implementation of Alternatives Report

Municipality	NJPDES #
PVSC	NJ0021016
Borough of East Newark	NJ0117846
Town of Harrison	NJ0108871
Town of Kearny	NJ0111244
City of Newark	NJ0108758
City of Paterson	NJ0108880
City of Bayonne	NJ0209240
North Bergen MUA	NJ0108898
Jersey City MUA	NJ0108723

The Regional SIAR has been completed in compliance with all regulatory requirements. The regulatory requirements governing the LTCP are described in the following sections.

B.2 NJPDES PERMIT REQUIREMENTS

Under Section 402 of the CWA, all point source discharges to the waters of the United States must be permitted. USEPA Region II has delegated permitting authority in New Jersey to NJDEP. The permits are reissued on a nominal five-year cycle. All twenty-one (21) New Jersey municipalities and municipal authorities with CSSs were issued new permits in 2015 that set forth the requirement for the completion of a LTCP SIAR by June 1, 2020, currently extended to October 1, 2020 as noted in Section A.

The NJPDES permits issued to each permittee include requirements for the Permittees to cooperatively develop a CSO LTCP to reduce CSO discharges to the receiving waters.

Part IV, Section D.3.b. of the NJDPES Permit for each of the Permittees requires the completion of an approvable LTCP, to be prepared in accordance with Part IV, Sections G.1 through G.9 of the permit. Those sections are listed below for reference:

- Section G.1 Characterization, Monitoring and Modeling of the Combined Sewer System
- Section G.2 Public Participation Process
- Section G.3 Consideration of Sensitive Areas
- Section G.4 Evaluation of Alternatives

- Section G.5 Cost/Performance Considerations
- Section G.6 Operational Plan
- Section G.7 Maximizing Treatment at the Existing STP
- Section G.8 Implementation Schedule
- Section G.9 Compliance Monitoring Program (CMP)

Section G.6 through Section G.8 state that the Selection and Implementation of Alternatives must also comply with the requirements of Subsection D.3.a and Section G.10, recited below:

- Subsection D.3.a Long Term Control Plan Submittal Requirements

  "The Department encourages a single LTCP to be developed and submitted on behalf of all of the permittees in a hydraulically connected sewer system."

- Section G.10 Permittee's LTCP Responsibilities

  "Where multiple permittees own/operate different portions of a hydraulically connected CSS, the permittee is required to work cooperatively with all other permittees to ensure the LTCPs are consistent. The LTCP documents must be based on the same data, characterization, models, engineering and cost studies, and other information, where appropriate. Each permittee is required to prepare the necessary information for the portion of the hydraulically connected system that the permittee owns/operates and provide this information to the other permittees within the hydraulically connected system in a timely manner for LTCP submission.

The specific requirements for the SIAR are outlined in Sections G.2 through G.8. These requirements are identified in **Table B-2**, along with the section of this report in which those requirements are addressed.

Table B-2: Review of Requirements of the LTCP

Permit Section	Permit Requirement	Report Section
Part IV G.1.a	"The permittee, as per D.3.a and G.10, shall submit an updated characterization study that will result in a comprehensive characterization of the CSS developed through records review, monitoring, modeling and other means as appropriate to establish the existing baseline conditions, evaluate the efficacy of the CSO technology based controls, and determine the baseline conditions upon which the LTCP will be based. The permittee shall work in coordination with the combined sewer community which is hydraulically connected to this STP, for appropriate Characterization, Monitoring and Modeling of the Sewer System."	**Section C:** Existing Conditions and **Appendix A**
Part IV G.2.a	"The permittee shall submit the Public Participation Process Report to include appropriate input and participation with other hydraulically connected communities, in accordance with D.3.a and G.10."	**Section G:** Public Participation and **Appendix E**
Part IV G.3.a	"The permittee's LTCP shall give the highest priority to controlling overflows to sensitive areas, in accordance with D.3.a and G.10. Sensitive areas include designated Outstanding National Resource Waters, National Marine Sanctuaries, waters with threatened or endangered species and their habitat, waters used for primary contact recreation (including but not limited to bathing beaches), public drinking water intakes or their designated protection areas, and shellfish beds."	**Section C.5:** Sensitive Areas and **Appendix C**
Part IV G.4.a	"The permittee shall evaluate a reasonable range of CSO control alternatives, in accordance with D.3.a and G.10. that will meet the water quality-based requirements of the CWA using either the Presumption Approach or the Demonstration Approach (as described in Sections G.4.f.and G.4.g)."	**Section D:** Screening of CSO Control Technologies and **Appendix D**
Part IV G.4.b	"The permittee shall submit, as per Section D.3.b.v, the Evaluation of Alternatives Report that will enable the permittee, in consultation with the Department, the public, owners and/or operators of the entire collection system that conveys flows to the treatment works, to select the alternatives to ensure the CSO controls will meet the water quality-based requirements of the CWA, will be protective of the existing and designated uses in accordance with N.J.A.C. 7:9B, give the highest priority to controlling CSOs to sensitive areas, and address minimizing impacts from SIU discharges."	**Section E:** Evaluation of Alternatives and **Appendix D**
Part IV G.5.a	"The permittee shall submit in accordance with the submittal requirements at Sections D.3.a. and D.3.b.v., the cost/performance considerations that demonstrate the relationships among proposed	**Section H:** Selection of Recommended LTCP

Permit Section	Permit Requirement	Report Section
	control alternatives that correspond to those required in accordance with Section G.4. This shall include an analysis to determine where the increment of pollution reduction achieved in the receiving water diminishes compared to the increased costs. If the permittee chooses to pursue the "Presumption Approach" of 'no more than an average of four discharge events per year', the permittee is not required to conduct this analysis for the other number of events (i.e. 0, 7, 10, 20). This analysis, often known as "knee of the curve", shall be among the considerations used to help guide selection of controls."	
Part IV G.6.a	"Upon Departmental approval of the final LTCP and throughout implementation of the approved LTCP as appropriate, the permittee shall modify the O&M Program and Manual in accordance with D.3.a and G.10, to address the final LTCP CSO control facilities and operating strategies, including but not limited to, maintaining Green Infrastructure, staffing and budgeting, I/I, and emergency plans."	Post Final LTCP Approval
Part IV G.7.a	"The LTCP shall include the maximization of the removal of pollutants during and after each precipitation event at the STP, in accordance with D.3.a and G.10, ensuring that such flows receive treatment to the greatest extent practicable utilizing existing tankage for storage, while still meeting all permit limits."	**Section J:** Recommended Long Term Control Plan and **Appendix F**
Part IV G.7.b	"The permittee shall incorporate the receiving STP's plan for maximizing flow and treatment at the STP."	**Section J**: Recommended Long Term Control Plan
Part IV G.8.a	"The permittee shall submit a construction and financing schedule in accordance with D.3.a and G.10, for implementation of Department approved LTCP CSO controls. Such schedules may be phased based on the relative importance of the adverse impacts upon water quality standards and designated uses, the permittee's financial capability, and other water quality related infrastructure improvements, including those related to stormwater improvements that would be connected to CSO control measures."	**Section J** Recommended Long Term Control Plan
Part IV G.8.b	"Upon Departmental approval of the LTCP, the permittee shall begin implementation of the LTCP in accordance with the schedule contained therein."	**Section J** Recommended Long Term Control Plan

Permit Section	Permit Requirement	Report Section
Part IV G.8.c	"In accordance with Section D.3.b.vi., the permittee shall submit an implementation schedule, including yearly milestones."	**Section J** Recommended Long Term Control Plan
Part IV G.8.c.i	"The permittee shall consider adequately addressing areas of sewage overflows, including to basements, streets and other public and private areas."	**Section H:** Selection of Recommended Long Term Control Plan
Part IV G.8.c.ii	"The permittee shall consider CSO overflows that discharge to sensitive areas as the highest priority."	**Section C:** Existing Conditions
Part IV G.8.c.iii	"The permittee shall consider use impairment of the receiving water."	**Section C:** Existing Conditions
Part IV G.8.c.iv	"The permittee shall consider the permittee's financial capability including, but not limited to, consideration of the factors: median household income, total annual wastewater and CSO control costs per household as a percent of median household income, overall net debt as a percent of full market property value, property tax revenues as a percent of full market property value, property tax collection rate, unemployment, and bond rating."	**Section I**: Financial Capability
Part IV G.8.c.v	"The permittee shall consider grant and loan availability."	**Section I**: Financial Capability
Part IV G.8.c.vi	"The permittee shall consider previous and current residential, commercial, and industrial sewer user fees and rate structures."	**Section I**: Financial Capability
Part IV G.8.c.vii	"The permittee shall consider other viable funding mechanisms and sources of financing."	**Section I**: Financial Capability
Part IV G.8.c.viii	"The permittee shall consider Resources necessary to design, construct and/or implement other water related infrastructure improvements as part of an Asset Management Plan as per Part IV.F.1"	**Section L**: Revision of Operation and Maintenance Plans

B.2.1 Nine Minimum Controls

Under their NJPDES permits, Permittees are required to implement and document implementation of the nine minimum controls ("NMCs"). The NMC are CSO controls developed by the EPA that require minimal cost and construction time. The NMC consists of the following:

1. Proper operation and regular maintenance
2. Maximizing the use of the collection system for storage where feasible
3. Review and modification of the Industrial Pretreatment Program to minimize CSO impacts
4. Maximization of flow to the wastewater treatment plant
5. Prohibition of CSOs during dry weather
6. Control of solids and floatables (addressed by NJDEP's requirement of screening or other facilities in earlier permit cycles);

7. Pollution prevention
8. Public notification
9. Monitoring CSO impacts and controls

The Permittees submitted their NMC programs under a previous permit cycle. The LTCP has been developed to be consistent with the NMCs. CSO control technologies already in place, scheduled to be implemented, or mandated by the NMC were removed from consideration in the LTCP during the DEAR screening process.

B.3 USEPA'S CSO POLICY

USEPA's CSO Policy (the "CSO Policy") was issued in April of 1994 (59 FR 18688 - 18698) to elaborate on the 1989 National CSO Control Strategy and to expedite compliance with the requirements of the Clean Water Act ("CWA"). The CSO Policy provided guidance to municipal Permittees with CSOs, to the state agencies issuing National Pollution Discharge Elimination System permits (e.g., NJDEP and NJPDES permits) and to state and interstate water quality standards authorities (e.g., the Interstate Environmental Commission). The CSO Policy establishes a framework for the coordination, planning, selection, and implementation of CSO controls required for permittee compliance with the CWA.

The CSO Policy also states that "In addition to considering sensitive areas, the long-term control plan should adopt either the Presumption Approach or the Demonstration Approach." In accordance with the CSO Policy, and the conditions of the permit, the 85% volume capture condition of the Presumption Approach was adopted by the municipalities. The Presumption and Demonstration approach, including the process for selecting the approach, are discussed in further detail in Section H of this report."

B.4 LOCAL AGREEMENTS

The 40 separate sanitary sewer communities and the eight CSO Permittees have contracts with PVSC for the treatment and disposal of wastewater for each of their communities. These CSO Permittees convey wastewater through their own local sewerage systems to the PVSC interceptors or the HCFM. The interceptor and HCFM then convey the wastewater to the PVSC WRRF for treatment and disposal. PVSC charges each community as a wholesale customer based on their current rate structure.

B.5 NEED FOR REGIONAL APPROACH

Although the CSO Permittees own and maintain independent yet hydraulically connected sections of the CSS within the PVSC Treatment District, they have acknowledged the need for a regional approach. The PVSC CSO communities have collaborated and worked cooperatively to provide consistency in the development, selection, and implementation of their respective LTCPs and Regional LTCP alternatives per the requirements of their NJPDES permits, as enumerated in Section B.2.

The following outlines the owner/operators of the CSSs and control facilities of the CSO Permittees:

City of Bayonne
Owner/Operator of CSS: City of Bayonne
Owner of Outfalls: City of Bayonne
Operator of Regulators: City of Bayonne

Borough of East Newark
Owner/Operator of CSS: East Newark Township
Owner of Outfalls: East Newark
Operator of Regulator: PVSC

Town of Harrison
Owner/Operator of CSS: Town of Harrison
Owner of Outfalls: Town of Harrison
Operator of Regulators: PVSC

Jersey City MUA
Owner/Operator of CSS: Jersey City MUA
Owner of Outfalls: Jersey City MUA
Operator of Regulators: Jersey City MUA

Town of Kearny
Owner/Operator of CSS: Town of Kearny
Owner of Outfalls: Town of Kearny
Operator of Regulators: PVSC

City of Newark
Owner/Operator of CSS: City of Newark
Owner of Outfalls: City of Newark
Operator of Regulators: City of Newark and PVSC

North Bergen MUA
Owner of CSS: North Bergen Township
Operator of CSS: North Bergen MUA
Owner of Outfalls: North Bergen MUA
Operator of Regulators: North Bergen MUA

City of Paterson
Owner/Operator of CSS: City of Paterson
Owner of Outfalls: City of Paterson
Operator of Regulators: City of Paterson and PVSC

SECTION C - EXISTING CONDITIONS

C.1 PVSC WASTEWATER RESOURCE RECOVERY FACILITY

PVSC owns and operates one of the nation's largest wastewater treatment facilities located in Newark, NJ on a 162-acre plant site. The PVSC WRRF is permitted for an annual average design treatment flow of 330 MGD. During wet weather, PVCS exceeds the annual average design flow and treats up to 400 MGD. Wet weather flows over 400 MGD are currently not feasible due to the current treatment capacity at the final clarifiers. **Figure C-1** provides a site aerial of the PVSC WRRF.

Figure C-1: PVSC Water Resources Recovery Facility

Solids treatment at the WRRF takes primary sludge from the primary clarifiers and waste sludge from the aeration tanks and transports them to gravity sludge thickeners. Thickened sludge then enters the thickening centrifuges to reduce its liquid volume. A wet-air oxidation process, Zimpro, conditions the sludge for dewatering before it is further reduced in volume in decant tanks. Sludge enters the final processing steps in filter presses and storage in cake silos prior to beneficial use.

C.2 PVSC TREATMENT DISTRICT AREA

The PVSC Treatment District is comprised of combined and separate sewer areas that contribute flow to the PVSC WRRF. The combined sewer areas include several different municipalities who own and operate the CSSs and the combined sewer outfalls located within their jurisdiction. Separate sewer areas comprise the majority of the drainage area but only contributes approximately 40 percent of the flow to the PVSC WRRF. **Figure C-2** shows the municipalities and the type of sewer network they operate.

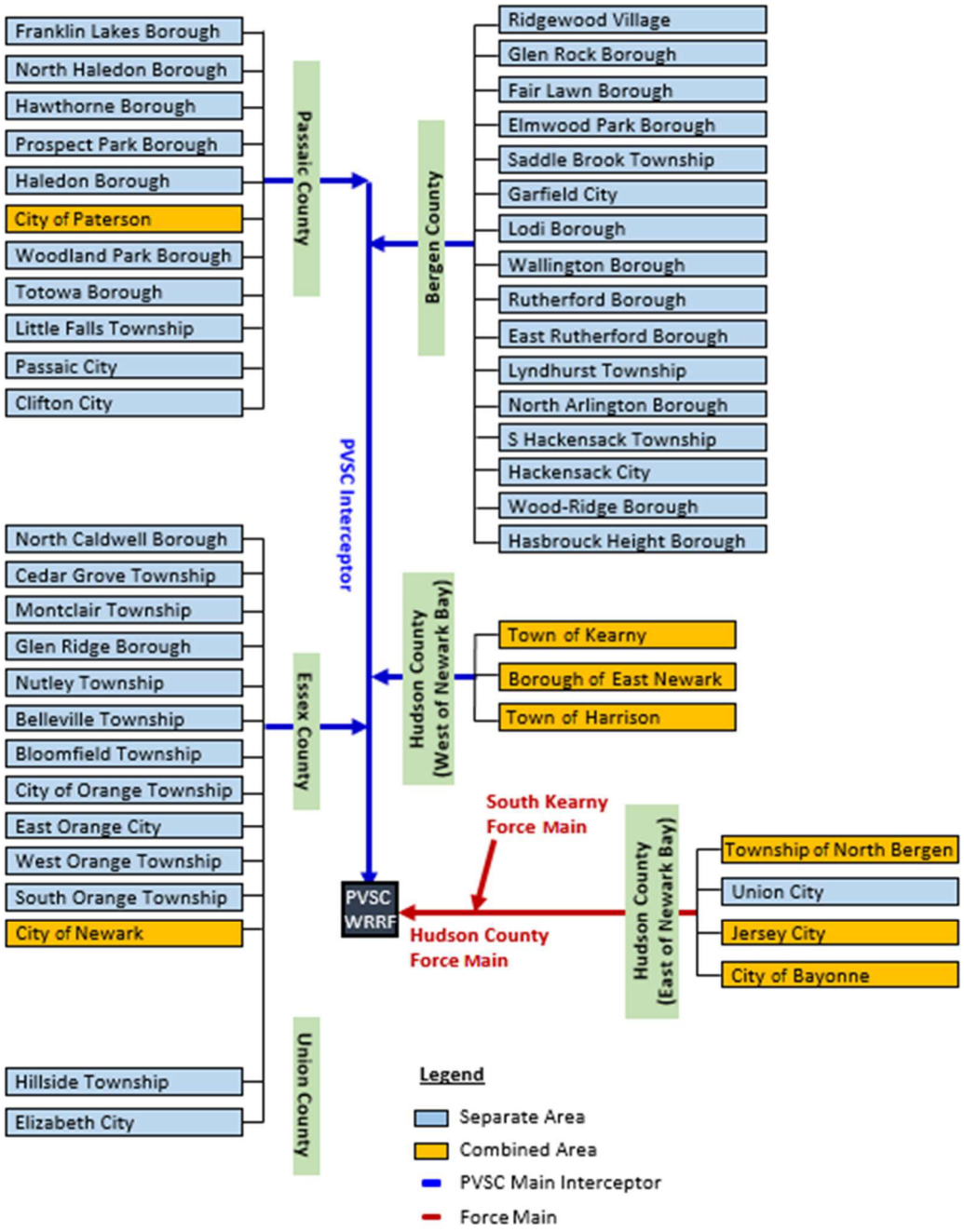

Figure C-2: PVSC Member Municipalities

C.2.1 Combined Sewer Service Area

Combined sewers serve eight of the municipalities within the PVSC Treatment District and collect surface runoff from the combined sewer service area. The total combined area is approximately 22,099 acres and makes up approximately 26 percent of the Total Combined Sewer Service Area. The eight municipalities, their service area acreage and the number of CSO outfalls are listed in **Table C-1** below. All eight municipalities are authorized to discharge under their respective NJPDES Permits for Combined Sewer Management. PVSC does not own or

operate any combined sewer outfalls. PVSC owns and operates CSO Facilities such as regulators, and netting facilities but the combined sewer outfalls are owned by other Permittees.

Table C-1: Combined and Separate Sewer Service Area Municipalities

Municipality/Sewer Authority	Contributing area (acres)		Total Contributing Area (acres) [1]	Number of CSOs Located within Service Area
	Combined Sewer	Separate Storm Sewer		
City of Bayonne	1,706	36	1,742	28
Borough of East Newark	62	0	62	1
Town of Harrison[2]	423	354	771	6
Jersey City MUA[3]	5,365	66	5,365	21
Town of Kearny	1,243	2,763	4,006	5
City of Newark	7,153	2,883	10,036	18
North Bergen MUA[4]	1,552	39	1,591	9
City of Paterson	4,595	600	5,195	23
Subtotal	**22,099**	**6,675**	**28,774**	**111**
40 Separate Sanitary Municipalities	--	55,214	55,214	--
Total	**22,099**	**61,889**	**83,988**	**111**

Note:

1. The total acreage in the table above includes only the subcatchment areas in the model that contribute flow to the PVSC WRRF. The acreage does not include rivers, creeks or unsewered areas within a municipality.
2. Harrison's NJPDES permit initially included 7 outfalls. NJDEP issued Harrison a minor modification NJPDES permit action on June 25, 2018 to remove Dey Street outfall 004A.
3. Jersey City provided details of this information separately as part of its System Characterization Report.
4. NBMUA (Woodcliff) and Guttenberg provided this information separately as part of its System Characterization Report.

The combined sewer municipalities on the east side of Newark Bay include the Cities of Jersey City and Bayonne, and the Township of North Bergen. These municipalities deliver their combined sewage through the HCFM into the PVSC primary clarifiers at the PVSC WRRF. Two of the combined sewer municipalities, the City of Bayonne and Jersey City MUA, own their own CSSs, interceptors, CSO control facilities, and pumping stations. Bayonne and Jersey City jointly own and operate the force main used to transport wastewater from the CSO area east of the Newark Bay in Hudson County, to the primary clarifiers at the PVSC WRRF in Newark. The North Bergen MUA owns and operates the CSO outfalls, but does not own the CSS, which

is owned by the Township of North Bergen. The North Bergen MUA discharges flow to the Jersey City Westside Interceptor and ultimately connects to PVSC through the Hudson County Force Main. PVSC does not own or operate any of the regulators and outfalls which service the CSO area east of Newark Bay. Jersey City MUA is included in the above description, however it submitted its own System Characterization report separately.

The other five municipalities with CSSs are located on the west side of Newark Bay include the Borough of East Newark, the Towns of Harrison and Kearny, and the Cities of Newark and Paterson. These municipalities all own and operate their CSS and are permitted by the NJDEP to discharge CSOs. All of these municipalities contribute to the PVSC Main Interceptor. A portion of the CSSs are tributaries to CSO control facilities owned and/or operated by the individual municipalities and a portion of the CSO control facilities are owned and/or operated by PVSC. PVSC owns and operates 45 of the regulator chambers in these communities that control the sewer flow to the PVSC trunk system.

These combined sewer municipalities collectively own and operate a total of 111 CSO outfalls in PVSC's Treatment District, which ultimately discharge to the waterbodies shown in **Figure** C-3**.**

City of Bayonne

The City of Bayonne is located in Hudson County and has an approximate population of 63,024 (2010 US Census Bureau). The City is located on a peninsula within the New Jersey - New York Metropolitan Area surrounded by Jersey City to the North, Newark Bay to the west, Kill Van Kull Channel to the south, and the Upper New York Bay, which separates it from the Borough of Manhattan, to the east. The City consist of a land area of approximately 3,200 acres of which approximately 1,742 acres are serviced by the combined sewer system.

The industrial section on the East side at Constable Hook is serviced primarily by a separate sewer system. Wastewater flows from the City of Bayonne, the Town of Kearny and Jersey City are conveyed to PVSC by a force main owned partially by PVSC and jointly by the City of Bayonne and the Jersey City MUA. The flow from the force main enters directly into the primary treatment facility at the PVSC WRRF. Under the current service agreement, wastewater flows from the City of Bayonne are restricted to an average daily flow of 11 MGD and a Peak flow of 17.6 MGD. The City of Bayonne entered into a forty (40) year agreement with United Water, now SUEZ, for operations and maintenance of the City's water and wastewater collection and transport facilities in December 2012. The Bayonne MUA was dissolved in 2016 as a result of this new agreement with SUEZ.

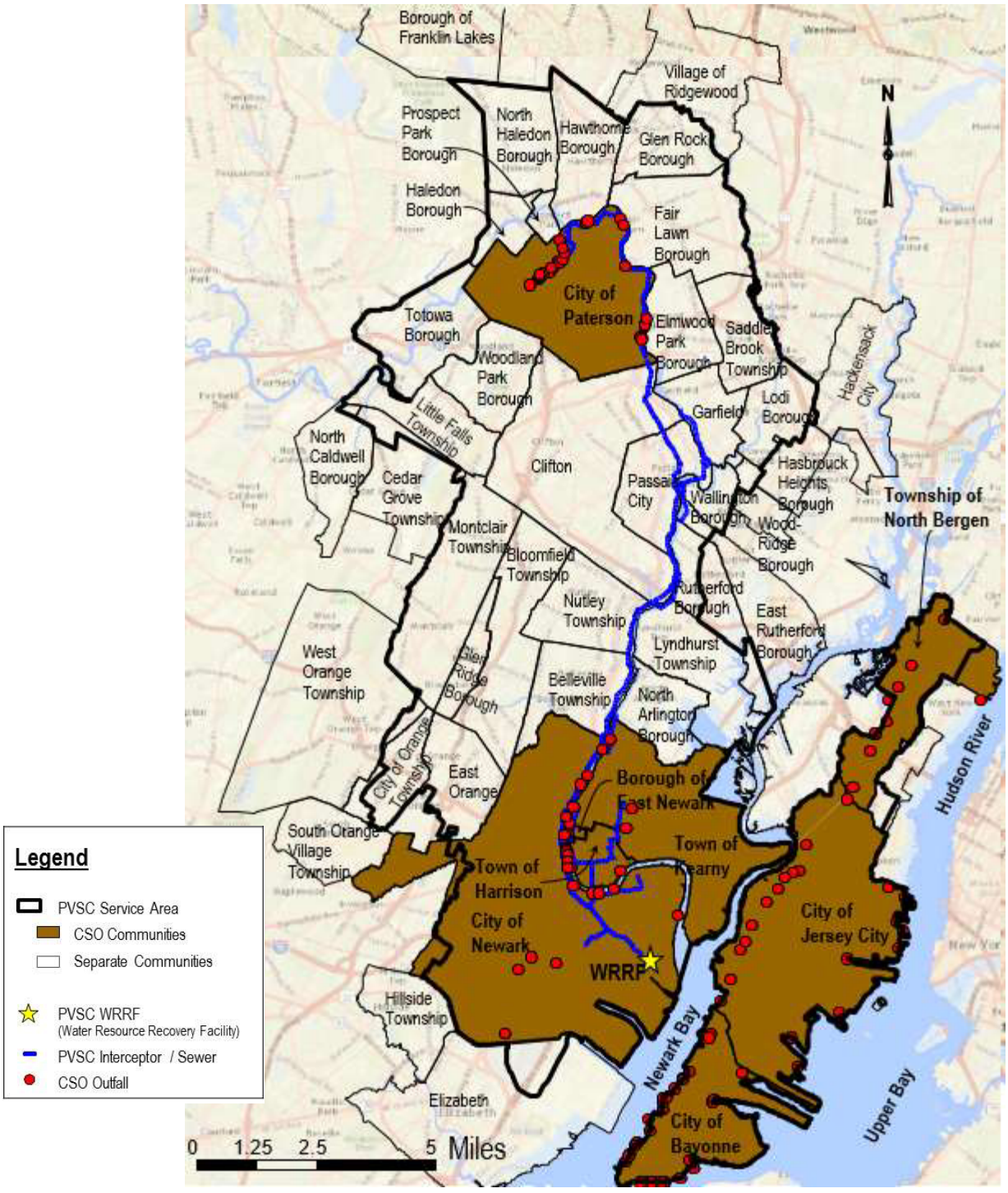

Figure C-3: PVSC Treatment District with CSO Outfall Location

Township of North Bergen

The Township of North Bergen is located in Hudson County and has an approximate population of 60,773 (2010 US Census Bureau). The Township.is located between the Hackensack and Hudson Rivers, and is bordered by Ridgefield, Cliffside Park, Secaucus, Guttenberg, Union City and Jersey City. The total area of the Township is approximately 2,060-acres, where approximately 1,130 acres is serviced by the CSS and the balance is serviced by separate systems for sanitary and storm flows.

North Bergen consists of two combined sewer areas, the Central and Woodcliff areas. North Bergen Township owns and operates the manholes and sewer systems in both of these areas. The North Bergen Municipal Utilities Authority (NBMUA) owns and operates the regulators, interceptors, outfalls, CSO facilities, and the Woodcliff STP under two separate NJPDES permits: NBMUA and NBMUA (Woodcliff). The largest combined sewer area is located in the central and western portions of the Township of North Bergen. The combined sewage in the Central/ Western section of North Bergen Township is conveyed via a pump station and force main to the Jersey City MUA where the flow is then pumped to PVSC's WRRF via the Hudson County force main. The second combined sewer area is generally located on the northeast side of North Bergen, to the east of Bergenline Avenue, and is connected to the NBMUA's Woodcliff STP. The Woodcliff STP service area is separate from the PVSC service area and is covered in a separate System Characterization Report (see **Appendix A**).

Borough of East Newark

East Newark is located in the western section of Hudson County and has an approximate population of 2,406 (2010 US Census Bureau). The Borough is bounded by the Passaic River and Newark to the west, the Town of Harrison on the southeast and the Town of Kearny on the northeast. The Borough encompasses approximately 72.5-acres and its land use is varied. East Newark mainly consists of high density residential and industrial areas primarily located along the Passaic River.

Town of Harrison

The Town of Harrison is located in Hudson County and has an approximate population of 13,620 (2010 US Census Bureau). The Town is bounded by the Town of Kearny and the Borough of East Newark to the north and the Passaic River to the south. Harrison comprises an area of approximately 1.3 square miles.

Town of Kearny

The Town of Kearny is located in the northwest corner of Hudson County and has an approximate population of 40,684 (2010 US Census Bureau). Kearny is bounded by the Hackensack River and Jersey City on the east, East Newark and Harrison on the south, the Passaic River and Belleville on the west, and North Arlington on the north. The total area of Kearny is approximately 10.19 square miles, of which 9.14 sq. mi. is land area and 1.05 sq. mi is water area.

City of Newark

The City of Newark is located in Essex County and has an approximate population of 277,140 (2010 US Census Bureau). The City is situated to the west of the Passaic River and Newark Bay, and to the north of the Peripheral Ditch which flows into the Elizabeth Channel of Newark Bay. The City covers an area of approximately 24 square miles and presently owns and maintains approximately 298 miles of sanitary and combined sewers. The City is mostly served by the Passaic Valley Sewerage Commission with approximately 5% of the city served by the Joint Meeting of Union and Essex Counties.

City of Paterson

The City of Paterson is located within Passaic County and has an approximate population of 146,199 (2010 US Census Bureau). The City is bounded on the west by the Boroughs of West Paterson and Totowa, on the north by the Passaic River and the Boroughs of Haledon and Prospect Park, on the east by the Passaic River and the Boroughs of Elmwood Park and Fairlawn, and the south by the City of Clifton. The City consists of approximately 5,290 acres.

C.2.2 Separate Sewer Service Area

In addition to the municipalities with combined systems, separately sewered municipalities convey their flow to the Main Interceptor Sewer through 13 branch intercepting sewers and various direct sewer connections. Forty of the 48 municipalities in the service area have separate sewer systems and, therefore, do not own or operate any CSOs. In all but one municipality with a separate sewer system, sewage discharges to the PVSC Main Interceptor and is conveyed to the PVSC WRRF. Union City's sewage flow is conveyed through the Hudson County Force Main and is discharged upstream of the primary clarifiers at the PVSC WRRF. See **Table C-1** above for details regarding separate and combined sewer area.

The following Passaic County towns and boroughs listed in **Table C-2** below contribute separate sewage flow to the PVSC WRRF through the Main Interceptor.

Table C-2: Passaic County Municipalities with Separate Sewer Systems

Passaic County (Towns and Boroughs)	
Franklin Lakes	Woodland Park
North Haledon	Totowa
Hawthorne	Townships of Little Falls
Prospect Park	Cities of Passaic
Haledon	Clifton City

The following towns, boroughs and cities listed in **Table C-3** are located in Bergen County with separate sewage networks are generally located east of the Passaic River and contribute separate sewage flow into the PVSC Main Interceptor.

Table C-3: Bergen County Municipalities with Separate Sewer Systems

Bergen County (Towns, Boroughs, and Cities)	
Ridgewood Village	North Arlington
Glen Rock	Wood Ridge
Fair Lawn	Hasbrouck Heights
Elmwood Park	Saddle Brook
Lodi	Lyndhurst
Wallington	South Hackensack
Rutherford	Hackensack
East Rutherford	Garfield

Table C-4 lists the Essex County towns, boroughs and cities which are located towards the south end of the PVSC Main Interceptor and contribute separate sewage flow to the PVSC WRRF via the Main Interceptor.

Table C-4: Essex County Municipalities with Separate Sewer Systems

Essex County (Towns, Boroughs, and Cities)	
Montclair	West Orange
Nutley	South Orange
Belleville	City of East Orange
Bloomfield	Glen Ridge Borough
City of Orange	North Caldwell
Cedar Grove	

The township and city listed in **Table C-5** are in Union County and are located towards the south end of the PVSC Main Interceptor. They contribute separate sewage flow to the PVSC WRRF via the Main Interceptor.

Table C-5: Union County Municipalities with Separate Sewer Systems

Union County (Township and City)	
Hillside Township	Elizabeth City

Union City listed in **Table C-6** is the only separate sewerage municipality located in Hudson County and contributes flow directly to the WRRF through the Hudson County Forcemain.

Table C-6: Hudson County Municipalities with Separate Sewer Systems

Union County (Township and City)	
Union City	

Most CSO Communities have both separate sewer sections and combined sewer areas. The contributing separate sanitary sewer system area for each CSO community is shown in **Table C-1.** A portion of the City of Bayonne includes a separate sewer system, which serves a small industrial area. Sewage is conveyed separately in the area between Pulaski Street and Constable Hook along the Hudson River and is discharged directly to the Eastern Interceptor Sewer. All wastewater within the City of Bayonne flows to the City of Bayonne Oak Street Pumping Station, which transports wastewater to the PVSC WRRF.

C.2.3 Existing CSO Controls and Programs

The PVSC Treatment District has implemented various CSO control and programs that are currently operating to reduce pollution of the waterways. The existing CSO controls and programs for each of the Permittees are described below.

PVSC

Ten regulators in Newark have been retrofitted and equipped with motorized sluice gates, which are remotely controlled from the plant via a telemetered control signal. PVSC operates the ten Newark sluice gates with radio transmission through Phoenix contact and Elpro™ transmitters back to PVSC's SCADA system. The gates can be utilized during rain events to prevent overloading the WRRF. The appropriate gates may be controlled to bypass the combined sewer from the regulator to the Passaic River.

City of Newark

The City of Newark has 16 CSO floatables control facilities, 12 netting facilities and four screening facilities. The South Side Interceptor has a gate that can be manually closed in the event of an emergency situation, causing a diversion of the entire flow to the Newark Airport Peripheral Ditch.

Borough of East Newark

The Borough of East Newark owns and operates 1 CSO floatables control facility to prevent introduction of solids and floatables to the waterways.

Town of Harrison

The Town of Harrison owns and operates 6 CSO floatables control facilities. Harrison formerly owned and operated an additional CSO floatables control facility on outfall 004A. This drainage area has been separated and on June 25, 2018 NJDEP issued Harrison a minor modification NJPDES permit action to remove Dey Street outfall 004A from the permit.

Town of Kearny

The Town of Kearny owns and operates five CSO floatables control facilities to prevent introduction of solids and floatables to the waterways.

City of Paterson

The City of Paterson has 23 CSO outfalls and one discharge currently under appeal to be re-added to the permit. Nineteen of the 23 outfalls have floatables control facilities installed upstream of the point of discharge.

City of Bayonne

The City of Bayonne owns and operates 17 CSO floatables control facilities and 17 discharge points originating at regulator chambers to the interceptor sewers. In addition to the CSO points originating at regulators to the interceptor, the City had constructed cross connections to provide hydraulic relief to the CSS. The cross connections consist of elevated overflow pipes between manholes that allow for diversion of excess wastewater flow from the combined sewer system to the storm sewer system and ultimately to the receiving waters. Each of the cross connections were retrofitted with static screens to provide control of floatables. Overall, the sewer system contains 37 floatables control facilities tributary to 13 CSO discharge pipes. During construction of the solids/floatables control facilities, several of the outfalls were combined to reduce the number of individual facilities from the total number of 28 CSO outfalls.

North Bergen MUA

The North Bergen MUA has eight netting facilities and one bar screen in the Central Service Area. Each CSO outfall receives flows from only one regulator.

Jersey City MUA

JCMUA owns and operates 20 netting facilities and one mechanical screening facility in the JCMUA's system. The netting facilities consist of nets and static screens that capture solids and floatables that would otherwise enter the receiving waters. These facilities are inspected on a regular basis, and solids and floatables are removed and disposed.

C.3 SYSTEM CHARACTERIZATION

C.3.1 System Characterization Work Plan for the LTCP

The System Characterization Work Plan for the LTCP was submitted as part of the System Characterization and Landside Modeling Program Quality Assurance Project Plan (QAPP) I and System Characterization and Landside Modeling Program QAPP II. The QAPPs describe work plans for data generation and acquisition, assessment and oversight, data validation and usability, and collections system modeling.

The System Characterization Work Plan I was submitted to the NJDEP on behalf of PVSC, Borough of East Newark, Town of Harrison, Town of Kearny, City of Newark, and City of Paterson on December 29, 2015. The NJDEP provided comments on February 17, 2016, and it was ultimately approved by the NJDEP on October 12, 2016.

The System Characterization Work Plan II was submitted to the NJDEP on behalf of Bayonne MUA and North Bergen MUA on December 28, 2015. The NJDEP provided comments on February 16, 2016, and it was approved by the NJDEP on October 12, 2016.

See **Appendix Q** for the approved System Characterization Work Plans.

C.3.2 System Characterization Report

The objective of the System Characterization Report (SCR) is to provide NJDEP, PVSC, and the Permittees with a comprehensive and empirical understanding of the physical nature and hydraulic performance of their respective sewerage systems for use in optimizing the

performance of the current systems and in the development of CSO control alternatives. The SCR incorporated the results of the QAPPs for the System Characterization and Landside Modeling Program, a summary of the Baseline Monitoring and Modeling Plan program, and the System Characterization mapping of the combined and separate sewer areas within the PVSC Treatment District. The SCR was submitted to the NJDEP on behalf of the Permittees on June 29, 2018. The NJDEP provided comments on October 9, 2018, and ultimately approved the SCR on April 12, 2019. The SCR can be found in **Appendix A**.

This System Characterization Report has been developed to include PVSC and seven of the CSO municipalities per agreement with each municipality. Jersey City MUA submitted their own System Characterization Report.

The SCR documents detail a thorough understanding of the Permittees' respective sewerage systems, the systems' responses to precipitation events of varying duration and intensity, the characteristics of system overflow events, and water quality issues associated with CSOs emanating from the systems. The latest revision of the SCR provides a more comprehensive summary of the system characterization. An overview of the organization and contents of the SCR are provided in **Table C-7.**

C.3.3 Receiving Waters Characterization

Characteristics of the receiving waters include description of the receiving waters designated use, shoreline characteristics, identification of the waters on the impaired waters of New Jersey and a summary of the sensitive areas, if any, within the receiving water. The USEPA CSO Control Policy Guideline requires that highest priority is given to CSOs that discharge to sensitive areas.

Major receiving waters impacted from PVSC service area combined sewer overflows include the Passaic River, Hackensack River, Newark Bay, Upper New York Bay, Hudson River, Kill Van Kull, Raritan River and Raritan Bay, as well as their tributaries. The NJDEP has categorized these receiving waters into Watershed Management Areas (WMA) 1 through 20 and refers to these designations in the 303(d) list of impaired water.

CSO receiving waters are waterbodies that either a CSO discharges into or receive flow from tributaries with CSOs. The receiving waters include the combined sewer service area of the PVSC Treatment District and expands from this service area to include all receiving and adjacent downstream waters that may be potentially affected by CSOs from the various combined sewer service areas of the NJ CSO Group. PVSC Treatment District receiving waters include the Passaic River, Hudson River, Newark Bay, Upper New York Bay, Hackensack River, Kill Van Kull, as well as their tributaries. All of the CSO outfalls and the waterbodies into which they discharge are listed in **Table C-8**.

Table C-7: System Characterization Report Contents and Organization

Section		Topics Covered
A	Introduction and Background	Documents the problem definition, background, project description, summary and table of contents.
B	Regulatory Requirements	Describes the scope, purpose and regulatory context of the System Characterization Report.
C	Overview of Wastewater Facilities and Service Area	Characterizes the service area comprising the PVSC combined sewered municipalities that are the subject of this system characterization report and current wastewater treatment facilities within the service area.
D	Characteristics of the Combined Sewer System	Characterizes the municipal collection sewers, sewer mains, interceptors and appurtenances such as pump stations, existing CSO control facilities, regulator structures, and CSO outfalls.
E	Collection of Precipitation and Sewer Flow Monitoring	Documents the precipitation and flow monitoring programs, data analyses, integration of wastewater treatment plant operational data, data validation and QA/QC and presents the results of the analyses.
F	Characteristics of the Receiving Waters	Describes the watersheds, physical characteristics, and hydrodynamics of the receiving streams. Also describes the designated uses and current water quality compliance (e.g. 303(d) listings) and achievement of designated use status.
G	Collection of Water Quality Data	Documents the regulatory requirements for water quality data collection, historic water quality data collection, the water quality monitoring program and related QAPP and receiving water quality results.
H	Typical Hydrologic Period	Documents the requirements for and selection of the typical year and summarizes the hydrologic characteristics of the typical year.
I	Hydrologic and Hydraulic Modeling	Documents the development and scope of the H&H model used in this system characterization and to be used in the development of CSO control alternatives. The documentation includes model inputs, sensitivity analyses, model calibration and validation and modeling results.
J	References	
K	Abbreviations	

Table C-8: CSO Outfalls and Their Receiving Waters

SPDES	Permittee	CSO Number	Regulator Number (Outfall Name)	Receiving Water Body
NJ0109240	Bayonne	001A	B-001A (E. 15th St.)	Kill Van Kull
NJ0109240	Bayonne	002A	B-002A (5th St.)	Kill Van Kull
NJ0109240	Bayonne	003A	B-003A (1st St.)	Kill Van Kull
NJ0109240	Bayonne	004A	B-004A (Lord Ave.)	Kill Van Kull
NJ0109240	Bayonne	006A	B-006A (E. 30th St.)	Upper NY Bay
NJ0109240	Bayonne	007A	B-007A (E. 34th St.)	Upper NY Bay
NJ0109240	Bayonne	008A	B-008A (E. 5th St.)	Kill Van Kull
NJ0109240	Bayonne	009A	B-009A (Broadway)	Kill Van Kull
NJ0109240	Bayonne	010A	B-010A (Ave. C)	Kill Van Kull
NJ0109240	Bayonne	011A	B-011A (W. 3rd St.)	Newark Bay
NJ0109240	Bayonne	012A	B-012A (W. 5th St.)	Newark Bay
NJ0109240	Bayonne	013A	B-013A (Edwards Ct.)	Newark Bay
NJ0109240	Bayonne	014A	B-014A (W. 16th St.)	Newark Bay
NJ0109240	Bayonne	015A	B-015A (W. 22nd St.)	Newark Bay
NJ0109240	Bayonne	016A	B-016A (W. 24th St.)	Newark Bay
NJ0109240	Bayonne	017A	B-017A (W. 25th St.)	Newark Bay
NJ0109240	Bayonne	018A	B-018A (W. 30th St.)	Newark Bay
NJ0109240	Bayonne	019A	B-019A (Lincoln Pkwy)	Newark Bay
NJ0109240	Bayonne	020A	B-020A (W. 59th St.)	Newark Bay
NJ0109240	Bayonne	021A	B-021A (E. 50th St.)	Upper NY Bay
NJ0109240	Bayonne	022A	B-022A (Zabriskie Ave.)	Newark Bay

SPDES	Permittee	CSO Number	Regulator Number (Outfall Name)	Receiving Water Body
NJ0109240	Bayonne	024A	B-024A (Humphrey's Ave.)	Kill Van Kull
NJ0109240	Bayonne	026A	B-026A (Veteran's Park)	Newark Bay
NJ0109240	Bayonne	028A	B-028A (Lincoln Pkwy)	Newark Bay
NJ0109240	Bayonne	029A	B-029A (W. 37th St.)	Newark Bay
NJ0109240	Bayonne	030A	B-030A (W. 54th St.)	Newark Bay
NJ0109240	Bayonne	034A	B-034A (Bayview Ct.)	Newark Bay
NJ0109240	Bayonne	037A	B-037A (Trask Ave.)	Kill Van Kull
NJ0117846	East Newark	001A	E-001A (Central Ave.)	Passaic River
NJ0108871	Harrison Town	001A	H-001A (Hamilton Ave.)	Passaic River
NJ0108871	Harrison Town	002A	H-002A (Cleveland Ave.)	Passaic River
NJ0108871	Harrison Town	003A	H-003A (Harrison Ave.)	Passaic River
NJ0108871	Harrison Town	005A	H-005A (Middlesex St.)	Passaic River
NJ0108871	Harrison Town	006A	H-006A (Bergen St.)	Passaic River
NJ0108871	Harrison Town	007A	H-007A (Worthington Ave.)	Passaic River
NJ0108723	Jersey City MUA	001A	RW-1 (Secaucus Rd.)	Penhorn Creek
NJ0108723	Jersey City MUA	002A	RW-2 (Manhattan Ave.)	Penhorn Creek
NJ0108723	Jersey City MUA	003A	RW-3 (St. Paul's Ave.)	Hackensack River
NJ0108723	Jersey City MUA	004A	RW-4 (Van Wrinkle Ave.)	Hackensack River
NJ0108723	Jersey City MUA	005A	RW-5 (Broadway)	Hackensack River
NJ0108723	Jersey City MUA	006A	RW-6 (Sip Ave.)	Hackensack River
NJ0108723	Jersey City MUA	007A	RW-7 (Duncan Ave.)	Hackensack River
NJ0108723	Jersey City MUA	008A	RW-8 (Clendenny Ave.)	Hackensack River

SPDES	Permittee	CSO Number	Regulator Number (Outfall Name)	Receiving Water Body
NJ0108723	Jersey City MUA	009A	RW-9 (Claremont Ave.)	Hackensack River
NJ0108723	Jersey City MUA	010A	RW-10 (Fisk St.)	Hackensack River
NJ0108723	Jersey City MUA	011A	RW-11/12 (North Danforth Ave.) RW-12 (South Danforth Ave.)	Newark Bay
NJ0108723	Jersey City MUA	013A	RW-13 (Mina Dr.)	Newark Bay
NJ0108723	Jersey City MUA	014A	RE-1 (Brown Place)	Hudson River
NJ0108723	Jersey City MUA	015A	RE-2 (Richard St.)	Hudson River
NJ0108723	Jersey City MUA	016A	RE-3/4 (Claremont and Carteret)	Hudson River
NJ0108723	Jersey City MUA	018A	RE-5/6 (Mill Creek and Pine)	Hudson River
NJ0108723	Jersey City MUA	020A	RE-10 (Grand St.) RE-11 (York St.)	Hudson River
NJ0108723	Jersey City MUA	025A	RE-15 (Second St.)	Hudson River
NJ0108723	Jersey City MUA	026A	RE-16 (South Sixth St.), RE-17 (North Sixth St.)	Hudson River
NJ0108723	Jersey City MUA	028A	RE-18 (Fourteenth St.)	Hudson River
NJ0108723	Jersey City MUA	029A	RE-19 (Eighteenth St.)	Hudson River
NJ0111244	Kearny Town	001A	K-001A (Stewart Ave.)	Passaic River
NJ0111244	Kearny Town	004A	K-004A (Nairne Ave.)	Passaic River
NJ0111244	Kearny Town	006A	K-006A (Johnston Ave.)	Passaic River
NJ0111244	Kearny Town	007A	K-007A (Ivy St.)	Frank's Creek
NJ0111244	Kearny Town	010A	K-010A (Duke St.)	Frank's Creek
NJ0108758	Newark City	002A	N-002A (Verona Ave.)	Passaic River

SPDES	Permittee	CSO Number	Regulator Number (Outfall Name)	Receiving Water Body
NJ0108758	Newark City	003A	N-003A (Delavan Ave.)	Passaic River
NJ0108758	Newark City	004A	N-004A/004A (Herbert)	Passaic River
NJ0108758	Newark City	005A	N-005A (Herbert Pl.)	Passaic River
NJ0108758	Newark City	008A	N-008A (Fourth Ave.)	Passaic River
NJ0108758	Newark City	009A	N-009A (Clay St.)	Passaic River
NJ0108758	Newark City	010A	N-010A (Clay St.)	Passaic River
NJ0108758	Newark City	014A	N-014A (Saybrook)	Passaic River
NJ0108758	Newark City	015A	N-015A (City Dock)	Passaic River
NJ0108758	Newark City	016A	N-016A (Jackson St.)	Passaic River
NJ0108758	Newark City	017A	N-017A (Polk St.)	Passaic River
NJ0108758	Newark City	018A	N-018A (Freeman St.)	Passaic River
NJ0108758	Newark City	022A	N-022A (Roanoke Ave.)	Passaic River
NJ0108758	Newark City	023A	N-023A (Adams St.)	Peripheral Ditch / Elizabeth Channel
NJ0108758	Newark City	025A	N-025A (Peddie St.)	Peripheral Ditch / Elizabeth Channel
NJ0108758	Newark City	026A	N-026A (Queen St.)	Queen Ditch
NJ0108758	Newark City	027A/029A	N-027A/029A (Waverly)	Peripheral Ditch / Elizabeth Channel
NJ0108758	Newark City	030A	N-030A (Ave. A)	Peripheral Ditch / Elizabeth Channel
NJ0108898	North Bergen MUA	003A	NB-003A (W. 91st St.)	Bellmans Creek
NJ0108898	North Bergen MUA	005A	NB-005A (W. 69th St.)	Cromakill Creek
NJ0108898	North Bergen MUA	006A	NB-006A (W. 60th St.)	Cromakill Creek
NJ0108898	North Bergen MUA	007A	NB-007A (51st St.)	Cromakill Creek
NJ0108898	North Bergen MUA	008A	NB-008A (43rd St.)	Cromakill Creek

SPDES	Permittee	CSO Number	Regulator Number (Outfall Name)	Receiving Water Body
NJ0108898	North Bergen MUA	009A	NB-009A (Paterson Plank Rd.)	Cromakill Creek
NJ0108898	North Bergen MUA	010A	NB-010A (29th St.)	Cromakill Creek
NJ0108898	North Bergen MUA	011A	NB-011A (11th St.)	Cromakill Creek
NJ0108898	North Bergen MUA	014A	NB-014A (Paterson Plank Rd.)	Cromakill Creek
NJ0108880	Paterson City	001A	P-001A (Curtis Pl.)	Passaic River
NJ0108880	Paterson City	003A	P-003A (W. Broadway)	Passaic River
NJ0108880	Paterson City	005A	P-005A (Bridge St.)	Passaic River
NJ0108880	Paterson City	006A	P-006A (Montgomery St.)	Passaic River
NJ0108880	Paterson City	007A	P-007A (Straight St.)	Passaic River
NJ0108880	Paterson City	010A	P-010A (Warren St.)	Passaic River
NJ0108880	Paterson City	013A	P-013A (E. Eleventh St.)	Passaic River
NJ0108880	Paterson City	014A	P-014A (Fourth Ave.)	Passaic River
NJ0108880	Paterson City	015A	P-015A (S.U.M. Park)	Passaic River
NJ0108880	Paterson City	016A	P-016A (Northwest St.)	Passaic River
NJ0108880	Paterson City	017A	P-017A (Arch St.)	Passaic River
NJ0108880	Paterson City	021A	P-021A (Bergen St.)	Passaic River
NJ0108880	Paterson City	022A	P-022A (Short St.)	Passaic River
NJ0108880	Paterson City	023A	P-023A (Second Ave.)	Passaic River
NJ0108880	Paterson City	024A	P-024A (Third Ave.)	Passaic River
NJ0108880	Paterson City	025A	P-025A (East 33rd Ave.)	Passaic River
NJ0108880	Paterson City	026A	P-026A (East 20th Ave.)	Passaic River
NJ0108880	Paterson City	027A	P-027A (Market St.)	Passaic River

SPDES	Permittee	CSO Number	Regulator Number (Outfall Name)	Receiving Water Body
NJ0108880	Paterson City	029A	P-029A (River St.)	Passaic River
NJ0108880	Paterson City	030A	P-030A (19th Ave.)	Passaic River
NJ0108880	Paterson City	031A	P-031A (Interstate 80)	Passaic River
NJ0108880	Paterson City	032A	P-032A (Hudson St.)	Passaic River
NJ0108880	Paterson City	033A	P-033A (River St.)	Passaic River

The receiving waters and their tributaries belong to drainage basins that are impacted by CSO discharges. Drainage basins, or watersheds, are areas that are separated by drainage divides and within a watershed, all surface water drains to a single outlet such as a river. The impacted watersheds within the PVSC Treatment District are listed in **Table C-9.** The watersheds are also shown with the QAPP Part 1 and Part 2 areas from the "System Characterization and Landside Modeling Program Quality Assurance Project Plan (QAPP)," which have been previously approved by NJDEP areas in **Figure C-4**.

Table C-9: Watersheds Affected by CSO Discharges

Watershed Name	Area (sq mi)
Hudson River	5
Passaic River Lower (Saddle to Pompton)	46
Hackensack River (below and including Hirschfeld Brook)	19
Passaic River Lower (Newark Bay to Saddle)	52
Elizabeth River	2
Newark Bay / Kill Van Kull / Upper NY Bay	25

C.3.4 Baseline Compliance Monitoring Program

Section D.3.c of the NJPDES Permit for each Permittee requires submittal of an approvable Baseline Compliance Monitoring Program (BCMP) Work Plan to the NJDEP 6 months from the effective date of the permit. The QAPPs for the BCMP and Receiving Water Quality Modeling were submitted separately from the Sewer System Characterization Work Plan QAPP described in **Section C.3.1**.

The BCMP (**Appendix R**) was developed to serve all of the North Jersey CSO Permittees and designed to generate sufficient data to establish existing ambient water quality conditions for pathogens in the CSO receiving waters and to update, calibrate and validate a pathogen water

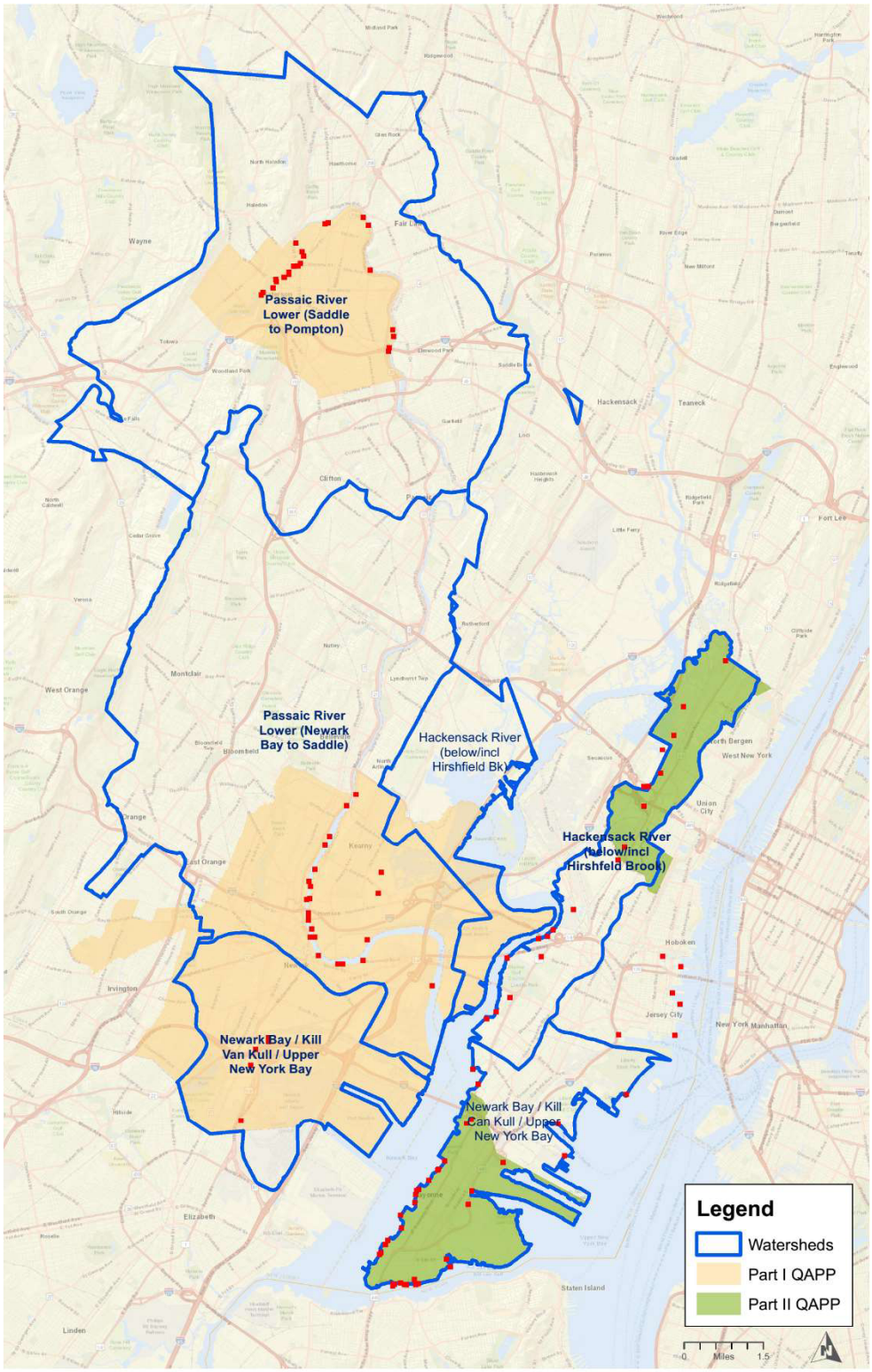

Figure C-4: PVSC Treatment District Watersheds

quality model of the receiving water bodies. The resulting model was used to support the development of CSO LTCPs by the PVSC and participating members of the NJ CSO Group. A review indicated that the data collected under the BCMP is sufficient for the intended goal of calibrating the water quality model to be used for PVSC and NJCSO communities' LTCPs.

C.4 TYPICAL HYDROLOGIC YEAR

The year 2004 was selected as the recommended typical hydrologic year for the PVSC CSO communities' LTCP. The selection of the typical hydrologic year was based on the historical records in the past 46 years from 1970 through 2015 as detailed in the SCR in **Appendix A** of this report. The Typical Year analysis that was performed accounted for climate change based on the increased precipitation trend over this 46 year period. In order to be more conservative, the typical year was selected from years with an annual precipitation depth greater than the average value.

Among the qualified periods, the year 2004 ranked first in the parameters described in **Table C-10** and contains a wide range of storms and antecedent conditions. Additionally, year 2004 has close to an average CSO volume and event number based on the hydrologic and hydraulic model results. A summary of the parameters and the percent difference is shown below in **Table C-10**.

Table C-10: Summary of the Recommended Typical Hydrologic Year - 2004

Parameters	2004
Annual Precipitation*	48.37 in (4.5% greater than average 46.27)
Number of Events >=0.2" Rainfall Depth	54 (5% greater than average 51.2)
Number of Events >=0.1" Rainfall Depth	73 (11% greater than average 66)
5th Largest Storm Volume	1.63 in (5% less than average 1.70)
Rainfall Volume for 85% Capture	1.18 in (12% less than average 1.35)
Back-to-Back Storm Events	12 (14% greater than average 10.5)
Max Peak Intensity of 5th Largest Storm & Smaller	0.99 in/hr (9.5% greater than average 0.90)
Extreme Storm	1 Year Storm (2) 2 Year Storm (1)
Average Rainfall Duration	10.3 hr (4.8% less than average 10.8)
Average Rainfall Intensity	0.084 in/hr (3.8% greater than average 0.081)

Note: *Includes snowfall

C.5 SENSITIVE AREAS

The USEPA's CSO Control Policy "expects a Permittee's long-term CSO control plan to give the highest priority to controlling overflows to sensitive areas" (Section II.C.3).

In compliance with this condition, PVSC prepared a Sensitive Areas Report on behalf of the Permittees. The study involved a comprehensive review of online databases, direct observations and correspondence with regulatory agencies and local environmental organizations to identify

potential sensitive areas within the PVSC Treatment District and in the associated receiving waters.

The results of the study are summarized below:

- Zero Outstanding National Resource Waters were located within the Service Area.
- Zero National Marine Sanctuaries were located within the Service Area.
- Zero* known critical habitats for an endangered species were located in the Service Area.
- Zero waters designated for primary contact were located within the Service Area.
- Zero operating commercial shellfish harvesters were located within the Service Area.
- Zero* drinking water intakes were located in the Service Area.

**T*here are multiple locations where endangered or threatened species have been identified near permitted CSOs, but no certainty of a critical habitat existing at these locations. As such, there have been no sensitive areas determined as a result from waters with threatened and endangered species within their habits.*

For details of the Sensitive Area Study refer to the System Characterization Report (**Appendix A**) and the Consideration of Sensitive Areas Report (**Appendix C**).

SECTION D - SCREENING OF CSO CONTROL TECHNOLOGIES

In order to determine the appropriate combined sewer overflow control technologies, a review of CSO technologies was completed in the Development and Evaluation of Alternatives Report (DEAR) to determine those technologies that have the greatest potential to meet the requirements of the NJPDES Permit for the Municipalities.

This screening of technologies did not consider cost or the cost effectiveness and was only intended to exclude CSO control technologies not technically or physically appropriate for the PVSC Treatment District. The screening of CSO control technologies was also presented to the public at a PVSC Regional Supplemental CSO Team Meeting. Public input received on the screening of CSO control technologies was reviewed and considered in this evaluation. The results of this screening brought several CSO control technologies forward for consideration in the development of the LTCP. These control technologies are further discussed in Section E of this report, and further details on the screening process are provided in **Appendix D**.

D.1 EVALUATION METHODOLOGY

Each CSO control technology evaluated in this section was assigned a value based on its effectiveness at achieving the primary goals defined above. The categories used to assign goal effectiveness are as follows:

- High: These CSO control technologies are highly effective and are among the best technologies to achieve primary CSO control goals. For this reason, these technologies are highly likely to be considered for further evaluation.
- Medium: These CSO control technologies are moderately effective at achieving the primary CSO control goals, but are not considered among the most effective technologies to achieve those goals. These technologies may or may not be considered for further evaluation.
- Low: These CSO control technologies are projected to have a minor impact on achieving the primary CSO control goals. These technologies will need other positive attributes to support achieving CSO control measures to be considered for further evaluation.
- None: The CSO control technology will have no impact or a negative impact on the primary CSO control goals. It is unlikely that these technologies will be considered for further evaluation.

A CSO technology that is highly effective in one or all evaluation factors was likely to be recommended for further investigation. A CSO technology that did not reach a “medium” effectiveness in meeting CSO control goals was not likely to be recommended for further evaluation.

Additionally, the positive impacts that each of the technologies could have on the community beyond achieving the primary goals described above were evaluated. The community benefits were identified using as a reference the New Jersey DEP Division of Water Quality’s report entitled “Evaluating Green Infrastructure: A Combined Sewer Overflow Control Alternative for Long Term Control Plans,” and the New Jersey Green Infrastructure Municipal Toolkit website. Public input received on the screenings of technologies also requested that community benefits were considered. As such, community benefits were incorporated in the evaluation methodology

and were identified to include aesthetic improvements, improvements to water quality, reduction of flooding potential, and alignment with sustainable community principles, among others.

CSO control technologies were recommended for further evaluation based on multiple factors:

- The first factor was the goal-effectiveness value that generally quantifies the effectiveness a technology would have towards achieving a CSO control goal. These goal-effectiveness values are described above.
- The second factor depended upon the CSO control technology requiring further evaluation pursuant to the NJPDES Permit. The permit identifies certain technologies that must be evaluated further before approval.
- The third factor in determining whether a technology would be evaluated further was the current or future implementation and operation of that technology. If the technology is currently in place, will be implemented, or is mandated by the Nine Minimum Controls, then further evaluation was not required.
- The fourth and final factor was the feasibility of implementation, particularly in terms of land/infrastructure ownership.

The community benefits identified for each technology also played an important role in determining whether implementation of the technology would be beneficial and recommended to be moved forward for further analysis.

CSO technologies found to be highly effective in one or all evaluation factors were likely to be recommended for further investigation. A CSO technology that would not achieve a "medium" effectiveness for water quality goals would not be expected to be recommended for further evaluation. This screening methodology was presented to the public at the October 2018 PVSC Regional Supplemental CSO Meeting. Input was requested from the public and the public feedback was considered in this evaluation.

D.2 SCREENING OF CONTROL TECHNOLOGIES

Templates of the screening tables used by the two municipalities for screening of the CSO control technologies are presented as **Table D-1**, **Table D-2**, and **Table D-3**. **Table D-1** presents the source control technologies, **Table D-2** presents the collection system technologies, and **Table D-3** presents the storage and treatment technologies.

Screening tables with the last two columns filled out by each municipality are presented in the individual DEAR for each Permittee, appended to the Regional DEAR, which is included as **Appendix D.** The CSO control technologies summarized in the individual DEARs present assigned values based on their effectiveness at reaching primary CSO control goals. CSO Control technologies recommended for further evaluation are recorded in these summary tables for each Permittee.

Table D-1 Source Control Technologies Screening Table

Source Control Technologies								
Technology Group	Practice	Primary Goals		Community Benefits	Implementation & Operation Factors	Consider Combining w/ Other Technologies	Being Implemented	Recommendation for Alternatives Evaluation
		Bacteria Reduction	Volume Reduction					
Stormwater Management	Street/Parking Lot Storage (Catch Basin Control)	Low	Low	▪ Reduced surface flooding	Flow restrictions to the CSS can cause flooding in lots, yards and buildings; potential for freezing in lots; low operational cost. Effective at reducing peak flows during wet weather events but can cause dangerous conditions for the public if pedestrian areas freeze during flooding.	No		
	Catch Basin Modification (for Floatables Control)	Low	None	▪ Water quality improvements ▪ Reduced surface flooding	Requires periodic catch basin cleaning; requires suitable catch basin configuration; potential for street flooding and increased maintenance efforts. Reduces debris and floatables that can cause operational problems with the mechanical regulators.	No		
	Catch Basin Modification (Leaching)	Low	Low	▪ Water quality improvements ▪ Reduced surface flooding	Can be installed in new developments or used as replacements for existing catch basins. Require similar maintenance as traditional catch basins. Leaching catch basins have minor effects on the primary CSO control goals.	No		
Public Education and Outreach	Water Conservation	None	Low	▪ Reduced surface flooding ▪ Align with goals for a sustainable community	Water purveyor is responsible for the water system and all related programs in the respective City. However, water conservation is a common topic for public education programs. Water conservation can reduce CSO discharge volume but would have little impact on peak flows.	Yes		
	Catch Basin Stenciling	None	None	▪ Align with goals for a sustainable community	Inexpensive; easy to implement; public education. Is only as effective as the public's input and understanding of the message. Public outreach programs would have a more effective result.	Yes		
	Community Cleanup Programs	None	None	▪ Water quality improvements ▪ Align with goals for a sustainable community	Inexpensive; sense of community ownership; educational BMP; aesthetic enhancement. Community cleanups are inexpensive and build ownership in the city.	Yes		
	Public Outreach Programs	Low	None	▪ Align with goals for a sustainable community	Public education program is ongoing. Permittee should continue its public education program as control measures demonstrate implementation of the NMC.	Yes		
	FOG Program	Low	None	▪ Water quality improvements ▪ Improves collection system efficiency	Requires communication with business owners; Permittee may not have enforcement authority. Reduces buildup and maintains flow capacity. Only as effective as business owner cooperation.	Yes		
	Garbage Disposal Restriction	Low	None	▪ Water quality improvements	Permittee may not be responsible for Garbage Disposal. This requires an increased allocation of resources for enforcement while providing very little reduction to wet weather CSO events.	Yes		
	Pet Waste Management	Medium	None	▪ Water quality improvements	Low cost of implementation and little to no maintenance. This is a low-cost technology that can significantly reduce bacteria loading in wet weather CSO's.	Yes		
	Lawn and Garden Maintenance	Low	Low	▪ Water quality improvements	Requires communication with business and homeowners. Guidelines are already established per USEPA. Educating the public on proper lawn and garden treatment protocols developed by USEPA will reduce waterway contamination. Since this information is already available to the public it is unlikely to have a significant effect on improving water quality.	Yes		
	Hazardous Waste Collection	Low	None	▪ Water quality improvements	The N.J.A.C. prohibits the discharge of hazardous waste to the collection system.	Yes		

Source Control Technologies								
Technology Group	Practice	Primary Goals		Community Benefits	Implementation & Operation Factors	Consider Combining w/ Other Technologies	Being Implemented	Recommendation for Alternatives Evaluation
		Bacteria Reduction	Volume Reduction					
Ordinance Enforcement	Construction Site Erosion & Sediment Control	None	None	▪ Water quality improvements	In building code; reduces sediment and silt loads to waterways; reduces clogging of catch basins; little O&M required; contractor or owner pays for erosion control. A Soil Erosion & Sediment Control Plan Application or 14-day notification (if Permittee covered under permit-by-rule) will be required by NJDEP per the N.J.A.C.	Yes		
	Illegal Dumping Control	Low	None	▪ Water quality improvements ▪ Aesthetic benefits	Enforcement of current law requires large number of code enforcement personnel; recycling sites maintained. Local ordinances already in place can be used as needed to address illegal dumping complaints.	Yes		
	Pet Waste Control	Medium	None	▪ Water quality improvements ▪ Reduced surface flooding	Requires resources to enforce pet waste ordinances. Public education and outreach are a more efficient use of resources, but this may also provide an alternative to reducing bacterial loads.	Yes		
	Litter Control	None	None	▪ Property value uplift ▪ Water quality improvements ▪ Reduced surface flooding	Aesthetic enhancement; labor intensive; City function. Litter control provides an aesthetic and water quality enhancement. It will require city resources to enforce. Public education and outreach are a more efficient use of resources.	Yes		
	Illicit Connection Control	Low	Low	▪ Water quality improvements ▪ Align with goals for sustainable community	Site specific; more applicable to separate sanitary system; new storm sewers may be required; interaction with homeowners required. The primary goal of the LTCP is to meet the NJPDES Permit requirements relative to POCs. Illicit connection control is not particularly effective at any of these goals and is not recommended for further evaluation unless separate sewers are in place.	Yes		
Good Housekeeping	Street Sweeping/Flushing	Low	None	▪ Reduced surface flooding	Labor intensive; specialized equipment; doesn't address flow or bacteria; City function. Street sweeping and flushing primarily addresses floatables entering the CSS while offering an aesthetic improvement.	Yes		
	Leaf Collection	Low	None	▪ Reduced surface flooding ▪ Aesthetic benefits	Requires additional seasonal labor. Leaf collection maximizes flow capacity and removes nutrients from the collection system.	Yes		
	Recycling Programs	None	None	▪ Align with goals for sustainable community	Most Cities have an ongoing recycling program.	Yes		
	Storage/Loading/Unloading Areas	None	None	▪ Water quality improvements	Requires industrial & commercial facilities designate and use specific areas for loading/unloading operations. There may be few major commercial or industrial users upstream of CSO regulators.	Yes		
	Industrial Spill Control	Low	None	▪ Protect surface waters ▪ Protect public health	PVSC has established a pretreatment program for industrial users subject to the Federal Categorical Pretreatment Standards 40 CFR 403.1.	Yes		
Green Infrastructure Buildings	Green Roofs	None	Medium	▪ Improved air quality ▪ Reduced carbon emissions ▪ Reduced heat island effect ▪ Property value uplift ▪ Local jobs ▪ Reduced surface flooding ▪ Reduced basement sewage flooding ▪ Align with goals for a sustainable community	Adds modest cost to new construction; not applicable to all retrofits; low operational resource demand; will require the Permittee or private owners to implement; requires regular cleaning of gutters & pipes; upkeep of roof vegetation. Portions of Cities have densely populated areas, but this technology is limited to rooftops. Can be difficult to require on private properties.	Yes		

Source Control Technologies								
Technology Group	Practice	Primary Goals		Community Benefits	Implementation & Operation Factors	Consider Combining w/ Other Technologies	Being Implemented	Recommendation for Alternatives Evaluation
		Bacteria Reduction	Volume Reduction					
Green Infrastructure Buildings	Blue Roofs	None	Medium	▪ Reduced heat island effect ▪ Property value uplift ▪ Local jobs ▪ Reduced surface flooding ▪ Reduced basement sewage flooding ▪ Align with goals for a sustainable community	Adds modest cost to new construction; not applicable to all retrofits; low operational resource demand; will require the Permittees or private owners to implement; requires regular cleaning of gutters & pipes; upkeep of roof debris. Portions of the Cities have densely populated areas, but this technology is limited to rooftops. Can be difficult to require on private properties.	Yes		
	Rainwater Harvesting	None	Medium	▪ Reduced surface flooding ▪ Reduced basement sewage flooding ▪ Align with goals for a sustainable community ▪ Water saving	Simple to install and operate; low operational resource demand; will require the Permittees or private owners to implement; requires regular cleaning of gutters & pipes. Portions of the Cities have densely populated areas, but this technology is limited to capturing rooftop drainage. Capture is limited to available storage, which can vary on rainwater use. Can be difficult to require on private properties.	Yes		
Green Infrastructure Impervious Areas	Permeable Pavements	Low	Medium	▪ Improved air quality ▪ Reduced carbon emissions ▪ Reduced heat island effect ▪ Property value uplift ▪ Water quality improvements ▪ Reduced surface flooding ▪ Reduced basement sewage flooding ▪ Align with goals for a sustainable community	Not durable and clogs in winter; oil and grease will clog; significant O&M requirements with vacuuming and replacing deteriorated surfaces; can be very effective in parking lots, lanes and sidewalks. Maintenance requirements could be reduced if located in low-traffic areas and can utilize underground infiltration beds or detention tanks to increase storage.	Yes		
	Planter Boxes	Low	Medium	▪ Improved air quality ▪ Reduced carbon emissions ▪ Reduced heat island effect ▪ Property value uplift ▪ Reduced surface flooding ▪ Reduced basement sewage flooding ▪ Align with goals for a sustainable community	Site specific; good BMP; minimal vegetation & mulch O&M requirements with regular overflow and underdrain cleaning; effective at containing, infiltrating and evapotranspiring runoff in developed areas. Flexible and can be implemented even on a small-scale to any high-priority drainage areas. Underground infiltration beds or detention tanks can be utilized to increase storage.	Yes		
Green Infrastructure Pervious Areas	Bioswales	Low	Low	▪ Improved air quality ▪ Reduced carbon emissions ▪ Reduced heat island effect ▪ Property value uplift ▪ Local jobs	Site specific; good BMP; minimal vegetation & mulch O&M requirements; not as flexible or infiltrate as much stormwater as planter boxes. Technology requires open space and is primarily a surface conveyance technology with additional storage & infiltration benefits. Can be modified with check dams to slow water flow. Limited open space in most Cities means land can be utilized in more effective ways with the existing infrastructure.	Yes		

Source Control Technologies								
Technology Group	Practice	Primary Goals: Bacteria Reduction	Primary Goals: Volume Reduction	Community Benefits	Implementation & Operation Factors	Consider Combining w/ Other Technologies	Being Implemented	Recommendation for Alternatives Evaluation
				▪ Passive and active recreational improvements ▪ Reduced surface flooding ▪ Reduced basement sewage flooding ▪ Community aesthetic improvements ▪ Reduced crime ▪ Align with goals for a sustainable community ▪ Increased pedestrian safety through curb retrofits				
	Free-Form Rain Gardens	Low	Medium	▪ Improved air quality ▪ Reduced carbon emissions ▪ Reduced heat island effect ▪ Property value uplift ▪ Passive and active recreational improvements ▪ Reduced surface flooding ▪ Reduced basement sewage flooding ▪ Community aesthetic improvements ▪ Reduced crime ▪ Align with goals for a sustainable community	Site specific; good BMP; minimal vegetation & mulch O&M requirements with regular overflow and underdrain cleaning; effective at containing, infiltrating and evapotranspiring diverted runoff. Rain Gardens are flexible and can be modified to fit into the previous areas. Underground infiltration beds or detention tanks can be utilized to increase storage.	Yes		

Table D-2: Collection System Technologies Screening Table

Collection System Technologies								
Technology Group	Practice	Primary Goals		Community Benefits	Implementation & Operation Factors	Consider Combining w/ Other Technologies	Being Implemented	Recommendation for Alternatives Evaluation
		Bacteria Reduction	Volume Reduction					
Operation and Maintenance (O&M)	I/I Reduction	Low	Medium	▪ Water quality improvements ▪ Reduced basement sewage flooding	Requires labor intensive work; changes to the conveyance system require temporary pumping measures; repairs on private property required by homeowners. Reduces the volume of flow and frequency; Provides additional capacity for future growth; House laterals account for 1/2 the sewer system length and significant sources of I/I in the sanitary sewer.	Yes		
	Advanced System Inspection & Maintenance	Low	Low	▪ Water quality improvements ▪ Reduced basement sewage flooding	Requires additional resources towards regular inspection and maintenance work. Inspection and maintenance programs can provide detailed information about the condition and future performance of infrastructure. Offers relatively small advances towards goals of the LTCP.	Yes		
	Combined Sewer Flushing	Low	Low	▪ Water quality improvements ▪ Reduced basement sewage flooding	Requires inspection after every flush; no changes to the existing conveyance system needed; requires flushing water source. Ongoing: CSO Operational Plan; maximizes existing collection system; reduces first flush effect.	Yes		
	Catch Basin Cleaning	Low	None	▪ Water quality improvements ▪ Reduced surface flooding	Labor intensive; requires specialized equipment. Catch Basin Cleaning reduces litter and floatables but will have no effect on flow and little effect on bacteria and BOD levels.	Yes		
Combined Sewer Separation	Roof Leader Disconnection	Low	Low	▪ Reduced basement sewage flooding	Site specific; Includes area drains and roof leaders; new storm sewers may be required; requires home and business owner participation. The Cities are densely populated, and disconnected roof leaders have limited options for discharge to pervious space. Disconnection may be coupled with other GI technologies but is not considered an effective standalone option.	Yes		
	Sump Pump Disconnection	Low	Low	▪ Reduced basement sewage flooding	Site specific; more applicable to separate sanitary system; new storm sewers may be required; interaction with homeowners required. The Cities are densely populated, and disconnected sump pumps have limited options for discharge to pervious space. Disconnection may be coupled with other GI technologies but is not considered an effective standalone option.	Yes		
	Combined Sewer Separation	High	High	▪ Water quality improvements ▪ Reduced basement sewage flooding ▪ Reduced surface flooding	Very disruptive to affected areas; requires homeowner participation; sewer asset renewal achieved at the same time; labor intensive.	No		
Combined Sewer Optimization	Additional Conveyance	High	High	▪ Water quality improvements ▪ Reduced basement sewage flooding	Additional conveyance can be costly and would require additional maintenance to keep new structures and pipelines operating.	No		
	Regulator Modifications	Medium	Medium	▪ Water quality improvements	Relatively easy to implement with existing regulators; mechanical controls will require O&M. May increase risk of upstream flooding. Permittees have an ongoing O&M program and system wide replacement program for CSO regulators and tide gates.	Yes		
	Outfall Consolidation/Relocation	High	High	▪ Water quality improvements ▪ Passive and active recreational improvements	Lower operational requirements; may reduce permitting/monitoring; can be used in conjunction with storage & treatment technologies. Combining and relocating outfalls may lower operating costs and CSO flows. It can also direct flow away from specific areas.	Yes		
	Real Time Control	High	High	▪ Water quality improvements ▪ Reduced basement sewage flooding	Requires periodic inspection of flow elements; highly automated system; increased potential for sewer backups. RTC is only effective if additional storage capacity is present in the system.	Yes		

Table D-3 Storage and Treatment Technologies Screening Table

Storage and Treatment Technologies								
Technology Group	Practice	Primary Goals		Community Benefits	Implementation & Operation Factors	Consider Combining w/ Other Technologies	Being Implemented	Recommendation for Alternatives Evaluation
		Bacteria Reduction	Volume Reduction					
Linear Storage	Pipeline	High	High	▪ Water quality improvements ▪ Reduced surface flooding ▪ Local jobs	Can only be implemented if in-line storage potential exists in the system; increased potential for basement flooding if not properly designed; maximizes use of existing facilities. Pipe storage for a CSS typically requires large diameter pipes to have a significant effect on reducing CSOs. This typically requires large open trenches and temporary closure of streets to install.	No		
	Tunnel	High	High	▪ Water quality improvements ▪ Reduced surface flooding	Requires small area at ground level relative to storage basins; disruptive at shaft locations; increased O&M burden.	No		
Point Storage	Tank (Above or Below Ground)	High	High	▪ Water quality improvements ▪ Reduced basement sewage flooding	Storage tanks typically require pumps to return wet weather flow to the system which will require additional O&M; disruptive to affected areas during construction. Several CSO outfalls have space available for tank storage. There may be existing tanks in abandoned commercial and industrial areas to be converted to hold stormwater. Tanks are an effective technology to reduce wet weather CSO's.	No		
	Industrial Discharge Detention	Low	Low	▪ Water quality improvements	Requires cooperation with industrial users; more resources devoted to enforcement; depends on IUs to maintain storage basins. IUs hold stormwater or combined sewage until wet weather flows subside; there may be commercial or industrial users upstream of CSO regulators.	Yes		
Treatment-CSO Facility	Vortex Separators	None	None	▪ Water quality improvements	Space required; challenging controls for intermittent and highly variable wet weather flows. Vortex separators would remove floatables and suspended solids when installed. It does not address volume, bacteria or BOD.	Yes		
	Screens and Trash Racks	None	None	▪ Water quality improvements	Prone to clogging; requires manual maintenance; requires suitable physical configuration; increased O&M burden. Screens and trash racks will only address floatables.	Yes		
	Netting	None	None	▪ Water quality improvements	Easy to implement; labor intensive; potential negative aesthetic impact; requires additional resources for inspection and maintenance. Netting will only address floatables.	Yes		
	Contaminant Booms	None	None	▪ Water quality improvements	Difficult to maintain requiring additional resources. Contaminant booms will only address floatables.	Yes		
	Baffles	None	None	▪ Water quality improvements	Very low maintenance; easy to install; requires proper hydraulic configuration; long lifespan. Baffles will only address floatables.	Yes		
	Disinfection & Satellite Treatment	High	None	▪ Water quality improvements ▪ Reduced basement sewage flooding	Requires additional flow stabilizing measures; requires additional resources for maintenance; requires additional system analysis. Disinfection is an effective control to reduce bacteria and BOD in CSO's.	Yes		
	High Rate Physical/Chemical Treatment (High Rate Clarification Process - ActiFlo)	None	None	▪ Water quality improvements	Challenging controls for intermittent and highly variable wet weather flows; smaller footprint than conventional methods. This technology primarily focuses on TSS & BOD removal but does not help reduce the bacteria or CSO discharge volume.	Yes		
	High Rate Physical (Fuzzy Filters)	None	None	▪ Water quality improvements	Relatively low O&M requirements; smaller footprint than traditional filtration methods. This technology primarily focuses on TSS removal but does not help reduce the bacteria or CSO discharge volume.	Yes		

Storage and Treatment Technologies								
Technology Group	**Practice**	**Primary Goals**		**Community Benefits**	**Implementation & Operation Factors**	**Consider Combining w/ Other Technologies**	**Being Implemented**	**Recommendation for Alternatives Evaluation**
		Bacteria Reduction	**Volume Reduction**					
Treatment-WRRF	Additional Treatment Capacity	High	High	▪ Water quality improvements ▪ Reduced surface flooding ▪ Reduced basement sewage flooding	May require additional space; increased O&M burden.	No		
	Wet Weather Blending	Low	High	▪ Water quality improvements ▪ Reduced surface flooding ▪ Reduced basement sewage flooding	Requires upgrading the capacity of influent pumping, primary treatment and disinfection processes; increased O&M burden. Wet weather blending does not address bacteria reduction, as it is a secondary treatment bypass for the POTW. Permittee must demonstrate there are no feasible alternatives to the diversion for this to be implemented.	Yes		
Treatment-Industrial	Industrial Pretreatment Program	Low	Low	▪ Water quality improvements ▪ Align with goals for a sustainable community	Requires cooperation with Industrial User's; more resources devoted to enforcement; depends on IU's to maintain treatment standards. May require Permits.	Yes		

SECTION E - EVALUATION OF ALTERNATIVES

E.1 INTRODUCTION

This section summarizes the alternatives developed and evaluated as part of the Regional DEAR submitted in June 2019, revised in November 2019, and approved by NJDEP in January 2020. The Regional DEAR describes the development of preliminary CSO control alternatives applicable to the Permittees in the PVSC Treatment District, the approaches selected to perform the evaluations, and the factors used to evaluate each of the alternatives.

As part of the DEAR evaluation, four alternatives were developed and evaluated regionally, as per requirement of the PVSC NJPDES Permit No. NJ0021016 (hereon referred to as "the Permit") Combined Sewer Management (CSM) Part IV.D.1.c.

Appendix D includes the Regional DEAR and PVSC DEAR for additional detail.

E.2 DEVELOPMENT OF ALTERNATIVES

In accordance with the NJPDES Permit and as defined by the USEPA's National CSO Policy and the New Jersey Administrative Code, a reasonable range of CSO control alternatives must be evaluated to meet the water quality-based requirements of the CWA. For the purpose of the evaluation of alternatives, various CSO control technologies were evaluated for varying levels of control, including 0, 4, 8, 12, and 20 CSO events per year, as well as 85% capture by volume.

Each of the CSO Permittees evaluated Municipal Alternatives as part of their development of alternatives utilizing the CSO control technologies that were identified as feasible. These Municipal Alternatives constitute an approach that was evaluated if each municipality were to achieve the LTCP objectives within their own municipal boundary (in lieu of a Regional Alternative). Additional details regarding these Municipal Alternatives can be found in the individual DEARs located in Appendices A through I of **Appendix D**.

In addition to the Municipal Alternatives, four regional alternatives were also developed using the CSO control technologies identified as feasible for implementation by the Permittees in each of their DEARs, and as required as part of the Permit in Part IV.G.4.e. Control technologies used for alternatives include: green infrastructure, regulator modifications, storage tanks, tunnels, baseflow reduction, water conservation, increased wastewater conveyance to PVSC for treatment, maximizing pump station and force main capacities, parallel interceptor, bypass line, satellite treatment, and sewer separation. A more detailed discussion of these four regional alternatives that were evaluated is included in Subsection E.3 of this report.

Evaluation factors for the CSO control alternatives are detailed by the Permittees in each of their DEARs and include siting, institutional issues, implementability concerns, public input, performance considerations, and cost.

E.3 REGIONAL ALTERNAIVES

The regional alternatives developed in the Regional DEAR are detailed below and summarized in **Table E-1**.

Table E-1: Regional Alternatives

Alternative	Description
No. 1	Most cost-effective alternatives for each Permittee
No. 2	Regional Tunnel
No. 3	Parallel Interceptor + Plant Bypass (720 MGD) + Jersey City Pipe (146 MGD HCFM) + Local
No. 4	Newark Regulator Modifications and Rehabilitation + Parallel Interceptor + Plant Bypass (720 MGD) + Jersey City Pipe (146 MGD HCFM) + Tunnels

Regional Alternative 1 incorporates the most cost-effective alternative for each Permittee to meet the yearly CSO frequencies and 85% capture, as described in their individual DEARs. The following summarizes the alternatives found to be the most cost effective or the most capable of achieving major performance objectives, either alone or in combination with other alternatives:

- City of Bayonne: Sewer separation, PAA disinfection with potential solids treatment, offline storage with increased conveyance of wet-weather flows to PVSC for treatment, and GI.
- Borough of East Newark: 5% conversion of impervious area to GI, partial sewer separation followed by storage tanks or high rate filtration with PAA disinfection.
- Town of Harrison: consolidated tank storage, 2.5% conversion of impervious area to GI
- Jersey City MUA: a combination of inflow/infiltration removal, partial sewer separation, green infrastructure, and grouped storage tanks
- Town of Kearny: complete sewer separation, partial sewer separation, high rate filtration with PAA disinfection
- City of Newark: PAA disinfection with pretreatment (level of pretreatment based on treatability studies), gate delay and disinfection at NE022
- North Bergen MUA: high rate filtration with PAA disinfection
- City of Paterson: Partial Sewer Separation, GI, PAA disinfection with potential primary treatment based on pilot project results, storage tanks and tunnels

Alternative 2 was created as a regional approach to improve capture and treatment using three regional tunnels to meet the yearly CSO frequencies and 85% capture scenario. Regional Alternative 2 includes three regional tunnels that can serve the region. PVSC's Evaluation of Alternatives Report provided the basis for two of the tunnels, with an additional tunnel (NJ440 Tunnel) and cost-effective alternatives identified in Regional Alternative 1 to serve the HCFM communities. Regional Alternative 2 was evaluated to meet each of the yearly CSO event frequencies and for 85% CSO volume capture for the PVSC interceptor communities and the west side of the HCFM communities. The regional tunnels would include the Paterson Citywide Tunnel, McCarter Highway Tunnel, and the NJ440 Tunnel, as shown in **Figure E-1** below. It is noted that dedicated surface level piping leading to the drop shafts and microtunneling to connect the drop shafts to McCarter Highway Tunnel would be needed in Harrison, East Newark, and Kearny. Alternative technologies identified by Jersey City and Bayonne in Regional Alternative 1 were evaluated for the 12 CSO outfalls not connected to the NJ440 Tunnel.

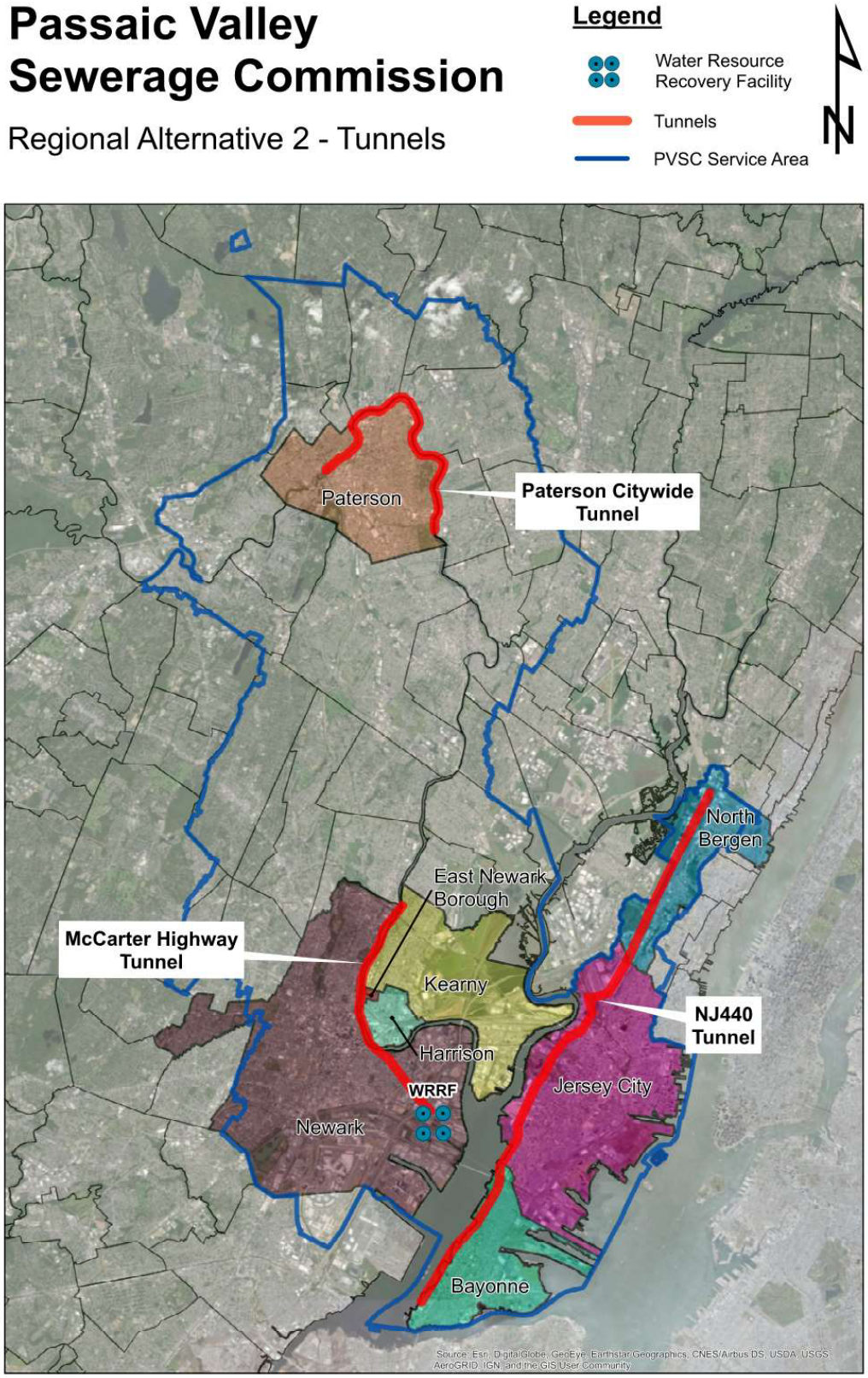

Figure E-1: Map of Regional Tunnel Locations

These technologies would be complimentary toward the NJ440 Tunnel so that every CSO outfall in the PVSC service area would meet the proposed levels of control. Regional Alternative 3 consist of a combination of Newark Regulator Modifications and Rehabilitation + Parallel Interceptor + Plant Bypass (720 MGD) + Hudson County Force Main Pump Expansion (146 MGD HCFM). Regional Alternative 3 aims to reduce CSO frequency by increasing storage and flow capacities using multiple CSO control technologies. The alternative was evaluated to meet the 85% CSO volume capture scenario only, as the level of controls cannot be adjusted for the individual technologies (i.e. implementation of the CSO control technologies is binary - they are either implemented or they are not with no intermediate levels of control).

Finally, Alternative 4, which is a combination of Newark Regulator Modifications and Rehabilitation + Parallel Interceptor + Plant Bypass (720 MGD) + Hudson County Force Main Pump Expansion (146 MGD HCFM) + Tunnels, was evaluated to meet the yearly CSO frequencies and 85% capture scenario. Regional Alternative 4 is the same as Alternative 7.a that was evaluated by PVSC in their DEAR with the addition of the NJ440 Tunnel and other alternative technologies for the remaining CSO outfalls in the HCFM communities. This alternative combines all technologies used in Regional Alternative 2 and Regional Alternative 3. Regional Alternative 4 was evaluated to meet each of the yearly CSO event frequencies and for 85% CSO volume capture. This alternative aims to reduce CSO frequency by increasing storage and flow capacities using multiple regional CSO control technologies.

Details of the regional alternatives are noted in the Regional DEAR (**Appendix D).**

SECTION F - POLLUTANT LOADS AND PREDICTED WATER QUALITY

F.1 INTRODUCTION

This section describes the models used to evaluate the hydraulic and water quality impact of the CSO control technologies on the receiving waters.

F.2 HYDROLOGIC AND HYDRAULIC MODEL

F.2.1 H&H Model Methodology

As part of the collaborative approach to the LTCP, the PVSC CSO communities elected to integrate their existing, disparate models into one comprehensive regional model on a common software platform. This integrated PVSC LTCP model includes all the service area that convey their sewage flow to the PVSC WRRF. It was used for the purpose of evaluating CSO control alternatives and the development of a holistic CSO LTCP for all the combined municipalities in the PVSC sewer service area.

Detailed disparate modeling information including communities, Permittees, STP, and modeling software are summarized in **Table F-1.**

Table F-1: PVSC WRRF Model Summary

	Model	Community	Permittee	Software	County
1	PVSC Interceptor Model	City of Paterson	Paterson City	InfoWorks CS	Passaic
		City of Newark	Newark City		Essex
		Town of Kearny	Town of Kearny		Hudson
		Borough of East Newark	East Newark Borough		Hudson
		Town of Harrison	Harrison Town		Hudson
2	Bayonne Model	City of Bayonne	City of Bayonne	InfoWorks CS	Hudson
3 & 4	North Bergen Model (PVSC)	Township of North Bergen	North Bergen MUA	PC-SWMM (2 models)	Hudson
5	Jersey City	City of Jersey City	Jersey City MUA	PC-SWMM	Hudson

F.2.2 Regional Model Integration

The LTCP PVSC Treatment District H&H model was developed by integrating the five pre-LTCP models in **Table F-1 (**the PVSC Interceptor model, the Bayonne model, the two North Bergen models, and the Jersey City model) into a regional PVSC model in InfoWorks ICM v9.0. The model was then expanded to include all 40 municipalities with separate sewer service area that contribute flows to the PVSC WRRF.

F.2.3 H&H Model of Regional Alternatives Baseline Summary

The calibrated regional model was simulated for the selected typical year of 2004 for evaluating the collection system performance under the existing conditions. The estimated percent capture for the typical year is approximately 69%. The percent capture is presented below in **Table F-2.**

Table F-2: Typical Year Percent Capture

	PVSC WRRF
Total CSO Volume (MG)	4,563
% Capture	69%

Note: Each one of the eight municipalities further refined their baseline models after the submission of their SCR. The flow and CSO values reported in the SIAR reflect the most up-to-date results.

The results from this regional model were used as the baseline for comparison in evaluating the CSO Control Alternatives.

F.3 WATER QUALITY MODEL

The Pathogens Water Quality Model (PWQM) was developed, calibrated, and validated to provide support for the development of LTCPs for the NJ CSO Group. Prior to the development of the PWQM, a PWQM QAPP was prepared and approved by NJDEP on February 7, 2017, which is included in **Appendix S**. The PWQM is based on an existing hydrodynamic model of the NY-NJ harbor complex that has been calibrated, validated, and peer-reviewed (Blumberg et al., 1999). The underlying source code for the hydrodynamic model portion of PWQM is the Estuarine, Coastal and Ocean Model with Sediment Transport (ECOMSED). The model domain also includes portions of New York Harbor and Raritan Bay as necessary to avoid boundary effects that would contaminate the model results in the region of interest. The hydrodynamic model portion of PWQM included freshwater inputs provided by H&H models developed for northern NJ and New York City, and USGS river gages. Meteorological forcings were based on NOAA's North American Regional Reanalysis (NARR) Dataset. Temperature and salinity boundary conditions were based on climatological data from World Ocean Atlas 2013 (WOA2013, https://www.nodc.noaa.gov/OC5/woa13/), published by NOAA. Details on the assignment of water elevation boundaries are provided in the Calibration and Validation of the Pathogen Water Quality Model (PWQM) report in **Appendix O.**

For the LTCP, the following state-variables were modeled with the water quality model portion of PWQM:

1. Salinity
2. Conservative Tracer
3. E. Coli
4. Fecal Coliform
5. Enterococcus

Salinity provides a check that the hydrodynamic model and water quality model are interfacing properly. The conservative tracer can be used to determine dilution. The three fecal indicator bacteria (FIB) were chosen because each one is used for a water quality criterion in the study area. Aside from these state-variables, other primary inputs to the water quality model include

CSOs, stormwater, WWTP/STP/WRRF, rivers/boundary conditions, dry-weather loads, and other sources. Loads were developed for three periods: calibration, validation, and baseline.

The calibration period for the PWQM is the calendar year 2016, the period when the majority of the baseline compliance monitoring was performed. The validation period is the calendar year 2017, when additional baseline compliance monitoring occurred. The year of 2004 represents a "typical" rainfall year based on precipitation data from Newark Liberty International Airport and was used to establish Baseline Conditions. For details on the PWQM refer to the Calibration and Validation of the Pathogen Water Quality Model (PWQM) report in **Appendix O**.

F.3.1 WQM Methodology

The water quality model source code underlying the water quality modeling portion of the PWQM is Row Column AESOP (RCA). RCA originates from the Water Analysis Simulation Program (WASP) developed by Hydroscience in the 1970's. RCA code has been used to develop numerous models inside and outside of the NY-NJ Harbor system.

There are 182 NJ CSO outfalls assigned in the model. As part of the CSO LTCP process, hydrologic and hydraulic (H&H or landside) models of the northern NJ communities' CSSs were upgraded and integrated for use in the sewer system characterizations. An InfoWorks stormwater model covering the separated portion on the NJ side of the NY-NJ Harbor system was developed to calculate flows and runoff from the separated areas of northern NJ that flow into the CSO affected waterbodies. The model included the area from the New York border south to the Raritan River. The model included 73 subcatchments corresponding to National Hydrography Dataset boundaries shown in **Figure F-1**.

There were two key assumptions used in the development of the PWQM. The first is that using maximum likelihood estimators (MLE) concentrations for bacteria sources adequately accounts for the total loading of bacteria. The sources of bacteria include CSOs, stormwater, rivers, STPs and other sources including illicit connections and domestic/wild animals. A second key assumption for both the hydrodynamic model and the water quality model, is that the landside models accurately calculate the flow and sanitary fraction discharged from the CSOs.

F.3.1.1 Baseline Attainment

Baseline conditions are based on the use of a "typical" rainfall condition. As previously stated in Section C.4, analysis of precipitation records indicated that 2004 rainfall conditions at Newark Liberty International Airport most closely reflected typical year conditions. River flow was used in the analysis to choose the typical year, so river flow and water elevations for 2004 are part of the baseline condition.

Additionally, to create a consistent baseline, the InfoWorks models were set up using "existing" 2015 infrastructure. New NJPDES permits were issued in 2015, so any infrastructure upgrades after this date are considered part of the LTCP.

Finally, baseline conditions assume that the non-CSO sources of bacteria to the NY-NJ harbor system remain unmitigated. As a result, the approach to developing the stormwater, river, and

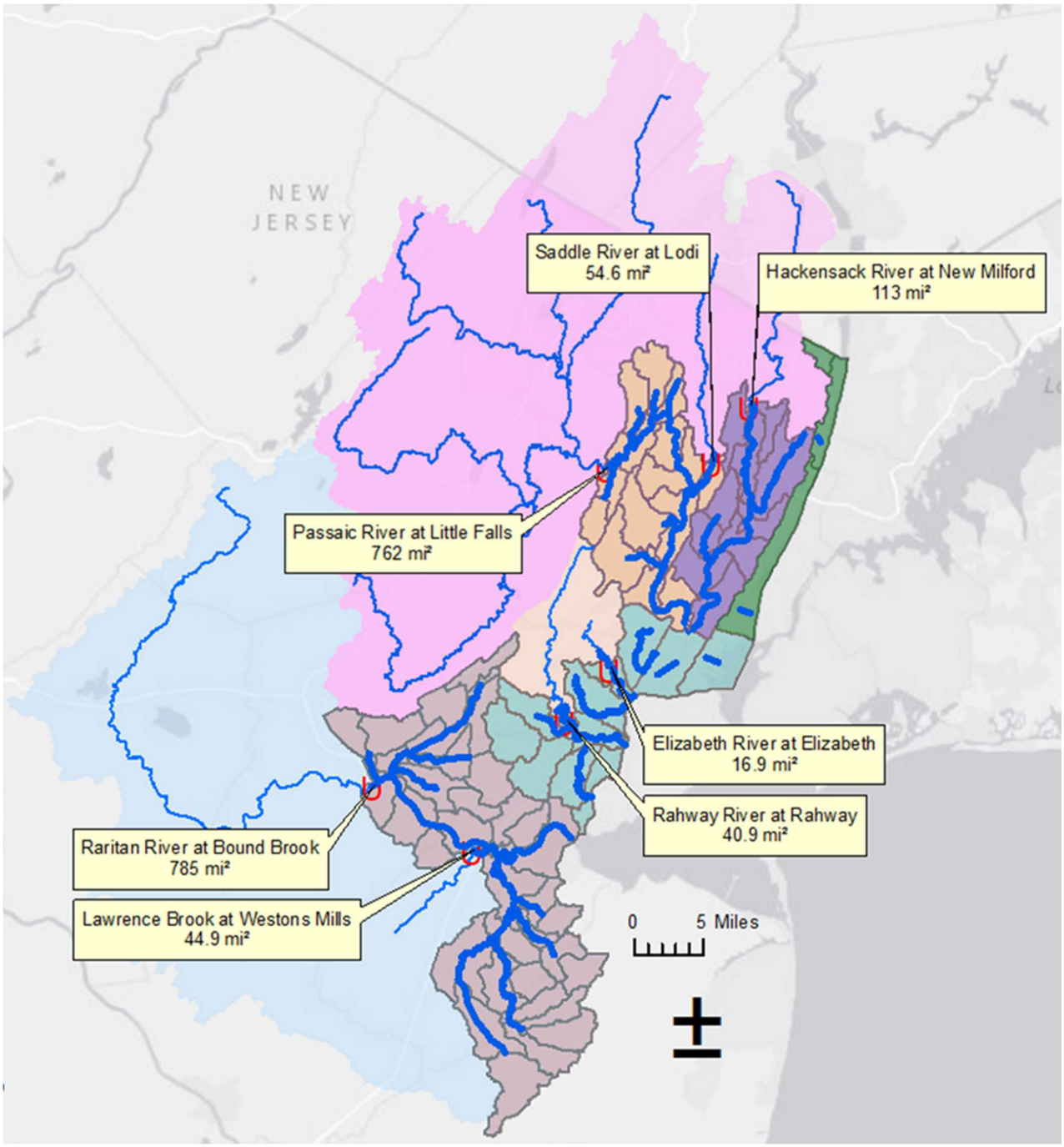

Figure F-1: Stormwater/Runoff Model Coverage Area

dry-weather loads remained the same and no efforts were made to reduce bacteria loads from the other sources.

F.3.1.2 Component Analysis

Components are defined as the various source categories of pollutants to the receiving water. A component analysis can quantify the impacts of the source categories (either geographical, type, or both) to assess which are most influential in affecting water quality for a particular time or location. This analysis is helpful to establish the level of load control to target during LTCP development.

The PWQM was applied to simulate eight component source categories to assess the impacts of these sources on water quality. The following source categories were evaluated: CSO, stormwater and runoff, the Hudson River, other rivers, NJ STPs, NY/CT STPs, dry-weather loads, and sources from New York City. For the component analysis each source component category was modeled separately to assess each component's contribution to the receiving water bacteria concentrations. The component analysis provides information as to the importance of the various pollution sources in locations throughout the model domain.

In general, the component analysis shows that different categories dominate the bacteria loading in the various portoins of the project area. In some cases, CSOs are a significant contributor to the bacteria concentrations, but these locations are often areas where the 30-day geometric mean criterion is not exceeded, or exceedances occur due to contributions from other sources.

F.3.1.3 Projection Analysis

The use of a 100% CSO Control scenario is part of a "gap analysis." 100% CSO control is the maximum level of control that can be attained for CSOs and results in the maximum possible improvement in water quality conditions due to CSO control during the typical hydrologic year. CSOs could still theoretically occur when there are storms that generate peak flows in excess of those experienced during the typical year.

If CSOs were the primary reason for non-attainment of water quality criteria, then some level of CSO control between baseline conditions and 100% control could conceivably result in attainment of the criteria. This level of CSO control would close the gap between attainment and non-attainment of water quality criteria. In many cases, other sources of bacteria, such as stormwater, are large enough that even 100% CSO control is not enough to meet criteria. In this case the 100% CSO Control scenario shows the highest level of water quality that can be achieved by CSO control only, and additional control scenarios can be analyzed that can be incorporated into a cost-benefit analysis.

The 100% CSO Control scenario was run for the receiving waters with results organized by the classification of the surface water as established under the Surface Water Quality Standards (SWQS), N.J.A.C. 7:9B. NJDEP classifies freshwaters as FW1 waters (not subject to any man-made wastewater discharges) and FW2 waters (all other freshwaters except Pinelands waters). Saline waters are classified as saline estuarine (SE) and saline coastal (SC). SE waters are further classified as SE1, SE2, and SE3 waters based on their ability to support recreation, shellfish harvesting and warm water fish species.

The results of 100% CSO Control scenario for FW2 (FW2/SE2), SE1, SE2, and SE3 indicate that FW2 and FW2/SE2 generally have poor attainment of the criteria, and that CSO control will not improve attainment of the criteria in most cases. SE1 waterbodies showed mixed results with some areas having poor attainment and others having high attainment. SE2 and SE3 waters generally fully attain the water quality criteria for bacteria. The full details of the modeling results can be found in the Calibration and Validation of the PWQM for the Passaic Valley Sewerage Commission in **Appendix O**.

F.4 CSO OVERFLOW PREDICTIONS

In addition to the baseline conditions, the H&H model was used to simulate the CSO volume and frequency for each of the control alternatives. The results of these simulations were used to evaluate the performance of each alternative as further described under Section H.4.2.

SECTION G - PUBLIC PARTICIPATION

The Public Participation Process Report outlines the public participation process and the associated activities. The goals for the program are to foster public awareness and to facilitate public involvement in the decision-making process to develop and select the final LTCP. The Public Participation Process Report was submitted to the NJDEP on behalf of the Permittees on June 25, 2018. The NJDEP provided comments on December 14, 2018, and the report was revised on January 25, 2019. It was approved by the NJDEP on March 29, 2019. The Public Participation Process Report can be found in **Appendix E**.

G.1 INTRODUCTION

The Public Participation Process Report outlines the public participation program and the associated activities. The goals for the program are to foster public awareness and to facilitate public involvement in the decision-making process to develop and select the final LTCP. The Public Participation Process Report was submitted to the NJDEP on behalf of the Permittees on June 25, 2018. The NJDEP provided comments on December 14, 2018, and the report was revised on January 25, 2019. It was approved by the NJDEP on March 29, 2019. The Public Participation Process Report can be found in **Appendix E**.

G.2 PUBLIC INPUT FOR SELECTION OF ALTERNATIVES

G.2.1 PVSC Sewerage District Supplemental CSO Team

The Supplemental CSO Team is an important part of the LTCP development process. The overall goal of the Supplemental CSO Team is to "work as an informal work group as a liaison between the general public and the decision makers for the permittee" as required by NJPDES Permit Part IV.G.2.C.

Since the submission and approval of The Public Participation Report, some new members have joined the Supplemental CSO Team and others have requested to no longer participate. A current listing of the members of the Supplemental CSO Team and the organizations to which they belong as of the writing of this report are listed in **Table G-1**.

Table G-1: Members of the Supplemental CSO Team (alphabetically by organization)

Name	Representing
Dan Smerda	Bayonne Water Guardians
Lisha Smerda	Bayonne Water Guardians
Nancy Kontos	Bunker Hill Special Improvement District
Ruben Gomenz	City of Paterson Economic Development
Sheri Ferreira	Greater Paterson Chamber of Commerce
Captain Bill Sheehan	Hackensack Riverkeeper
Janet Castro	Hudson Regional Health Commission/Township of North Bergen
Drew Curtis	Ironbound Community Corporation
Alison Cucco	Jersey City Environmental Commission

Name	Representing
Jorge Santos	Newark Community Economic Development Corporation
Nicole Miller	Newark DIG
Robin Dougherty	Newark Greater Conservancy/Newark Business Partnership
Betty Boros	New Jersey Business & Industrial Association
Tom Stampe	North Bergen Green Team
Michele Langa	NY/NJ Baykeeper
Harvey Morginstin	Passaic River Boat Club & Passaic River Superfund CAG
Laurie Howard	Passaic River Coalition
Ben Delisle	Passaic River Rowing Association
Sue Levine	Paterson Smart
Christopher Obropta, Ph.D.	Rutgers University
Leslie Brunell	Stevens Institute of Technology
Pat Hester-Fearon	Town of Kearny
Christopher Vasquez	Town of Kearny
Christopher Pianese	Township of North Bergen

Supplemental CSO Team Public Meetings that were held after the submission of the Public Participation Report are presented in **Table G-2**:

Table G-2: Dates and Locations of Supplemental CSO Team Public Meetings

Meeting Number	Date	Location	City
1	October 5, 2016	Harrison Elks Lodge	Harrison
2	January 10, 2017	Bayonne Public Library	Bayonne
3	April 11, 2017	The Hamilton Club at Passaic County Community College	Paterson
4	July 11, 2017	Newark City Hall	Newark
5	October 16, 2017	PVSC WRRF	Newark
6	January 9, 2018	North Bergen Municipal Building	North Bergen
7	April 17, 2018	Jersey City Council Chambers	Jersey City
8	July 31, 2018	Kearny Town Hall	Kearny
9	October 16, 2018	PVSC WRRF	Newark
10	January 22, 2019	East Newark Senior Citizen Center	East Newark
11	March 7, 2019	North Jersey Transportation Planning Authority Conference Room	Newark

Meeting Number	Date	Location	City
12	May 28 2019	Bayonne Washington School	Bayonne
13	July 31, 2019	The Ironbound Early Learn Center	Kearny
14	January 9, 2020	Harrison High School	Harrison
15	June 17, 2020	Virtual Meeting Facilitated through Microsoft Teams	Online
16	September 2, 2020	Virtual Meeting Facilitated through Microsoft Teams	Online

Error! Reference source not found. lists a summary of the topics presented at meetings 1 through 16, as well as discussion items, concerns, and/or comments raised by the Supplemental CSO Team members and/or the public.

Table G-3: Supplemental CSO Team Public Meetings 1 through 16

Public Meeting No.	No. of Total Attendees (SCSO Team)	Presentation Topics	Public Concerns / Comments
1	23 (11)	• Introduction to the Permittees • Passaic Valley Sewerage Commission Service Area • Supplemental CSO Team Roster • Overview of Separate and Combined Sewer Systems • Regulatory Background • Program progress to Date • Branding of LTCP Program • Next Steps • Questions and Final Discussion	• Supplemental CSO Team should set some ground rules for the group and establish what it expects from PVSC and the project team and create accountability on both sides • Suggested the creation of a clear definition of the relationship between the Supplemental CSO team, PVSC and the consultants • For the alternatives analysis Supplemental CSO Team input is expected to be weighed against a cost-benefit analysis. • Suggested the creation of a guide for community engagement • All meeting documents were requested to be sent to the Supplemental CSO Team in advance so that the team has time to review • Team requested to be updated on the water quality model at future meetings
2	44 (13)	• Introduction • Supplemental CSO Team Roster • Overview the SharePoint Site • Recap of the October 5, 2016	• Discussion about why the flow monitoring lasted for a 12-week period and adequacy of rain events to calibrate the water quality model

Public Meeting No.	No. of Total Attendees (SCSO Team)	Presentation Topics	Public Concerns / Comments
		Supplemental CSO Meeting • History of Combined Sewers in the Passaic Valley Sewerage Commission District • NJDEP – New Jersey CSO Permits • Permit Responsibilities • Highlights from CSO LTCPs from Elsewhere in the U.S. • Status Update on the PVSC District LTCP • Branding of LTCP Program	• Concern about inspections of sewer interceptors • Discussed the reporting requirements for Permittees in terms of Nine Minimum Control compliance • It was confirmed that population growth is a factor in the model and LTCP • Sewer separation can be costly. • Concern that warning signs for CSOs aren't visible enough • Discussion about Supplemental Team's input on deliverables • Concern about how alternatives analysis will be discussed with the community at large • Discussion about how payment for sewer usage and improvements is distributed within the PVSC communities • Branding and logo was discussed
3	29 (12)	• Introduction and Recap • Branding Update • Project Schedule • Green Infrastructure (GI) for CSO Control • Supplemental CSO Team Member Presentations • Paterson SMART	• Discussion about the most effective methods of GI • Concern that public outreach is the most important part of GI. Consulting with the public would hopefully help implementation issues • GI can create jobs and build a relationship between the general public and the government • Brainstorming best uses for porous pavement • Discussion of GI costs and permit requirements
4	43 (13)	• Introduction and Recap • NJ CSO Permit Overview (NJDEP) • Water Quality Standards (NJDEP) Hydrologic and Hydraulic Models	• Discussion about the flow monitoring that was completed for use in the model • The model was discussed. • Discussion regarding the details of PVSC's plant outfall • The Team requested a tour of the PVSC WRRF
5	40 (14)	• PVSC Plant Tour • Introduction and Recap • Introduction to Alternative Analysis • Stimulating Green Infrastructure	• PVSC plant tour was provided • Discussion about the pros and cons of the presumption and demonstration approaches • Questions about how funding

Public Meeting No.	No. of Total Attendees (SCSO Team)	Presentation Topics	Public Concerns / Comments
		on Private Property Bayonne CSO Treatment Demonstration Project	for GI is gathered and managed • Discussion about end-of-pipe treatment technologies such as peracetic acid
6	34 (11)	• Introduction and Recap • LTCP Deliverables due to NJDEP on July 1, 2018 • Cost estimate of the LTCP • Update on the activities performed by the Project Team • Passaic Valley Regional Planning & Design Studio presentation by Rutgers University • PVSC and Rutgers Green Infrastructure Municipal Outreach and Technical Assistance Program	• SCSO Team requested time to review all deliverables and give input before they are submitted to NJDEP • The cost opinions will be included in the LTCP submission. All eight of the CSO communities will be included in the cost opinions • Discussion about the different types of public outreach materials, whether they provide more general or region-specific information and in which languages they are available
7	48 (13)	• Introduction and Recap • Water Quality Monitoring Program Overview • Overview of Reports to be submitted to NJDEP on July 1, 2018 • Timeline for Submittals and Supplemental CSO Team Input • NJDEP Guidance Document for Evaluating Green Infrastructure Social Media for Clean Waterways, Healthy Neighborhoods	• Discussion of contaminant and contamination source identification • Discussion of sampling methodology including weather patterns, specific contaminants, sampling locations, and saline and fresh water body sampling • Discussion regarding the model calibration, the contaminants being modeled, and the accuracy of the model • SCSO team recommended adding Arabic translations to the public outreach materials • Discussion about the effect the GI pilot studies will have on stormwater volume
8	25 (11)	• Introduction and Recap • Project Status Update • July 1st Report Submittals • Evaluation of Alternatives • City of Newark Evaluation of Green Infrastructure for CSO Control • Questions and Final Discussion	• Discussed the project status and the timeline • Reviewed the goals of the Evaluation of Alternatives • Discussed green infrastructure
9	29 (9)	• Introduction and Recap • Timeline for Evaluation of Alternatives • Preliminary Screenings of Technologies • CSO Bypass Alternative	• Discussed Green Infrastructure Alternatives • Reviewed which outfalls would be impacted by various alternatives • Discussed WRRF improvements

Public Meeting No.	No. of Total Attendees (SCSO Team)	Presentation Topics	Public Concerns / Comments
		• No Feasible Alternatives Analysis • Jersey City MUA Evaluation of Alternatives for CSO Control • Questions and Discussion	• The City of Newark is conducting ten community-wide meetings until May 2019
10	34 (10)	• Introduction and Recap • Timeline for Evaluation of Alternatives • Preliminary Screenings of Technologies • Reducing CSOs Using a Surface Channel System (Stevens Institute of Technology Research Presentation) • Facilities Inventory and Condition Assessment Program • Green Infrastructure • Harrison Evaluation of Alternatives • Questions and Discussion	• Discussed community benefits of alternatives and how those community benefits are noted in the screenings of technologies matrix • Discussed maintenance, water quality improvements, impacts to traffic flow during construction, and construction materials of surface level drainage systems. • The group discussed eventually including a cost analysis for alternatives
11	26 (8)	• Introduction and Background • Overview of CSO Control Technologies • Evaluation of Alternatives Status Updates • Questions and Discussion	• Discussed Clean Waterways Healthy Neighborhoods • Reviewed CSO basics • Discussed Regulatory Background • Reviewed the Long Term Control Plan Requirements • Reviewed the current project status and schedule
12	56 (15)	• Introduction and Recap • Harrison Alternatives Analysis • Newark Alternatives Analysis • Presentation and Survey • Questions and Discussion	• Discussed maintenance costs • Comparison of benefits of surface piping versus green infrastructure. • Discussed community engagement in Harrison (Harrison Tide) • Discussion of Peracetic Acid (PAA) Disinfection
13	26 (5)	• Update on the July 1, 2019 submittal of the Development and Evaluation of Alternatives Report • Summary of Alternatives to be further developed • Discuss Public Comments on Development and Evaluation of Alternatives Report • Breakout Groups • Discuss next steps for development of Selection and Implementation of Alternatives	• Discussed the DEAR • Discussed the further development of the Summary of Alternatives • Discussed public comments on the DEAR • Group discussions were facilitated for each municipality • Reviewed the next steps for the development of the SIAR

Public Meeting No.	No. of Total Attendees (SCSO Team)	Presentation Topics	Public Concerns / Comments
		Report • Questions and Discussion	
14	47 (11)	• Introduction and Recap • Water Quality Model Results • Microbial Source Tracking Study • Review of Public Comments ad Responses for DEAR • Discuss Next Steps for Development of Selection and Implementation of Alternatives Report • Questions and Discussion	• Discussed the results of the water quality model • Presented and discussed the Microbial Source Tracking Study • Discussion of the comments received on the DEAR and the responses to comment • Reviewed the next steps for the development of the SIAR
15	64 (16*)	• Introduction to Virtual Room and online tools to access information • Project Status and Schedule • Current Alternative Options, Municipal vs. Regional • Performance Summary of Municipal and Regional Alternatives • Cost Summary of Municipal and Regional Alternatives • Next Steps: SIAR • Coordination across Municipalities	• Positive feedback provided by the public on the virtual/online delivery. • Coordination and agreement on cost allocation across municipalities for implementation of the Regional Alternative is a concern • Cost of improvements • Location of the regional interceptor • Implementation of the projects in the municipal alternatives despite selection of the Regional Alternative.
16	44 (11*)	• Introduction and Recap • Project Status and Schedule • Municipal and Regional Alternatives (Recap) • Performance Summary of Alternatives (Recap) • Cost Summary • Next steps • Questions and Discussion • Breakout Sessions	• Municipalities' Regional Alternative decision • Impact of CSO control technologies on flooding • Cost of improvements and township resources • Would like to provide more input on areas and types of Green Infrastructure • Impacts of storage tanks on surrounding developments • Wanted SCSO events to continue in the future • Interested in reviewing the LTCP as soon as possible

*This meeting was virtual and had no sign-in sheet. These are the self-identified members of the Supplemental CSO Team present

Public input received during the development of this LTCP requested more direct communication with each of the individual Permittees. To incorporate this public input, breakout groups were incorporated into various Supplemental CSO Team Meetings. These breakout groups were facilitated by the individual Permittees to allow direct communication between the Permittees and the public relative to the evaluation of alternatives. The latest example of these breakout groups was during Supplemental CSO Team Meeting No. 16 in which 7 individual virtual breakout rooms were developed to allow members of the public to provide direct input and ask questions to the Permittees.

Additionally, a contact list for each Permittee (name, telephone number, and email address) was distributed to any member of the public included on the public distribution list for this project. This contact list was also posted to the home page of the Clean Waterways, Healthy Neighborhoods website (www.njcleanwaterways.com).

In addition to the Supplemental CSO Team Public Meetings, the following Draft Reports were provided to the members of the Supplemental CSO Team for review and comment:

- Service Area System Characterization Report;
- Public Participation Report;
- Identification of Sensitive Areas Report;
- Compliance Monitoring Program Report; and
- Regional and Permittee Development and Evaluation of Alternatives Reports

All Supplemental CSO Team Meetings are open to the public and are advertised in advance. During each Supplemental CSO Team Meeting, the Supplemental CSO Team Members and all members of the public are updated on further LTCP development and are encouraged to provide input on such milestones, including the Long Term Control Plan.

G.2.2 Local Newark Supplemental CSO Teams

In addition to participating in the Supplemental CSO Team Meetings held by the PVSC Sewerage District Supplemental CSO Team, Newark and Bayonne assembled their own local Supplemental CSO Teams. These municipal SCSO Teams met and conducted additional meetings throughout the development of the LTCP independent of the activities listed in Sections G-2 and G-3.

G.2.3 NJ CSO Group Meetings

The NJ CSO Group was originally formed to work cooperatively to fulfill the requirements of the last CSO General Permit. NJ CSO Group Permittees and their NJPDES Permit Numbers are listed in The Public Participation Report.

Meetings with the NJ CSO Group were, in general, on a quarterly basis. NJ CSO Group Meetings that were held are listed in **Table G-4:**

Table G-4: NJ CSO Group Meeting Dates

Date		
August 7, 2013	October 19, 2015	September 6, 2018
February 20, 2014	April 6, 2017	February 27, 2019
March 7, 2014	October 16, 2017	September 5, 2019
July 1, 2014	February 2, 2017	November 21, 2019
October 8, 2014	February 20, 2018	February 20, 2020
January 15, 2015	April 5, 2018	August 20, 2020
June 29, 2015	May 3, 2018	

The various topics that were discussed at the above meetings are provided in The Public Participation Report.

G.2.4 PVSC CSO Sewer District and NBMUA-Woodcliff Permittees Meetings

NJPDES Permittees located within the PVSC Treatment District and NBMUA-Woodcliff Service Area hold near monthly meeting to assist in collaboration, CSO compliance, and sharing of public information and/or input. The Permittees that participated in these meetings are provided in The Public Participation Report. Permittee Meetings that were held are listed in **Table G-5:**

Table G-5: PVSC Treatment District and NBMUA-Woodcliff Permittees Meeting Dates

Date		
July 5, 2018	July 18, 2019	April 16, 2020
August 2, 2018	August 1, 2019	May 7, 2020
October 16, 2018	September 19, 2019	May 21, 2020
November 1, 2018	October 3, 2019	June 4, 2020
January 22, 2019	October 17, 2019	June 18, 2020
February 7, 2019	November 7, 2019	July 16, 2020
March 7, 2019	December 5, 2019	August 6, 2020
April 18, 2019	January 9, 2020	August 20, 2020
May 2, 2019	February 6, 2020	September 3, 2020
May 31, 2019	February 20, 2020	September 17, 2020
June 20, 2019	April 2, 2020	

The various topics that were discussed at the above meetings are provided in The Public Participation Report.

G.2.5 Individual Permittee Meetings

Multiple meetings were held between PVSC and individual Permittees to discuss specific concerns unique to the Permittees. Meetings were held on as a needed basis.

G.2.6 Other Opportunities for Public Input

Other opportunities for public participation include municipal action teams, ad hoc stakeholder meetings, Model Evaluation Group meetings, municipal council meetings, collaboration with Rutgers University and Stevens Institute of Technology, the Rain Barrel Program, green infrastructure pilot projects, JCMUA partnerships and initiatives, City of Newark partnerships and initiatives, public outreach to separate sewer system communities, PVSC WRRF plant tours, public information, City of Newark CSO Brochure, the social media plan, various LTCP flyers, and public comments on the draft SIAR. Details regarding all other public participation activities conducted under the LTCP are provided in the Public Participation Report, which is included as **Appendix E**, and have continued subsequent to the date of The Public Participation Report**.**

G.2.7 Public Comments on Draft LTCP

G.2.7.1 Opportunities for Public Comment on Draft LTCP

Many forums and opportunities have been made available for public comment. An overview of the major opportunities is summarized in The Public Participation Report.

The majority of comments received thus far on the SIAR have been verbal comments at public meetings. Comments and responses at Supplemental CSO Team Public Meetings are tracked in meeting minutes. The other public comments received have been through social media (commenting, liking, or sharing tweets and Facebook posts), which drive individuals to the website. No questions or comments have been received from the website contact form.

The number and types of comments received on the Draft SIAR will continue to be tracked and documented. Draft LTCP plans were discussed at SCSO Team Meetings No. 15 and No. 16, providing the Supplemental CSO teams an opportunity for review and feedback. 25 text comments from the virtual chat feature and 3 verbal comments were received during the meeting, and an additional 11 text comments were received after the meeting was adjourned. All comments provided during the meeting were verbally addressed.

Comments were grouped by type and subject matter and addressed jointly in a commentary type response. The goal of this approach was to produce a commentary that is both readable and comprehensive. Groups of comments are as follows and are summarized in the Public Participation Report in **Appendix E**:

- Nine Minimum Controls;
- Alternatives Evaluation;
- Separation;

- Low Impact Development Source Control, Pollution Prevention;
- PVSC Wastewater Treatment Plant;
- CSO Location;
- Flooding;
- Implementability;
- Tunneling;
- Regulatory Compliance;
- Public Participation;
- Financial Capability;
- Schedule;
- Water Quality Standards Requirements; and
- Miscellaneous Comments.

G.3 FUTURE PUBLIC PARTICIPATION

PVSC and each of the CSO Permittees are committed to active public participation and consultation during the planning, design and construction of CSO control projects. Future public participation will be designed to educate the public about the status of the program; progress in implementing the program; to inform neighborhood residents and businesses before, during, and after construction; and to report on progress in reducing CSOs and improving water quality as a result of the program on an as-needed basis as determined necessary by the Permittee.

SECTION H - SELECTION OF RECOMMENDED LTCP

H.1 INTRODUCTION

The NJPDES Permits require each municipality to be "responsible for submitting a LTCP for their CSO facilities that addresses all nine elements in Part IV.G". The nine elements are listed below:

1. Characterization, Monitoring, and Modeling of the Combined Sewer System
2. Public Participation Process
3. Consideration of Sensitive Area
4. Evaluation of Alternatives
5. Cost/Performance Considerations
6. Operational Plan
7. Maximizing Treatment at the existing STP
8. Implementation Schedule
9. Compliance Monitoring Program

Although the nine Permittees are responsible for their own LTCPs, they worked cooperatively to coordinate their selected alternatives in developing a Regional LTCP approach.

H.2 LTCP SELECTION PROCESS

The nine Permittees followed the same criteria during the selection process of their recommended alternatives for the final LTCP, including the steps listed in Section A.7 of this report. All Permittees evaluated alternatives on monetary and non-monetary factors including impact on CSO overflows and impact on receiving water quality. This section describes the overall selection process used to select the LTCP.

H.3 APPROACH SELECTION

Part IV, Section G.4.c of each Permittee's NJDPES Permit states:

> *"The Permittee shall select either Demonstration or Presumption Approach for each group of hydraulically connected CSOs and identify each CSO group and its individual discharge locations."*

The two approaches are defined, analyzed, and compared in the following subsections.

H.3.1 Presumption Approach from USEPA's CSO Policy

Subsection II.C.4.a of the USEPA's CSO Policy (Presumption Approach) states that:

> *"A program that meets any of the criteria listed below would be presumed to provide an adequate level of control to meet the water quality-based requirements of the CWA, provided the permitting authority determines that such presumption is reasonable in light of the data and analysis conducted in the characterization, monitoring, and modeling of the system and the consideration of sensitive areas...These criteria are provided because data and modeling of wet weather events often do not give a clear picture of the level of CSO controls necessary to protect [water quality standards]."*

Under the Presumption Approach, CSO controls proposed in the LTCP are presumed to protect water quality in the receiving water bodies if the CSS achieves any of the following three (3) criteria:

i. *"No more than an average of four overflow events per year, provided that the permitting authority may allow up to two additional overflow events per year. For the purpose of this criterion, an overflow event is one or more overflows from a CSS as the result of a precipitation event that does not receive the minimum treatment specified below; or*

ii. *The elimination or the capture for treatment of no less than 85% by volume of the combined sewage collected in the CSS during precipitation events on a system-wide annual average basis; or*

iii. *The elimination or removal of no less than the mass of the pollutants identified as causing water quality impairment through the sewer system characterization, monitoring, and modeling effort, for the volumes that would be eliminated or captured for treatment under the paragraph ii above."*

"Minimum treatment," as noted in Item "i" above, is defined in Subsection II.C.4.a of the CSO Control Policy as:

- *"Primary Clarification (Removal of floatables and settleable solids may be achieved by any combination of treatment technologies or methods that are shown to be equivalent to primary clarification.);*
- *Solids and floatables disposal; and*
- *Disinfection of effluent, if necessary, to meet [water quality standards], protect designated uses and protect human health, including removal of harmful disinfection chemical residuals, where necessary."*

H.3.2 Demonstration Approach from USEPA's CSO Policy

Subsection II.C.4.b of the USEPA's CSO Policy (Demonstration Approach) states that:

> *"A permittee may demonstrate that a selected control program, though not meeting the criteria specified in II.C.4.a. above is adequate to meet the water quality-based requirements of the CWA."*

Under the Demonstration Approach, the municipality would be required to successfully demonstrate compliance with each of the following criteria from the CSO Policy:

I. *"The planned control program is adequate to meet [water quality standards] and protect designated uses, unless [water quality standards] or uses cannot be met as a result of natural background conditions or pollution sources other than CSOs;*

II. *The CSO discharges remaining after implementation of the proposed control program will not preclude the attainment of [water quality standards] or the*

receiving waters' designated uses or contribution to their impairment. Where [water quality standards] are not met in part because of natural background conditions or pollution sources other than CSO discharges, a total maximum daily load, including a waste load allocation and a load allocation or other means should be used to apportion pollutant loads;

III. *The planned control program will provide the maximum pollution reduction benefits reasonably attainable; and*

IV. *The planned control program is designed to allow cost effective expansion or cost effective retrofitting if additional controls are determined to be necessary to meet [water quality standards] or designated uses."*

H.3.3 USEPA's Guidance for Long-Term Control Plan Requirements

The USEPA's CSO Guidance for Long-Term Control Plan (or CSO Guidance Document) states that the Demonstration Approach and the Presumption Approach are the two general approaches to attainment of water quality standards (WQS), and that these two approaches provide municipalities with targets for CSO controls that achieve compliance with the CWA, particularly the protection of designated uses.

Section 1.3 of the CSO Guidance Document states:

"Permittees should develop long-term control plans (LTCPs) for controlling CSOs. A permittee may use one of two approaches: 1) demonstrate that its plan is adequate to meet the water quality-based requirements of the CWA ("demonstration approach"), or 2) implement a minimum level of treatment (e.g., primary clarification of at least 85 percent of the collected combined sewage flows) that is presumed to meet the water quality-based requirements of the CWA, unless data indicate otherwise ("presumption approach")."

Section 2.6.2.1 states that:

"Under the [CSO Policy], a municipality should develop an LTCP that adopts either the demonstration or the presumption approach to attainment of WQS. The demonstration approach is based on adequately demonstrating that the selected CSOs will provide for the attainment of WQS, including designated uses in the receiving water. The presumption approach does not explicitly call for analysis of receiving water impacts. The presumption approach usually involves at least screening-level models of receiving water impacts, however, because the approach will not apply if the NPDES permitting authority determines that the LTCP will not result in attainment of CWA requirements."

H.3.3.1 Presumption Approach from USEPA's CSO Guidance for LTCP

For the Presumption Approach, Section 3.2.1 of the USEPA's CSO Guidance Document states that:

> *"If the data collected by a community do not provide "...a clear picture of the level of CSO controls necessary to protect WQS", the presumption approach may be considered. Use of the presumption approach is contingent, however, on the municipality presenting sufficient data to the NPDES permitting authority to allow the agency to make a reasonable judgment that WQS will probably be met with a control plan that meets one of the three presumption criteria."*

Furthermore, the CSO Guidance Document states:

> *"Use of the presumption approach does not release municipalities from the overall requirement that WQS be attained. If data collected during system characterization suggest that use of the presumption approach cannot be reasonably expected to result in attainment of WQS, the municipality should be required to use the demonstration approach instead. Furthermore, if implementation of the presumption approach does not result in attainment of WQS, additional controls beyond those already implemented might be required."*

H.3.3.2 Demonstration Approach from USEPA's CSO Guidance for LTCP

For the Demonstration Approach, Section 3.2.1 of the USEPA's CSO Guidance Document states that:

> *"Generally, if sufficient data are available to demonstrate that the proposed plan would result in an appropriate level of CSO control, then the demonstration approach will be selected. The demonstration approach is particularly appropriate where attainment of WQS cannot be achieved through CSO control alone, due to the impacts of non-CSO sources of pollution. In such cases, an appropriate level of CSO control cannot be dictated directly by existing WQS but must be defined based on water quality data, system performance modeling, and economic factors."*

The Demonstration Approach is consistent with the total maximum daily load (TMDL) development approach and may be used in the TMDL process where the WQS and designated uses are not met in part because of natural background conditions or pollution sources other than CSOs. Section 3.2.1.1 of the CSO Guidance Document states:

> *"The demonstration approach encourages the development of total maximum daily loads and/or the use of a watershed approach throughout the LTCP process. In conducting the existing baseline water quality assessments as part of the system characterization, for example, the specific pollutants causing nonattainment of WQS, including existing or designated uses, would be identified, and then the sources of these pollutants could be identified and loads apportioned and quantified."*

H.3.4 NJPDES Permit Approach Selection

Part IV, Section G.4.a of the Permittees' NJDPES Permit states:

> *"The permittee shall evaluate a reasonable range of CSO control alternatives…that will meet the water-quality based requirements of the CWA using either the Presumption Approach or the Demonstration Approach (as described in Sections G.4.f. and G.4.g)."*

The descriptions of both approaches in the Permit are identical to those found in the USEPA's CSO Policy detailed in Sections H.3.1 and H.3.2 of this report.

H.3.5 Comparison of the Two Approaches

Table H-1 summarizes the major differences between the Presumption Approach and the Demonstration Approach.

Table H-1: Comparison of the Presumption Approach and Demonstration Approach

Item	Presumption Approach	Demonstration Approach
Criteria	• Meet one of three criteria and compliance is **presumed**: 1) No more than an average of 4-6 overflow events per year; 2) 85% capture (by volume) 3) Elimination or removal of the mass of pollutants, identified as causing water quality impairment.	• Number of CSO events, flow or pollutant loading limited by a proposed CSO system Waste Load Allocation which will not preclude the attainment of Water Quality Standards (WQS). • Relies on data collection and model simulation to **demonstrate** that the proposed LTCP results in meeting the current WQS and designated uses.
Monitoring Data Collection	• Flow metering of the collection system and/or water quality sampling of CSOs.	• Flow metering of the collection system and water quality sampling of CSOs and receiving water bodies.
Modeling	• Combined sewer system (CSS) hydrologic and hydraulic (H&H) model.	• CSS H&H Model and Receiving Water Quality Model(s).
Pollutant Sources Evaluated	• Only CSOs.	• The contributing pollutant sources in the watershed including urban stormwater, agricultural (if any), wildlife, etc.

The Demonstration Approach takes a holistic watershed based approach to understand the pollutant sources and their relative contributions, so that appropriate level of controls can be cost-effectively applied to each pollutant source instead of focusing on just the CSOs. The Demonstration Approach can help to understand where the current CSO program is in terms of meeting the WQS and demonstrate the impact of future WQS changes on the CSO controls. Under the Demonstration Approach, the Permittee must document that their CSO control program is adequate to meet the water quality-based requirements of the CWA.

Use of the Presumption Approach for a particular water body is allowed when approved by the NJDEP that the specific presumption(s) to be used in a particular water body are reasonable pursuant to Section II.C.4.a of the CSO Policy.

Certain tasks must be completed regardless if the Presumption or Demonstration Approach is used, such as system characterization, sewer and GIS mapping, and the evaluation of alternatives. However, the study phase for the Demonstration Approach also requires water quality sampling and water quality modeling of the receiving waters. These tasks have been previously completed and the Reports and/or submittals that document the findings of each of these tasks have been submitted to the NJDEP in accordance with the NJPDES Permits.

H.3.6 PVSC Treatment District Hydraulically Connected Groups

Table H-2 summarizes the NJPDES, Permittee name, CSO numbers, and receiving water body.

Table H-2: Summary of CSO Discharge Locations

NJPDES	Permittee	CSO Number	Receiving Water Body
NJ0109240	Bayonne	001A	Kill Van Kull
NJ0109240	Bayonne	002A	Kill Van Kull
NJ0109240	Bayonne	003A	Kill Van Kull
NJ0109240	Bayonne	004A	Kill Van Kull
NJ0109240	Bayonne	006A	Upper NY Bay
NJ0109240	Bayonne	007A	Upper NY Bay
NJ0109240	Bayonne	008A	Kill Van Kull
NJ0109240	Bayonne	009A	Kill Van Kull
NJ0109240	Bayonne	010A	Kill Van Kull
NJ0109240	Bayonne	011A	Newark Bay
NJ0109240	Bayonne	012A	Newark Bay
NJ0109240	Bayonne	013A	Newark Bay
NJ0109240	Bayonne	014A	Newark Bay
NJ0109240	Bayonne	015A	Newark Bay
NJ0109240	Bayonne	016A	Newark Bay
NJ0109240	Bayonne	017A	Newark Bay
NJ0109240	Bayonne	018A	Newark Bay
NJ0109240	Bayonne	019A	Newark Bay
NJ0109240	Bayonne	020A	Newark Bay
NJ0109240	Bayonne	021A	Upper NY Bay
NJ0109240	Bayonne	022A	Newark Bay
NJ0109240	Bayonne	024A	Kill Van Kull
NJ0109240	Bayonne	026A	Newark Bay
NJ0109240	Bayonne	028A	Newark Bay
NJ0109240	Bayonne	029A	Newark Bay
NJ0109240	Bayonne	030A	Newark Bay
NJ0109240	Bayonne	034A	Newark Bay
NJ0109240	Bayonne	037A	Kill Van Kull
NJ0117846	East Newark	001A	Passaic River

NJPDES	Permittee	CSO Number	Receiving Water Body
NJ0108871	Harrison	001A	Passaic River
NJ0108871	Harrison	002A	Passaic River
NJ0108871	Harrison	003A	Passaic River
NJ0108871	Harrison	005A	Passaic River
NJ0108871	Harrison	006A	Passaic River
NJ0108871	Harrison	007A	Passaic River
NJ0111244	Kearny	001A	Passaic River
NJ0111244	Kearny	004A	Passaic River
NJ0111244	Kearny	006A	Passaic River
NJ0111244	Kearny	007A	Frank's Creek
NJ0111244	Kearny	010A	Frank's Creek
NJ0108758	Newark	002A	Passaic River
NJ0108758	Newark	003A	Passaic River
NJ0108758	Newark	004A	Passaic River
NJ0108758	Newark	005A	Passaic River
NJ0108758	Newark	008A	Passaic River
NJ0108758	Newark	009A	Passaic River
NJ0108758	Newark	010A	Passaic River
NJ0108758	Newark	014A	Passaic River
NJ0108758	Newark	015A	Passaic River
NJ0108758	Newark	016A	Passaic River
NJ0108758	Newark	017A	Passaic River
NJ0108758	Newark	018A	Passaic River
NJ0108758	Newark	022A	Passaic River
NJ0108758	Newark	023A	Peripheral Ditch / Elizabeth Channel
NJ0108758	Newark	025A	Peripheral Ditch / Elizabeth Channel
NJ0108758	Newark	026A	Queen Ditch
NJ0108758	Newark	027A/029A	Peripheral Ditch / Elizabeth Channel
NJ0108758	Newark	030A	Peripheral Ditch / Elizabeth Channel
NJ0108723	Jersey City MUA	001A	Penhorn Creek
NJ0108723	Jersey City MUA	002A	Penhorn Creek
NJ0108723	Jersey City MUA	003A	Hackensack River
NJ0108723	Jersey City MUA	004A	Hackensack River
NJ0108723	Jersey City MUA	005A	Hackensack River
NJ0108723	Jersey City MUA	006A	Hackensack River
NJ0108723	Jersey City MUA	007A	Hackensack River
NJ0108723	Jersey City MUA	008A	Hackensack River
NJ0108723	Jersey City MUA	009A	Hackensack River
NJ0108723	Jersey City MUA	010A	Hackensack River
NJ0108723	Jersey City MUA	011A	Newark Bay
NJ0108723	Jersey City MUA	013A	Newark Bay

NJPDES	Permittee	CSO Number	Receiving Water Body
NJ0108723	Jersey City MUA	014A	Hudson River
NJ0108723	Jersey City MUA	015A	Hudson River
NJ0108723	Jersey City MUA	016A	Hudson River
NJ0108723	Jersey City MUA	018A	Hudson River
NJ0108723	Jersey City MUA	020A	Hudson River
NJ0108723	Jersey City MUA	025A	Hudson River
NJ0108723	Jersey City MUA	026A	Hudson River
NJ0108723	Jersey City MUA	028A	Hudson River
NJ0108723	Jersey City MUA	029A	Hudson River
NJ0108898	North Bergen MUA	003A	Bellmans Creek
NJ0108898	North Bergen MUA	005A	Cromakill Creek
NJ0108898	North Bergen MUA	006A	Cromakill Creek
NJ0108898	North Bergen MUA	007A	Cromakill Creek
NJ0108898	North Bergen MUA	008A	Cromakill Creek
NJ0108898	North Bergen MUA	009A	Cromakill Creek
NJ0108898	North Bergen MUA	010A	Cromakill Creek
NJ0108898	North Bergen MUA	011A	Cromakill Creek
NJ0108898	North Bergen MUA	014A	Cromakill Creek
NJ0108880	Paterson	001A	Passaic River
NJ0108880	Paterson	003A	Passaic River
NJ0108880	Paterson	005A	Passaic River
NJ0108880	Paterson	006A	Passaic River
NJ0108880	Paterson	007A	Passaic River
NJ0108880	Paterson	010A	Passaic River
NJ0108880	Paterson	013A	Passaic River
NJ0108880	Paterson	014A	Passaic River
NJ0108880	Paterson	015A	Passaic River
NJ0108880	Paterson	016A	Passaic River
NJ0108880	Paterson	017A	Passaic River
NJ0108880	Paterson	021A	Passaic River
NJ0108880	Paterson	022A	Passaic River
NJ0108880	Paterson	023A	Passaic River
NJ0108880	Paterson	024A	Passaic River
NJ0108880	Paterson	025A	Passaic River
NJ0108880	Paterson	026A	Passaic River
NJ0108880	Paterson	027A	Passaic River
NJ0108880	Paterson	029A	Passaic River
NJ0108880	Paterson	030A	Passaic River
NJ0108880	Paterson	031A	Passaic River
NJ0108880	Paterson	032A	Passaic River
NJ0108880	Paterson	033A	Passaic River

H.3.7 Selected Approach and CSO Discharge Locations

In consideration of the complexity in characterizing the impacts of natural background conditions and CSO and non-CSO pollutant sources from other parties on the ability to achieve water quality standards and support designated uses, PVSC and the Permittees have elected to adopt criteria ii of the Presumption Approach in the formation of their local LTCP. The NJPDES permit defines criteria ii as follows:

> *ii. The elimination or the capture for treatment of no less than 85% by volume of the combined sewage collected in the CSS during precipitation events on a hydraulically connected system-wide annual average basis.*

Presumption Approach criteria ii provides a metric (85% capture) that simplifies the LTCP development process by eliminating the need to analyze the impacts of outside pollutant sources, as required under the Demonstration Approach, to achieve NJPDES Permit compliance. This approach allows the Permittees to primarily focus on the performance of their collection and treatment facilities by applying nationally accepted industry practices in support of each phase of developing this LTCP.

H.4 SELECTION OF ALTERNATIVES

H.4.1 Description

This section details the factors, both monetary and non-monetary, and procedures that went into the selection process carried out to identify the recommended alternative(s) for inclusion in the Regional LTCP.

H.4.2 Remaining Overflows

The primary criteria for evaluation of alternatives is the technology's effectiveness in reducing the volume and frequency of overflow events. At a minimum, the selected alternatives must be capable of meeting the 85% capture rate required under the Presumption Approach. The effectiveness of different alternatives CSO reduction was evaluated using the LTCP PVSC Treatment District H&H model described in Section F.

Technologies that do not impact the volume or frequency were not excluded, as they may lead to other benefits for the municipalities including, but not limited to, the ability to meet water quality standards or hydraulic benefits to the overall CSS system. This considers adequately addressing areas of sewage overflows, including to basements, streets and other public and private areas.

H.4.3 Ability to Meet Water Quality Standards

Based upon the findings of previous studies and reports submitted and approved by NJDEP (including the System Characterization Report, the Receiving Water Quality Modeling Report, the Baseline Compliance Monitoring Program Report, and the Pathogen Water Quality Modeling Report, among others), the CSO discharges are not precluding the attainment of water quality standards in any of the receiving waters PVSC or its member communities discharge to under baseline conditions.

H.4.4 Non-Monetary Factors

There are several non-monetary factors that were considered in selecting the elements of the Regional LTCP. These factors include siting, institutional issues, implementation, and public input. A brief description of these factors is included below. For a detailed description refer to the PVSC Regional DEAR which is included as **Appendix D.**

Siting of CSO Control Facilities

Identifying an appropriate site for the alternatives is an important consideration when determining the feasibility of the alternative. Siting is unique to each Permittee and is further discussed in the DEAR and individual SIARs which are included as **Appendices F-N**.

Institutional Issues

PVSC does not own any of the CSO outfalls in the CSS. The outfalls are owned by the City of Paterson, City of Newark, Township of Kearny, Town of Harrison, Borough of East Newark, City of Bayonne, Jersey City MUA, and North Bergen MUA, who have received authorization to discharge under their respective NJPDES Permits for Combined Sewer Management.

As a result, implementation of the Regional Alternative is contingent on commitment by PVSC and the eight other Permittees. Each party has factors, monetary and non-monetary, unique to them that affects their selection process. Given these circumstances, PVSC and Permittees developed both a Regional Alternative and individual LTCPs for their geographic boundaries in the event that the Regional Alternative is no longer viable for any reason; the potential for monetary constraints in the event that one or multiple Permittees opt-out is one such possibility.

Implementability

Implementability and technical issues for the Regional Alternative identified in this LTCP was evaluated based on criteria from the EPA CSO Guidance for Long-Term Control Plan document.

Public Input

Public input is a significant factor in the development of the LTCP and was continuously solicited technologies through the implementation of the LTCP Public Participation Plan (PPP), as described in Section G. For instance, throughout the LTCP process it was clear that the public desired a plan that would include green infrastructure. The use of green infrastructure provides the community with several benefits including increased green space, reduction of heat island effect and the potential for green jobs.

H.4.5 Cost Opinion

The cost and performance analysis was prepared in accordance with Passaic Valley Sewerage Commissioners CSO Long Term Control Plan Updated Technical Guidance Manual (January 2018). All present worth costs include the costs for capital costs, land costs, and O&M costs over a 20-year period or life of the project. All capital costs include an additional 25% for contingencies, 20% for engineering costs and 15% for contractor overhead and profit. A discount rate of 2.75% and a 20-year life cycle was assumed for present value calculations. The total present worth (TPW) cost is calculated as the sum of the capital cost, land cost, and the O&M costs multiplied by a 15.227 PW factor based on the discount rate and 20-year life cycle

estimated years. All costs have been adjusted for present day worth using the ENR construction indices. The cost estimates were used to determine the most cost-effective alternative. Cost-effectiveness was the leading monetary factor.

Table H-3 summarizes the CSO control technologies to be implemented under the Regional Alternative CSO LTCP, for those Permittees that have selected the Regional Alternative. The CSO control technologies to be implemented under the Municipal Alternative, for those Permittees that have selected the Municipal Alternative, are shown in each Permittee's individual SIARs. Implementation of the Regional plan, or Regional Alternative, is subject to cost allocation agreements across the various Permittees. Should regional implementation not be feasible due to a cost allocation agreement not being achieved within a specified time frame, each Permittee will implement the LTCP delineated in the individual SIARs, and referred to as the Municipal Alternative, upon NJDEP approval.

Table H-3 below shows the summary of costs for the Regional alternative of the LTCP.

Table H-3: Summary of Costs for the Regional Alternative

Permittee	Technology	Quantity	Units	CC [1] ($M)	O&M[2] ($M)	LCC[3] ($M)
Bayonne	Green Infrastructure Phases 1, 2 & 3	40	AC	15.6	0.09	17.0
Bayonne	Storage Tank at BA001/002	10.5	MG	131.6	0.19	134.5
Bayonne	Storage Tank at BA007	3.2	MG	47.5	0.11	49.2
Bayonne	Storage Tank at BA021	2.0	MG	32.2	0.09	33.6
Bayonne	OSPS Improvements to 27.8 MGD	10.2	MGD	12.0	0.60	21.1
Bayonne	Forcemain Capacity Increase	6,019	LF	23	0.06	23.9
Bayonne Subtotal				***261.9***	***1.14***	***279.4***
East Newark	Sewer Separation	13.0	Acres	3.9	0.00	3.9
East Newark	Sewer Separation	7.0	Acres	2.1	0.000	2.1
East Newark Subtotal				***6.0***	***0.00***	***6.0***
Harrison	Green Infrastructure Program	N/A	N/A	0.8	0.03	1.2
Harrison	PSS at 004 (3.3 ac completed) and 005 (87.1 ac; 37.6 ac completed, 49.5 ac remaining)	49.5	Acres	15.3	0.00	15.3
Harrison Subtotal (in addition to $11M already invested in sewer separation)				***16.1***	***0.03***	***16.5***
Jersey City	Sewer Rehabilitation and I/I Elimination	87890	LF	36.8	0.00	36.8
Jersey City	Bates and Bright Street to Jersey Avenue Sewer Separation Project	28.9	Acres	10.8	0.00	10.8
Jersey City	Green Infrastructure to Control 7% of Impervious Area	188	Acres	92.1	0.42	98.5
Jersey City	Penhorn Creek Treatment Shaft 1 – CSOs JC001, JC002	6.2	MG	104.8	0.15	107.1
Jersey City	Penhorn Creek Treatment Shaft 2 - CSOs JC003, JC004, JC005	7.1	MG	116.7	0.16	119.2
Jersey City Subtotal				***361.2***	***0.74***	***372.4***

Permittee	Technology	Quantity	Units	CC [1] ($M)	O&M[2] ($M)	LCC[3] ($M)
Kearny	Sewer Separation at Outfall KE010	34.0	Acres	10.2	0.00	10.2
Kearny	Sewer Separation at KE006	199.0	Acres	59.7	0.00	59.7
Kearny Subtotal				***69.9***	***0.00***	***69.9***
Newark	Regulator Modifications on Main Interceptor	N/A	N/A	0.0	0.00	0.0
Newark	Increasing Flow from South Interceptor	N/A	N/A	0.4	0.00	0.4
Newark	Green Infrastructure	212.7	Acres	90.2	0.48	97.5
Newark	Water Conservation Program	N/A	N/A	1.5	0.00	1.5
Newark Subtotal				***92.1***	***0.48***	***99.4***
North Bergen	Storage Tank at NB003	5.0	MG	26.5	0.20	29.6
North Bergen	Closure of outfall NB014	N/A	N/A	0.1	0.00	0.1
North Bergen	Green infrastructure	1.0	Acres	0.4	0.05	1.2
North Bergen Subtotal				***27.0***	***0.25***	***30.8***
Paterson	Sewer Separation Projects Completed Since 2006	47.5	Acres	N/A	N/A	N/A
Paterson	Planned Sewer Separation for PT023	29.8	Acres	8.9	0.0	8.9
Paterson	19th Ave. Relief Sewer for PT030	7,706	LF	49.9	0.00	49.9
Paterson	2.5% Impervious Area Green Infrastructure	75.0	Acres	29.3	0.17	31.8
Paterson	15' Dia. 1600 LF Storage Tunnel at PT025	2.1	MG	33.7	0.10	35.2
Paterson Subtotal				***121.8***	***0.26***	***125.8***
PVSC	PVSC WRRF Secondary Bypass to 720 MGD WWF	720	MGD	45.2	0.64	54.9
All	Parallel Interceptor to Main Interceptor	29,296	LF	219.0	0.00	219.0
Regional Facilities Subtotal				***264.2***	***0.64***	***273.9***
Total				**1,220**	**3.54**	**1,274**

[1] Capital Cost.
[2] Operation and Maintenance.
[3] Life Cycle Cost. Through financial capability assessment, each Permittee will adjust the LCC accordingly. This is a preliminary cost projection based on a 20-year implementation schedule. This will be adjusted pending the changes to each Permittee's implementation schedule.

H.5 DESCRIPTION OF RECOMMENDED LTCP

Since the submission of the Regional DEAR, PVSC and the eight other Permittees have conducted several meetings to discuss and decide upon two options for the recommended LTCP. The first is the Municipal Alternative, where each Permittee independently implements CSO control technologies to achieve no less than 85% capture by volume of wet weather flow within their geographic boundary's combined sewer system. Secondly, there is the Regional Alternative where the 85% capture criterion is achieved across the PVSC combined sewer system as a combined effort of all the Permittees. Not all Permittees will reach 85% capture individually in the Regional Alternative, but the combination of CSO control technologies used across the hydraulically connected communities within the PVSC Treatment District will meet

this criterion. This Regional Alternative primarily utilizes a major improvement: the construction of a parallel interceptor to the main interceptor. This parallel interceptor would allow the proposed secondary bypass at the PVSC WRRF to increase wet weather flow treatment capacity to 720 MGD. These improvements will then be coupled with local CSO control technologies in order to constitute the entire Regional Alternative.

The SIARs developed by each of the Permittees (included as Appendices to this LTCP) discuss the Municipal Alternative to be implemented by each Permittee independently from the other CSO Communities, and if the Municipal Alternative is selected by the individual Permittee (in lieu of the Regional Alternative). This report discusses selection of a Regional Alternative to be implemented throughout the PVSC Treatment District, and the adjustments of the CSO control technologies proposed in these SIARs. This section highlights the differences and similarities between the Municipal and Regional Alternative CSO control technologies selected.

The LTCP recommendations are based upon information and evaluations performed during the earlier phases of the planning process, including the characterization of the receiving waters, hydraulic and water quality modeling, screening of CSO control technologies, and development and evaluation of alternatives, public participation, and the nine minimum controls. Following completion of these permit requirements, the selection and implementation of alternatives for regional implementation took place and is further discussed in this section.

Table H-4 summarizes the alternative (either the Municipal Alternative or the Regional Alternative) that each Permittee has selected. For those Permittees that have selected the Regional Alternative, those Permittees are committing to working towards a negotiated cost allocation/sharing Agreement for the Regional Alternative prior to beginning the implementation of the Regional Alternative. If these cost allocation/sharing negotiations are not successful, each of these Permittees would then implement the Municipal Alternative as discussed in each of the Permittees' individual Selection and Implementation of Alternatives Reports included in **Appendices F-N**. Any Permittee selecting the Regional Alternative may instead choose to implement their Municipal Alternative at any time during the negotiations.

Table H-4: Permittee Alternative Selection

Permittee	NJPDES #	Selected Alternative
Bayonne	NJ0109240	Regional
East Newark	NJ0117846	Regional
Harrison	NJ0108871	Regional
JCMUA	NJ0108723	Regional
Kearny	NJ0111244	Municipal
Newark	NJ0108758	Regional
NBMUA	NJ0108898	Regional
Paterson	NJ0108880	Regional

Table H-5 highlights the differences and similarities between the Municipal and Regional Alternative CSO control technologies selected.

The two alternatives that most resemble Alternatives 1 (Municipal) and 3 (Regional) submitted in the Regional DEAR, noted in **Section E.3** above, have been coined Alternatives 1b (Municipal) and 3b (Regional) after iterative analysis of different alternatives with the Permittees. Detailed descriptions of each of the CSO control technologies evaluated in the Municipal and Regional Alternatives can be found in the respective Permittee SIARs (**Appendices F through N**). **Table H-6** compares the alternatives put forth in the Regional DEAR report and those agreed upon by the Permittees for the final LTCP.

Table H-5: Regional Alternatives Versus Municipal Alternatives

Permittee	Technology	Municipal Alternative	Regional Alternative
Bayonne	Green Infrastructure Phases 1, 2 & 3	✓	✓
Bayonne	Storage tank at BA001/BA002	✓	✓
Bayonne	Storage tank at BA007	✓	✓
Bayonne	Storage tank at BA010	✓	
Bayonne	Storage Tank at BA014	✓	
Bayonne	Storage Tank at BA015	✓	
Bayonne	Storage Tank at BA017	✓	
Bayonne	Storage Tank at BA021	✓	✓
Bayonne	OSPS Improvements to 27.8 MGD	✓	✓
Bayonne	FM Upgrade (replace existing force main with 36" Pipe)	✓	✓
East Newark	Thread Mill Sewer Separation (13 ac)	✓	✓
East Newark	Water Front Sewer Separation (7 ac)	✓	✓
Harrison	Green Infrastructure Program	✓	✓
Harrison	Sewer Separation at 004 (3.3ac completed) and 005 (87.1 ac; 37.6 completed, 49.5 ac remaining)	✓	✓
Jersey City	Sewer Rehabilitation and I/I Elimination	✓	✓
Jersey City	Bates and Bright Street to Jersey Avenue Sewer Separation Project	✓	✓
Jersey City	Green Infrastructure to Control 7% of Impervious Area	✓	✓
Jersey City	Penhorn Creek Treatment Shaft 1 – CSOs JC001, JC002	✓	✓
Jersey City	Penhorn Creek Treatment Shaft 2 - CSOs JC003, JC004, JC005	✓	✓
Jersey City	Hackensack River Treatment Shaft - JC006, JC007, JC008, JC009, JC010	✓	
Jersey City	Newark Bay Treatment Shaft - JC011, JC013	✓	
Jersey City	North Hudson Treatment Shaft - JC028, JC029	✓	
Kearny	Sewer Separation at KE010	✓	
Kearny	Sewer Separation at KE006	✓	
Newark	Storage Tank at NE022	✓	
Newark	Storage Tank at NE009 & NE010	✓	
Newark	Storage Tank at NE014	✓	

Permittee	Technology	Municipal Alternative	Regional Alternative
Newark	Regulator Modifications on Main Interceptor	✓	✓
Newark	Green Infrastructure	✓	✓
Newark	Increasing flow from South Interceptor		✓
Newark	Water Conservation Program	✓	✓
North Bergen	Storage Tank at NB003	✓	✓
North Bergen	Storage Tank at NB008	✓	
North Bergen	Closure of outfall NB014	✓	✓
North Bergen	Green Infrastructure	✓	✓
Paterson	Sewer Separation Projects Completed Since 2006	✓	✓
Paterson	Planned Sewer Separation for PT023	✓	✓
Paterson	19th Ave. Relief Sewer for PT030	✓	✓
Paterson	2.5% Green Infrastructure	✓	✓
Paterson	15' Dia. 1600 LF Storage Tunnel at PT025, 85% Capture	✓	✓
PVSC	PVSC WRRF Secondary Bypass to 720 MGD WWF	✓	✓
All	Parallel Interceptor to Main Interceptor		✓

Table H-6: Alternatives Presented in the Regional DEAR and Final Alternatives for the LTCP

Alternative	Description
Municipal Alternative (No. 1b)	Alternatives that achieve 85% wet weather capture within each municipality
Regional Alternative (No. 3b)	Parallel Interceptor + WRRF Secondary Bypass to 720 MGD + Local technologies

The percent capture and volume reduction information for each permittee for the Regional and Municipal Alternatives is presented in Error! Reference source not found.. Error! Reference source not found.These baseline capture rates for each Permittee and the improvements in capture for the Municipal and Regional Alternatives were presented in Supplemental CSO Group Meeting No. 16 on September 2nd, 2020:

Table H-7: Percent Capture and Volume Reduction for each Permittee for the Regional and Municipal Alternatives

Municipality	Baseline		Municipal Alternative		Regional Alternative	
	Annual CSO (MG)	% Capture	Annual CSO (MG)	% Capture	Annual CSO (MG)	% Capture
Bayonne	747	49%	205	86%	319	78%
East Newark	17	77%	11	85%	11	85%
Harrison	47	82%	38	85%	38	85%
Jersey City	1557	72%	550	88%	1145	78%
Kearny	255	75%	99	85%	99	85%
Newark	1319	77%	686	88%	174	96%
North Bergen	274	77%	176	86%	186	85%
Paterson	353	82%	283	85%	283	85%
Totals – System Wide CSO / Percent Capture	**4,569**	**69%**	**2,048**	**86%**	**2,255**	**85%**

Note: Each one of the eight municipalities further refined their baseline models after the submission of their SCR. The flow and CSO values reported in the SIAR reflect the most up-to-date results.

SECTION I - FINANCIAL CAPABILITY

I.1 Introduction

This section of the report quantifies the projected affordability impacts of the proposed long term CSO controls for the:

- City of Bayonne
- East Newark Township
- Town of Harrison
- Jersey City
- Town of Kearny
- City of Newark;
- North Bergen Township; and
- City of Paterson.

These municipalities are members of the Clean Waters, Healthy Neighborhoods initiative. The initiative is a collaboration of the entities who own and operate combined sewer systems within the PVSC service areas.

This analysis focuses on the Municipal Control Alternatives that the eight municipalities have identified in their respective Selection and Implementation Reports.

While a regional alternative would result in lowered overall costs for the control of CSOs within the PVSC service area, the basis of this allocation remains under discussion as of the writing of this report. Under this approach both the costs of the regional facilities such as a relief interceptor and the resultant savings would be allocated amongst the PVSC municipalities with combined sewer systems. As the basis of this allocation remains under discussion as of the writing of this SIAR, this document focuses on implementation of the Municipal Control Alternative. Should the Permittees come to agreement on the cost allocation for the Regional Control Plan, the FCA will be revisited to reassess the affordability and schedule for implementation of the LTCP.

This section is excerpted from individual memoranda prepared by PVSC for these municipalities. The memoranda are incorporated as **Appendix P** of this Regional LTCP.

I.2 Methodology

I.2.1 USEPA's Two Step Process

The Financial Capability assessment is a two-step process including Affordability which evaluates the impact of the CSO control program on the residential ratepayers and Financial Capability which examines a Permittee's ability to finance the program. Affordability is measured in terms of the Residential Indicator (RI) which is the percentage of median household income (MHI) spent on wastewater services. Total wastewater services exceeding 2.0% (1% for

communities with a "weak" Financial Capability Indicator score) of the median household income are considered to impose a high burden by USEPA. The financial capability analysis uses metrics similar to the municipal bond rating agencies.

I.2.2 Dynamic FCA Modeling Approach

EPA's November 24, 2014 memorandum encourages the use of a time-based ("dynamic" model per the memo) model to supplement the snapshot approach. PVSC has developed time-based models for each municipality that calculate annual costs and revenue requirements based on assumed program costs, schedules and economic variables such as interest and inflation rates. The residential indicator is calculated for each year based upon the costs per typical residential users which changes annually based on the annual system revenue requirements.

I.2.3 Evolving Analytical Framework

USEPA encourages the use of additional information and metrics to more accurately capture the impacts of the proposed CSO controls on the Permittee and its residents. Therefore, this FCA includes information on the impacts of future costs among lower income residents and within the context of local costs of living.

Detailed discussion of the FCA for the PVSC service area and Permittees and a detailed analysis of the FCAs can be found in the FCA Memoranda specifically written for the eight municipalities are attached as part of Appendix P of the Regional LTCP.

I.3 Current Baseline Conditions

I.3.1 Current Affordability Assessments

The starting point for the affordability assessment was an estimation of annual wastewater costs for the typical single family residential wastewater user in each municipality. Due to varying municipal schedules for setting rates, 2019 was used as the base year. The estimated annual costs are shown on

Table I-1. Also shown are the current (2019 unless noted) Residential Indicators which are the percentages of the municipality's MHI and the estimated MHIs.

Table I-1: Estimated Baseline Wastewater Costs per Typical Single Family Residential User (2019 unless noted)

	Municipality	User Charge	From Taxes	Total	MHI	RI
1	Bayonne (2020)	$659	$42	$701	$59,000	1.2%
2	East Newark	$436	$0	$436	$61,400	0.7%
3	Harrison	$210	$185	$395	$63,600	0.6%
4	Jersey City	$482	$0	$482	$65,300	0.7%
5	Kearny	$0	$499	$499	$64,400	0.8%

Municipality		User Charge	From Taxes	Total	MHI	RI
6	Newark	$340	$0	$340	$35,600	1.0%
7	North Bergen	$431	$126	$557	$59,600	0.9%
8	Paterson	$290	$170	$460	$40,000	1.1%

The estimated 2019 costs per single family residential user are based on the following:

- Typical residential potable water usage is 4,500 gallons monthly;
- Where applicable, collection sewer system costs that are paid for by the municipalities through their general (property tax based) funds are estimated based upon the average assessed valuation for a single family home per municipal budget materials submitted to the New Jersey Department of Community Services and the ratio of sewer system costs in the municipal budgets to the overall tax-funded municipal budgets.
- Median household incomes were based on the 2013 – 2017 US Census National Community Survey, inflated to 2019 using individual income growth rates calculated from the 2000 Census and the 2015 (mid-point of the 2013-2017 survey).

By definition, whatever the residential indicator is in a given municipality, the costs as a percentage of household will be more for half of the households.

The total Census households are broken out by income brackets on **Table I-2** below, along with the respective current Residential Indicators by income bracket. The RI for each bracket was calculated from the mid-point income within the bracket.

Table I-2: Analysis of the Current Residential Indicator

Income Bracket	Bracket Average Income	Bayonne	E. Newark	Harrison	Jersey City	Kearny	Newark	N. Bergen	Paterson
		R.I.	R.I.	R.I.	R.I.	R.I.	R.I.	R.I.	R.I.
		Number*	Number*	Number*	Number*	Number*	Number*	Number*	Number*
Less than $10,000	$5,000	14.0%	8.7%	7.9%	8.3%	10.0%	6.8%	10.6%	9.2%
		2,189	28	330	8,818	671	14,841	1,887	6,379
$10,000 to $14,999	$12,500	5.6%	3.5%	3.2%	3.3%	4.0%	2.7%	4.2%	3.7%
		1,061	44	186	5,377	381	7,790	1,050	3,445
$15,000 to $24,999	$20,000	3.5%	2.2%	2.0%	2.1%	2.5%	1.7%	2.6%	2.3%
		2,403	56	434	9,457	1,230	13,900	2,117	6,340
$25,000 to $34,999	$30,000	2.3%	1.5%	1.3%	1.4%	1.7%	1.1%	1.8%	1.5%
		2,410	86	493	7,901	962	11,283	2,004	5,096
$35,000 to $49,999	$42,500	1.7%	1.0%	0.9%	1.0%	1.2%	0.8%	1.2%	1.1%
		3,046	133	820	10,331	2,011	13,618	2,623	6,526

Income Bracket	Bracket Average Income	Bayonne	E. Newark	Harrison	Jersey City	Kearny	Newark	N. Bergen	Paterson
		R.I.	R.I.	R.I.	R.I.	R.I.	R.I.	R.I.	R.I.
		Number*	Number*	Number*	Number*	Number*	Number*	Number*	Number*
$50,000 to $74,999	$62,500	1.1%	0.7%	0.6%	0.7%	0.8%	0.5%	0.8%	0.7%
		4,496	156	1,238	14,468	2,720	14,743	4,171	6,335
$75,000 to $99,999	$87,500	0.48%	0.5%	0.5%	0.5%	0.6%	0.4%	0.6%	0.5%
		2,826	104	621	10,216	1,810	7,855	2,859	4,307
$100,000 to $149,999	$125,000	0.6%	0.4%	0.3%	0.3%	0.4%	0.3%	0.4%	0.4%
		3,302	140	822	15,064	2,196	7,600	3,290	3,723
$150,000 to $199,999	$175,000	0.4%	0.3%	0.2%	0.2%	0.3%	0.2%	0.3%	0.3%
		2,011	53	381	7,961	1,025	2,136	1,007	837
$200,000 or more	>$200,000	0.4%	0.2%	0.2%	0.2%	0.2%	0.2%	0.3%	0.2%
		1,469	30	297	10,456	467	1,550	924	798

* Number of Census households per income bracket.

- PVSC has developed a time-based model that calculates annual costs and revenue requirements based on assumed program costs, schedules and economic variables such as interest and inflation rates. The residential indicator is calculated for each year based upon the costs per typical residential users which changes annually based on the annual system revenue requirements.

- The estimated inflationary impacts on wastewater costs per typical single family residential user without additional CSO control costs are shown on **Table I-3**. The costs are projected to the first year after the full implementation of the respective Municipal Control Alternatives. For example, if the scheduled completion of all capital expenditures required to implement a Municipal Control Alternative is 2040, the affordability test year would be 2041. For all municipalities, annual operation and maintenance (O&M) costs are projected to increase at a rate of 3.9% annually based on the 2017 NACWA survey of wastewater utilities.[I-1]

Table I-3: Projected Residential Indicator without Additional CSO Control Costs

Municipality	Metric	Baseline (2019 unless noted)	Test Year	Test Year Cost per Typical Residential Wastewater (With Inflation)
Bayonne (2020)	RI	1.2%	2051	2.2%
	Annual $	$701		$2,296
East Newark	RI	0.7%	2031	0.8%

I-1 2017 Financial Survey – Opportunities and Challenges in Clean Water Utility Management July 2018; National Association of Clean Water Agencies (NACWA)

Municipality	Metric	Baseline (2019 unless noted)	Test Year	Test Year Cost per Typical Residential Wastewater (With Inflation)
	Annual $	$436		$595
Harrison	RI	0.6%	2041	1.0%
	Annual $	$395		$1,008
Jersey City	RI	0.7%	2051	0.9%
	Annual $	$482		$1,082
Kearny	RI	0.8%	2051	1.1%
	Annual $	$499		$1,258
Newark	RI	1.0%	2031	1.2%
	Annual $	$340		$476
North Bergen	RI	0.9%	2041	1.3%
	Annual $	$557		$1,231
Paterson	RI	1.1%	2061	1.5%
	Annual $	$460		$1,257

I.3.2 Current Financial Capability Assessments

The second part of the financial capability assessment - calculation of the financial capability indicator for the Permittee - includes six items that fall into three general categories of debt, socioeconomic, and financial management indicators. The six items are:

- Bond rating
- Total net debt as a percentage of full market real estate value
- Unemployment rate
- Median household income
- Property tax revenues as a percentage of full market property value
- Property tax revenue collection rate

Each item is given a score of three, two, or one, corresponding to ratings of strong, mid-range, or weak, according to EPA-suggested standards. The overall financial capability indicator is then derived by taking a simple average of the ratings. This value is then entered into the financial capability matrix to be compared with the residential indicator for an overall capability assessment. The Financial Capability scores for the municipalities are shown on **Table I-4**.

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Table I-4: Financial Capability Indicator Benchmarks

Municipality	Bond Rating	Net Debt	Unem-ployment Rate	MHI	Property Tax as % Market Value	Property Tax Collection Rate	Combined
	Value	Value	Value	Value	Value	Value	Value
	Score	Score	Score	Score	Score	Score	Score
Bayonne	2	1	3	2	2	3	2.2
	Mid-Range	Weak	Strong	Mid-Range	Mid-Range	Strong	Mid-Range
East Newark	NA	3	3	2	2	2	2.4
	NA	Strong	Strong	Mid-Range	Mid-Range	Mid-Range	Mid-Range
Harrison	2	2	1	2	2	3	2.0
	Mid-Range	Mid-Range	Weak	Mid-Range	Mid-Range	Strong	Mid-Range
Jersey City	3	2	2	2	2	1	2.0
	Strong	Mid-Range	Mid-Range	Mid-Range	Mid-Range	Weak	Mid-Range
Kearny	2	3	1	2	2	2	2.0
	Mid-Range	Strong	Weak	Mid-Range	Mid-Range	Mid-Range	Mid-Range
Newark	2	3	1	1	2	3	2.0
	Mid-Range	Strong	Weak	Weak	Mid-Range	Strong	Mid-Range
North Bergen	3	3	1	2	2	3	2.3
	Strong	Strong	Weak	Mid-Range	Mid-Range	Strong	Mid-Range
Paterson	2	3	1	2	2	1	1.8
	Mid-Range	Strong	Weak	Mid-Range	Mid-Range	Weak	Mid-Range

The derivations of these scores are presented in the detailed FCA memorandum presented in **Appendix P** of this PVSC Regional LTCP. As each of the financial indicators are generally based upon publicly available data from 2019 or earlier, this analysis does not reflect the current and lingering impacts of the COVID -19 pandemic and should be revisited upon memorializing the LTCP implementation schedule in the municipalities' and MUA's next NJPDES Permits.

I.4 Other Economic & Demographic Factors

In addition to following EPA guidelines for completion of the financial capability assessment matrix, a discussion of socioeconomic trends among the municipalities is essential to the consideration of scheduling and compliance levels with CSO guidelines.

I.4.1 Cost of Living Factors

General Cost of Living

Specific cost of living comparisons with national averages are not available for each municipality. However, the cost of living for the Cities of Elizabeth and Newark is approximately 30% higher than the national average.[I-2] Proxy "effective MHI" values reflecting the impact of the higher cost living have been estimated and are presented in **Table I-5**. Included on **Table I-5** are "effective MHIs" calculated for this evaluation which represent the ratio of the differences between the municipal MHIs and the national MHI and the municipal cost of living and the national average cost of living (which is 100%). For example, if a municipality has a MHI that is 110% of the national average and a cost of living that is 20% higher than the national average, the effective MHI would be about 92% which is calculated as follows:

MHI @ 95% / Cost of Living @ 1.20 = 91.67% Effective MHI.

This is not an official EPA metric but reinforces the impacts of the high costs of living in the PVSC service area which is not reflected in the basic EPA residential indicator calculation.

Table I-5: Cost of Living and "Effective" MHI

Municipality		Cost of Living .v. National Average	MHI .v. National Average	"Effective" MHI
1	Bayonne	130%	99%	76%
2	East Newark	130%	103%	78%
3	Harrison	130%	106%	81%
4	Jersey City	130%	109%	84%
5	Kearny	130%	110%	85%
6	Newark	130%	60%	46%
7	North Bergen	130%	99%	76%
8	Paterson	130%	63%	48%

Housing Costs

Housing costs in the PVSC municipalities are substantially higher than the national average[I-3]. The Residential Indicator is a national screening parameter and does not account for localized factors which erode the effective household income. Based upon a 2017 study[I-4] by the National Low Income Housing Coalition, the fair market value of a two bedroom apartment in the counties in which the PVSC municipalities are located is presented in **Table I-6** along with the percentages of median household incomes that this represents.

I-2 http://www.infloplease.com/business/economy/cost of living - index.us-cities html

I-3 Using the Newark – Elizabeth cost of living indices.

I-4 Out of Reach 2017 – The High Cost of Housing National Low Income Housing Coalition.

Table I-6: Housing Costs Using Monthly Rents as a % of MHI

Municipality		Monthly Rent for 2 Bedroom Apartment	MHI (2017)	Rent as % of MHI
1	Bayonne	$1,519	$56,700	32%
2	East Newark	$1,519	$59,300	31%
3	Harrison	$1,519	$61,170	30%
4	Jersey City	$1,519	$62,700	29%
5	Kearny	$1,519	$63,300	29%
6	Newark	$1,288	$34,800	44%
7	North Bergen	$1,519	$57,300	32%
8	Paterson	$1,557	$36,100	52%

Local Tax Burdens

Average property tax levies for the average assessed valuations for single family homes in the municipalities have been calculated and are compared with a national average local property tax levy of $3,500 for a similarly priced home. Moreover, as housing prices are higher in the New York – Newark metropolitan area than nationally, houses costing well over the national median value of $193,500 are purchased by families of modest incomes. These data are shown on **Table I-7Table I-7**.

Table I-7: Average Property Tax Burden Compared to National Averages – Single Family Home

Municipality		Average Tax Levy (municipal + School, etc.)	National Average Levy
1	Bayonne	$9,800	$3,500
2	East Newark	$10,900	
3	Harrison	$11,000	
4	Jersey City	$7,200	
5	Kearny	$10,200	
6	Newark	$6,000	
7	North Bergen	$7,700	
8	Paterson	$7,700	

The high housing costs and tax burdens facing households in the PVSC municipalities reduces their effective household income. Consequently, measuring the household burden imposed by wastewater costs as a percentage of the median household income may underestimate the

financial burden of the projected wastewater costs per household. As was noted in an analysis of the impacts of CSO controls in the Boston region:

> *"The greater are the costs of other necessities as a share of MHI, the greater will be the economic burden associated with sewer charges equal to a given percent of MHI."*[I-5]

I.4.2 Poverty Factors

Poverty Rate

Circa 2017 poverty rates for the municipalities are provided in **Table I-8**. These can be compared to the United States poverty rate of 14.6%.

Table I-8: Poverty Rates

	Municipality	Municipal	United States
1	Bayonne	15.7%	14.6%
2	East Newark	13.0%	
3	Harrison	16.2%	
4	Jersey City	18.7%	
5	Kearny	11.7%	
6	Newark	28.3%	
7	North Bergen	15.8%	
8	Paterson	29.0%	

New Jersey Department of Community Affairs Municipal Revitalization Index

New Jersey's Municipal Renewal Index[I-6] measures the social, economic, physical and financial conditions of the 565 municipalities within New Jersey. The MRI is compiled by the NJ Department of Community Affairs and is used in the distribution of needs-based funding. Six primary along with four secondary criteria are used:

Primary Criteria

- Children on TANF (Temporary Assistance for Needy Families) per 1,000 persons
- Unemployment Rate
- Poverty Rate
- High school diploma or higher

I-5 Assessment of the Economic Impact of Additional Combined Sewer Overflow Controls in the Massachusetts Water Resource Authority Service Area (page 13) prepared by Robert N. Stavins, Genia Long, and Judson Jaffee. Analysis Group Incorporated, August 2004.

I-6 Measuring Distress in New Jersey: the 2017 Municipal Revitalization Index Office of Policy and Regulatory Affairs, New Jersey Department of Community Affairs.

- Median Household Income
- Percent of households receiving SNAP (food stamps)

Secondary Criteria

- Ten-year rate of change in population
- Non-seasonal housing vacancy rate
- Equalized three year effective property tax rate
- Equalized property valuation per capita

The 2017 state-wide MRI rankings for the combined sewered municipalities within the PVSC service area are shown on **Table I-9**.

Table I-9: Municipal Renewal Index for the PVSC Combined Sewered Municipalities

Municipality	2017 Municipal Revitalization Index			Percentile of Least Resourced Municipalities
	MRI Score	MRI Distress Score	MRI Rank	
Bayonne	-4.56	40.2	82	15%
East Newark	-5.71	43.4	65	12%
Harrison	-4.49	40.0	87	15%
Jersey City	-5.80	43.7	64	11%
Kearny	-3.67	37.7	106	19%
Newark	-16.53	73.5	12	2%
North Bergen	-4.65	40.5	80	14%
Paterson	-19.43	81.6	8	1%

I.5 Future Conditions

I.5.1 Impacts of the Selected CSO Control Strategies

The projected future capital costs for the Municipal Control Alternatives on the part of the eight PVSC combined sewered municipalities are shown on **Table I-10**. As noted above, the development of potential intermunicipal allocation of costs for the Regional Control Alternative are underway and the financial capability analyses can be re-evaluated to reflect the regional approach at a later date.

Table I-10: Remaining Capital Costs for Implementing the Municipal Control Alternatives

Municipal Permittee		Schedule		Capital Costs (current $ in millions)
		End Year	Years	
1	Bayonne (depending on capacity available from PVSC)	2050	30	$363.3
2	East Newark	2030	10	$6.0
3	Harrison	2040	20	$16
4	Jersey City	2050	30	$658
5	Kearny	2050	30	$70
6	Newark	2030	10	$449
7	North Bergen	2040	20	$36
8	Paterson	2060	40	$122
			Total	$1,720

The various projects comprising costs for the Municipal Control Alternatives are summarized in the individual Financial Capability Assessment memoranda provided as Appendix P to this report and are detailed in the individual municipalities' Selection and Implementation of Alternatives Reports. Also shown are the currently anticipated implementation periods per the respective municipalities SIARs. It is assumed that the Long Term Control Plans will be approved by NJDEP during 2021, triggering the implementation period per the updated NJPDES discharge permits which will be negotiated and finalized during 2021.

It should be noted that the $1.72 billion total shown below does not include costs incurred to date that are already included in the municipalities' respective rate bases such as the $20 million for the expansion of North Bergen MUA's Woodcliff Sewage Treatment Plant, which is underway, and the Town of Harrison's $11 million investment in sewer separation.

Implementation of the $1.72 billion Municipal Control Alternative results in projected annual costs per typical single family user for the eight PVSC municipalities as shown on **Table I-11**.

Table I-11: Projected Impacts of Implementing the Municipal Control Options

Municipal Permittee	Current Typical Residential		RI Based on Cost / Schedule*			Test Year	Projected MHI	Projected Typical Residential Annual Cost*	
	R.I.	Annual Cost	Uninflated	Inflated	EPA Burden (inflated)			Uninflated	Inflated
Bayonne	1.2%	$701	2.2% To 2.4%	3.5% To 3.6%	High To High	2051	$105,500	$1,222 To $1,336	$3,642 To $3,825
East Newark	0.7%	$436	1.5%	1.6%	Medium	2031	$75,400	$901	$1,191
Harrison	0.6%	$395	1.2%	1.5%	Medium	2041	$98,400	$754	$1460
Jersey City	0.7%	$482	1.1%	1.3%	Medium	2051	$123,300	$703	$1,652
Kearny	0.8%	$499	1.3%	2.0%	High	2051	$111,100	$848	$2,189
Newark	1.0%	$340	1.5%	1.8%	Medium	2031	$40,700	$515	$723
North Bergen	0.9%	$557	1.2%	1.4%	Medium	2041	$92,300	$701	$1,280
Paterson	1.1%	$460	1.6%	2.0%	High	2061	$84,200	$633	$1,683

Assuming inflation, Bayonne, Kearny and Paterson have projected residential indicators triggering the USEPA "high burden" criterion. Without inflation, no municipalities would be projected to have a residential indicator over 2.0% upon completion of the Municipal Control Alternatives. While excluding inflation obviates the need for long term projections of inflation, income growth and interest rates; assuming no inflation is equally fraught. The necessary ambiguity and unpredictability of future economic conditions beyond the municipalities' control provides a strong argument as to the need for adaptive management to be incorporated into what will ultimately be enforceable implementation schedules. Moreover, the Residential Indicator is a crude metric in that it uses a single income data point, the median household income for the entire municipality. As detailed in the following sub-section, annual wastewater costs that result in a "moderate" impact on households at or near the median household income can impose severe impacts on low income households.

This limitation is one of the drivers behind the April 2019 affordability framework proposed by the National Association of Clean Water Agencies and other national organizations.[7] The key recommendations focus on the impacts of water and wastewater investment decisions on the lowest median household income quintile (lowest 20 percent). On September 15, 2020 USEPA issued draft revisions to its circa 1997 affordability / financial capability guidance titled "EPA Proposes 2020 Financial Capability Assessment for Water Services in Disadvantaged Communities" which incorporate the concepts in the 2019 Framework for long term CSO control compliance scheduling.

[7] Developing a New Framework for Household Affordability and Financial Capability Assessment in the Water Sector April 2019. Prepared for the American Water Works Association, National Association of Clean Water Agencies, and the Water Environment Federation.

PVSC and the municipalities are aware of these pending changes to EPA's guidance on Financial Capability Assessment (FCA). This new guidance is still under review and not yet final, but it is recognized that it may impact the FCA and in turn the LTCP implementation schedule presented in this report. If the final guidance prompts changes to the FCA and the implementation schedule, these elements of this LTCP may be modified and resubmitted to NJDEP for review and approval.

I.5.2 Affordability Impacts by Household Income Brackets

As noted in the context of baseline residential indicators, when the residential indicator (RI) is at X% for the median household income, it is greater than X% for half of the households. The total Census households are broken out by income brackets on **Table I-12** below, along with the respective current RI by income bracket. The RI for each bracket was calculated from the mid-point income within the bracket.

Table I-12: Impacts of the Municipal Control Alternative by Income Brackets

Income Bracket	Bracket Average Income	Bayonne	E. Newark	Harrison	Jersey City	Kearny	Newark	N. Bergen	Paterson
		R.I.	R.I.	R.I.	R.I.	R.I.	R.I.	R.I.	R.I.
		Number of Households	Number of Households	Number of Households	Number of Households	Number of Households	Number of Households	Number of Households	Number of Households
At Municipal MHI		3.6%	1.6%	1.5%	1.3%	2.0%	1.8%	1.4%	2.0%
Less than $10,000	$5,000	42.6%	19.4%	18.9%	17.5%	25.4%	12.7%	1,887	16.0%
		2189	28	330	8,818	671	14,841	16.5%	6,379
$10,000 to $14,999	$12,500	17.1%	7.8%	7.6%	7.0%	10.2%	5.1%	1,050	6.4%
		1061	44	186	5,377	381	7,790	6.6%	3,445
$15,000 to $24,999	$20,000	10.7%	4.9%	4.7%	4.4%	6.3%	3.2%	2,117	4.0%
		2403	56	434	9,457	1,230	13,900	4.1%	6,340
$25,000 to $34,999	$30,000	7.1%	3.2%	3.1%	2.9%	4.2%	2.1%	2,004	2.7%
		2410	86	493	7,901	962	11,283	2.8%	5,096
$35,000 to $49,999	$42,500	5.0%	2.3%	2.2%	2.1%	3.0%	1.5%	2,623	1.9%
		3046	133	820	10,331	2,011	13,618	1.9%	6,526
$50,000 to $74,999	$62,500	3.4%	1.6%	1.5%	1.4%	2.0%	1.0%	4,171	1.3%
		4496	156	1,238	14,468	2,720	14,743	1.3%	6,335
$75,000 to $99,999	$87,500	2.4%	1.1%	1.1%	1.0%	1.5%	0.7%	2,859	0.9%
		2826	104	621	10,216	1,810	7,855	0.9%	4,307
$100,000 to $149,999	$125,000	1.74%	0.8%	0.8%	0.7%	1.0%	0.5%	3,290	0.6%
		3302	140	822	15,064	2,196	7,600	0.7%	3,723
$150,000 to $199,999	$175,000	1.2%	0.6%	0.5%	0.5%	0.7%	0.4%	1,007	0.5%
		2011	53	381	7,961	1,025	2,136	0.5%	837
$200,000 or more	>$200,000	1.1%	0.5%	0.5%	0.4%	0.6%	0.3%	924	0.4%
		1,469	30	297	10,456	467	1,550	0.4%	798

I.5.3 Financial Capability Matrix

The final step in the USEPA financial capability assessment is to combine the affordability burden score which is intended to assess the impacts of the CSO controls on the rate payers with the financial capability score which is intended to assess the impacts of the CSO controls on the Permittee municipality's ability to finance the controls. The affordability and financial capability scores are brought together on **Table I-13** in what USEPA calls the "Financial Capability Matrix"

Table I-13: The Financial Capability Matrix

Permittee Financial Capability Indicators Score		Residential Indicator		
		Low (Below 1.0%)	Mid-Range (Between 1.0 and 2.0%)	High (Above 2.0%)
(Socioeconomic, Debt and Financial Indicators)	Weak (Below 1.5)	*Medium Burden*	*High Burden*	*High Burden*
	Mid-Range (Between 1.5 and 2.5)	*Low Burden*	*Medium Burden*	*High Burden*
			- East Newark - Harrison - Jersey City - Newark - North Bergen	- Bayonne - Kearny - Paterson
	Strong (Above 2.5)	Low Burden	Low Burden	Medium Burden

I.5.4 Potential Impacts of the COVID-19 Pandemic on Affordability

The projections and conclusions concerning the affordability of the CSO control program proposed in this Regional LTCP by the eight combined sewered municipalities and their respective financial capabilities to finance their Municipal Control Alternative are premised on the baseline financial conditions of the municipalities as well as the economic conditions in New Jersey and the United States generally at the time that work on this LTCP commenced. While the impacts of the pandemic on the long-term affordability of the CSO LTCP are obviously still unknown, it is reasonable to expect that there will be impacts, and potentially significant impacts. There are several dimensions to these potential impacts, including both potentially reduced utility revenues, and potentially reduced household incomes.

Potential Wastewater Utility Revenue Impacts

This Financial Capability Assessment cannot reflect the currently unknowable impacts on wastewater utility revenues stemming from the national economic upheaval resulting from the

COVID-19 pandemic. It is however extremely likely that the PVSC municipalities and municipal wastewater utilities in general across the United States will face significant and potentially permanent declines in revenues from households unable to pay their water and sewer bills and the sudden decline in industrial and commercial demands for potable water and wastewater treatment.

On March 20, 2020 the National Association of Clean Water Agencies (NACWA) issued a press release stating that:

> ***"NACWA conservatively estimates the impact to clean water utilities nationwide of lost revenues due to coronavirus at $12.5 Billion.*** *This is a low-end estimate, assuming an average loss of revenue of 20% which is well within the range of what individual utilities are already projecting. Some utilities are anticipating closer to a 30% or 40% loss in revenue. This estimate is based on the substantial historical utility financial data NACWA has on file through its Financial Survey and recent reports from NACWA members on the decrease in usage they are observing in their systems over the last few weeks."*[I-8]

The impact of a 20% to 40% revenue loss, along with increased costs that have been and will continue to be experienced by water and wastewater utilities such as overtime and the writing off of customer accounts receivable could have a profound impact on the affordability of the proposed CSO controls and the municipalities' abilities to finance them.

Most of the costs of a municipal wastewater system are relatively fixed within broad operating ranges. Debt service and other capital costs are fixed once incurred. Some operating costs are somewhat variable with wastewater flows, e.g. chemical and electrical power usage but this variability is lessened by the reality that inflow, infiltration and stormwater flow in a combined system are not affected by billed water consumption. Labor costs are not directly variable, e.g. a twenty percent reduction in billed flow would not result in a need for twenty percent less labor. Maintenance costs might go down somewhat as equipment operating times may be reduced. As costs do not decline proportionately to billed flow, it can be expected that user charge rates must be raised to generate sufficient revenue to sustain current operations. The relationship between changes in costs and revenues and the resultant changes in user charge rates is complex and has not yet been fully analyzed. At this point it can be assumed that user rate increases may be necessary to simply maintain current operations, and these rate increases will likely erode the financial capabilities of the municipalities to fund the CSO LTCP.

[I-8] NACWA press release: Coronavirus Impacting Clean Water Agencies; Local Utilities and Ratepayers Need Assistance March 20, 2020

Potential Median Household Income Impacts

The impacts of the pandemic on median household incomes in the PVSC municipalities cannot be determined at this point. However, historical analogies may provide some useful, albeit disturbing, context but are not presented as predictive:

- U.S. median household income fell by 6.2% from $53,000 in 2007 to $49,000 in 2010. In New Jersey, the MHI decreased by around 4.0% for the same period.[I-9]
- The U.S. unemployment rates rose from 5.0% in December of 2007 to 9.9% in December of 2009.[I-10]
- Data on impacts of the Great Depression on median household income are not available. As a proxy, the personal income per capita data are available. For 1929 this was $700. By 1933 this figure bottomed out at $376, a decline of 46%. Unemployment for the same period rose from around 3.0% to 25%.[I-11]

While a quantifiable assessment of the impact of the pandemic on median household income is not feasible at this time, reduction in base year MHI can be expected. This will further exacerbate the impacts of the revenue reductions described above on LTCP affordability, as higher base user charge rates will absorb an increased portion of lower MHI.

Implications for the Long Term CSO Control Program

PVSC and the eight combined sewered municipalities anticipate that the financial implications of the COVID-19 pandemic will be discussed with NJDEP during the review of the SIARs and as the 2021 – 2025 NJPDES permit is developed.

Given the current and likely continuing uncertainties as to the New Jersey and national economic conditions, PVSC and the combined sewered municipalities will be reticent to commit to long term capital expenditures for CSO controls without the incorporation of adaptive management provisions, including provisions to revise and reschedule the long term CSO controls proposed in this LTCP based on emergent economic conditions beyond their control. These provisions could include scheduling the implementation of specific CSO control measures to occur during the five year NJPDES permit cycles. A revised affordability assessment should be performed during review of the next NJPDES permit to identify controls that are financially feasible during that next permit period.

I.5.5 Implementation Feasibility Implications

With the exceptions of Bayonne, Kearny, and Paterson, the affordability analysis detailed above has documented that the capital costs for the proposed Municipal Control Alternatives along with related operation and maintenance costs would result in a Residential Indicator within the EPA "medium burden" criterion.

Notwithstanding the 1997 EPA guidance, the reality of the poverty rates, low effective household incomes compared to the rest of New Jersey and nationally and the high costs of

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I-9 Source: Fact Sheet: Income and Poverty Across the States, 2010 Joint Economic Committee, United States Congress, Senator Robert P. Casey, Jr. Chairman.

I-10 Source: Bureau of Labor Statistics data series LNS1400000

I-11 Source: Federal Reserve Economic Data (FRED) data series: A792RC0A052NBEA

living in the eight municipalities argue strongly that the EPA metric understates the impacts of the CSO control costs on the residents of the eight municipalities and that they are likely to remain financially distressed due to structural economic factors beyond their direct control. Therefore, their abilities to afford and finance future CSO control facilities are restricted.

SECTION J - IMPLEMENTATION OF THE RECOMMENDED LONG TERM CONTROL PLAN

J.1 INTRODUCTION

The conclusion reached from the selection of the Recommended LTCP (Section H) was a selected plan for the completion of implementing the CSO control technologies as capital projects in an affordable manner. The purpose of this section is to discuss the overall execution of the LTCP, including the financial capabilities of the PVSC Treatment District Permittees and the impact of the selected plan to determine how and when the Permittees will be able to implement the chosen control technologies.

J.2 REGIONAL ALTERNATIVE AGREEMENT

With the exception of the Town of Kearny, the PVSC Treatment District Permittees have stated a preference for the Regional Alternative selected in Section H.5 as the Regional LTCP. The Town of Kearny has selected the Municipal Alternative as defined in their individual SIAR included in **Appendix K**. Although the Permittees agree on the technologies to be used in the LTCP, an agreement for a Regional Alternative to be implemented is not final. A separate group consisting of legal and technical representatives from the Permittees have already begun to collaborate on reaching an agreement on cost allocation, responsibilities, schedule and other factors impacting the implementation of the Regional Alternative. This process is expected to take an additional 6 months or more after LTCP submittal. Should the Permittees fail to reach agreements on the implementation of the Regional Alternative, the plan will default to the Municipal Alternatives presented in each Permittees' respective SIAR. It is important to note that the proposed 6-month schedule for negotiations does not equate to an extension of time before implementation needs to begin. There are many projects that can be initiated while negotiations are finalized, including Green Infrastructure, separation and I/I reduction projects, which can be broken into smaller design contracts and phased in a way that allows progress on implementation while negotiations are underway. Additionally, design of projects common to both the Regional and Municipal plans can proceed as needed to meet schedule milestones for projects planned in the first 5-year permit cycle.

J.3 IMPLEMENTATION COST OPINION

As discussed in Section H and summarized in Table H-3, the total capital cost associated with the Recommended Regional Alternative is $1,220 million, with an annual O&M cost projected at $3.55 million and total Life Cycle Cost of $1,274 million. The specific cost allocation of these costs by municipality will need to be finalized during negotiations between participating Permittees. As discussed previously, the total costs borne by each municipality will be less than or equal to the Municipal Alternative for each Permittee as the capital cost for the Recommended Regional Alternative is approximately $500 million lower than the total cost for the Municipal Alternative. The negotiations between participating Permittees on how to allocate these cost savings and regional plan facilities is ongoing.

J.4 FINANCIAL IMPACTS

The financial impacts and Financial Capability Assessment associated with the Recommended Regional Plan for each Permittee cannot be finalized until the cost allocation negotiations associated with this plan are completed as this will dictate the share of the total $1,175 million

capital cost each municipality will pay. PVSC is not a municipality involved in the negotiations, but is providing the WRRF Secondary Bypass, so this cost excludes the $45 million for the bypass. It can be stated that the financial impacts of the Regional Plan will be less than or equal to that presented for the Municipal Plan for each Permittee given the significant cost savings available. The Financial Capability Assessment for each Permittee under the Municipal Plan is presented in the individual SIARs for each municipality appended to this report.

J.5 IMPLEMENTATION SCHEDULE

Table J-1 presents the proposed schedule and associated capital cost opinion for implementation of the Recommended Regional CSO LTCP. This schedule assumes that a regional cost-sharing approach is negotiated by the participating municipalities. The implementation schedule for those Permittees that have selected the Municipal Alternative is included in the individual SIAR of that respective Permittee. In addition to the capital improvements presented in **Table** J-1**,** it is anticipated that negotiations for regional cost sharing between participating Permittees will span a 6-month period. The negotiations are not expected to affect the overall implementation schedule for the program as design and implementation of projects common to both the Regional and Municipal Plans can proceed while negotiations are underway.

J.6 BASIS FOR LTCP DEVELOPMENT AND IMPLEMENTATION SCHEDULE

The LTCP development and implementation schedule is based on the construction schedule for each project, and the financing schedule for the overall LTCP. The schedule of projects proposed within each municipality is based on that proposed by each respective municipality in their Municipal Plan SIAR for that particular project. The exception to this is the pump station and force main upgrade proposed by Bayonne, which is not part of their Municipal plan. These pump station and force main improvements are proposed in the first 10 years of the program given their ability to convey more flow to the PVSC WRRF. The Regional Plan allows municipalities to reduce capital improvements within their municipal boundaries due to the benefit provided by the Parallel Interceptor and WRRF bypass. Therefore, some projects from the Municipal Plan are common to both the Municipal Plan and the Regional Plan, while others are reduced in size or eliminated. Given the projected benefit of the Parallel Interceptor in terms of maximizing conveyance to the WRRF and use of the secondary bypass providing total wet weather treatment capacity of 720 mgd, this project is scheduled for completion in the first 15 years of the program, including design in the first five-year permit cycle and construction in the second and third cycles. The extent and complexity of this project along with construction impacts poses challenges to compressing this schedule beyond that proposed.

J.7 CSO REDUCTION VERSUS TIME

The approximate CSO reduction improvements completed over each 5-year permit cycle is presented in **Figure J-1**. These improvements will provide a significant CSO reduction that is front loaded over the first 5 to 15 years. The greatest CSO reduction of any individual project is achieved through the construction of the PVSC WRRF secondary bypass, which will be completed by 2026. This project, combined with pump station and force main improvements in Bayonne and storage, separation, GI and I/I reduction projects in various communities is projected to reduce CSO by approximately 1.2 billion gallons (BG) by 2026. An additional

Table J-1: Implementation Schedule of Regional Alternative with 5-year Permit Cycles

Permittee	Technology	Quantity/Size	Units	Updated CC Total	Annual O&M Cost Total	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050	2051-2055	2056-2060
				CC ($M)	O&M ($M)	CC ($M)	CC ($M)	CC ($M)	CC ($M)	CC ($M)	CC ($M)	CC ($M)	CC ($M)
Bayonne	Storage Tank at BA001, 002	10.5	MG	131.6	0.19					26.3	105.3		
Bayonne	Storage Tank at BA007	3.2	MG	47.5	0.11			15.7	31.8				
Bayonne	Storage Tank at BA021	2.0	MG	32.2	0.09				16.1	16.1			
Bayonne	Green Infrastructure Phases 1, 2 & 3	40	Acres	15.6	0.09	2.6	2.6	2.6	2.6	2.6	2.6		
Bayonne	Oak St. Pump Station Improvements to 27.8 MGD	27.8	MGD	12.0	0.60	12.0							
Bayonne	FM Upgrade (6,019 ft of pipe increased to 36" Pipe)	6019	LF	23.0	0.06	23.0							
Bayonne Subtotal				***261.9***	***1.14***	***37.6***	***2.6***	***18.3***	***50.5***	***45.0***	***107.9***	***0.0***	***0.0***
East Newark	Sewer Separation	13.0	Acres	3.9	0.00	1.0	2.9						
East Newark	Sewer Separation	7.0	Acres	2.1	0.00	2.1							
East Newark Subtotal				***6.0***	***0.00***	***3.1***	***2.9***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***
Harrison	GI Program	$750,000	N/A	0.8	0.03	0.4	0.4						
Harrison	PSS at 004 (3.3ac completed) and 005 (87.1 ac; 37.6 completed, 49.5 remaining)	49.5	Acres	15.3	0.00			1.5	13.8				
Harrison Subtotal				***16.1***	***0.03***	***0.4***	***0.4***	***1.5***	***13.8***	***0.0***	***0.0***	***0.0***	***0.0***
Jersey City	Sewer Rehabilitation and I/I Elimination	87890	LF	36.8	0.00	36.8							
Jersey City	Bates and Bright Street to Jersey Avenue Sewer Separation Project	28.9	Acres	10.8	0.00	10.8							
Jersey City	Green Infrastructure to Control 7% of Impervious Area	188	Acres	92.1	0.42	23.0	23.0	23.0	23.0				
Jersey City	Penhorn Creek Treatment Shaft 1 – CSOs JC001, JC002	6.2	MG	104.8	0.15			52.4	52.4				
Jersey City	Penhorn Creek Treatment Shaft 2 - CSOs JC003, JC004, JC005	7.1	MG	116.7	0.16				58.4	58.4			
Jersey City Subtotal				***361.2***	***0.73***	***70.6***	***23.0***	***75.4***	***133.8***	***58.4***	***0.0***	***0.0***	***0.0***
Newark	Regulator Modifications on Main Interceptor	N/A	N/A	0.0	0.00	0.0							
Newark	Increasing Flow from South Interceptor (Peddie St. Regulator Modifications)	N/A	N/A	0.4	0.00				0.4				
Newark	Green Infrastructure	212.67	Acres	90.2	0.48	36.0	52.4	1.8					
Newark	Water Conservation	N/A	N/A	1.5	0.00	0.4	0.4	0.4	0.4				

Permittee	Technology	Quantity/Size	Units	Updated CC Total	Annual O&M Cost Total	2021-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050	2051-2055	2056-2060
				CC ($M)	O&M ($M)	CC ($M)	CC ($M)	CC ($M)	CC ($M)	CC ($M)	CC ($M)	CC ($M)	CC ($M)
Newark Subtotal				***92.1***	***0.48***	***36.4***	***52.8***	***2.2***	***0.8***	***0.0***	***0.0***	***0.0***	***0.0***
North Bergen	Storage Tank at NB003	5.0	MG	26.5	0.20	26.5							
North Bergen	Closure of Outfall NB014	N/A	N/A	0.1	0.00		0.1						
North Bergen	Green infrastructure	1.0	Acres	0.4	0.05		0.4						
	North Bergen Subtotal			***27.0***	***0.25***	***26.5***	***0.5***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***	***0.0***
Paterson	Sewer Separation Projects Completed Since 2006	47.5	Acres	N/A	N/A								
Paterson	Planned Sewer Separation for PT023	29.8	Acres	8.9	0.00	8.9							
Paterson	19th Ave. Relief Sewer for PT030	7705.6	LF	49.9	0.00				49.9				
Paterson	2.5% Green Infrastructure	75.0	Acres	29.3	0.17	2.0	3.9	3.9		5.9	5.9		7.8
Paterson	15' Dia. 1600 LF Storage Tunnel at PT025, 85% Capture	2.1	MG	33.7	0.10							33.7	
Paterson Subtotal				***121.8***	***0.27***	***10.9***	***3.9***	***3.9***	***49.9***	***5.9***	***5.9***	***33.7***	***7.8***
PVSC	PVSC WRRF Secondary Bypass to 720 MGD	720	MGD	45.2	0.64	36.2	9.0						
PVSC Subtotal				**45.2**	**0.64**	**36.2**	**9.0**						
All	Parallel Interceptor to Main Interceptor	29296	LF	219	0	21.9	98.6	98.6					
Regional Facilities Subtotal				***219***	***0.00***	***21.9***	***98.6***	***98.6***					
Total				**1150.2**	**3.54**	**243.5**	**193.7**	**199.9**	**248.7**	**109.2**	**113.7**	**33.7**	**7.8**

nearly 400 MG of CSO is estimated to be reduced by the end of the third permit cycle with the construction of the parallel interceptor and as storage, GI, separation and I/I reduction projects continue. A total reduction of approximately 1.7 BG is projected to be achieved by the end of the first 20 years of the program, exceeding 80% capture. An additional 620 MG of CSO will be reduced by the end of the total 40-year program in 2060 for a total reduction of 2.3 BG and 85% capture.

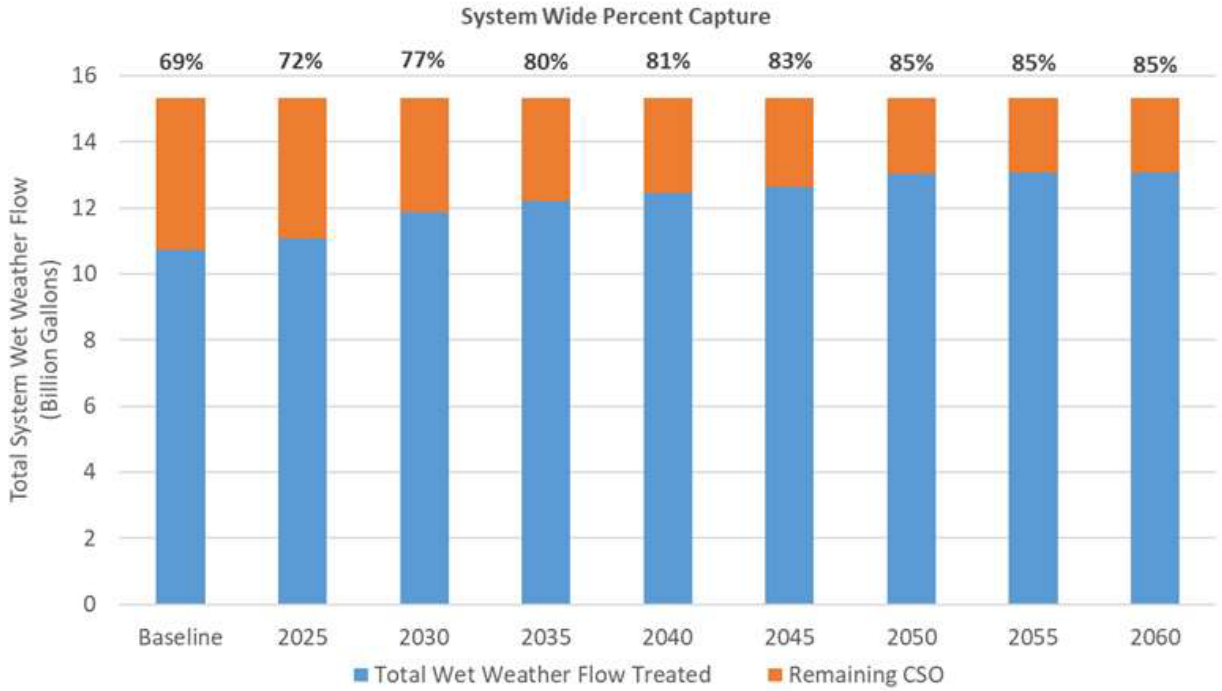

Figure J-1: Approximate System Wide CSO Reduction Improvements Completed Over Each 5-year Permit Cycle

J.8 PERFORMANCE CRITERIA

Upon completion of the CSO projects described in Subsection J.2, post-construction monitoring will be performed to evaluate the incremental reduction in overflow rates and volumes as CSO Control facilities are placed into operation. For the selected Presumption Approach, the National CSO Policy and the NJPDES Permit requires an 85% wet weather capture on an annual system wide basis for the Typical Year. Wet weather capture will be determined on a system wide basis using an updated H&H model that will be calibrated using post construction monitoring data and evaluated over the Typical Year, which has been previously approved by the NJDEP. This is the performance criteria that will be used for the LTCP capital projects.

SECTION K - POST-CONSTRUCTION COMPLIANCE MONITORING PLAN

K.1 INTRODUCTION

PVSC and the Permittees are required Under Section G.9 of their NJDPES permits to develop a Compliance Monitoring Plan (CMP) that is "adequate to: verify baseline and existing conditions, the effectiveness of CSO controls, compliance with water quality standards, and protection of designated uses. This CMP shall be conducted before, during and after implementation of the LTCP and shall include a work plan to be approved by the Department that details the monitoring."

The portion of the CMP conducted after implementation of the LTCP is specifically referred to as the Post Construction Compliance Monitoring Plan (PCCMP) and is the focus of this section. The monitoring plan proposed in this section satisfies the requirements of the Permittees' NJDPES permits and is consistent with and informed by National CSO Control Policy and USEPA's *CSO Post Construction Compliance Monitoring Guidance*, May 2012. The main elements of the PCCMP include the following:

- A process to determine whether the CSO control measures are meeting the Performance Criteria established in Subsection J.8.
- A monitoring schedule, regulator monitoring locations, receiving water sampling locations, and rain gauge locations.
- The approach for analysis of the PCCMP data for assessing the performance of CSO control measures and for reporting progress to regulatory agencies and the general public.
- A Public Notification System to notify the public of the occurrence of Combined Sewer Overflows for each receiving water body.

K.2 OVERVIEW OF APPROACH

Post-construction monitoring is a requirement of the NJPDES Permit and the approach provided herein has been developed for the purposes of providing enough data to evaluate the effectiveness of the CSO control measures constructed during the implementation of the LTCP. The evaluation of the control measures will be based on the Performance Criteria established in Subsection J.8 and further discussed in this Section and will be used to verify that PVSC and the Permittees are in compliance with their respective NJPDES Permits. The general scope of the PCCMP will include the implementation of a rainfall and hydraulic monitoring program, as well as a detailed analysis and evaluation of the CSO control measures' efficacy. The PCCMP has been developed for the PVSC Treatment District and the remaining CSO discharges to the receiving water bodies. The program will be conducted during the LTCP implementation to corroborate that the completed CSO control measures are performing effectively, while providing sufficient data to identify and remedy underperforming control measures.

As mentioned in Section F of this report, results of the 100% control conditions during the typical rainfall year (2004) for the receiving yielded mixed results and indicate that CSO control will not improve attainment of the criteria for pathogens. Post construction monitoring will serve its role in demonstrating that CSOs will be reduced to the levels predicted in the recommended plan based on the typical year conditions to meet the CWA requirements. Pathogen loads, contributed by the remaining CSOs, based on post construction monitoring will

be compared to non-CSO loads to the receiving waters estimated in the LTCP (or Baseline Compliance Monitoring Report previously approved by NJDEP). Any reductions in non-CSO loads as a result of then-current water quality compliance requirements in the receiving waters will also be considered. This information, as developed and made available during post construction monitoring, will be used to assess CSO compliance with the current NJPDES Permit and WQS.

As rainfall varies substantially from year to year and from storm to storm, it will require normalizing rainfall to the typical year to assess performance. The same is true for receiving water monitoring where the variables include other pollutant sources that are also driven by wet weather conditions. For these reasons and in accordance with the CSO Policy, the LTCP is based on "typical year" conditions (2004 precipitation at Newark Liberty International Airport).

PVSC and the Permittees will evaluate the performance of the control measures through use of the H&H model. The model output will be compared with actual CSO flow data for the post-construction monitoring period to determine whether recalibration of the H&H model is needed. Once the H&H model has been determined to be adequately calibrated, a continuous simulation of the Typical Year (2004) will be run to compare the remaining CSO discharge volume to baseline conditions and determine whether the CSO control measures have achieved the Performance Criteria.

For the purposes of addressing the NJPDES Permit PCCMP ambient monitoring requirements, PVSC and the Permittees plan to utilize water quality sampling data collected by the existing NJ/NY Harbor Dischargers Group sampling program to supplement the findings of the collection system modeling and to support the water quality modeling efforts, to be performed upon the implementation of all CSO control measures to verify that the remaining CSOs are not precluding the attainment of water quality standards for pathogens. For purposes of defining the implementation of all CSO control measures, implementation of all CSO Control measures is defined as the implementation of all projects within NBMUA, Guttenberg, and all NJ CSO Group Permittees

K.3 EXISTING DATA SOURCES

A temporary flow monitoring program was conducted from April 2016 to August 2016, installing eighteen flow meters in the PVSC sewer system. This existing data will be utilized, as needed, as part of the PCCMP.

K.4 PERFORMANCE CRITERIA AND COMPLIANCE ASSESSMENT

The Performance Criteria developed in Subsection J.8 were based on a percentage of total volume entering the CSS that is "captured" for treatment at the WRRF, as part of the Presumption Approach. Upon full implementation of the CSO control measures of the LTCP, the Performance Criteria will be a minimum of 85% capture by volume of the system-wide wet weather volume for treatment at the WRRF based on the Typical Year (2004). The minimum 85% capture by volume meets the requirements of the Presumption Approach, and this minimum capture amount may increase based on the selected CSO control measures detailed in Section J. Actual overflow volume will vary from one year to another after full implementation of the CSO control measures, based on real-life precipitation conditions. Recognizing the hydraulics of the

combined sewer system and the interconnection between CSO regulators, CSO control measures that do not achieve the performance criteria as a result of other controls that have yet to be completed will not be fully evaluated until all CSO control measures are constructed.

K.5 POST-CONSTRUCTION COMPLIANCE MONITORING DATA COLLECTION

Temporary flow meters will be installed at select locations within the PVSC Treatment District. **Table K-1** summarizes the type, location, ownership, and, frequency of the flow meters, and rain gauges to be implemented.

Table K-1: Proposed Post-Construction Compliance Monitoring Plan

Monitoring Type	Municipality	Meter Identification	Location	Frequency
Flow Monitoring	The number of flow meters, location and schedule for installation will be determined upon approval of the respective LTCPs and associated implementation schedules for each permittee participating in the PVSC Regional Alternative.			Monitor for 6-month period every 5 years*
Rainfall Monitoring	North Bergen and Guttenberg	Newark Airport and/or Local Rain Gauge	Existing Rain Gauge at Newark Airport and/or Local Rain Gauge	Monitor for 1-year period every 5 years*
Ambient In-Stream Monitoring	North Bergen and Guttenberg	NJ/NY Harbor Dischargers Group Sampling Locations	NJ/NY Harbor Dischargers Group Sampling Locations (at current time)	Based on NJ/NY Harbor Dischargers Group Frequency (at current time)

* While it is anticipated that flow and rainfall monitoring may occur approximately every 5 years, the frequency of monitoring will be dependent upon the implementation of projects that are to be evaluated for effectiveness.

K.6 PERFORMANCE ASSESSMENT

To demonstrate compliance under the Presumption Approach, PVSC and the Permittees will continue to update and calibrate the H&H model after the implementation of CSO control measures and post-construction monitoring phase data has been collected. The model will be used to simulate CSS performance in the PVSC Treatment District collection system and to demonstrate compliance with the performance criteria identified in Subsection K.4, a minimum of 85% capture by volume of the system-wide wet weather volume during the Typical Year (2004). An H&H model will also be used to assess the performance of green infrastructure control measures. PVSC and the Permittees will submit a series of milestone reports to the NJDEP detailing the implementation and performance of CSO control measures. An Adaptive Management Plan shall be developed in the event that CSO control measures exceed or do not meet the Performance Criteria. The Performance Assessment approach, reporting, and adaptive management plan are outlined in the following subsections.

K.6.1 APPROACH

PVSC and the Permittees will evaluate the performance of the CSO control measures through the use of its H&H model. The following steps will be used to determine compliance with the Performance Criteria:

1. Collect flow monitoring and rainfall data during post-construction monitoring period of each phase of CSO control measures. Perform QA/QC on the data.

2. If needed, once every five years, update the H&H model to include all completed CSO control measures and any other modifications to the CSS since the H&H model was calibrated for this LTCP.

3. Recalibrate and/or validate the updated H&H model, if needed, using the flow and rainfall data collected during the 12-month post-construction monitoring period.

4. Perform continuous simulation using the updated H&H model for the typical year (2004) and calculate percent capture for verification of compliance with milestone CSO reductions towards the 85% capture requirements of the Presumption Approach.

K.6.2 ADAPTIVE MANAGEMENT PLAN

PVSC and the Permittees are confident that the CSO control measures implemented prior to the final 2060 post construction monitoring period will meet the 85% wet weather capture percentage Performance Criteria based on the simulation of the Typical Year (2004). However, should the post construction monitoring suggest the CSO control measures exceed the performance criteria or do not perform as anticipated, performance factors and deficiencies responsible for this exceedance or shortfall will be identified. Modified, reduced, or additional control measures will then be implemented to allow PVSC and the Permittees to meet the 85% Performance Criteria. An Adaptive Management Plan shall be developed that details this analysis, including the implementation plan and schedule of the additional controls. This Adaptive Management Plan will include any adaptive management modifications based on Post-Construction Monitoring and evaluation. The Adaptive Management Plan shall be submitted to NJDEP as part of each Post Construction Compliance Monitoring Plan (PCCMP) Report for each of the 5-year monitoring periods. Generally, these 5-year reports are meant to coincide with the renewal of each NJPDES Permit, such that any required adaptive actions could then be included in the NJPDES Permit renewal, as applicable. The Adaptive Management Plan, if needed based on the performance of the implemented CSO control measures, will be included in the PCCMP, as further described in Subsection K.6.3.

PVSC and the Permittees will consider multiple adaptive management actions for over-performing or under-performing CSO control measures, including eliminating or reducing the size of proposed facilities, revising technologies, or constructing additional grey infrastructure (i.e. storage) or green infrastructure (i.e. bio retention).

Additionally, the financial impacts of the recent COVID-19 Pandemic are yet to be fully realized and may not be fully realized for several years. These financial impacts may be due to several factors, which could be caused by a decrease in revenue or an impact on collection rates, among

other items. PVSC and the Permittees will continue to monitor these potential financial impacts and will include any negative impacts to their financial capability within the Adaptive Management Plan, which may include the need for a longer implementation schedule in order to reduce the financial burden as a result of lost revenue, a reduction in collection rates, or other financial factors.

Upon review and approval of the Adaptive Management Plan by the NJDEP, PVSC and the Permittees shall implement those measures in accordance with the schedule set forth in the Adaptive Management Plan.

K.6.3 REPORTING

The PCCMP will evaluate whether the CSO control measures are achieving the Performance Criteria and assess CSO capture volumes of remaining PVSC Treatment District CSO discharges to the receiving waters. The progress and evaluation of the CSO control measure implementation will be reported to the NJDEP, and to the public through a series of reports, namely the PCCMP Reports, which will include any necessary adaptive management. PVSC and the Permittees will also continue to submit the monthly Discharge Monitoring Reports (DMRs) as required by their respective NJPDES Permits.

The PCCMP Reports shall provide the following information:

- A statement setting forth the deadlines and other terms that PVSC and the Permittees were required to meet since the last Reporting Period;
- A general description of work completed within the prior period, and a projection of work to be completed within the succeeding period;
- A summary of principal contacts with NJDEP during the reporting period relating to CSOs or implementation of the LTCP;
- NJPDES permit violations;
- A summary of all flow and hydraulic monitoring data collected by PVSC and the Permittees during the five-year reporting period;
- A description of the CSO control measures completed within the five-year reporting period and a projection of CSO control measure work to be performed during the next five-year period; and,
- An evaluation of the effectiveness of the CSO control measures constructed to date, including proposed adjustments to the components of the recommended plan (adaptive management), if needed, and as outlined in Subsection K.6.2.

PVSC and the Permittees shall submit a PCCMP Report to the NJDEP at the end of each NJPDES Permit cycle (in 5-year increments). The final PCCMP Report will be submitted to the NJDEP for their review and approval within 1-year after the last LTCP project has been implemented (currently scheduled for 2060). The purpose of the Final PCCMP Report shall be to evaluate and document the system-wide performance of PVSC and the Permittees' fully implemented LTCP CSO control measures. The report shall include an assessment of whether the control measures are meeting the Performance Criteria and complying with water-quality

based CWA requirements and PVSC and the Permittees respective NJPDES permits, including the following information:

- A complete Post-Construction Compliance Monitoring Period data summary and analysis;
- A reporting of all of the CSO control measures that have been constructed, implemented, and that are in operation;
- An evaluation of the system-wide CSO control measure performance, and whether the controls meet the Performance Criteria;
- A description of any adaptive management actions that need to be implemented to meet the Performance Criteria where they are not being achieved or to manage affordability in the case where the Performance Criteria are being exceeded.

K.7 FUTURE REGULATORY REQUIREMENTS

Given the impacts of upstream loading, it is recommended that any future regulatory effort to further reduce bacteria loadings to the receiving streams be assigned to the background and non-CSO contributors.

K.8 PUBLIC NOTIFICATION

In order to advise the public of overflows, the existing notification system will continue to be utilized. This system notifies the public of the occurrence of CSOs based on rainfall monitoring near the representative CSO outfalls. The notification system can be accessed using the following link: https://njcso.hdrgateway.com/.

SECTION L - REVISION OF OPERATION AND MAINTENANCE PLANS

L.1 INTRODUCTION

This section summaries the current O&M programs for each Permittee and how the program will be updated to reflect the LTCP. This section also describes how responsibilities for O&M of the proposed CSO technologies will be dispersed between Permittees.

Under their respective NJPDES permits, the Permittees are required to develop and implement a comprehensive Operation and Maintenance (O&M) program for appropriate and consistent operation of their CSS facilities. In compliance with this requirement, the Permittees have developed O&M's which are reviewed and updated as needed annually. In addition to these annual reviews, the Permittees are required to update the O&M's as the changes proposed under the LTCP are implemented.

Part IV, Combined Sewer Management, Section G.6.a. of the permit states:

> *"Upon Department approval of the final LTCP and throughout implementation of the approved LTCP as appropriate, the permittee shall modify the O&M Program and Manual in accordance with D.3.a and G.10, to address the final LTCP CSO control facilities and operating strategies including but not limited to maintain Green Infrastructure, staffing and budgeting, I/I, and emergency plans."*

Fulfillment of this requirement will be addressed upon approval of the Regional LTCP by NJDEP, and throughout the implementation process as needed. The following summarizes the municipalities' current O&M programs and how they will be updated as the CSO control measures are implemented.

L.2 CURRENT OPERATION AND MAINTENANCE PLAN

All PVSC CSO Permittees have updated O&M plans and are in compliance with all permit requirements as indicated in their quarterly progress reports submitted to NJDEP.

L.3 OPERATION AND MAINTENANCE PROGRAM UPDATES FOR CSO CONTROL MEASURES

As required by their NJPDES permits, the Permittees will update their current O&M manuals to include any new facilities which are a part of the approved LTCP. Updates to the O&M manuals will include a description of the equipment and features of the new facilities, operating instructions, maintenance guides, and safety considerations.

The updates to the O&M Programs will begin upon placing the CSO Control Measures into operation, and will follow a two-step process:

1. Proposed Operation and Maintenance Manual Updates - The municipalities will modify their O&M Manual to address the final LTCP CSO control facilities and operating strategies, after placing the recommended controls into operation.

2. Integrated Operation and Maintenance Manual – Once approved by NJDEP, the municipalities will incorporate the proposed updates into the current O&M Manuals, described in the preceding section.

L.4 STAFFING NEEDS

In developing the LTCP, the Permittees have made preliminary estimates of O&M costs, which include staffing. The exact number of staff, and the specific staff responsibilities and qualifications will be determined during the implementation of the LTCP and reviewed by the Permittees as part of their annual budget process.

SECTION M - REFERENCES

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SECTION N - ABBREVIATIONS

AACE:	Association for the Advancement of Cost Engineering
BA:	Bayonne
BG:	Billion Gallons
BMP:	Best Management Practices
BOD:	Biochemical Oxygen Demand
CC:	Capital Cost
CMP:	Compliance Monitoring Program
CSO:	Combined Sewer Overflow
CSS:	Combined Sewer System
CWA:	Clean Water Act
EDP:	Effective Date of the Permit
EN:	East Newark
EPA:	Environmental Protection Agency
FOG:	Fats, Oils, and Grease
FW2-NT:	Fresh Water Non Trout
GI:	Green Infrastructure
GIS:	Geographic Information System
GM:	Geometric Mean
GRDs:	Grease Removal Devices
HA:	Harrison Town
HCFM:	Hudson County Force Main
HDD:	Horizontal Directional Drilling
H&H:	Hydrologic and Hydraulic
IDDE:	Illicit Discharge Detection and Elimination
IEC:	Interstate Environmental Commission
I/I:	Inflow and Infiltration
JC:	Jersey City
JCMUA:	Jersey City Municipal Utilities Authority
KEA:	Kearny Town
LCC:	Life Cycle Cost
LTCP:	Long Term Control Plan
MEG:	Model Evaluation Group
MG:	Million Gallons
MGD:	Million Gallons per Day
MUA:	Municipal Utilities Authority
NACWA:	National Association of Clean Water Agencies
NJAC:	New Jersey Administrative Code
NB:	North Bergen
NBMUA:	North Bergen Municipal Utilities Authority
NE:	Newark
NJDEP:	New Jersey Department of Environmental Protection
NJPDES:	New Jersey Pollutant Discharge Elimination System
NRCS:	Natural Resources Conservation Service
O&M:	Operation and Maintenance

PAA:	Peracetic Acid
PAT:	Paterson
PCCMP:	Post Construction Compliance Monitoring Plan
POC:	Pollutants of Concern
POTW:	Publicly Owned Treatment Works
PPP:	Public Participation Plan
PVSC:	Passaic Valley Sewerage Commission
PWQM:	Pathogens Water Quality Model
QAPP:	Quality Assurance Project Plan
RI:	Residential Indicator
SCR:	System Characterization Report
SC:	Saline Coastal
SE:	Saline Estuarine
STP:	Sewage Treatment Plant
SWQS:	Surface Water Quality Standards
RCA:	Row Column AESOP
TMDL:	Total Maximum Daily Load
TPW:	Total Present Worth
TSS:	Total Suspended Solids
USEPA:	United States Environmental Protection Agency
WASP:	Water Analysis Simulation Program
WMA:	Watershed Management Areas
WWF:	Wet Weather Flow
WWRF:	Water Resources Recovery Facility