FINAL

Appendix A – Data Collection and Review

For the Feasibility Study of Rebuild by Design Meadowlands Flood Protection Project

May 2021







Boroughs of Little Ferry, Moonachie, Carlstadt, and Teterboro and the Township of South Hackensack, Bergen County, New Jersey

REBUILD BY DESIGN
MEADOWLANDS

Prepared by AECOM for the State of New Jersey Department of Environmental Protection

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Attachment A1-1: GIS System Index

Acronyms and Abbreviations

GIS	Geographic Information System
RBD	Rebuild by Design

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1.0 Introduction

A Geographic Information System (GIS) was used to manage the data for the Rebuild by Design (RBD) Meadowlands Flood Protection Project (the Proposed Project). This appendix describes the GIS data management and transfer protocol as well as the GIS system index.

2.0 Data Transfer Protocol

The following pages present the Proposed Project data transfer protocol.

3.0 GIS System Index

See **Attachment A1-1**.

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RBD Meadowlands Project Data Transfer Protocol

Purpose

To facilitate and document the transfer of GIS data from HDR to members of the Rebuild by Design Meadowlands (RBDM) Flood Protection Project team, the following data transfer protocol will be used. In order to make and track data requests; requestors will complete a data request form located on the RBDM project SharePoint site. HDR will have one 'gate keeper' whose responsibility will be to manage requests, including gathering the requested information and making it available to the requester. SharePoint will be the platform for request submittals and provision of data. This plan does not address data that is not in GIS format or that HDR may need from other team members. Additional protocol may need to be developed for such transfers.

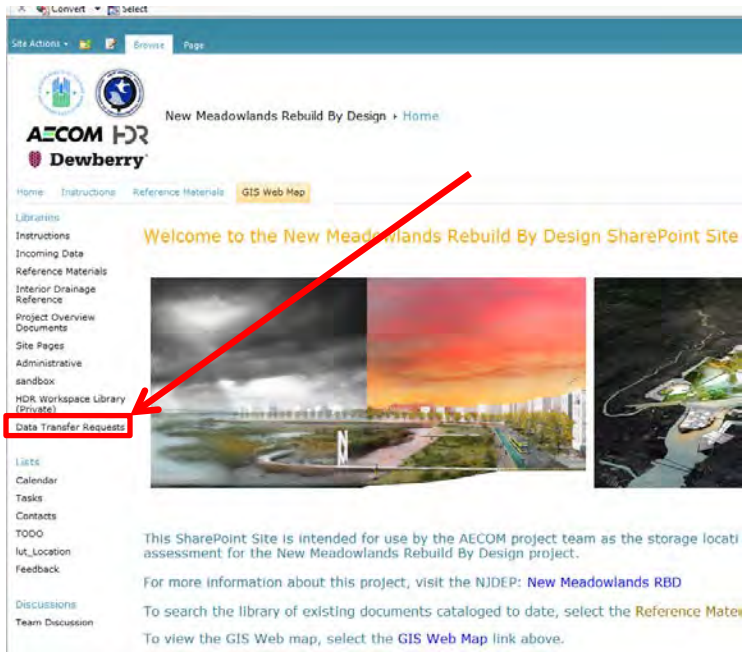
RBDM Project SharePoint

https://share.hdrinc.com/sites/NMRBD/SitePages/Home.aspx

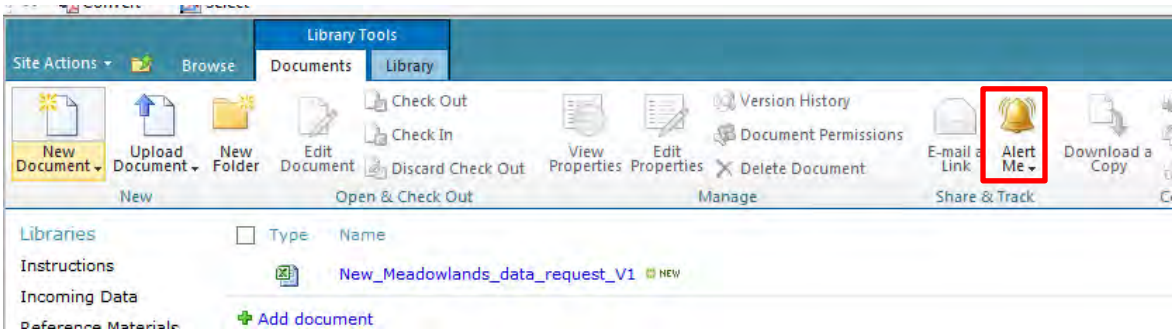
Data Transfer Requests Library

Libraries > Data Transfer Requests

https://share.hdrinc.com/sites/NMRBD/Data%20Transfer%20Requests



The data transfer request library will contain a spreadsheet template for requesting GIS data from HDR, this document and folders for storing completed data requests. Data requestors should set a SharePoint Alert to ensure that they are notified when changes occur to the data transfer request library. To set an alert click on the “Alert Me” icon of the SharePoint site.

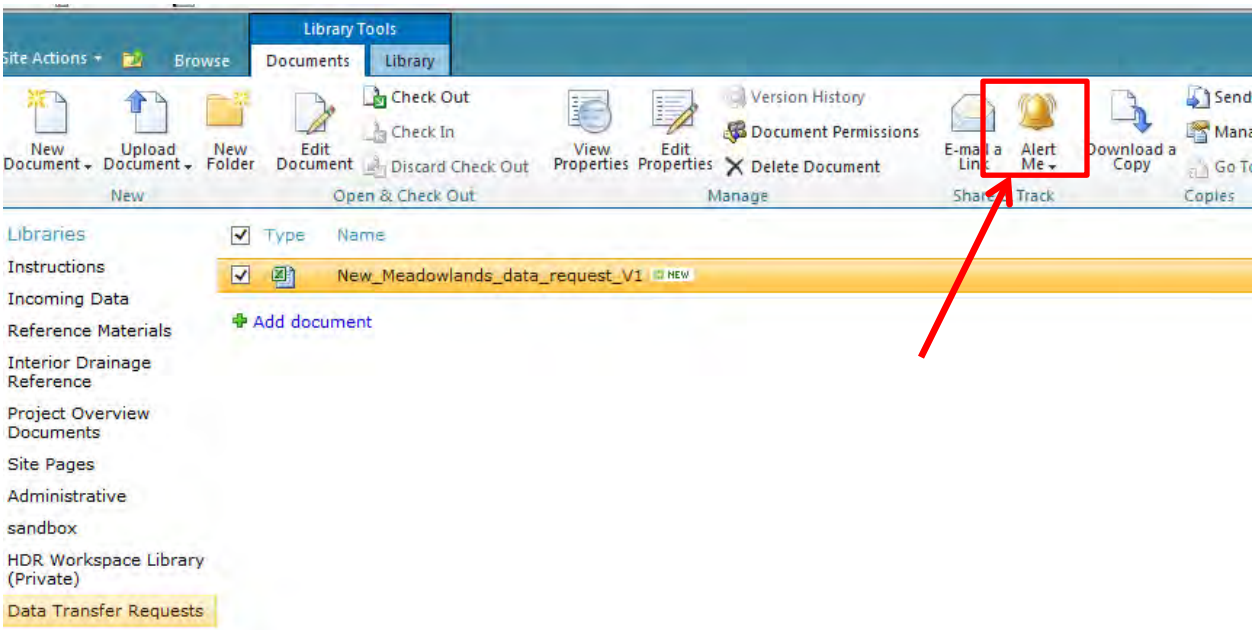


Data Transfer Requests Form

The spreadsheet template for making a data request will be located in the SharePoint “Data Transfer Request” Library. The template file name is “New_Meadowlands_data_request_vX”, with “X” denoting the version (always use the version with the highest number).

Making a data Request

1. From the Data Transfer Request Library download the “New_Medowland_data_request_vX” form by checking the box next to it and clicking the “Download a Copy” button.

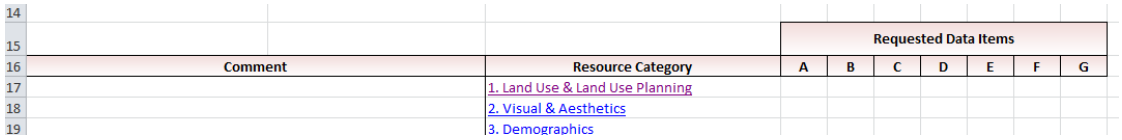


2.

3. On the “Data Request” tab Complete the **Requested by:** fields with the data requestor’s information and the **Completed by:** fields with the information for who the request is being made too. If this information is not know enter:

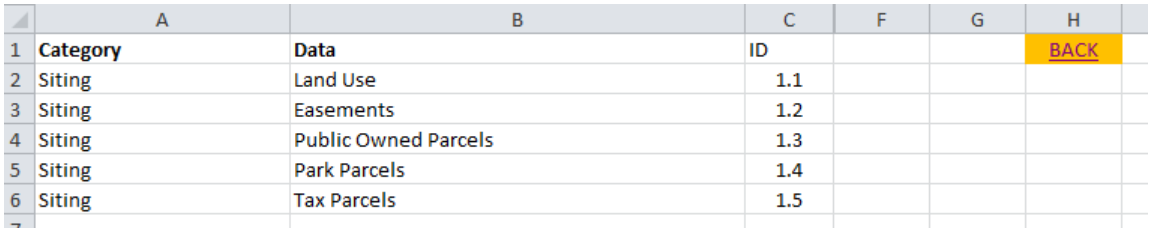
Name (Last, First) Brilhante, Francisco
E-mail francisco.brilhante@hdrinc.com
Organization HDR

4. Next select one of the “Resource Category” cells to navigate to a menu of data available for that subject. The list of resource categories represents major sections of the New Meadowlands Rebuild by Design EIS. Additional resource categories will be added as needed. For example if data on “Land Use & Land Use Planning” was needed that cell should be clicked to view available data.



		Requested Data Items						
Comment	Resource Category	A	B	C	D	E	F	G
	1. Land Use & Land Use Planning							
	2. Visual & Aesthetics							
	3. Demographics							

5. Once the resource category menu is visible note the ID of the specific data requested and click BACK to return to the data request form. For example if Land Use, Easements, and Tax Parcels were need, ID numbers 1.1, 1.2, and 1.5 would be noted and the “BACK” clicked to return to the data request form.



	A	B	C	F	G	H
1	**Category**	**Data**	ID			BACK
2	Siting	Land Use	1.1			
3	Siting	Easements	1.2			
4	Siting	Public Owned Parcels	1.3			
5	Siting	Park Parcels	1.4			
6	Siting	Tax Parcels	1.5			

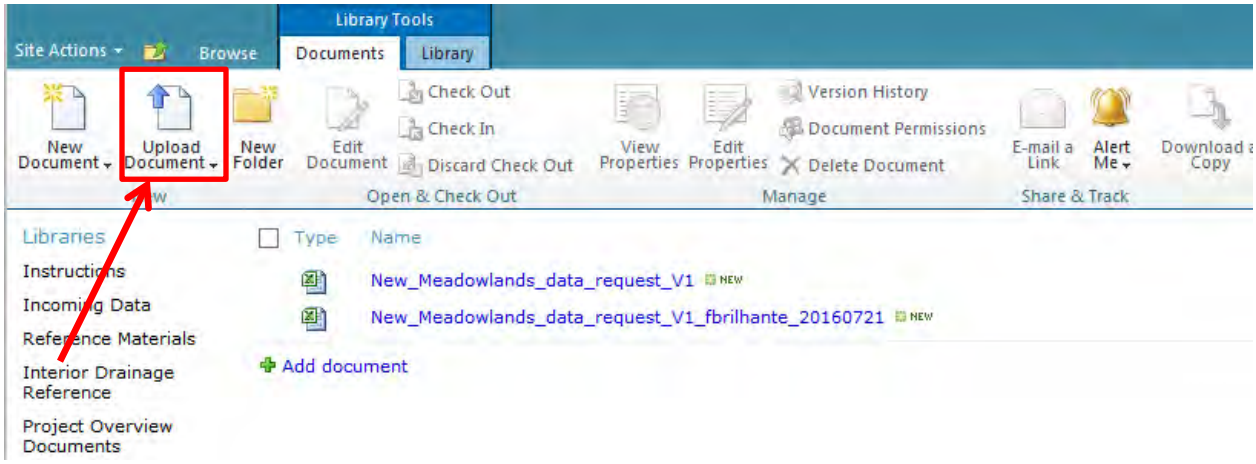
6. Then enter the ID for the requested data in columns next to the corresponding resource category. Note any number of items can be entered for any of the given resource categories



		Requested Data Items						
Comment	Resource Category	A	B	C	D	E	F	G
	1. Land Use & Land Use Planning	1.1	1.2	1.5				
	2. Visual & Aesthetics							
	3. Demographics							

7. Finally, once all selections have been made, using “Save As”, save the data request form using the following naming convention:
New_Meadowlands_data_request_V1_[First Initial][Last Name]_YYYYMMDD.xlsx
Example: New_Meadowlands_data_request_V1_fbrilhante_20160721.xlxs
Once saved close Excel.

8. Upload the data request to the “Data Transfer Request” library using the “Upload Document” button



Notes

The data transfer request library will be monitored and data request will be fill in the order in which they are received. If the data request is urgent please contact Francisco Brilhante (francisco.brilhante@hdrinc.com) to coordinate.

Additional resource categories and data will be add as needed

Contact Francisco Brilhante (francisco.brilhante@hdrinc.com) with any questions.

Attachment A1-1: GIS System Index

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Requested BY									
Name (Last, First)	Ming Jiang								
E-mail	Ming.Jiang@aecom.com								
Organization	AECOM								
Date	11/2/2016								
Completed by:									
Name (Last, First)	Julie Greenfield								
E-mail	julie.greenfield@hdrinc.com								
Organization	HDR								
Date	11/2/2016								
Transfer Method	sharepoint link								
			Requested Data Items						
Comment		**Affected Environment**	**A**	**B**	**C**	**D**	**E**	**F**	**G**
		1. Land Use & Land Use Planning							
		2. Visual & Aesthetics							
		3. Demographics							
		4. Env. Justice							
		5. Cultural & Historical							
		6. Transportation							
		7. Noise & Vibration							
		8. Air Quality & Greenhouse Gas							
		9. Climate Change & Sea Level Rise							
		10. Recreation							
		11. Utilities							
		12. Public Services							
		13. Biological Resources							
		14. Geology & Soils							
		15. Civil Design							
Only for the following reaches: Depeyster, Losen Slote, and Peach Island (missing from stream channel X-S survey)		16. Drainage, Hydrology, Flooding	24						
		17. Water Resources							
		18. Coastal Zone							
		19. Sustainability,GI							
		20. Hazards & Hazardous Material							
		21. Mineral & Energy							
		22. Agricultural							
		23. AECOM Alt 2							
		24. Drainage Model Output							

Category	**Data**	ID
Siting	Land Use	1.1
Siting	Easements	1.2
Siting	Public Owned Parcels	1.3
Siting	Park Parcels	1.4
Siting	Tax Parcels	1.5

Category	**Data**	ID
		2.1
		2.2
		2.3
		2.4

Category	**Data**	ID
Boundaries	Pilot Area	3.1
Boundaries	New Meadowlands	3.2
Boundaries	Census Blocks	3.3
		3.4

Category	**Data**	ID
		4.1
		4.2
		4.3
		4.4

Category	**Data**	ID
existing conditions	Historic Sites	5.1

Category	Data	ID			BACK
Siting	Roads	6.1			
Siting	Rail	6.2			
		6.3			
		6.4			

Category	Data	ID			BACK
		7.1			
		7.2			
		7.3			
		7.4			

Category	Data	ID			BACK
		8.1			
		8.2			
		8.3			
		8.4			

Category	Data	ID			BACK
Hydrology	Sea level change gages	9.1			
		9.2			
		9.3			
		9.4			

Category	Data	ID			BACK
		10.1			
		10.2			
		10.3			
		10.4			

Category	Data	ID			BACK
PSE&E	Gas Mains	11.1			
PSE&E	Manholes	11.2			
PSE&E	pipe cable	11.3			
PSE&E	Manholes hand hold	11.4			
PSE&E	Mat	11.5			
PSE&E	Pads	11.6			
PSE&E	Primary Overhead Elec. Line Segment	11.7			
PSE&E	Primary underground Elec. Line Segment	11.8			
PSE&E	support structure	11.9			
PSE&E	vault	11.10			
PSE&E	pole	11.11			

Category	Data	ID			BACK
Emergency Services	Hospitals	12.1			
Emergency Services	Fire Stations	12.2			
Other Infrastructure	Colleges/Universities	12.3			
Other Infrastructure	Nursing Homes	12.4			
Other Infrastructure	Airports	12.5			

Category	Data	ID			BACK
Environmental	T&E Species	13.1			
Environmental	Wetlands DEC	13.2			
Environmental	Wetlands NWI	13.3			
		13.4			

Category	Data	ID			BACK
basemap	Soils	14.1			
data	Boring Locations	14.2			
		14.3			
		14.4			

Category	**Data**	ID			BACK
Alignment	Existing Berm Survey Stationing	15.1			
Alignment	Stream Baseline Stationing	15.2			
H&H Modeling	HEC-HMS Flow Nodes	15.3			
H&H Modeling	Building Footprints	15.4			
H&H Modeling	Building Footprint Centroids	15.5			
Survey	Tide Gates	15.6			
Survey	Pump Stations	15.7			
Survey	Berms	15.8			

Category	Data	ID			BACK
Topography	2-ft contours	16.1			
Topography	10-ft contours	16.2			
Existing Infrastructure	Legacy berms	16.3			
Existing Infrastructure	Pump Stations	16.4			
Existing Infrastructure	Tide Gates	16.5			
Existing Infrastructure	Conveyances	16.6			
Existing Infrastructure	Levees/Floodwalls	16.7			
Survey	Berm Cross Section Locations	16.8			
Survey	Ditches	16.9			
Hydrology	Waterways	16.10			
Hydrology	Water bodies	16.11			
Hydrology	HDR Topo Derived Drainage Basins	16.12			
Hydrology	Dams	16.13			
Flooding	Floodplains	16.14			
Flooding	Flooding Concerns (CAG mtg)	16.15			
Flooding	Flooding Concerns (town mtg)	16.16			
Flooding	Flood-Prone Areas	16.17			
Flooding	Critical Infrastructure	16.18			
Flooding	Capacity Improvements	16.19			
Hydrology	Draft_Delin_SubBasin	16.20			
Hydrology	Rough_Opp_Locations_poly	16.21			
Hydrology	Drainage Basins - HDR & AECOM Combined	16.22			
HECRAS	Preliminary XS cut off LiDAR using HEC GeoRAS (to be updated with survey data). Includes stationing.	16.23			
HECRAS	HEC-RAS Stream centerlines for the 5 tribs (Depeyster, Losen Slote, ERD, WRD, and Peach Island)	16.24			
Hydrology	AECOM Derived Drainage Basins With HDR opportunitiy areas	16.25			

Category	Data	ID			BACK
		17.1			
		17.2			
		17.3			
		17.4			

Category	Data	ID			BACK
		18.1			
		18.2			
		18.3			
		18.4			

Category	Data	ID			BACK
		19.1			
		19.2			
		19.3			
		19.4			

Category	Data	ID			BACK
HAZMAT	Known Contaminated sites (KCS)	20.1			
HAZMAT	Landfills	20.2			
HAZMAT	Brownfields	20.3			
HAZMAT	Chrome Sites	20.4			
HAZMAT	Groundwater Monitoring	20.5			
HAZMAT	Gas Stations	20.6			
HAZMAT	Historic Fill	20.7			
HAZMAT	Classificartion Exception Area (CEA)	20.8			
HAZMAT	UST_Remediation_Sites.shp	20.9			

Category	Data	ID					BACK
Energy	Power plants	21.1	21	1			
Energy	Pipelines	21.2	21	2			
Energy	Terminals	21.3	21	3			
		21.4	21	4			
		21.5	21	5			
		21.6	21	6			
		21.7	21	7			
		21.8	21	8			
		21.9	21	9			
		21.10	21	10			
		21.11	21	11			
		21.12	21	12			
		21.13	21	13			
		21.14	21	14			
		21.15	21	15			
		21.16	21	16			
		21.17	21	17			
		21.18	21	18			
		21.19	21	19			
		21.20	21	20			

Category	Data	ID			BACK
		22.1			
		22.2			
		22.3			
		22.4			

Category	Data	ID			BACK
Opportunity areas 20161010	Focus_Streets	23.1			
Opportunity areas 20161011	RBDM_Opportunity_Areas_TaxParcels	23.2			
Opportunity areas 20161012	Strc_emgy_school_Bergen-County_selection	23.3			
Opportunity areas 20161013	Tran_railroad_station_selection.shp	23.4			

Category	Data	ID				BACK			
Infoworks Pre-simplified	nodes	24.1	24	1		note these are place holders to be finalized			
Infoworks Pre-simplified	links	24.2	24	2					
Infoworks Pre-simplified	catchments	24.3	24	3					
Infoworks Pre-simplified	triangulated surface	24.4	24	4					
Infoworks Pre-simplified	impacted buildings	24.5	24	5					
HEC-RAS	Crosssection	24.6	24	6					

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Subappendix A2: Shorefront Structures Survey

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Acronyms and Abbreviations

LOP	Line of Protection
RBD	Rebuild by Design

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1.0 Introduction

Matrix New World Engineering, Inc. (Matrix) was tasked to perform a shorefront structures visual inspection in February 2016 as part of the Rebuild by Design (RBD) Meadowlands Flood Protection Project (the Proposed Project) (Matrix New World Engineering, Inc. 2016). Matrix's waterfront structures inspection included evaluating 86 specific locations along the Hackensack River and Berry's Creek. This inspection intended to provide a conceptual existing condition assessment for the Feasibility Study. If the existing waterfront structures are to be relied upon for the future, proposed implemented Line of Protection (LOP), a design level inspection of the existing waterfront structures must be performed.

2.0 Summary of Waterfront Structure Conditions

Table A2-1shows a summary of the waterfront structure inspections and **Table A2-2** provides a detailed summary of the inspections.. **Figure A2-1** presents the location and condition of waterfront structures inspected under this task within the Project Area. The shape of the symbol represents the type of structure, and the filled color indicates the condition of the structure. In general, the existing waterfront structures would require significant reinforcement or reconstruction in order to support new coastal protection structures; approximately 48 percent of the structures are in critical to poor condition.

The general condition assessment ratings for the waterfront structures are based on a six-point assessment scale developed by the American Society of Civil Engineers (Waterfront Inspection Task Committee 2015):

- 1 – Critical: Very advanced deterioration, overstressing, or breakage has resulted in localized failure(s) of primary structural components. More widespread failures are possible or likely to occur, and load restrictions should be implemented as necessary.
- 2 – Serious: Advanced deterioration, overstressing, or breakage may have significantly affected the structural or load-bearing capacity of primary components. Local failures are possible and loading restrictions may be necessary.
- 3 – Poor: Advanced deterioration or overstressing is observed on widespread portions of the structure but does not significantly reduce the load-bearing capacity of the structure.
- 4 – Fair: All primary structural elements are sound, but minor to moderate defects or deterioration are observed. Localized areas of moderate to advanced deterioration may be present but do not significantly reduce the overall structural capacity.
- 5 – Satisfactory: Limited minor to moderate defects or deterioration levels are observed, but no overstressing is observed.
- 6 – Good: No visible damage or only minor damage is noted. Structural elements may show minor deterioration, but no overstressing is observed.

Table A2-1: Summary of Waterfront Structure Inspections

Condition Rating	No. of Structures	Percent (%) of All Structures
1 - Critical	6	7%
2 - Serious	13	15%
3 - Poor	22	26%
4 - Fair	23	27%
5 - Satisfactory	4	5%
6 - Good	1	1%
7 - Unknown	15	17%
8 - Null	2	2%
Total	**86**	**100%**

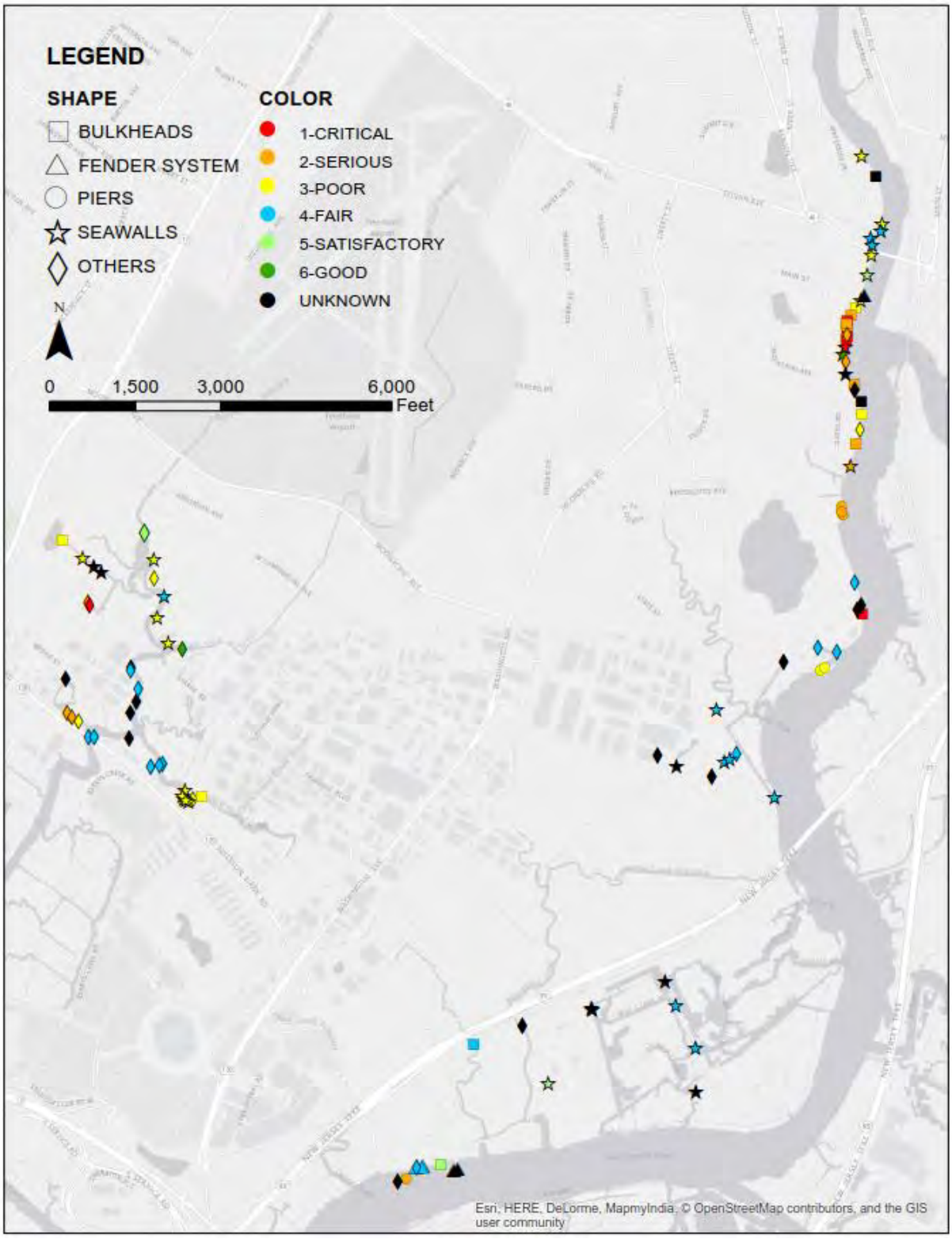


Figure A2-1: Location and Condition of Waterfront Structures Inspected within the Project Area

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Table A2-2: Detailed Summary of Waterfront Structure Inspections

MUNI	BLOCK	LOT	NORTHING	EASTING	Structure Type	Condition Rating	Structure Description	Existed prior to 1978	Permits Record	Permit Description
0205	84	2	40° 50' 15.037" N	74° 4' 53.121" W	BULKHEADS	3-POOR	Steel bulkhead with pipe crossing above water.	UNKNOWN	YES	Discharge of Stormwater, Hazardous Waste Handler, Underground Storage Tank, Remedial Action (2014),
0205	84	7	40° 50' 12.200" N	74° 4' 48.530" W	SEAWALLS	3-POOR		UNKNOWN	UNKNOWN	
0205	84	8.01	40° 50' 10.604" N	74° 4' 46.032" W	SEAWALLS	<NULL>		UNKNOWN	UNKNOWN	
0205	84	8.02	40° 50' 9.824" N	74° 4' 44.233" W	SEAWALLS	<NULL>	Appear to be revetment. Hard to see with vegetation.	UNKNOWN	UNKNOWN	
0205	84	10	40° 50' 4.342" N	74° 4' 47.324" W	OTHERS	2-SERIOUS	Poorly built revetment/ wall with chain link fence.	UNKNOWN	NA	
0205	92	1	40° 50' 3.759" N	74° 4' 46.956" W	OTHERS	1-CRITICAL	Poorly built revetment/ wall with chain link fence.	UNKNOWN	UNKNOWN	
0205	120	1	40° 49' 41.034" N	74° 4' 47.426" W	OTHERS	4-FAIR	Paterson Plank Road concrete bridge on timber pile in fair condition. Steel bulkhead protecting bridge abutment and ripraps.	YES	YES	Remedial Action Permit (2013), Discharge to Stormwater, Radiation Materials Permit
0205	120	2	40° 49' 43.637" N	74° 4' 49.667" W	OTHERS	3-POOR	Berm soil without erosion protection. No riprap.	UNKNOWN		
0205	120	3	40° 49' 44.473" N	74° 4' 51.182" W	OTHERS	2-SERIOUS	Berm, Timber pile and deck for outdoor storage. The structure doesn't seem to be stable.	NO	NO	
0205	120	4	40° 49' 45.097" N	74° 4' 52.217" W	OTHERS	2-SERIOUS	Timber pile shelving in serious condition. Berm without erosion control.	NO	NO	N/A
0205	120	13	40° 49' 50.951" N	74° 4' 52.510" W	OTHERS	UNKNOWN	No access low tide.	UNKNOWN		
0205	120	15	40° 49' 45.060" N	74° 4' 37.851" W	OTHERS	UNKNOWN	Possible revetment, not able to confirm and inspect due to grown vegetation.	UNKNOWN	YES	Discharge of Stormwater, Air Contaminants, Radiation / Failed to Prepare SPPP
0205	120	16	40° 49' 46.963" N	74° 4' 36.428" W	OTHERS	UNKNOWN	Possible revetment, not able to confirm and inspect due to grown vegetation.	YES	NO	N/A
0205	120	17	40° 49' 49.311" N	74° 4' 35.945" W	OTHERS	4-FAIR	Outfall with grate in fair condition. Possible revetment, not able to confirm and inspect due to grown vegetation.	YES	NO	
0205	120	18	40° 49' 53.044" N	74° 4' 37.597" W	OTHERS	UNKNOWN	Possible revetment, not able to confirm and inspect due to grown vegetation.	YES	NO	
0205	121	1.01	40° 49' 40.620" N	74° 4' 38.140" W	OTHERS	UNKNOWN	Possible revetment, not able to confirm and inspect due to grown vegetation.	UNKNOWN	NO	N/A
0205	121	1.02	40° 49' 40.874" N	74° 4' 46.079" W	OTHERS	4-FAIR	Paterson Plank Road concrete bridge on timber pile in fair condition. Steel bulkhead protecting bridge abutment and ripraps.	YES	YES	Remedial Action Permit (2015), Tidelands License
0205	121	3.01	40° 49' 35.704" N	74° 4' 33.190" W	OTHERS	4-FAIR	Cell towers, trestle in fair condition.	NO	NO	
0205	122	2	40° 49' 30.868" N	74° 4' 26.069" W	SEAWALLS	3-POOR	Poor revetment without riprap and erosion control.	NO	NO	NA
0205	122	3	40° 49' 30.409" N	74° 4' 25.678" W	SEAWALLS	3-POOR	Poor revetment without riprap and erosion control.	NO	NO	N/A
0205	122	4	40° 49' 29.989" N	74° 4' 25.279" W	SEAWALLS	3-POOR	Poor revetment without riprap and erosion control.	NO	NO	NA
0205	122	5	40° 49' 29.869" N	74° 4' 24.678" W	SEAWALLS	3-POOR	Poor revetment without riprap and erosion control.	NO	NO	
0205	122	6	40° 49' 29.994" N	74° 4' 23.584" W	OTHERS	3-POOR	Poor revetment without riprap and erosion control.	YES	NO	
0205	123	19	40° 50' 5.406" N	74° 4' 30.013" W	SEAWALLS	4-FAIR	Parking lot revetment.	NO	YES	Remedial Action Permit (2015)
0205	123.01	2	40° 50' 11.894" N	74° 4' 32.311" W	SEAWALLS	3-POOR	Revetment to parking lot.	NO	YES	Tidelands Grant
0205	123.01	3	40° 50' 8.374" N	74° 4' 32.234" W	OTHERS	3-POOR	Revetment in poor condition with vegetation.	NO	YES	Flood Hazard Area, Discharge of Stormwater
0205	123.01	4	40° 50' 1.686" N	74° 4' 31.542" W	SEAWALLS	3-POOR	Revetment in poor condition.	NO	YES	Discharge of Stormwater

MUNI	BLOCK	LOT	NORTHING	EASTING	Structure Type	Condition Rating	Structure Description	Existed prior to 1978	Permits Record	Permit Description
0205	123.01	5	40° 49' 57.254" N	74° 4' 29.088" W	SEAWALLS	3-POOR	Revetment in poor condition. Tide gate or dam appear to be in good condition.	NO	YES	Discharge of Stormwater, Air Contaminants / Failed to Prepare SPPP
0205	123.01	9	40° 49' 36.227" N	74° 4' 30.491" W	OTHERS	4-FAIR	Piled trestle.	UNKNOWN	UNKNOWN	
0205	123.01	10	40° 49' 31.877" N	74° 4' 25.426" W	SEAWALLS	3-POOR	Revetment and chain link fence in poor condition. Tide gate outfalls in poor condition, concrete bulkhead in poor condition.	UNKNOWN	NO	
0205	131	8	40° 49' 33.628" N	74° 2' 25.105" W	OTHERS	UNKNOWN	Steel bridge, revetment.	UNKNOWN	UNKNOWN	
0205	131	9.01	40° 49' 37.255" N	74° 2' 37.520" W	OTHERS	UNKNOWN	Unable to access due to trestle on 0205_131_8.	UNKNOWN		
0205	131	10	40° 49' 36.214" N	74° 2' 22.223" W	SEAWALLS	4-FAIR	Dike, Revetment, Fabric flood wall.	YES	YES	Flood Hazard Area, Mitigation Permit, Tidelands Grant, Tidelands License, Waterfront Development
0205	131	11	40° 49' 29.974" N	74° 2' 10.817" W	SEAWALLS	4-FAIR	Dike, Revetment, Fabric flood wall.	YES	YES	Flood Hazard Area, Mitigation Permit, Tidelands Grant, Tidelands License, Waterfront Development
0205	136	7	40° 48' 25.337" N	74° 3' 24.551" W	FENDER SYSTEM	UNKNOWN	Marina/ floating dock.	YES	YES	Tidelands License, Waterfront Development, CAFRA
0205	136	8	40° 48' 26.385" N	74° 3' 27.456" W	BULKHEADS	5-SATISFACTORY	Public park with a boat ramp, marina/floating dock.	YES	YES	Tidelands License, Waterfront Development, CAFRA
0205	136	10	40° 48' 26.013" N	74° 3' 31.649" W	FENDER SYSTEM	4-FAIR	Private Marina with Dock and Boat Ramp/Appear to be fair condition.	YES	YES	Tidelands License, Waterfront Development, CAFRA
0205	136	11	40° 48' 25.969" N	74° 3' 31.947" W	FENDER SYSTEM	4-FAIR	Private Marina with Dock and Boat Ramp/Appear to be fair condition.	YES		
0205	136	12	40° 48' 25.933" N	74° 3' 32.918" W	OTHERS	4-FAIR		UNKNOWN		
0205	136	13	40° 48' 25.838" N	74° 3' 33.244" W	FENDER SYSTEM	4-FAIR	Private Marina with Dock and Boat Ramp/Appear to be fair condition.	YES		
0205	136	14	40° 48' 23.892" N	74° 3' 35.439" W	PIERS	2-SERIOUS	Dock is Missing, Piers in poor condition.	YES	YES	Tideland License
0205	137	1	40° 48' 47.181" N	74° 3' 19.861" W	BULKHEADS	4-FAIR	Metro Road crossing bridge with high water elevation, only observed bulkhead of the bridge crossing.	UNKNOWN		
0205	137	10	40° 48' 50.620" N	74° 3' 8.708" W	OTHERS	UNKNOWN	Metro Road crossing bridge. Timber bridge structure with metal guide rails and pipe crossing. With high water elevation, only able to inspect top of the bridge.			
0205	137	12	40° 48' 53.641" N	74° 2' 52.850" W	SEAWALLS	UNKNOWN	Appear to be revetment with chain link fence. Not able to see the revetment with grown vegetation.	YES		
0205	137	15	40° 48' 40.697" N	74° 3' 2.882" W	SEAWALLS	5-SATISFACTORY	Revetment with chain link fence/ northern section may have concrete wall or bulkhead.	NO		
0205	137	20	40° 48' 53.303" N	74° 2' 52.709" W	SEAWALLS	UNKNOWN	Appear to be revetment with chain link fence. Not able to see the revetment with grown vegetation.	UNKNOWN	UNKNOWN	
0205	137	22	40° 48' 46.734" N	74° 2' 29.180" W	SEAWALLS	4-FAIR	Road Way, Revetment.	YES	YES	Discharge of Stormwater, Discharge to Surface Water, Treatment Works Approval, Mitigation, Waterfront
0205	137	23	40° 48' 53.936" N	74° 2' 33.600" W	SEAWALLS	4-FAIR	Road Way, Revetment.	YES	YES	Discharge of Stormwater, Discharge to Surface Water, Treatment Works Approval, Mitigation, Waterfront

MUNI	BLOCK	LOT	NORTHING	EASTING	Structure Type	Condition Rating	Structure Description	Existed prior to 1978	Permits Record	Permit Description
0205	137	24	40° 48' 58.260" N	74° 2' 36.065" W	SEAWALLS	UNKNOWN	Road Way, Revetment.	YES	YES	Discharge of Stormwater, Discharge to Surface Water, Treatment Works Approval, Mitigation, Waterfront
0205	138	2	40° 48' 39.028" N	74° 2' 29.112" W	SEAWALLS	UNKNOWN	Appear to be revetment with chain link fence. Not able to see the revetment with grown vegetation.	UNKNOWN	UNKNOWN	
0230	5.01	1.02	40° 51' 21.334" N	74° 1' 50.163" W	SEAWALLS	3-POOR	Revetments and Stone wall fair and poor condition. Outfalls.	YES	NO	Wall with riprap unauthorized
0230	5.01	4	40° 51' 9.479" N	74° 1' 45.615" W	SEAWALLS	3-POOR	Revetments with fence. Dumped soils without erosion control.	YES	NO	N/A
0230	5.01	8	40° 51' 8.185" N	74° 1' 45.903" W	SEAWALLS	4-FAIR	Revetments. Filled ground with fence. Fair con. Deck post serious con.	UNKNOWN	YES	FWGP11, FWGP17, FWGPEXT, FWTW4I, IP Upland (Waterfront Development), Tidelands License
0230	5.01	9	40° 51' 6.996" N	74° 1' 48.217" W	SEAWALLS	4-FAIR	Appear to be revetment with vegetation.	UNKNOWN	YES	FWGP11, FWGP17, FWGPEXT, FWTW4I, IP Upland (Waterfront Development), Tidelands License
0230	5.01	10	40° 51' 5.723" N	74° 1' 47.894" W	SEAWALLS	4-FAIR	Appear to be revetment with grown vegetation.	NO	YES	FWGP11, FWGP17, FWGPEXT, FWTW4I, IP Upland (Waterfront Development), Tidelands License
0230	25	2	40° 51' 3.942" N	74° 1' 48.043" W	SEAWALLS	3-POOR	Revetment in poor condition. Sign of erosion.	NO	NO	failed to submit community right to know survey for facility in 2004
0230	25	5.01	40° 51' 0.701" N	74° 1' 49.069" W	SEAWALLS	5-SATISFACTORY	Revetments with chain link fence.	NO	NO	N/A
0230	25	8.01	40° 50' 56.104" N	74° 1' 50.542" W	SEAWALLS	3-POOR	Revetment in fair condition. Floating dock is in poor condition. Timber pier supporting a building is in poor condition. Pump station discharge pipes. Boat ramp in serious condition.	YES	YES	Tideland License
0230	45	8	40° 50' 54.521" N	74° 1' 51.754" W	BULKHEADS	3-POOR	Steel bulkhead.	NO	YES	Remedial Action Permit (2015), Discharge of Stormwater (2013), Air Contaminants Permit
0230	45	11	40° 50' 53.276" N	74° 1' 52.810" W	BULKHEADS	2-SERIOUS	Timber Bulkhead is in poor condition. Floating dock in poor condition. Floating dock is supporting a trailer.	NO	NO	N/A
0230	45	13	40° 50' 52.399" N	74° 1' 53.687" W	BULKHEADS	1-CRITICAL	Timber bulkhead in serious condition. Floating dock in critical condition.	NO	NO	N/A
0230	45	14	40° 50' 51.984" N	74° 1' 53.908" W	BULKHEADS	2-SERIOUS	Timber bulkhead in serious condition. Floating dock in critical condition.	NO	NO	
0230	45	15.02	40° 50' 51.415" N	74° 1' 53.751" W	BULKHEADS	2-SERIOUS	Timber bulkhead in serious condition.	UNKNOWN	UNKNOWN	
0230	45	16	40° 50' 50.641" N	74° 1' 53.704" W	BULKHEADS	2-SERIOUS	Timber bulkhead in serious condition. Revetment in poor condition. Timber pier and metal dock in fair condition.	UNKNOWN	UNKNOWN	N/A
0230	106.01	4	40° 49' 53.465" N	74° 2' 8.606" W	OTHERS	UNKNOWN	Unable to confirm the waterfront structure due to grown vegetation.	UNKNOWN	NA	
0230	106.01	5	40° 49' 51.637" N	74° 2' 0.155" W	PIERS	3-POOR	Pier, boat concrete dock. Barge in rusted condition.	YES	YES	Flood Hazard Area Permit, Mitigation Permit, Tidelands Grant, Tidelands License, Waterfront Develop

MUNI	BLOCK	LOT	NORTHING	EASTING	Structure Type	Condition Rating	Structure Description	Existed prior to 1978	Permits Record	Permit Description
0230	106.01	8	40° 49' 52.182" N	74° 1' 59.298" W	PIERS	3-POOR	Pier, boat concrete dock. Barge in rusted condition. Concrete Bridge crossing in fair condition.	YES	YES	Flood Hazard Area Permit, Mitigation Permit, Tidelands Grant, Tidelands License, Waterfront Develop
0230	106.01	9	40° 49' 54.984" N	74° 1' 56.464" W	OTHERS	4-FAIR	Bergen County Utility Authority Wastewater Treatment Plant Outfall. May be wall. Unable to see due to water elevation and vegetation.	NO	YES	Flood Hazard Area Permit, Mitigation Permit, Tidelands Grant, Tidelands License, Waterfront Development
0230	106.01	11	40° 50' 1.411" N	74° 1' 50.553" W	BULKHEADS	1-CRITICAL	Critical condition bulkheads. Fair condition outfall with tidegate. Appear to be revetment, but unable to confirm due to grown vegetation.	YES	NO	
0230	106.01	13.01	40° 50' 7.143" N	74° 1' 52.286" W	OTHERS	4-FAIR	Shares Outfall from 0230_106.01_11. Unable to confirm revetment due to grown vegetation.	YES	YES	Flood Hazard Area Permit, Mitigation Permit, Tidelands Grant, Tidelands License, Waterfront Development
0230	107.01	1	40° 50' 20.353" N	74° 1' 55.092" W	PIERS	2-SERIOUS	Boat timber pier. Timber dock, concrete pier and dock. Concrete piers supporting building. Chan linked fence.	YES	UNKNOWN	
0230	108.01	2.01	40° 50' 27.481" N	74° 1' 53.077" W	SEAWALLS	2-SERIOUS	Revetments. Steel bulkhead.	NO	NO	
0230	108.01	2.02	40° 50' 31.170" N	74° 1' 51.829" W	BULKHEADS	2-SERIOUS	Poor revetments. Steel wall/timber wall with concrete deck in serious condition.	YES	NO	
0230	108.01	2.03	40° 50' 33.656" N	74° 1' 50.914" W	OTHERS	3-POOR	Revetments with chain link fence.	YES		
0230	108.01	2.04	40° 50' 36.152" N	74° 1' 50.549" W	BULKHEADS	3-POOR	Steel sheet piled bulkhead.	YES	NO	
0230	108.01	2.05	40° 50' 38.362" N	74° 1' 50.624" W	BULKHEADS	UNKNOWN	Damaged sheet piling bulkhead. Falling bulkhead. Falling piles. Outfall. Concrete headwall outfall.	YES	YES	Tidelands License, Tidelands Management Agreement
0230	108.04	1.02	40° 50' 41.366" N	74° 1' 52.102" W	BULKHEADS	2-SERIOUS	Timber Dock in serious condition. Steel piled bulkhead in poor condition. Floating dock in Poor condition. Revetment is in fair condition. Timber pier in poor condition. An outfall with metal tide gate with concrete headwall in fair condition.	YES	NO	
0230	108.04	3	40° 50' 46.984" N	74° 1' 54.705" W	SEAWALLS	6-GOOD	Timber piers and dock in serious condition. Revetments in good condition.	YES	YES	Failed to pay NJDEP oversight cost in 2012
0230	108.04	3	40° 50' 45.369" N	74° 1' 53.978" W	OTHERS	2-SERIOUS	Timber pier and dock.			
0230	111	11	40° 50' 49.746" N	74° 1' 53.727" W	BULKHEADS	1-CRITICAL	Timber bulkhead critical. Revetment in poor condition.	NO	NO	
0230	111	12	40° 50' 48.015" N	74° 1' 54.139" W	SEAWALLS	1-CRITICAL	Timber Bulkhead in critical condition. Timber pier is serious condition. Revetment in poor condition.	NO	NO	no permits
0230	111	13.01	40° 50' 49.312" N	74° 1' 53.895" W	BULKHEADS	1-CRITICAL	Timber bulkhead critical. Revetment in poor condition.	NO	NO	
0237	70	12	40° 50' 16.396" N	74° 4' 34.396" W	OTHERS	5-SATISFACTORY	Dam/Flood control, Riprap revetment.	NO	NA	N/A
0259	106	3.01	40° 49' 45.279" N	74° 2' 23.991" W	SEAWALLS	4-FAIR	Dike, Revetment, Fabric flood wall. Dam.	NO	NO	
0259	106	3.02	40° 49' 37.513" N	74° 2' 19.440" W	OTHERS	4-FAIR	Dike, Revetment, Fabric flood wall.	YES	YES	Flood Hazard Area, Mitigation Permit, Tidelands Grant, Tidelands License, Waterfront Development
0259	106	4.01	40° 49' 36.789" N	74° 2' 21.063" W	SEAWALLS	4-FAIR	Dike, Revetment, Fabric flood wall.	YES	YES	Flood Hazard Area, Mitigation Permit, Tidelands Grant, Tidelands License, Waterfront Development

3.0 Inspection Forms

Inspection forms are organized in alphabetical order of MUNI number, then BLOCK and LOT number.

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NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/27/2016 **Inspection Time:** 1:37 **Weather:** 35° sunny **Inspector:** Jei Chon

PPIN: 0205_84_2 **TOWNSHIP** Little Ferry **Block Number:** 84 **Lot Number** 2

Property Owner's Information:

NAME: RUSSO MEADOWLANDS PK LLC

MAILING ADDRESS: 570 COMMERCE BLVD

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope: YES

2. If "Yes", identity of waterfront Structure with physical descript

BULKHEADS	Steel bulkhead with pipe crossing above water
REVETMENT	

3. Is the waterfront structure existed prior to 1978? UNKNOWN

4. Is there a record of existing waterfront structure permits? YES

If "Yes", permit description: Discharge of Stormwater, Hazardous Waste Handler, Underground Storage Tank, Remedial Action (2014)

5. Waterfront structure condition rating

3-POOR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 4' 53.655" W **EASTING** 40° 50' 16.360" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_84_2 **Township:** Little Ferry **Block Number:** 84 **Lot Number:** 2

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: | **Inspection Time:** 1:37 | **Weather:** 35° sunny | **Inspector:** Jei Chon

PPIN: 0205_84_7 **TOWNSHIP** Carlstadt **Block Number:** 84 **Lot Number** 7

Property Owner's Information:

NAME: 626 REALTY

MAILING ADDRESS: P.O. BOX 0498, CARLSTADT

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope NA

2. If "Yes", identity of waterfront Structure with physical descript

REVETMENT

3. Is the waterfront structure existed prior to 1978? UNKNOWN

4. Is there a record of existing waterfront structure permits? UNKNOWN

If "Yes", permit description

5. Waterfront structure condition rating

3-POOR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 4' 50.423" W **EASTING** 40° 50' 10.753" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_84_7 **Township:** Carlstadt **Block Number:** 84 **Lot Number:** 7

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: | **Inspection Time:** 1:37 | **Weather:** 35° sunny | **Inspector:** Jei Chon

PPIN: 0205_84_8.01 **TOWNSHIP** Carlstadt **Block Number:** 84 **Lot Number** 8.01

Property Owner's Information:

NAME: CCNY 66 REALTY LLC

MAILING ADDRESS: 630-666 16TH ST.

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope NO

2. If "Yes", identity of waterfront Structure with physical descript

REVETMENT

3. Is the waterfront structure existed prior to 1978? UNKNOWN

4. Is there a record of existing waterfront structure permits? UNKNOWN

If "Yes", permit description

5. Waterfront structure condition rating

<Null>

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 4' 47.711" W **EASTING** 40° 50' 9.409" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_84_8.01 **Township:** Carlstadt **Block Number:** 84 **Lot Number:** 8.01

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/27/2016 **Inspection Time:** 1:37 **Weather:** 35° sunny **Inspector:** Jei Chon

PPIN: 0205_84_8.02 **TOWNSHIP** Carlstadt **Block Number:** 84 **Lot Number** 8.02

Property Owner's Information:

NAME:

MAILING ADDRESS:

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope: YES

2. If "Yes", identity of waterfront Structure with physical descript

REVETMENT	Appear to be revetment. Hard to see with vegetation

3. Is the waterfront structure existed prior to 1978? UNKNOWN

4. Is there a record of existing waterfront structure permits? UNKNOWN

If "Yes", permit description

5. Waterfront structure condition rating

<Null>

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 4' 45.608" W **EASTING** 40° 50' 8.348" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_84_8.02 **Township:** Carlstadt **Block Number:** 84 **Lot Number:** 8.02

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1

TERM CONTRACT TC-001

DPM PROJECT P 1131-00

Date: | **Inspection Time:** 1:45 | **Weather:** 35° sunny | **Inspector:** Jei Chon

PPIN: 0205_84_10 **TOWNSHIP** Carlstadt **Block Number:** 84 **Lot Number** 10

Property Owner's Information:

NAME: SKC 97, LLC

MAILING ADDRESS: 601 16TH ST.

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope YES

2. If "Yes", identity of waterfront Structure with physical descript

OTHERS	Poorly built revetment/ wall with chain link fence

3. Is the waterfront structure existed prior to 1978? UNKNOWN

4. Is there a record of existing waterfront structure permits? NA

If "Yes", permit description

5. Waterfront structure condition rating

2-SERIOUS

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted

5 - Satisfactory: Limited minor to moderate defects or deterioration

4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser

3 - Poor: Advanced deterioration observed on widespread portion of the structure

2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc

1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 4' 49.478" W **EASTING** 40° 50' 6.589" N

Photograph 1:

Photograph 2:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_84_10 **Township:** Carlstadt **Block Number:** 84 **Lot Number:** 10

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: | **Inspection Time:** 1:45 | **Weather:** 35° sunny | **Inspector:** Jei Chon

PPIN: 0205_92_1 **TOWNSHIP** Carlstadt **Block Number:** 92 **Lot Number** 1

Property Owner's Information:

NAME: 455 SIXTEENTH ST. LLC

MAILING ADDRESS: 455 SIXTEENTH ST.

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope YES

2. If "Yes", identity of waterfront Structure with physical descript

OTHERS	Poorly built revetment/ wall with chain link fence
REVETMENT	

3. Is the waterfront structure existed prior to 1978? UNKNOWN

4. Is there a record of existing waterfront structure permits? UNKNOWN

If "Yes", permit description

5. Waterfront structure condition rating

1-CRITICAL

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 4' 51.753" W **EASTING** 40° 50' 2.517" N

Photograph 1:



Photograph 2:

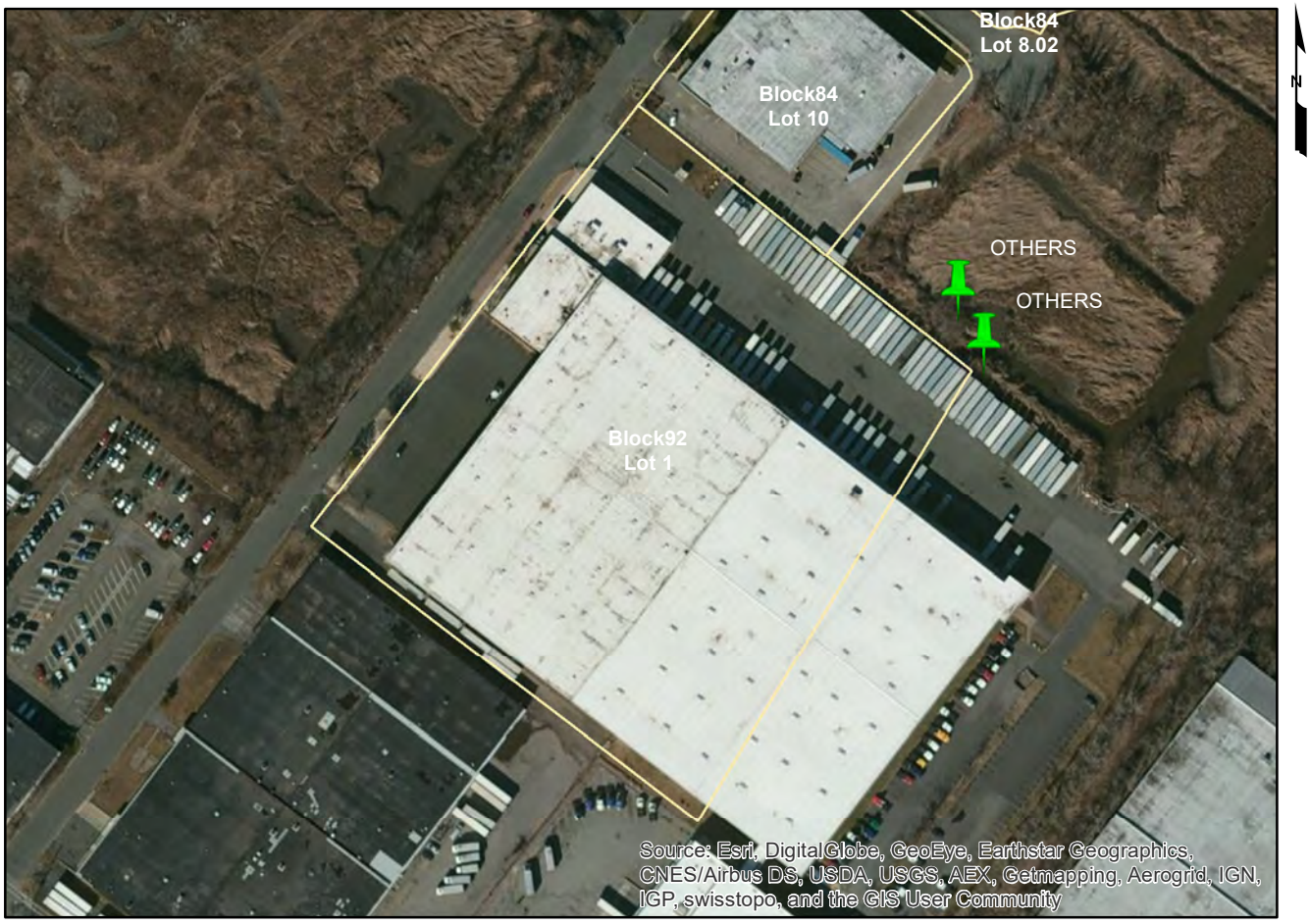


NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_92_1 **Township:** Carlstadt **Block Number:** 92 **Lot Number:** 1

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/27/2016 **Inspection Time:** 1:35 **Weather:** 35° sunny **Inspector:** Jei Chon

PPIN: 0205_120_1 **TOWNSHIP** Carlstadt **Block Number:** 120 **Lot Number** 1

Property Owner's Information:

NAME: HACKENSACK WATER CO.

MAILING ADDRESS: 200 OLD HOOK ROAD

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope: YES

2. If "Yes", identity of waterfront Structure with physical descript

OTHERS	Paterson Plank Road concrete bridge on timber pile in fair condition. Steel bulkhead protecting bridge abutment and ripraps.
PIERS	
BULKHEADS	

3. Is the waterfront structure existed prior to 1978? YES

4. Is there a record of existing waterfront structure permits? YES

If "Yes", permit description: Remedial Action Permit (2013), Discharge to Stormwater, Radiation Materials Permit

5. Waterfront structure condition rating: 4-FAIR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 4' 47.835" W **EASTING** 40° 49' 42.126" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_120_1 **Township:** Carlstadt **Block Number:** 120 **Lot Number:** 1

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/27/2016 **Inspection Time:** 1:56 **Weather:** 35° sunny **Inspector:** Jei Chon

PPIN: 0205_120_2 **TOWNSHIP** Carlstadt **Block Number:** 120 **Lot Number** 2

Property Owner's Information:

NAME: M.G.K./STILETTO'S/D. ZARUCHA

MAILING ADDRESS: 4A ARTHUR CT

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope YES

2. If "Yes", identity of waterfront Structure with physical descript

OTHERS

Berm soil without erosion protection. No riprap

3. Is the waterfront structure existed prior to 1978?

4. Is there a record of existing waterfront structure permits?

If "Yes", permit description

5. Waterfront structure condition rating

3-POOR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 4' 49.810" W **EASTING** 40° 49' 43.116" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_120_2 **Township:** Carlstadt **Block Number:** 120 **Lot Number:** 2

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/27/2016 **Inspection Time:** 1:59 **Weather:** 35° sunny **Inspector:** Jei Chon

PPIN: 0205_120_3 **TOWNSHIP** Carlstadt **Block Number:** 120 **Lot Number** 3

Property Owner's Information:

NAME: BARTKOWSKI L.L.C. C/O SCHANEL,J.

MAILING ADDRESS: 331 PATERSON PLANK RD

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope: YES

2. If "Yes", identity of waterfront Structure with physical descript

OTHERS	Berm, Timber pile and deck for outdoor storage. The structure doesn't seem to be stable
REVETMENT	

3. Is the waterfront structure existed prior to 1978? NO

4. Is there a record of existing waterfront structure permits? NO

If "Yes", permit description

5. Waterfront structure condition rating: 2-SERIOUS

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 4' 51.588" W **EASTING** 40° 49' 44.048" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_120_3 **Township:** Carlstadt **Block Number:** 120 **Lot Number:** 3

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/27/2016 **Inspection Time:** 2:00 **Weather:** 35° sunny **Inspector:** Jei Chon

PPIN: 0205_120_4 **TOWNSHIP** Carlstadt **Block Number:** 120 **Lot Number** 4

Property Owner's Information:

NAME: CARTER, LILLIAN E

MAILING ADDRESS: 128 STANLEY ST

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope YES

2. If "Yes", identity of waterfront Structure with physical descript

OTHERS
OTHERS

Timber pile shelving in serious condition. Berm without erosion control.

3. Is the waterfront structure existed prior to 1978? NO

4. Is there a record of existing waterfront structure permits? NO

If "Yes", permit description N/A

5. Waterfront structure condition rating

2-SERIOUS

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 4' 52.622" W **EASTING** 40° 49' 44.684" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_120_4 **Township:** Carlstadt **Block Number:** 120 **Lot Number:** 4

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1

TERM CONTRACT TC-001

DPM PROJECT P 1131-00

Date: 2/27/2016 **Inspection Time:** **Weather:** **Inspector:**

PPIN: 0205_120_13 **TOWNSHIP** **Block Number:** 120 **Lot Number** 13

Property Owner's Information:

NAME: BOROUGH OF CARLSTADT

MAILING ADDRESS: 00 MADISON ST

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope

2. If "Yes", identity of waterfront Structure with physical descript

No access low tide

3. Is the waterfront structure existed prior to 1978?

4. Is there a record of existing waterfront structure permits?

If "Yes", permit description

5. Waterfront structure condition rating

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted

5 - Satisfactory: Limited minor to moderate defects or deterioration

4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser

3 - Poor: Advanced deterioration observed on widespread portion of the structure

2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc

1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 4' 52.510" W **EASTING** 40° 49' 50.951" N

Photograph 1:

Photograph 2:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_120_13 **Township:** **Block Number:** 120 **Lot Number:** 13

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/27/2016 **Inspection Time:** 1:06 **Weather:** 35° sunny **Inspector:** Jei Chon

PPIN: 0205_120_15 **TOWNSHIP** Carlstadt **Block Number:** 120 **Lot Number** 15

Property Owner's Information:

NAME: STANBEE CO., INC.

MAILING ADDRESS: 70 BROAD ST

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope NO

2. If "Yes", identity of waterfront Structure with physical descript

Possible revetment, not able to confirm and inspect due to grown vegetation

3. Is the waterfront structure existed prior to 1978? UNKNOWN

4. Is there a record of existing waterfront structure permits? YES

If "Yes", permit description Discharge of Stormwater, Air Contaminants, Radiation / Failed to Prepare SPPP

5. Waterfront structure condition rating

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 4' 40.366" W **EASTING** 40° 49' 46.485" N

Photograph 1:



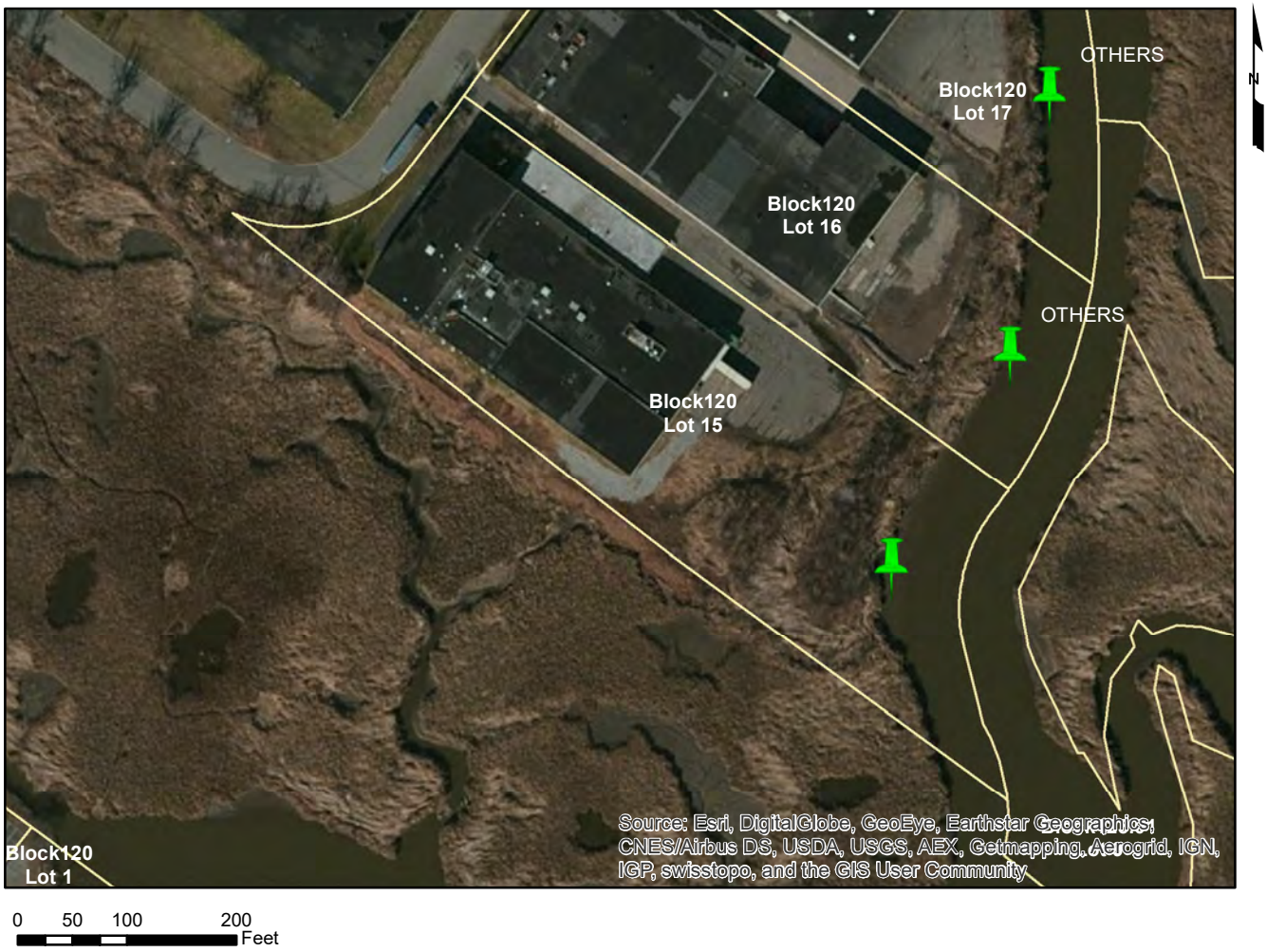
Photograph 2:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_120_15 **Township:** Carlstadt **Block Number:** 120 **Lot Number:** 15

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/27/2016 **Inspection Time:** 1:03 **Weather:** 35° sunny **Inspector:** Jei Chon

PPIN: 0205_120_16 **TOWNSHIP** Carlstadt **Block Number:** 120 **Lot Number** 16

Property Owner's Information:

NAME: CHENG'S ENTERPRISES, INC

MAILING ADDRESS: 68 BROAD ST

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope: NO

2. If "Yes", identity of waterfront Structure with physical descript

OTHERS	Possible revetment, not able to confirm and inspect due to grown vegetation

3. Is the waterfront structure existed prior to 1978? YES

4. Is there a record of existing waterfront structure permits? NO

If "Yes", permit description: N/A

5. Waterfront structure condition rating

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 4' 39.010" W **EASTING** 40° 49' 48.389" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_120_16 **Township:** Carlstadt **Block Number:** 120 **Lot Number:** 16

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/27/2016 **Inspection Time:** 1:01 **Weather:** 35° sunny **Inspector:** Jei Chon

PPIN: 0205_120_17 **TOWNSHIP** Carlstadt **Block Number:** 120 **Lot Number** 17

Property Owner's Information:

NAME: MOMENI REALTY, LLC

MAILING ADDRESS: 60 BROAD ST

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope: YES

2. If "Yes", identity of waterfront Structure with physical descript

OTHERS

Outfall with grate in fair condition. Possible revetment, not able to confirm and inspect due to grown vegetation.

3. Is the waterfront structure existed prior to 1978? YES

4. Is there a record of existing waterfront structure permits? NO

If "Yes", permit description

5. Waterfront structure condition rating

4-FAIR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 4' 37.893" W **EASTING** 40° 49' 50.661" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_120_17 **Township:** Carlstadt **Block Number:** 120 **Lot Number:** 17

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/27/2016 **Inspection Time:** 12:58 **Weather:** 35° sunny **Inspector:** Jei Chon

PPIN: 0205_120_18 **TOWNSHIP** Carlstadt **Block Number:** 120 **Lot Number** 18

Property Owner's Information:

NAME: AMB/PROLOGIS

MAILING ADDRESS: 60 STATE ST STE.2200

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope NO

2. If "Yes", identity of waterfront Structure with physical descript

Possible revetment, not able to confirm and inspect due to grown vegetation

3. Is the waterfront structure existed prior to 1978? YES

4. Is there a record of existing waterfront structure permits? NO

If "Yes", permit description

5. Waterfront structure condition rating

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 4' 38.748" W **EASTING** 40° 49' 55.388" N

Photograph 1:



Photograph 2:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_120_18 **Township:** Carlstadt **Block Number:** 120 **Lot Number:** 18

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/27/2016 **Inspection Time:** 12:30PM **Weather:** 35° sunny **Inspector:** Jei Chon

PPIN: 0205_121_1.01 **TOWNSHIP** Carlstadt **Block Number:** 121 **Lot Number** 1.01

Property Owner's Information:

NAME: HACKENSACK WATER CO.

MAILING ADDRESS: 200 OLD HOOK ROAD

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope: NO

2. If "Yes", identity of waterfront Structure with physical descript

OTHERS	Possible revetment, not able to confirm and inspect due to grown vegetation

3. Is the waterfront structure existed prior to 1978? UNKNOWN

4. Is there a record of existing waterfront structure permits? NO

If "Yes", permit description: N/A

5. Waterfront structure condition rating

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 4' 37.351" W **EASTING** 40° 49' 38.342" N

Photograph 1:



Photograph 2:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_121_1.01 **Township:** Carlstadt **Block Number:** 121 **Lot Number:** 1.01

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: | **Inspection Time:** 1:35 | **Weather:** 35° sunny | **Inspector:** Jei Chon

PPIN: 0205_121_1.02 **TOWNSHIP** Carlstadt **Block Number:** 121 **Lot Number** 1.02

Property Owner's Information:

NAME: 240-248 PATERSON PLANK RD ASSOC

MAILING ADDRESS: 241 PATERSON PLK. RD.

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope YES

2. If "Yes", identity of waterfront Structure with physical descript

OTHERS	Paterson Plank Road concrete bridge on timber pile in fair condition. Steel bulkhead protecting bridge abutment and ripraps.
PIERS	
BULKHEADS	

3. Is the waterfront structure existed prior to 1978? YES

4. Is there a record of existing waterfront structure permits? YES

If "Yes", permit description: Remedial Action Permit (2015), Tidelands License

5. Waterfront structure condition rating

4-FAIR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 4' 42.703" W **EASTING** 40° 49' 40.059" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_121_1.02 **Township:** Carlstadt **Block Number:** 121 **Lot Number:** 1.02

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/27/2016 **Inspection Time:** 12:30PM **Weather:** 35° sunny **Inspector:** Jei Chon

PPIN: 0205_121_3.01 **TOWNSHIP** Carlstadt **Block Number:** 121 **Lot Number** 3.01

Property Owner's Information:

NAME: STATE OF NJ/DEP

MAILING ADDRESS: CN 401, CARLSTADT

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope: YES

2. If "Yes", identity of waterfront Structure with physical descript

OTHERS	cell towers, trestle in fair condition

3. Is the waterfront structure existed prior to 1978? NO

4. Is there a record of existing waterfront structure permits? NO

If "Yes", permit description

5. Waterfront structure condition rating

4-FAIR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 4' 32.867" W **EASTING** 40° 49' 35.819" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_121_3.01 **Township:** Carlstadt **Block Number:** 121 **Lot Number:** 3.01

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: | **Inspection Time:** 1:22 | **Weather:** 1:22 | **Inspector:** Jei Chon

PPIN: 0205_122_2 **TOWNSHIP** Carlstadt **Block Number:** 122 **Lot Number** 2

Property Owner's Information:

NAME: BOROUGH OF CARLSTADT

MAILING ADDRESS: 500 MADISON ST

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope YES

2. If "Yes", identity of waterfront Structure with physical descript

REVETMENT

Poor revetment without riprap and erosion control

3. Is the waterfront structure existed prior to 1978? NO

4. Is there a record of existing waterfront structure permits? NO

If "Yes", permit description NA

5. Waterfront structure condition rating

3-POOR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 4' 27.000" W **EASTING** 40° 49' 30.377" N

Photograph 1:

Photograph 2:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_122_2 **Township:** Carlstadt **Block Number:** 122 **Lot Number:** 2

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/27/2016 **Inspection Time:** 1:22 **Weather:** 35° sunny **Inspector:** Jei Chon

PPIN: 0205_122_3 **TOWNSHIP** Carlstadt **Block Number:** 122 **Lot Number** 3

Property Owner's Information:

NAME: JAMES WILLIAMS, WILLIAMS ESTATE

MAILING ADDRESS: 269 PATERSON PLK RD.

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope: YES

2. If "Yes", identity of waterfront Structure with physical descript

REVETMENT	Poor revetment without riprap and erosion control

3. Is the waterfront structure existed prior to 1978? NO

4. Is there a record of existing waterfront structure permits? NO

If "Yes", permit description: N/A

5. Waterfront structure condition rating

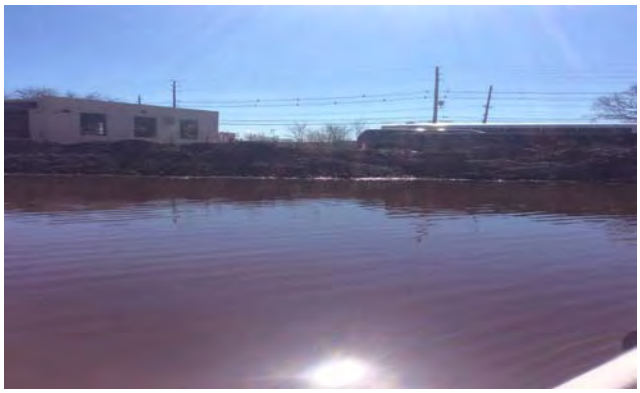
3-POOR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 4' 26.359" W **EASTING** 40° 49' 29.898" N

Photograph 1:



Photograph 2:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_122_3 **Township:** Carlstadt **Block Number:** 122 **Lot Number:** 3

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: | **Inspection Time:** 1:25 | **Weather:** 1:22 | **Inspector:** Jei Chon

PPIN: 0205_122_4 **TOWNSHIP** Carlstadt **Block Number:** 122 **Lot Number** 4

Property Owner's Information:

NAME: DAVANZO, JESSIE

MAILING ADDRESS: 63 WHITE OAK DRIVE

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope YES

2. If "Yes", identity of waterfront Structure with physical descript

REVETMENT	Poor revetment without riprap and erosion control

3. Is the waterfront structure existed prior to 1978? NO

4. Is there a record of existing waterfront structure permits? NO

If "Yes", permit description NA

5. Waterfront structure condition rating

3-POOR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 4' 25.797" W **EASTING** 40° 49' 29.546" N

Photograph 1:

Photograph 2:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_122_4 **Township:** Carlstadt **Block Number:** 122 **Lot Number:** 4

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/27/2016 **Inspection Time:** 1:24 **Weather:** 35° sunny **Inspector:** Jei Chon

PPIN: 0205_122_5 **TOWNSHIP** Carlstadt **Block Number:** 122 **Lot Number** 5

Property Owner's Information:

NAME: MARIANO, MARIO

MAILING ADDRESS: PATERSON PLK RD

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope YES

2. If "Yes", identity of waterfront Structure with physical descript

REVETMENT	Poor revetment without riprap and erosion control

3. Is the waterfront structure existed prior to 1978? NO

4. Is there a record of existing waterfront structure permits? NO

If "Yes", permit description

5. Waterfront structure condition rating

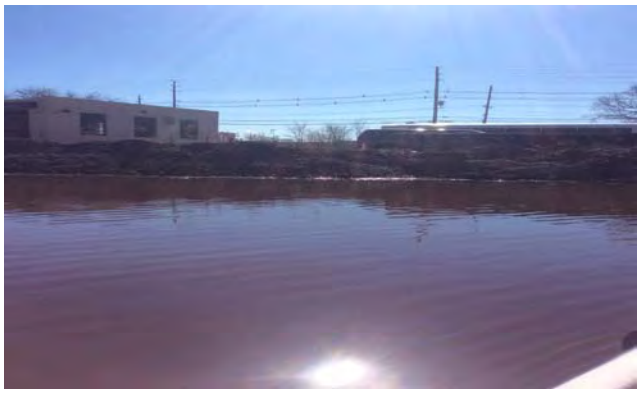
3-POOR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

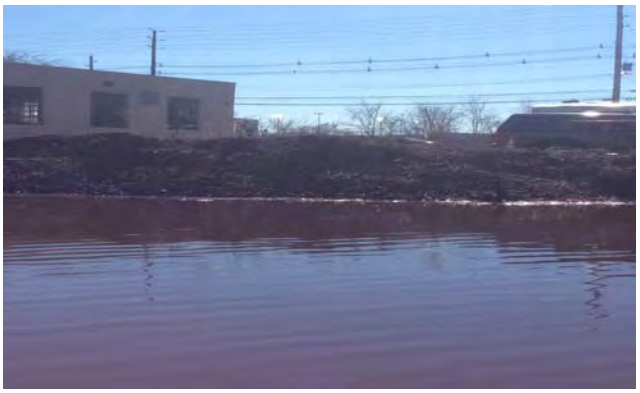
6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 4' 25.181" W **EASTING** 40° 49' 29.317" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_122_5 **Township:** Carlstadt **Block Number:** 122 **Lot Number:** 5

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/27/2016 **Inspection Time:** 1:26 **Weather:** 35° sunny **Inspector:** Jei Chon

PPIN: 0205_122_6 **TOWNSHIP** Carlstadt **Block Number:** 122 **Lot Number** 6

Property Owner's Information:

NAME: MARIANO, MARIO

MAILING ADDRESS: 420 PATERSON PLK RD

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope YES

2. If "Yes", identity of waterfront Structure with physical descript

OTHERS

Poor revetment without riprap and erosion control

3. Is the waterfront structure existed prior to 1978? YES

4. Is there a record of existing waterfront structure permits? NO

If "Yes", permit description

5. Waterfront structure condition rating

3-POOR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 4' 24.239" W **EASTING** 40° 49' 28.951" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_122_6 **Township:** Carlstadt **Block Number:** 122 **Lot Number:** 6

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: | **Inspection Time:** 1:09pm | **Weather:** 35° sunny | **Inspector:** Jei Chon

PPIN: 0205_123.01_2 **TOWNSHIP** Carlstadt **Block Number:** 123.01 **Lot Number** 2

Property Owner's Information:

NAME: GRAND 145 LLC, NJ LTD CO

MAILING ADDRESS: 145 GRAND ST

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope

2. If "Yes", identity of waterfront Structure with physical descript

REVETMENT	Revetment to parking lot

3. Is the waterfront structure existed prior to 1978? NO

4. Is there a record of existing waterfront structure permits? YES

If "Yes", permit description Tidelands Grant

5. Waterfront structure condition rating

3-POOR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 4' 30.106" W **EASTING** 40° 50' 10.462" N

Photograph 1:



Photograph 2:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_123.01_2 **Township:** Carlstadt **Block Number:** 123.01 **Lot Number:** 2

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: | **Inspection Time:** 1:05pm | **Weather:** 35° sunny | **Inspector:** Jei chon

PPIN: 0205_123.01_3 **TOWNSHIP** Carlstadt **Block Number:** 123.01 **Lot Number** 3

Property Owner's Information:

NAME: CSR REALTY VENTURES LLC

MAILING ADDRESS: 139 CHESTNUT ST

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope YES

2. If "Yes", identity of waterfront Structure with physical descript

OTHERS

revetment in poor condition with vegetation

3. Is the waterfront structure existed prior to 1978? NO

4. Is there a record of existing waterfront structure permits? YES

If "Yes", permit description Flood Hazard Area, Discharge of Stormwater

5. Waterfront structure condition rating

3-POOR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 4' 32.234" W **EASTING** 40° 50' 8.374" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_123.01_3 **Township:** Carlstadt **Block Number:** 123.01 **Lot Number:** 3

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: | **Inspection Time:** 12:55 | **Weather:** 35° sunny | **Inspector:** Jei Chon

PPIN: 0205_123.01_4 **TOWNSHIP** Carlstadt **Block Number:** 123.01 **Lot Number** 4

Property Owner's Information:

NAME: GRAND BK CORP

MAILING ADDRESS: 333 STARKE RD

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope: YES

2. If "Yes", identity of waterfront Structure with physical descript

REVETMENT	revetment in poor condition

3. Is the waterfront structure existed prior to 1978? NO

4. Is there a record of existing waterfront structure permits? YES

If "Yes", permit description: Discharge of Stormwater

5. Waterfront structure condition rating

3-POOR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 4' 30.565" W **EASTING** 40° 50' 1.375" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_123.01_4 **Township:** Carlstadt **Block Number:** 123.01 **Lot Number:** 4

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/27/2016 **Inspection Time:** 12:55 **Weather:** 35° sunny **Inspector:** Jei Chon

PPIN: 0205_123.01_5 **TOWNSHIP** Carlstadt **Block Number:** 123.01 **Lot Number** 5

Property Owner's Information:

NAME: GRAND BK CORP/H MART CO.

MAILING ADDRESS: 300 CHUBB AVE

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope: YES

2. If "Yes", identity of waterfront Structure with physical descript

REVETMENT	Revetement in poor condition. Tide gate or dam appear to be in good condition
OTHERS	

3. Is the waterfront structure existed prior to 1978? NO

4. Is there a record of existing waterfront structure permits? YES

If "Yes", permit description: Discharge of Stormwater, Air Contaminants / Failed to Prepare SPPP

5. Waterfront structure condition rating

3-POOR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 4' 29.106" W **EASTING** 40° 49' 58.216" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_123.01_5 **Township:** Carlstadt **Block Number:** 123.01 **Lot Number:** 5

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/27/2016 **Inspection Time:** 1:12 **Weather:** **Inspector:**

PPIN: 0205_123.01_9 **TOWNSHIP** **Block Number:** 123.01 **Lot Number** 9

Property Owner's Information:

NAME: STATE OF NEW JERSEY

MAILING ADDRESS: 1035 PARKWAY AVE

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope YES

2. If "Yes", identity of waterfront Structure with physical descript

OTHERS

Pile walkway bridge for cell tower

3. Is the waterfront structure existed prior to 1978?

4. Is there a record of existing waterfront structure permits?

If "Yes", permit description

5. Waterfront structure condition rating

4-FAIR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 4' 29.885" W **EASTING** 40° 49' 41.358" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_123.01_9 **Township:** **Block Number:** 123.01 **Lot Number:** 9

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/27/2016 **Inspection Time:** 1:20 **Weather:** 35° sunny **Inspector:** Jei Chon

PPIN: 0205_123.01_10 **TOWNSHIP** Carlstadt **Block Number:** 123.01 **Lot Number** 10

Property Owner's Information:

NAME: TERRENCO DELL LLC

MAILING ADDRESS: 101 MONTGOMERY ST.STE 200

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope: YES

2. If "Yes", identity of waterfront Structure with physical descript

REVETMENT	Revitment and chain link fence in poor condition. Tide gate outfalls in poor condition, concrete bulkhead in poor condition
BULKHEADS	
OTHERS	

3. Is the waterfront structure existed prior to 1978? UNKNOWN

4. Is there a record of existing waterfront structure permits? NO

If "Yes", permit description

5. Waterfront structure condition rating: 3-POOR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 4' 20.391" W **EASTING** 40° 49' 36.994" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_123.01_10 **Township:** Carlstadt **Block Number:** 123.01 **Lot Number:** 10

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1

TERM CONTRACT TC-001

DPM PROJECT P 1131-00

Date: | **Inspection Time:** 1:05pm | **Weather:** 35° sunny | **Inspector:** Jei Chon

PPIN: 0205_123_19 **TOWNSHIP** Carlstadt **Block Number:** 123 **Lot Number** 19

Property Owner's Information:

NAME: 150 GRAND ST HOLDING LTD

MAILING ADDRESS: 13229 33RD AVE, NY

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope

2. If "Yes", identity of waterfront Structure with physical descript

REVETMENT	parking lot revetment

3. Is the waterfront structure existed prior to 1978? NO

4. Is there a record of existing waterfront structure permits? YES

If "Yes", permit description: Remedial Action Permit (2015)

5. Waterfront structure condition rating

4-FAIR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted

5 - Satisfactory: Limited minor to moderate defects or deterioration

4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser

3 - Poor: Advanced deterioration observed on widespread portion of the structure

2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc

1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 4' 28.050" W **EASTING** 40° 50' 5.907" N

Photograph 1:

Photograph 2:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_123_19 **Township:** Carlstadt **Block Number:** 123 **Lot Number:** 19

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1

TERM CONTRACT TC-001

DPM PROJECT P 1131-00

Date: | **Inspection Time:** | **Weather:** | **Inspector:**

PPIN: 0205_131_8 **TOWNSHIP** | **Block Number:** 131 **Lot Number** 8

Property Owner's Information:

NAME: MEADOWLANDS CONSERV TRUST

MAILING ADDRESS: 1 DEKORTE PLAZA, LYNDHURST

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope

2. If "Yes", identity of waterfront Structure with physical descript

3. Is the waterfront structure existed prior to 1978?

4. Is there a record of existing waterfront structure permits? YES

If "Yes", permit description: Flood Hazard Area, Mitigation Permit, Tidelands Grant, Tidelands License, Waterfront Development

5. Waterfront structure condition rating

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted

5 - Satisfactory: Limited minor to moderate defects or deterioration

4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser

3 - Poor: Advanced deterioration observed on widespread portion of the structure

2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc

1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 2' 37.887" W **EASTING** 40° 49' 18.444" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_131_8 **Township:** **Block Number:** 131 **Lot Number:** 8

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/25/2016 **Inspection Time:** 11:08am **Weather:** 50° windy and cloudy **Inspector:** Jei Chon

PPIN: 0205_131_9.01 **TOWNSHIP** Carlstadt **Block Number:** 131 **Lot Number** 9.01

Property Owner's Information:

NAME: RUSSO/INDUSTRY CONSULTIN GROUP

MAILING ADDRESS: P.O. BOX 810490

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope

2. If "Yes", identity of waterfront Structure with physical descript

Can't access due to testle on 0205_131_8

3. Is the waterfront structure existed prior to 1978? UNKNOWN

4. Is there a record of existing waterfront structure permits?

If "Yes", permit description

5. Waterfront structure condition rating

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 2' 37.520" W **EASTING** 40° 49' 37.255" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_131_9.01 **Township:** Carlstadt **Block Number:** 131 **Lot Number:** 9.01

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: | **Inspection Time:** Jei Chon | **Weather:** 50° windy and cloudy | **Inspector:** Jei Chon

PPIN: 0205_131_10 **TOWNSHIP** Little Ferry **Block Number:** 131 **Lot Number** 10

Property Owner's Information:

NAME: MEADOWLANDS CONSERV TRUST

MAILING ADDRESS: 1 DEKORTE PLAZA, LYNDHURST

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope YES

2. If "Yes", identity of waterfront Structure with physical descript

REVETMENT

Dike, Revetment, Fabric flood wall.

3. Is the waterfront structure existed prior to 1978? YES

4. Is there a record of existing waterfront structure permits? YES

If "Yes", permit description Flood Hazard Area, Mitigation Permit, Tidelands Grant, Tidelands License, Waterfront Development

5. Waterfront structure condition rating

4-FAIR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 2' 16.551" W **EASTING** 40° 49' 31.795" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_131_10 **Township:** Little Ferry **Block Number:** 131 **Lot Number:** 10

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: | **Inspection Time:** 11:00am | **Weather:** 50° windy and cloudy | **Inspector:** Jei Chon

PPIN: 0205_131_11 **TOWNSHIP** Carlstadt **Block Number:** 131 **Lot Number** 11

Property Owner's Information:

NAME: MEADOWLANDS CONSERV TRUST

MAILING ADDRESS: HACKENSACK RIVER

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope YES

2. If "Yes", identity of waterfront Structure with physical descript

REVETMENT

Dike, Revetment, Fabric flood wall.

3. Is the waterfront structure existed prior to 1978? YES

4. Is there a record of existing waterfront structure permits? YES

If "Yes", permit description Flood Hazard Area, Mitigation Permit, Tidelands Grant, Tidelands License, Waterfront Development

5. Waterfront structure condition rating

4-FAIR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 2' 11.887" W **EASTING** 40° 49' 27.097" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_131_11 **Township:** Carlstadt **Block Number:** 131 **Lot Number:** 11

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/22/2016 **Inspection Time:** 2:27pm **Weather:** Sunny about 50° sligh **Inspector:** Jei Chon

PPIN: 0205_136_7 **TOWNSHIP** Carlstadt **Block Number:** 136 **Lot Number** 7

Property Owner's Information:

NAME: MEADOWLANDS CONSERV TRUST

MAILING ADDRESS: 1 DEKORTE PK PLAZA, LYNDHURST

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope YES

2. If "Yes", identity of waterfront Structure with physical descript

FLOATING DOCK
PIERS

Public park with a boat ramp, marina/floating dock.

3. Is the waterfront structure existed prior to 1978? YES

4. Is there a record of existing waterfront structure permits? YES

If "Yes", permit description Tidelands License, Waterfront Development, CAFRA

5. Waterfront structure condition rating

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 3' 22.052" W **EASTING** 40° 48' 29.316" N

Photograph 1:



Photograph 2:

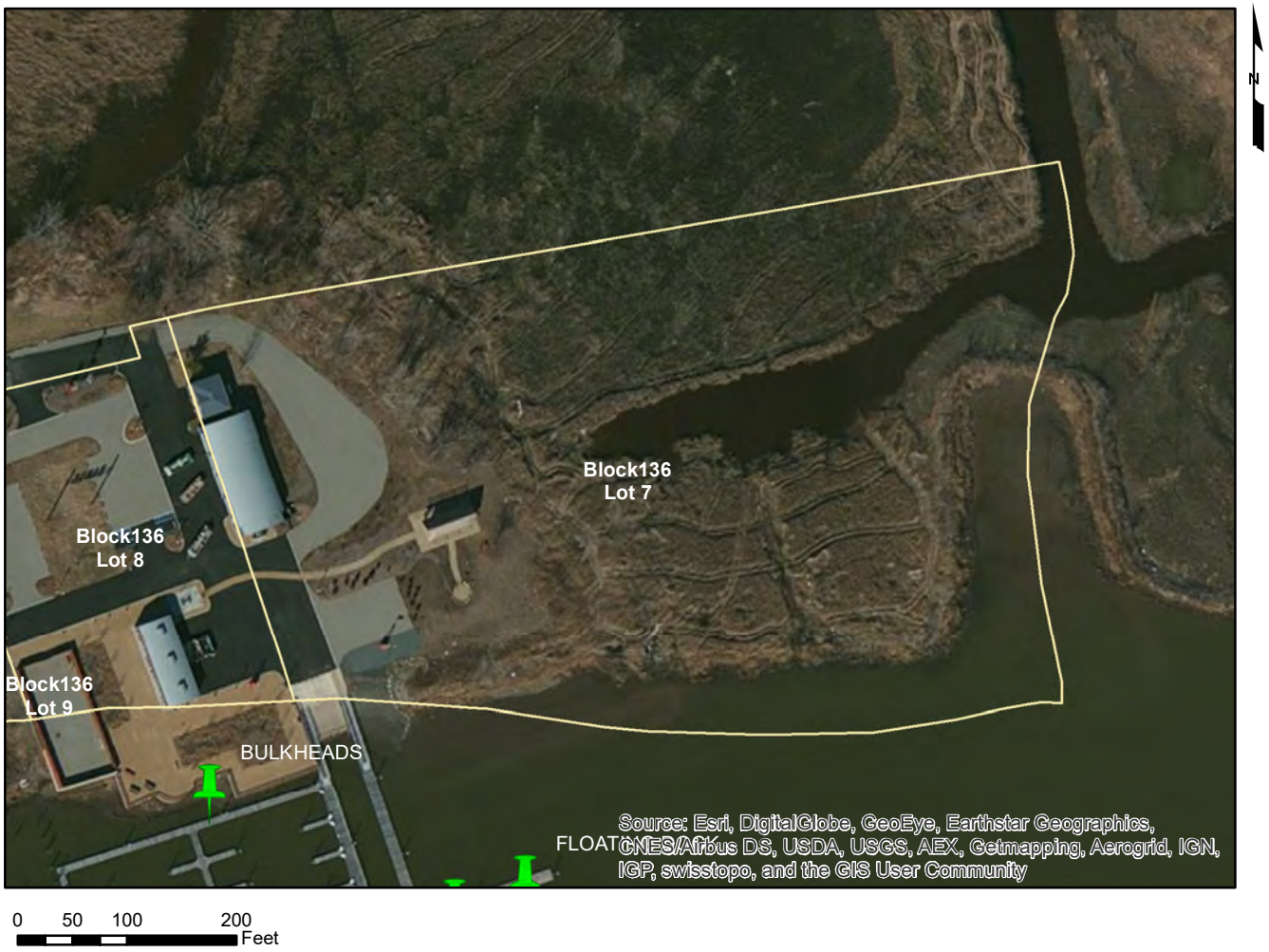


NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_136_7 **Township:** Carlstadt **Block Number:** 136 **Lot Number:** 7

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/22/2016 **Inspection Time:** 2:11pm **Weather:** Sunny about 50° sligh **Inspector:** Jei Chon

PPIN: 0205_136_8 **TOWNSHIP** Carlstadt **Block Number:** 136 **Lot Number** 8

Property Owner's Information:

NAME: NJ MEADOWLANDS COMMISSION

MAILING ADDRESS: 1 DEKORTE PK PLAZA, LYNDHURST

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope YES

2. If "Yes", identity of waterfront Structure with physical descript

BULKHEADS
PIERS
FLOATING DOCK

Public park with a boat ramp, marina/floating dock.

3. Is the waterfront structure existed prior to 1978? YES

4. Is there a record of existing waterfront structure permits? YES

If "Yes", permit description Tidelands License, Waterfront Development, CAFRA

5. Waterfront structure condition rating

5-SATISFACTORY

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 3' 28.643" W **EASTING** 40° 48' 28.704" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_136_8 **Township:** Carlstadt **Block Number:** 136 **Lot Number:** 8

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1

TERM CONTRACT TC-001

DPM PROJECT P 1131-00

Date: 2/27/2016 **Inspection Time:** 1:20PM **Weather:** Sunny, About 40 degr **Inspector:** Jei Chon

PPIN: 0205_136_9 **TOWNSHIP** Carlstadt **Block Number:** 136 **Lot Number** 9

Property Owner's Information:

NAME: NJ MEADOWLANDS COMMISSION

MAILING ADDRESS: 1 DEKORTE PK PLAZA, LYNDHURST

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope: YES

2. If "Yes", identity of waterfront Structure with physical descript

FLOATING DOCK	Private Marina with Dock and Boat Ramp/Appear to be fair condition
PIERS	
REVETMENT	

3. Is the waterfront structure existed prior to 1978? YES

4. Is there a record of existing waterfront structure permits? YES

If "Yes", permit description: Tidelands License, Waterfront Development, CAFRA

5. Waterfront structure condition rating

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted

5 - Satisfactory: Limited minor to moderate defects or deterioration

4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser

3 - Poor: Advanced deterioration observed on widespread portion of the structure

2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc

1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 3' 30.541" W **EASTING** 40° 48' 28.437" N

Photograph 1:

Photograph 2:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_136_9 **Township:** Carlstadt **Block Number:** 136 **Lot Number:** 9

GIS MAP:



0 40 80 160 Feet

Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/27/2016 **Inspection Time:** 1:20PM **Weather:** Sunny, About 40 degr **Inspector:** Jei Chon

PPIN: 0205_136_10 **TOWNSHIP** Carlstadt **Block Number:** 136 **Lot Number** 10

Property Owner's Information:

NAME: KRETZ,ET AL & MARTINS, GEORGE

MAILING ADDRESS: 19 SCHLOSSER DR

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope: YES

2. If "Yes", identity of waterfront Structure with physical descript

FLOATING DOCK
REVETMENT
FLOATING DOCK

Private Marina with Dock and Boat Ramp/Appear to be fair condition

3. Is the waterfront structure existed prior to 1978? YES

4. Is there a record of existing waterfront structure permits? YES

If "Yes", permit description: Tidelands License, Waterfront Development, CAFRA

5. Waterfront structure condition rating

4-FAIR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 3' 31.792" W **EASTING** 40° 48' 28.296" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_136_10 **Township:** Carlstadt **Block Number:** 136 **Lot Number:** 10

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/27/2016 **Inspection Time:** 1:20PM **Weather:** Sunny, about 40 degr **Inspector:** Jei Chon

PPIN: 0205_136_11 **TOWNSHIP** Carlstadt **Block Number:** 136 **Lot Number** 11

Property Owner's Information:

NAME: SNIPE BOAT CLUB

MAILING ADDRESS: OUTWATER LANE

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope YES

2. If "Yes", identity of waterfront Structure with physical descript

FLOATING DOCK
PIERS

Private Marina with Dock and Boat Ramp/Appear to be fair condition

3. Is the waterfront structure existed prior to 1978? YES

4. Is there a record of existing waterfront structure permits?

If "Yes", permit description

5. Waterfront structure condition rating

4-FAIR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 3' 33.067" W **EASTING** 40° 48' 28.148" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_136_11 **Township:** **Block Number:** 136 **Lot Number:** 11

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1

TERM CONTRACT TC-001

DPM PROJECT P 1131-00

Date: 2/27/2016 **Inspection Time:** 1:20PM **Weather:** Sunny About 40 Degr **Inspector:** Jei Chon

PPIN: 0205_136_12 **TOWNSHIP** Carlstadt **Block Number:** 136 **Lot Number** 12

Property Owner's Information:

NAME: NJ MEADOWLANDS COMMISSION

MAILING ADDRESS: 1 DEKORTE PK PLAZA, LYNDHURST

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope YES

2. If "Yes", identity of waterfront Structure with physical descript

PIERS

FLOATING DOCK

Private Marina with Dock and Boat Ramp/Appear to be fair condition

3. Is the waterfront structure existed prior to 1978? YES

4. Is there a record of existing waterfront structure permits?

If "Yes", permit description

5. Waterfront structure condition rating

4-FAIR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted

5 - Satisfactory: Limited minor to moderate defects or deterioration

4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser

3 - Poor: Advanced deterioration observed on widespread portion of the structure

2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc

1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 3' 33.680" W **EASTING** 40° 48' 28.048" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_136_12 **Township:** Carlstadt **Block Number:** 136 **Lot Number:** 12

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/27/2016 **Inspection Time:** 1:20PM **Weather:** Sunny about 40 degre **Inspector:** Jei Chon

PPIN: 0205_136_13 **TOWNSHIP** Carlstadt **Block Number:** 136 **Lot Number** 13

Property Owner's Information:

NAME: MAJESTIC BOAT CLUB/TOM BERTOLINI

MAILING ADDRESS: 444 SECOND ST

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope YES

2. If "Yes", identity of waterfront Structure with physical descript

FLOATING DOCK
PIERS

Private Marina with Dock and Boat Ramp/Appear to be fair condition

3. Is the waterfront structure existed prior to 1978? YES

4. Is there a record of existing waterfront structure permits?

If "Yes", permit description

5. Waterfront structure condition rating

4-FAIR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 3' 34.331" W **EASTING** 40° 48' 27.976" N

Photograph 1:



Photograph 2:

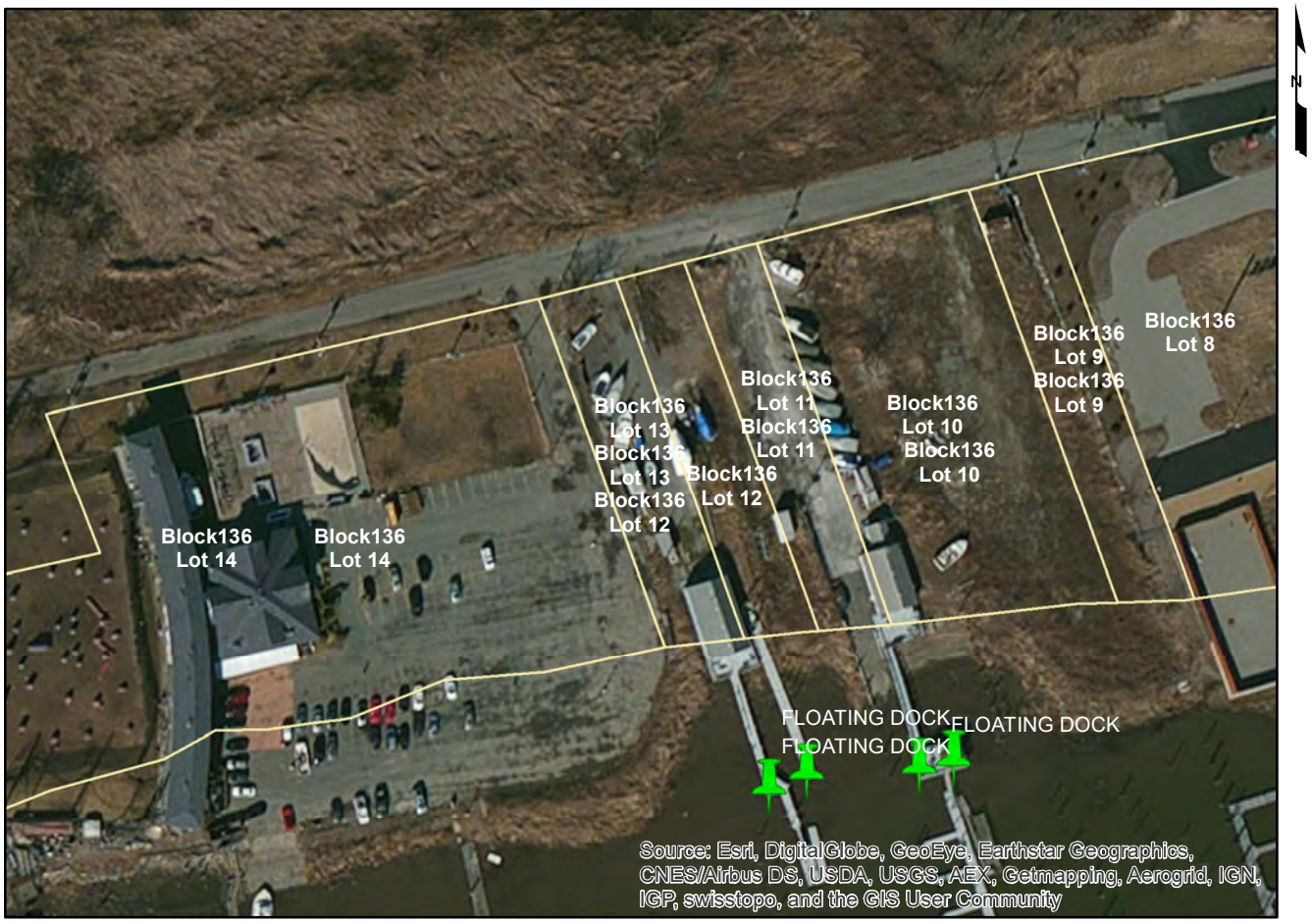


NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_136_13 **Township:** **Block Number:** 136 **Lot Number:** 13

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/27/2016 **Inspection Time:** 1:22PM **Weather:** 34 Degree, Sunny **Inspector:** Jei Chon

PPIN: 0205_136_14 **TOWNSHIP** Carlstadt **Block Number:** 136 **Lot Number** 14

Property Owner's Information:

NAME: TOMU/DEVLPMT C/O MURPHY

MAILING ADDRESS: 24 DOCKSIDE LN # 39

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope: YES

2. If "Yes", identity of waterfront Structure with physical descript

PIERS	Dock is Missing, Piers in poor condition.
REVETMENT	

3. Is the waterfront structure existed prior to 1978? YES

4. Is there a record of existing waterfront structure permits? YES

If "Yes", permit description: Tideland License

5. Waterfront structure condition rating: 2-SERIOUS

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 3' 37.406" W **EASTING** 40° 48' 27.363" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_136_14 **Township:** **Block Number:** 136 **Lot Number:** 14

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/25/2016 **Inspection Time:** 9am **Weather:** 50° cloudy **Inspector:** Jei Chon

PPIN: 0205_137_1 **TOWNSHIP** Carlstadt **Block Number:** 137 **Lot Number** 1

Property Owner's Information:

NAME: TRANS-CON PIPE LINE/MD 46-4

MAILING ADDRESS: P.O.BOX 2400

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope: YES

2. If "Yes", identity of waterfront Structure with physical descript

BULKHEADS
OTHERS

Metro Road crossing bridge with high water elevation, only observed bulkhead of the bridge crossing.

3. Is the waterfront structure existed prior to 1978? UNKNOWN

4. Is there a record of existing waterfront structure permits? YES

If "Yes", permit description: TIDE GATES

5. Waterfront structure condition rating

4-FAIR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 3' 33.732" W **EASTING** 40° 48' 38.020" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_137_1 **Township:** Carlstadt **Block Number:** 137 **Lot Number:** 1

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1

TERM CONTRACT TC-001

DPM PROJECT P 1131-00

Date: 2/25/2016 **Inspection Time:** 9:40am **Weather:** 50° cloudy **Inspector:** Jei Chon

PPIN: 0205_137_10 **TOWNSHIP** Carlstadt **Block Number:** 137 **Lot Number** 10

Property Owner's Information:

NAME:

MAILING ADDRESS:

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope NO

2. If "Yes", identity of waterfront Structure with physical descript

OTHERS

Metro Road crossing bridge. Timber bridge structure with metal guide rails and pipe crossing. With high water elevation, only able to inspect top of the bridge.

3. Is the waterfront structure existed prior to 1978?

4. Is there a record of existing waterfront structure permits?

If "Yes", permit description

5. Waterfront structure condition rating

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted

5 - Satisfactory: Limited minor to moderate defects or deterioration

4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser

3 - Poor: Advanced deterioration observed on widespread portion of the structure

2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc

1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 3' 3.517" W **EASTING** 40° 48' 50.154" N

Photograph 1:



Photograph 2:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_137_10 **Township:** Carlstadt **Block Number:** 137 **Lot Number:** 10

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1

TERM CONTRACT TC-001

DPM PROJECT P 1131-00

Date: 2/25/2016 **Inspection Time:** 10:03am **Weather:** 50° cloudy **Inspector:** Jei Chon

PPIN: 0205_137_12 **TOWNSHIP** Carlstadt **Block Number:** 137 **Lot Number** 12

Property Owner's Information:

NAME:

MAILING ADDRESS:

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope YES

2. If "Yes", identity of waterfront Structure with physical descript

REVETMENT

Appear to be revetment with chain link fence. Not able to see the revetment with grown vegetation

3. Is the waterfront structure existed prior to 1978? YES

4. Is there a record of existing waterfront structure permits?

If "Yes", permit description

5. Waterfront structure condition rating

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted

5 - Satisfactory: Limited minor to moderate defects or deterioration

4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser

3 - Poor: Advanced deterioration observed on widespread portion of the structure

2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc

1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 2' 55.070" W **EASTING** 40° 48' 50.845" N

Photograph 1:

Photograph 2:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_137_12 **Township:** Carlstadt **Block Number:** 137 **Lot Number:** 12

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1

TERM CONTRACT TC-001

DPM PROJECT P 1131-00

Date: 2/25/2016 **Inspection Time:** 9:15am **Weather:** 50° cloudy **Inspector:** Jei Chon

PPIN: 0205_137_15 **TOWNSHIP** Carlstadt **Block Number:** 137 **Lot Number** 15

Property Owner's Information:

NAME:

MAILING ADDRESS:

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope YES

2. If "Yes", identity of waterfront Structure with physical descript

REVETMENT

BULKHEADS

Revetment with chain link fence/ northern section may have concrete wall or bulkhead

3. Is the waterfront structure existed prior to 1978? NO

4. Is there a record of existing waterfront structure permits?

If "Yes", permit description

5. Waterfront structure condition rating

5-SATISFACTORY

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted

5 - Satisfactory: Limited minor to moderate defects or deterioration

4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser

3 - Poor: Advanced deterioration observed on widespread portion of the structure

2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc

1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 3' 1.189" W **EASTING** 40° 48' 40.690" N

Photograph 1:



Photograph 2:



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NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1

TERM CONTRACT TC-001

DPM PROJECT P 1131-00

Date: 2/25/2016 **Inspection Time:** 10:03am **Weather:** 50° cloudy **Inspector:** Jei chon

PPIN: 0205_137_20 **TOWNSHIP** Carlstadt **Block Number:** 137 **Lot Number** 20

Property Owner's Information:

NAME:

MAILING ADDRESS:

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope YES

2. If "Yes", identity of waterfront Structure with physical descript

REVETMENT	Appear to be revetment with chain link fence. Not able to see the revetment with grown vegetation

3. Is the waterfront structure existed prior to 1978?

4. Is there a record of existing waterfront structure permits?

If "Yes", permit description

5. Waterfront structure condition rating

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted

5 - Satisfactory: Limited minor to moderate defects or deterioration

4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser

3 - Poor: Advanced deterioration observed on widespread portion of the structure

2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc

1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 2' 44.664" W **EASTING** 40° 48' 52.621" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_137_20 **Township:** Carlstadt **Block Number:** 137 **Lot Number:** 20

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1

TERM CONTRACT TC-001

DPM PROJECT P 1131-00

Date: 2/25/2016 **Inspection Time:** 10:10am **Weather:** 50° cloudy **Inspector:** Jei Chon

PPIN: 0205_137_22 **TOWNSHIP** Little Ferry **Block Number:** 137 **Lot Number** 22

Property Owner's Information:

NAME: (TRANS-CON PIPE LINE M&R STATION 0240)

MAILING ADDRESS: (718 PATERSON PLANK RD)

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope YES

2. If "Yes", identity of waterfront Structure with physical descript

REVETMENT	Road Way, Revetment

3. Is the waterfront structure existed prior to 1978? YES

4. Is there a record of existing waterfront structure permits? YES

If "Yes", permit description Discharge of Stormwater, Discharge to Surface Water, Treatment Works Approval, Mitigation, Waterfron

5. Waterfront structure condition rating

4-FAIR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted

5 - Satisfactory: Limited minor to moderate defects or deterioration

4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser

3 - Poor: Advanced deterioration observed on widespread portion of the structure

2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc

1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 2' 28.210" W **EASTING** 40° 48' 47.348" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_137_22 **Township:** Little Ferry **Block Number:** 137 **Lot Number:** 22

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1

TERM CONTRACT TC-001

DPM PROJECT P 1131-00

Date: | **Inspection Time:** 10:10am | **Weather:** 50° cloudy | **Inspector:** Jei chon

PPIN: 0205_137_23 **TOWNSHIP** Little Ferry **Block Number:** 137 **Lot Number** 23

Property Owner's Information:

NAME: (TRANS-CON PIPE LINE M&R STATION 0240)

MAILING ADDRESS: (718 PATERSON PLANK RD)

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope YES

2. If "Yes", identity of waterfront Structure with physical descript

REVETMENT	Road Way, Revetment

3. Is the waterfront structure existed prior to 1978? YES

4. Is there a record of existing waterfront structure permits? YES

If "Yes", permit description: Discharge of Stormwater, Discharge to Surface Water, Treatment Works Approval, Mitigation, Waterfron

5. Waterfront structure condition rating

4-FAIR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted

5 - Satisfactory: Limited minor to moderate defects or deterioration

4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser

3 - Poor: Advanced deterioration observed on widespread portion of the structure

2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc

1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 2' 34.714" W **EASTING** 40° 48' 54.506" N

Photograph 1:



Photograph 2:

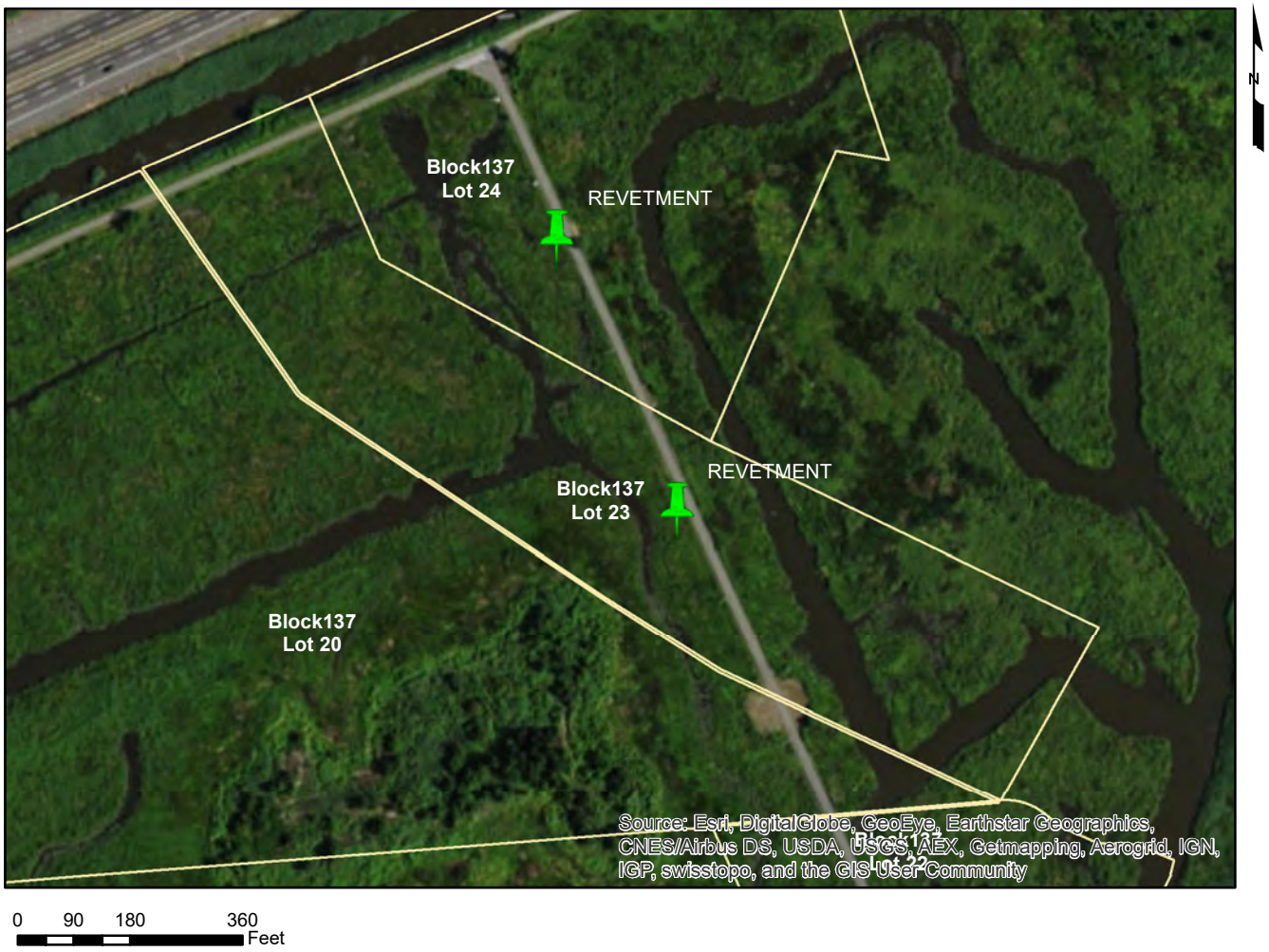


NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_137_23 **Township:** Little Ferry **Block Number:** 137 **Lot Number:** 23

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1

TERM CONTRACT TC-001

DPM PROJECT P 1131-00

Date: | **Inspection Time:** 10:15am | **Weather:** 50° cloudy | **Inspector:** Jei chon

PPIN: 0205_137_24 **TOWNSHIP** Little Ferry **Block Number:** 137 **Lot Number** 24

Property Owner's Information:

NAME: (TRANS-CON PIPE LINE M&R STATION 0240)

MAILING ADDRESS: (718 PATERSON PLANK RD)

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope YES

2. If "Yes", identity of waterfront Structure with physical descript

REVETMENT	Road Way, Revetment

3. Is the waterfront structure existed prior to 1978? YES

4. Is there a record of existing waterfront structure permits? YES

If "Yes", permit description: Discharge of Stormwater, Discharge to Surface Water, Treatment Works Approval, Mitigation, Waterfron

5. Waterfront structure condition rating

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted

5 - Satisfactory: Limited minor to moderate defects or deterioration

4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser

3 - Poor: Advanced deterioration observed on widespread portion of the structure

2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc

1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 2' 34.871" W **EASTING** 40° 48' 59.464" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_137_24 **Township:** Little Ferry **Block Number:** 137 **Lot Number:** 24

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/25/2016 **Inspection Time:** 10:30am **Weather:** 50 windy cloudy **Inspector:** Jei Chon

PPIN: 0205_138_2 **TOWNSHIP** Carlstadt **Block Number:** 138 **Lot Number** 2

Property Owner's Information:

NAME: NJ MEADOWLANDS COMMISSION

MAILING ADDRESS: 1 DEKORTE PK PLAZA, LYNDHURST

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope: YES

2. If "Yes", identity of waterfront Structure with physical descript

REVETMENT	Appear to be revetment with chain link fence. Not able to see the revetment with grown vegetation

3. Is the waterfront structure existed prior to 1978? UNKNOWN

4. Is there a record of existing waterfront structure permits?

If "Yes", permit description

5. Waterfront structure condition rating

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

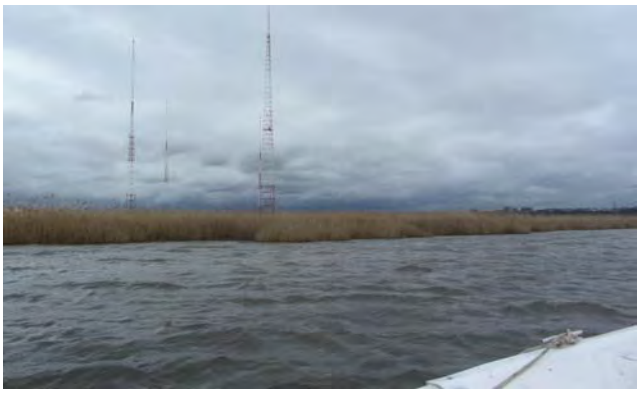
6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 2' 29.443" W **EASTING** 40° 48' 36.817" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0205_138_2 **Township:** Carlstadt **Block Number:** 138 **Lot Number:** 2

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/27/2016 **Inspection Time:** 9:49 **Weather:** 35° sunny **Inspector:** Jei Chon

PPIN: 0230_25_2 **TOWNSHIP** Little Ferry **Block Number:** 25 **Lot Number** 2

Property Owner's Information:

NAME: 110 BERGEN TPKE LLC, SUNG HO CHOI

MAILING ADDRESS: 110 BERGEN TPKE LLC, SUNG HO CHOI

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope: YES

2. If "Yes", identity of waterfront Structure with physical descript

REVETMENT	Revetment in poor condition. Sign of erosion

3. Is the waterfront structure existed prior to 1978? NO

4. Is there a record of existing waterfront structure permits? NO

If "Yes", permit description: failed to submit community right to know survey for facility in 2004

5. Waterfront structure condition rating

3-POOR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 1' 55.783" W **EASTING** 40° 51' 6.028" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0230_5.01_1.02 **Township:** Little Ferry **Block Number:** 5.01 **Lot Number:** 1.02

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/27/2016 **Inspection Time:** 9:59 **Weather:** 35° sunny **Inspector:** Jei Chon

PPIN: 0230_5.01_4 **TOWNSHIP** Little Ferry **Block Number:** 5.01 **Lot Number** 4

Property Owner's Information:

NAME: WATERSIDE PLAZA APTS. ASSOCIATES

MAILING ADDRESS: 820 MORRIS TURNPIKE, SUITE 301

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope: YES

2. If "Yes", identity of waterfront Structure with physical descript

REVETMENT	Revetments with fence. Dumped soils without erosion control

3. Is the waterfront structure existed prior to 1978? YES

4. Is there a record of existing waterfront structure permits? NO

If "Yes", permit description: N/A

5. Waterfront structure condition rating

3-POOR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 1' 50.615" W **EASTING** 40° 51' 13.475" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0230_5.01_4 **Township:** Little Ferry **Block Number:** 5.01 **Lot Number:** 4

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/27/2016 **Inspection Time:** 9:56 **Weather:** 35° sunny **Inspector:** Jei Chon

PPIN: 0230_5.01_8 **TOWNSHIP** Little Ferry **Block Number:** 5.01 **Lot Number** 8

Property Owner's Information:

NAME: THE GENERAL'S GROUP, LLC

MAILING ADDRESS: 67 LEUNING ST

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope: YES

2. If "Yes", identity of waterfront Structure with physical descript

REVETMENT	Revetments. Filled ground with fence. Fair con. Deck post serious con

3. Is the waterfront structure existed prior to 1978? UNKNOWN

4. Is there a record of existing waterfront structure permits? YES

If "Yes", permit description: FWGP11, FWGP17, FWGPEXT, FWTW4I, IP Upland (Waterfront Development), Tidelands License

5. Waterfront structure condition rating

4-FAIR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 1' 52.381" W **EASTING** 40° 51' 8.964" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0230_5.01_8 **Township:** Little Ferry **Block Number:** 5.01 **Lot Number:** 8

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/27/2016 **Inspection Time:** 9:55 **Weather:** 35° sunny **Inspector:** Jei Chon

PPIN: 0230_5.01_9 **TOWNSHIP** Little Ferry **Block Number:** 5.01 **Lot Number** 9

Property Owner's Information:

NAME:

MAILING ADDRESS:

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope: NO

2. If "Yes", identity of waterfront Structure with physical descript

REVETMENT	appear to be revetment with vegetation

3. Is the waterfront structure existed prior to 1978?

4. Is there a record of existing waterfront structure permits? YES

If "Yes", permit description: FWGP11, FWGP17, FWGPEXT, FWTW4I, IP Upland (Waterfront Development), Tidelands License

5. Waterfront structure condition rating

4-FAIR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 1' 50.901" W **EASTING** 40° 51' 7.477" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0230_5.01_9 **Township:** Little Ferry **Block Number:** 5.01 **Lot Number:** 9

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/27/2016 **Inspection Time:** 9:54 **Weather:** 35° sunny **Inspector:** Jei Chon

PPIN: 0230_5.01_10 **TOWNSHIP** Little Ferry **Block Number:** 5.01 **Lot Number** 10

Property Owner's Information:

NAME:

MAILING ADDRESS:

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope: NO

2. If "Yes", identity of waterfront Structure with physical descript

REVETMENT	appear to be revetment with grown vegetation

3. Is the waterfront structure existed prior to 1978? NO

4. Is there a record of existing waterfront structure permits? YES

If "Yes", permit description: FWGP11, FWGP17, FWGPEXT, FWTW4I, IP Upland (Waterfront Development), Tidelands License

5. Waterfront structure condition rating: 4-FAIR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 1' 49.240" W **EASTING** 40° 51' 6.084" N

Photograph 1:



Photograph 2:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0230_5.01_10 **Township:** Little Ferry **Block Number:** 5.01 **Lot Number:** 10

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/27/2016 **Inspection Time:** 9:49 **Weather:** 35° sunny **Inspector:** Jei Chon

PPIN: 0230_25_2 **TOWNSHIP** Little Ferry **Block Number:** 25 **Lot Number** 2

Property Owner's Information:

NAME: 110 BERGEN TPKE LLC, SUNG HO CHOI

MAILING ADDRESS: 110 BERGEN TPKE LLC, SUNG HO CHOI

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope: YES

2. If "Yes", identity of waterfront Structure with physical descript

REVETMENT	Revetment in poor condition. Sign of erosion

3. Is the waterfront structure existed prior to 1978? NO

4. Is there a record of existing waterfront structure permits? NO

If "Yes", permit description: failed to submit community right to know survey for facility in 2004

5. Waterfront structure condition rating

3-POOR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 1' 55.783" W **EASTING** 40° 51' 6.028" N

Photograph 1:



Photograph 2:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0230_25_2 **Township:** Little Ferry **Block Number:** 25 **Lot Number:** 2

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/27/2016 **Inspection Time:** 9:45 **Weather:** 35° sunny **Inspector:** Jei Chon

PPIN: 0230_25_5.01 **TOWNSHIP** Little Ferry **Block Number:** 25 **Lot Number** 5.01

Property Owner's Information:

NAME: GATES REALTY CORP

MAILING ADDRESS: 211 GATES ROAD UNIT A

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope: YES

2. If "Yes", identity of waterfront Structure with physical descript

REVETMENT	Revetments with chain link fence

3. Is the waterfront structure existed prior to 1978? NO

4. Is there a record of existing waterfront structure permits? NO

If "Yes", permit description: N/A

5. Waterfront structure condition rating

5-SATISFACTORY

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 1' 51.553" W **EASTING** 40° 51' 1.178" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0230_25_5.01 **Township:** Little Ferry **Block Number:** 25 **Lot Number:** 5.01

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/27/2016 **Inspection Time:** 9:39 **Weather:** 35° sunny **Inspector:** Jei Chon

PPIN: 0230_25_8.01 **TOWNSHIP** Litle Ferry **Block Number:** 25 **Lot Number** 8.01

Property Owner's Information:

NAME:

MAILING ADDRESS:

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope YES

2. If "Yes", identity of waterfront Structure with physical descript

BULKHEADS
REVETMENT
FLOATING DOCK
OTHERS

Revetment in fair condition. Floating dock is in poor condition. Timber pier supporting a building is in poor conditiion. Pump station discharge pipes. Boat ramp in serious condition.

3. Is the waterfront structure existed prior to 1978? YES

4. Is there a record of existing waterfront structure permits? YES

If "Yes", permit description Tideland License

5. Waterfront structure condition rating

3-POOR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 1' 52.151" W **EASTING** 40° 50' 57.462" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0230_25_8.01 **Township:** Litle Ferry **Block Number:** 25 **Lot Number:** 8.01

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/27/2016 **Inspection Time:** 9:33 **Weather:** 35° sunny **Inspector:** Jei Chon

PPIN: 0230_45_8 **TOWNSHIP** Little Ferry **Block Number:** 45 **Lot Number** 8

Property Owner's Information:

NAME: TILCON MINERALS,INC.

MAILING ADDRESS: 625 MOUNT HOPE RD

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope: YES

2. If "Yes", identity of waterfront Structure with physical descript

BULKHEADS	Steel bulkhead

3. Is the waterfront structure existed prior to 1978? NO

4. Is there a record of existing waterfront structure permits? YES

If "Yes", permit description: Remedial Action Permit (2015), Discharge of Stormwater (2013), Air Contaminants Permit

5. Waterfront structure condition rating: 3-POOR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

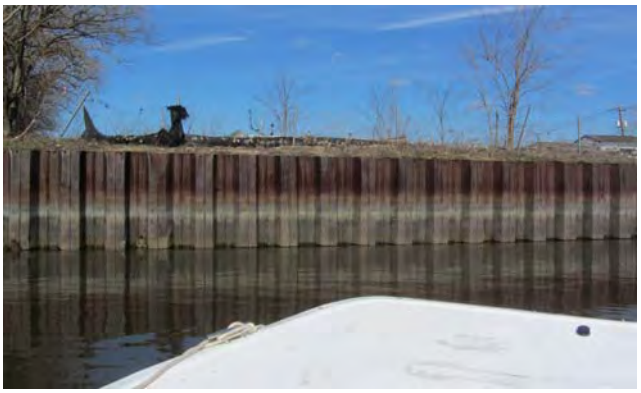
6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 1' 54.742" W **EASTING** 40° 50' 55.224" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0230_45_8 **Township:** Little Ferry **Block Number:** 45 **Lot Number:** 8

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/27/2016 **Inspection Time:** 9:30 **Weather:** 35° sunny **Inspector:** Jei Chon

PPIN: 0230_45_11 **TOWNSHIP** Little Ferry **Block Number:** 45 **Lot Number** 11

Property Owner's Information:

NAME: SWAGGER FAMILY LP II

MAILING ADDRESS: 10 HILLDALE RD

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope YES

2. If "Yes", identity of waterfront Structure with physical descript

BULKHEADS
FLOATING DOCK

Timber Bulkhead is in poor condition. Floating dock in poor condition. Floating dock is supporting a trailor.

3. Is the waterfront structure existed prior to 1978? NO

4. Is there a record of existing waterfront structure permits? NO

If "Yes", permit description N/A

5. Waterfront structure condition rating

2-SERIOUS

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 1' 55.219" W **EASTING** 40° 50' 53.742" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0230_45_11 **Township:** Little Ferry **Block Number:** 45 **Lot Number:** 11

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/27/2016 **Inspection Time:** 9:26am **Weather:** 33° Sunny **Inspector:** Jei Chon

PPIN: 0230_45_13 **TOWNSHIP** Little Ferry **Block Number:** 45 **Lot Number** 13

Property Owner's Information:

NAME: SWAGGER FAMILY LP II

MAILING ADDRESS: 10 HILLDALE RD

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope YES

2. If "Yes", identity of waterfront Structure with physical descript

BULKHEADS	Timber bulkhead in serious condition. Floating dock in critical condition.
PIERS	
FLOATING DOCK	

3. Is the waterfront structure existed prior to 1978? NO

4. Is there a record of existing waterfront structure permits? NO

If "Yes", permit description N/A

5. Waterfront structure condition rating

1-CRITICAL

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 1' 55.082" W **EASTING** 40° 50' 52.908" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0230_45_13 **Township:** Little Ferry **Block Number:** 45 **Lot Number:** 13

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: | **Inspection Time:** 9:26am | **Weather:** 33° Sunny | **Inspector:** Jei Chon

PPIN: 0230_45_14 **TOWNSHIP** Little Ferry **Block Number:** 45 **Lot Number** 14

Property Owner's Information:

NAME:

MAILING ADDRESS:

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope YES

2. If "Yes", identity of waterfront Structure with physical descript

BULKHEADS	Timber bulkhead in serious condition. Floating dock in critical condition.

3. Is the waterfront structure existed prior to 1978? NO

4. Is there a record of existing waterfront structure permits? NO

If "Yes", permit description

5. Waterfront structure condition rating

2-SERIOUS

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 1' 55.148" W **EASTING** 40° 50' 52.307" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0230_45_14 **Township:** Little Ferry **Block Number:** 45 **Lot Number:** 14

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/25/2016 **Inspection Time:** 1:11pm **Weather:** 50° windy and cloudy **Inspector:** Jei Chon

PPIN: 0230_45_15.02 **TOWNSHIP** Little Ferry **Block Number:** 45 **Lot Number** 15.02

Property Owner's Information:

NAME: OCEAN ED. INST. FOR WORLD PEACE

MAILING ADDRESS: 20 RIVERSIDE AVE

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope: YES

2. If "Yes", identity of waterfront Structure with physical descript

BULKHEADS	Timber bulkhead in serious condition.

3. Is the waterfront structure existed prior to 1978? UNKNOWN

4. Is there a record of existing waterfront structure permits?

If "Yes", permit description

5. Waterfront structure condition rating: 2-SERIOUS

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 1' 55.933" W **EASTING** 40° 50' 51.317" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0230_45_15.02 **Township:** Little Ferry **Block Number:** 45 **Lot Number:** 15.02

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/25/2016 **Inspection Time:** 1:09 pm **Weather:** **Inspector:**

PPIN: 0230_45_16 **TOWNSHIP** Little Ferry **Block Number:** 45 **Lot Number** 16

Property Owner's Information:

NAME: OCEAN ED. INST. FOR WORLD PEACE

MAILING ADDRESS: 20 RIVERSIDE AVE

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope YES

2. If "Yes", identity of waterfront Structure with physical descript

BULKHEADS
REVETMENT
PIERS

Timber bulkhead in serious condition. Revetment in poor condition. Timber pier and metal dock in fair condition.

3. Is the waterfront structure existed prior to 1978? UNKNOWN

4. Is there a record of existing waterfront structure permits?

If "Yes", permit description N/A

5. Waterfront structure condition rating

2-SERIOUS

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 1' 55.840" W **EASTING** 40° 50' 50.619" N

Photograph 1:



Photograph 2:

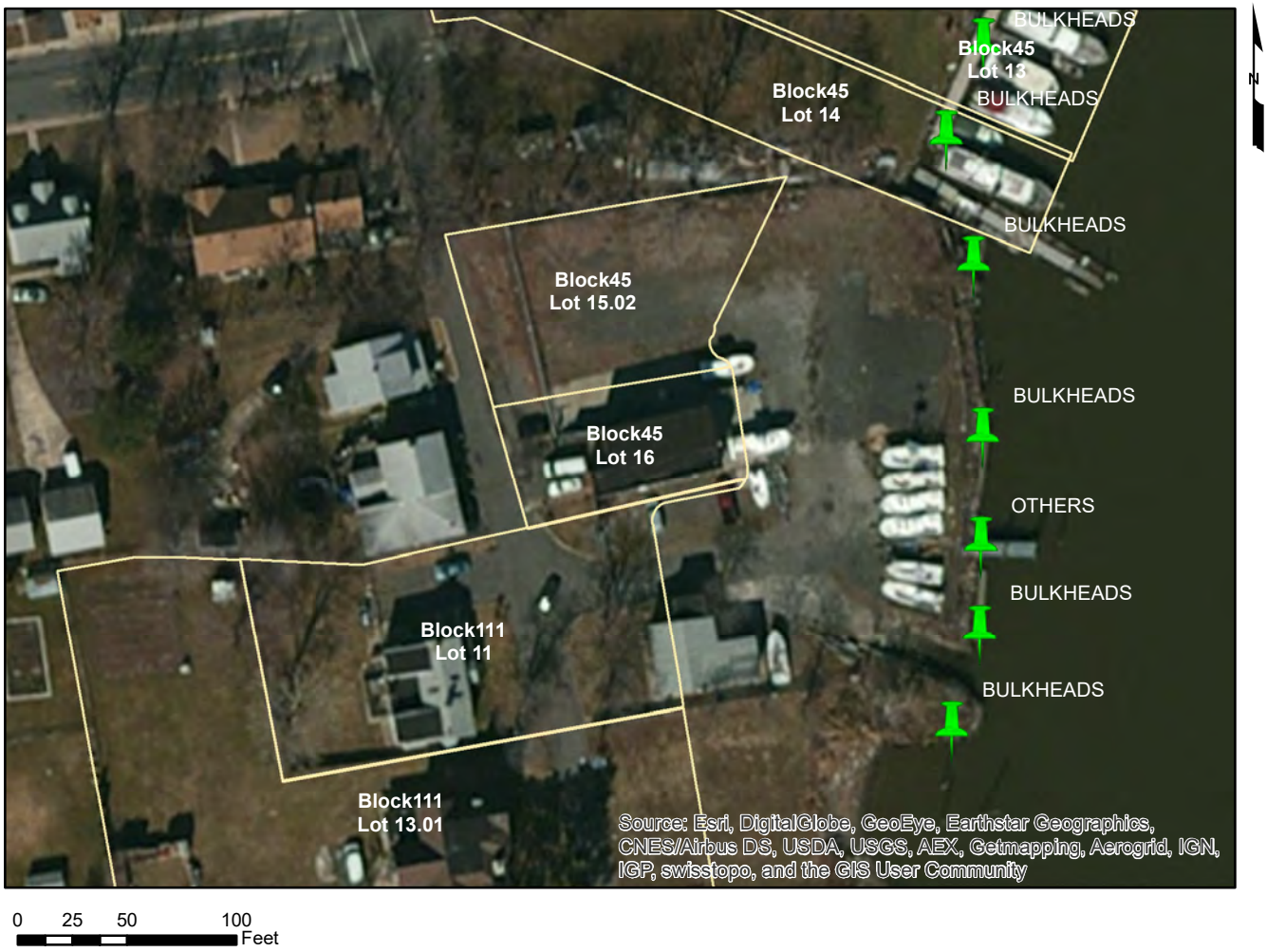


NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0230_45_16 **Township:** Little Ferry **Block Number:** 45 **Lot Number:** 16

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/25/2016 **Inspection Time:** 11:23am **Weather:** About 50° cloudy and **Inspector:** Jei Chon

PPIN: 0230_106.01_4 **TOWNSHIP** Little Ferry **Block Number:** 106.01 **Lot Number** 4

Property Owner's Information:

NAME: BERGEN COUNTY SEWER AUTH

MAILING ADDRESS:

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope NO

2. If "Yes", identity of waterfront Structure with physical descript

Can't confirm the waterfront structure due to grown vegetation.

3. Is the waterfront structure existed prior to 1978?

4. Is there a record of existing waterfront structure permits?

If "Yes", permit description

5. Waterfront structure condition rating

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 2' 9.673" W **EASTING** 40° 49' 52.269" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0230_106.01_4 **Township:** Little Ferry **Block Number:** 106.01 **Lot Number:** 4

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/25/2016 **Inspection Time:** 11:33 **Weather:** About 50° cloudy and **Inspector:** Jei Chon

PPIN: 0230_106.01_5 **TOWNSHIP** Little Ferry **Block Number:** 106.01 **Lot Number** 5

Property Owner's Information:

NAME: BERGEN COUNTY SEWER AUTH

MAILING ADDRESS:

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope YES

2. If "Yes", identity of waterfront Structure with physical descript

PIERS	Pier, boat concrete dock. Barge in rusted condition.
OTHERS	
REVETMENT	

3. Is the waterfront structure existed prior to 1978? YES

4. Is there a record of existing waterfront structure permits? YES

If "Yes", permit description Flood Hazard Area Permit, Mitigation Permit, Tidelands Grant, Tidelands License, Waterfront Develop

5. Waterfront structure condition rating

3-POOR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

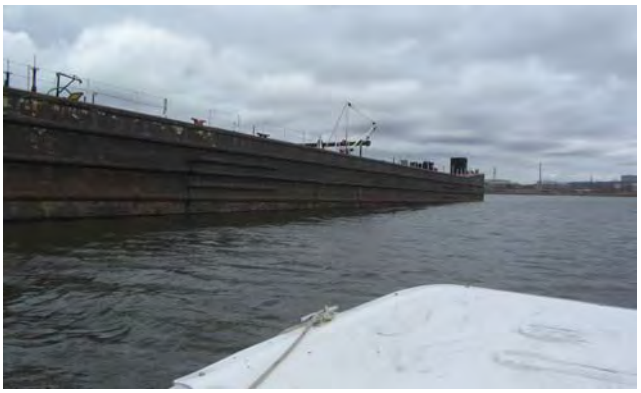
6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 2' 3.618" W **EASTING** 40° 49' 52.970" N

Photograph 1:



Photograph 2:

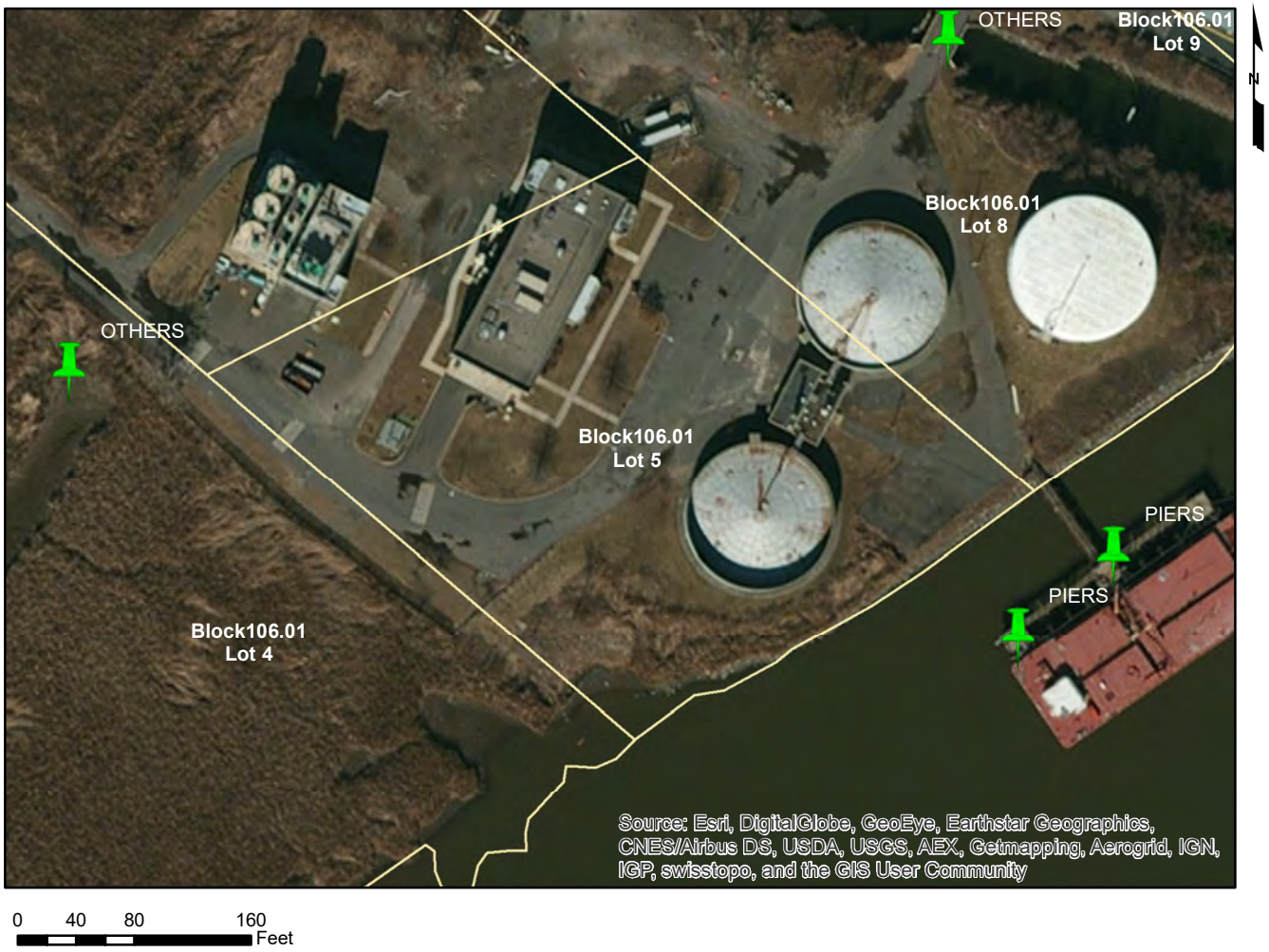


NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0230_106.01_5 **Township:** Little Ferry **Block Number:** 106.01 **Lot Number:** 5

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1

TERM CONTRACT TC-001

DPM PROJECT P 1131-00

Date: 2/25/2016 **Inspection Time:** **Weather:** **Inspector:**

PPIN: 0230_106.01_8 **TOWNSHIP** Little Ferry **Block Number:** 106.01 **Lot Number** 8

Property Owner's Information:

NAME: BERGEN COUNTY SEWER AUTH

MAILING ADDRESS:

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope YES

2. If "Yes", identity of waterfront Structure with physical descript

PIERS	Pier, boat concrete dock. Barge in rusted condition. Concrete Bridge crossing in fair condition
REVETMENT	
OTHERS	

3. Is the waterfront structure existed prior to 1978? YES

4. Is there a record of existing waterfront structure permits? YES

If "Yes", permit description Flood Hazard Area Permit, Mitigation Permit, Tidelands Grant, Tidelands License, Waterfront Develop

5. Waterfront structure condition rating

3-POOR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted

5 - Satisfactory: Limited minor to moderate defects or deterioration

4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser

3 - Poor: Advanced deterioration observed on widespread portion of the structure

2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc

1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 2' 3.289" W **EASTING** 40° 49' 56.798" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0230_106.01_8 **Township:** Little Ferry **Block Number:** 106.01 **Lot Number:** 8

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/25/2016 **Inspection Time:** 11:46am **Weather:** About 50° cloudy win **Inspector:** Jei Chon

PPIN: 0230_106.01_9 **TOWNSHIP** Little Ferry **Block Number:** 106.01 **Lot Number** 9

Property Owner's Information:

NAME: BERGEN COUNTY SEWER AUTH

MAILING ADDRESS:

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope: YES

2. If "Yes", identity of waterfront Structure with physical descript

OTHERS	Bergen County Utility Authority Wastewater Treatement Plant Outfall. May be wall. Can't see with water elevation and vegetation
REVETMENT	

3. Is the waterfront structure existed prior to 1978? NO

4. Is there a record of existing waterfront structure permits? YES

If "Yes", permit description: Flood Hazard Area Permit, Mitigation Permit, Tidelands Grant, Tidelands License, Waterfront Developm

5. Waterfront structure condition rating: 4-FAIR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 1' 57.481" W **EASTING** 40° 49' 58.162" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0230_106.01_9 **Township:** Little Ferry **Block Number:** 106.01 **Lot Number:** 9

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/25/2016 **Inspection Time:** 11:53am **Weather:** 50° cloudy and windy **Inspector:** Jei chon

PPIN: 0230_106.01_11 **TOWNSHIP** Little Ferry **Block Number:** 106.01 **Lot Number** 11

Property Owner's Information:

NAME: BERGEN COUNTY SEWER AUTH

MAILING ADDRESS:

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope

2. If "Yes", identity of waterfront Structure with physical descript

BULKHEADS
OTHERS
REVETMENT

Critical condition bulkheads. Fair condition outfall with tidegate. Appear to be revetment, but can't confirm with grown vegetation.

3. Is the waterfront structure existed prior to 1978? YES

4. Is there a record of existing waterfront structure permits? NO

If "Yes", permit description

5. Waterfront structure condition rating

1-CRITICAL

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

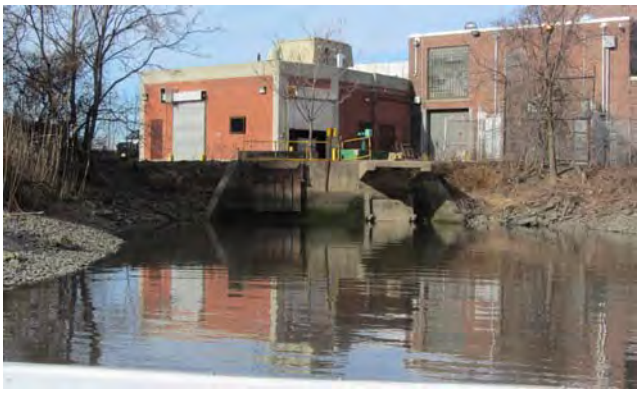
6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 1' 56.767" W **EASTING** 40° 50' 2.249" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0230_106.01_11 **Township:** Little Ferry **Block Number:** 106.01 **Lot Number:** 11

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1

TERM CONTRACT TC-001

DPM PROJECT P 1131-00

Date: 2/25/2016 **Inspection Time:** 11:58am **Weather:** 50 degree windy clou **Inspector:** Jei chon

PPIN: 0230_106.01_13.01 **TOWNSHIP** Little Ferry **Block Number:** 106.01 **Lot Number** 13.01

Property Owner's Information:

NAME: BERGEN COUNTY SEWER AUTH

MAILING ADDRESS:

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope: YES

2. If "Yes", identity of waterfront Structure with physical descript

OTHERS	Shares Outfall from 0230_106.01_11. Can't confirm revetment due to grown vegetation
REVETMENT	

3. Is the waterfront structure existed prior to 1978? YES

4. Is there a record of existing waterfront structure permits? YES

If "Yes", permit description: Flood Hazard Area Permit, Mitigation Permit, Tidelands Grant, Tidelands License, Waterfront Developm

5. Waterfront structure condition rating: 4-FAIR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted

5 - Satisfactory: Limited minor to moderate defects or deterioration

4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser

3 - Poor: Advanced deterioration observed on widespread portion of the structure

2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc

1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 2' 10.685" W **EASTING** 40° 50' 8.603" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0230_106.01_13.01 **Township:** Little Ferry **Block Number:** 106.01 **Lot Number:** 13.01

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/25/2016 **Inspection Time:** 12:10pm **Weather:** 50 degree windy clou **Inspector:** Jei chon

PPIN: 0230_107.01_1 **TOWNSHIP** Little Ferry **Block Number:** 107.01 **Lot Number** 1

Property Owner's Information:

NAME: TRIPLE TEE ACQUISITIONS LLC

MAILING ADDRESS: 67 LEUNING ST

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope YES

2. If "Yes", identity of waterfront Structure with physical descript

PIERS	Boat timber pier. Timber dock, Concrete pier and dock. concrete piers supporting building. Chan linked fence
REVETMENT	
OTHERS	

3. Is the waterfront structure existed prior to 1978? YES

4. Is there a record of existing waterfront structure permits?

If "Yes", permit description

5. Waterfront structure condition rating

2-SERIOUS

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 1' 57.698" W **EASTING** 40° 50' 19.206" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0230_107.01_1 **Township:** Little Ferry **Block Number:** 107.01 **Lot Number:** 1

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/25/2016 **Inspection Time:** 12:14pm **Weather:** 50 degree windy clou **Inspector:** Jei Chon

PPIN: 0230_107_2.01 **TOWNSHIP** Little Ferry **Block Number:** 107 **Lot Number** 2.01

Property Owner's Information:

NAME: UNI REALTY LLC

MAILING ADDRESS: 67 LEUNING ST

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope NO

2. If "Yes", identity of waterfront Structure with physical descript

3. Is the waterfront structure existed prior to 1978?

4. Is there a record of existing waterfront structure permits?

If "Yes", permit description

5. Waterfront structure condition rating

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted

5 - Satisfactory: Limited minor to moderate defects or deterioration

4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser

3 - Poor: Advanced deterioration observed on widespread portion of the structure

2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc

1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 1' 59.849" W **EASTING** 40° 50' 25.078" N

Photograph 1:

Photograph 2:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0230_107_2.01 **Township:** Little Ferry **Block Number:** 107 **Lot Number:** 2.01

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/25/2016 **Inspection Time:** 12:18pm **Weather:** 50° cloudy **Inspector:** Jei Chon

PPIN: 0230_108.01_2.01 **TOWNSHIP** Little Ferry **Block Number:** 108.01 **Lot Number** 2.01

Property Owner's Information:

NAME: GATES BROS.C/O GATES REALTY CORP

MAILING ADDRESS: 211 GATES ROAD, UNIT A

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope: YES

2. If "Yes", identity of waterfront Structure with physical descript

REVETMENT	Filled ground . Revetments. Steel bulkhead
BULKHEADS	

3. Is the waterfront structure existed prior to 1978? NO

4. Is there a record of existing waterfront structure permits? NO

If "Yes", permit description

5. Waterfront structure condition rating

2-SERIOUS

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 1' 54.556" W **EASTING** 40° 50' 27.964" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0230_108.01_2.01 **Township:** Little Ferry **Block Number:** 108.01 **Lot Number:** 2.01

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1

TERM CONTRACT TC-001

DPM PROJECT P 1131-00

Date: 2/25/2016 **Inspection Time:** 12:28pm **Weather:** 50 degree windy clou **Inspector:** Jei chon

PPIN: 0230_108.01_2.02 **TOWNSHIP** Little Ferry **Block Number:** 108.01 **Lot Number** 2.02

Property Owner's Information:

NAME: GATES BROS.C/O GATES REALTY CORP

MAILING ADDRESS: 211 GATES ROAD, UNIT A

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope: YES

2. If "Yes", identity of waterfront Structure with physical descript

BULKHEADS	Poor revetments. Steel wall/timber wall with concrete deck in serious condition
REVETMENT	
OTHERS	

3. Is the waterfront structure existed prior to 1978? YES

4. Is there a record of existing waterfront structure permits? NO

If "Yes", permit description

5. Waterfront structure condition rating: 2-SERIOUS

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted

5 - Satisfactory: Limited minor to moderate defects or deterioration

4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser

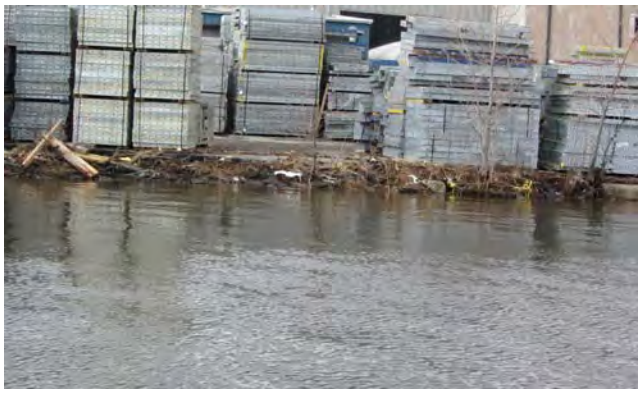
3 - Poor: Advanced deterioration observed on widespread portion of the structure

2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc

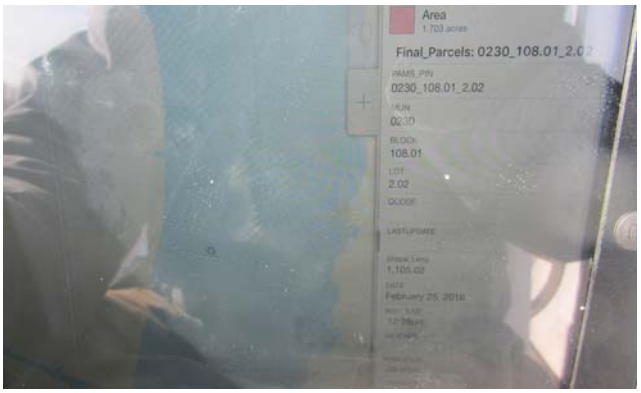
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 1' 53.640" W **EASTING** 40° 50' 31.388" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0230_108.01_2.02 **Township:** Little Ferry **Block Number:** 108.01 **Lot Number:** 2.02

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/25/2016 **Inspection Time:** 12:31 **Weather:** **Inspector:** Jei chon

PPIN: 0230_108.01_2.03 **TOWNSHIP** Litle Ferry **Block Number:** 108.01 **Lot Number** 2.03

Property Owner's Information:

NAME: GATES BROS.C/O GATES REALTY CORP

MAILING ADDRESS: 211 GATES ROAD, UNIT A

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope YES

2. If "Yes", identity of waterfront Structure with physical descript

OTHERS

Revetments with chain link fence

3. Is the waterfront structure existed prior to 1978? YES

4. Is there a record of existing waterfront structure permits?

If "Yes", permit description

5. Waterfront structure condition rating

3-POOR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 1' 53.047" W **EASTING** 40° 50' 33.896" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0230_108.01_2.03 **Township:** Litle Ferry **Block Number:** 108.01 **Lot Number:** 2.03

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/25/2016 **Inspection Time:** 12:35pm **Weather:** 50 degree. Cloudy. **Inspector:** Jei chon

PPIN: 0230_108.01_2.04 **TOWNSHIP** Little Ferry **Block Number:** 108.01 **Lot Number** 2.04

Property Owner's Information:

NAME: GATES BROS.C/O GATES REALTY CORP

MAILING ADDRESS: 211 GATES ROAD, UNIT A

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope: YES

2. If "Yes", identity of waterfront Structure with physical descript

BULKHEADS	Steel sheet piled bulkhead

3. Is the waterfront structure existed prior to 1978? YES

4. Is there a record of existing waterfront structure permits? NO

If "Yes", permit description

5. Waterfront structure condition rating

3-POOR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 1' 52.706" W **EASTING** 40° 50' 36.221" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0230_108.01_2.04 **Township:** Little Ferry **Block Number:** 108.01 **Lot Number:** 2.04

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/25/2016 **Inspection Time:** 12:39pm **Weather:** 50° windy and cloudy **Inspector:** Jei chon

PPIN: 0230_108.01_2.05 **TOWNSHIP** Little Ferry **Block Number:** 108.01 **Lot Number** 2.05

Property Owner's Information:

NAME: GATES ROAD PARTNERS, LLC

MAILING ADDRESS: 211 GATES ROAD, UNIT A

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope: YES

2. If "Yes", identity of waterfront Structure with physical descript

BULKHEADS	Damaged sheet piling bulkhead. Falling bulkhead. Falling piles. Outfall. Concrete headwall outfall

3. Is the waterfront structure existed prior to 1978? YES

4. Is there a record of existing waterfront structure permits? YES

If "Yes", permit description: Tidelands License, Tidelands Management Agreement

5. Waterfront structure condition rating

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 1' 52.934" W **EASTING** 40° 50' 38.739" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0230_108.01_2.05 **Township:** Little Ferry **Block Number:** 108.01 **Lot Number:** 2.05

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1

TERM CONTRACT TC-001

DPM PROJECT P 1131-00

Date: 2/25/2016 **Inspection Time:** 12:44pm **Weather:** 50° windy and cloudy **Inspector:** Jei Chon

PPIN: 0230_108.04_1.02 **TOWNSHIP** Litle Ferry **Block Number:** 108.04 **Lot Number** 1.02

Property Owner's Information:

NAME: HOBBY WORLD DEV. INC, USP CO

MAILING ADDRESS: 4211 PLEASANT VALLEY RD

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope: YES

2. If "Yes", identity of waterfront Structure with physical descript

BULKHEADS	Timber Dock in serious condition. Steel piled bulkhead in poor condition. Floating dock in Poor condition. Revetment is in fair condition. Timber pier in poor condition. An outfall with metal tidegate with concrete headwall in fair condition
REVETMENT	
PIERS	
OTHERS	

3. Is the waterfront structure existed prior to 1978? YES

4. Is there a record of existing waterfront structure permits? NO

If "Yes", permit description

5. Waterfront structure condition rating: 2-SERIOUS

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted

5 - Satisfactory: Limited minor to moderate defects or deterioration

4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser

3 - Poor: Advanced deterioration observed on widespread portion of the structure

2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc

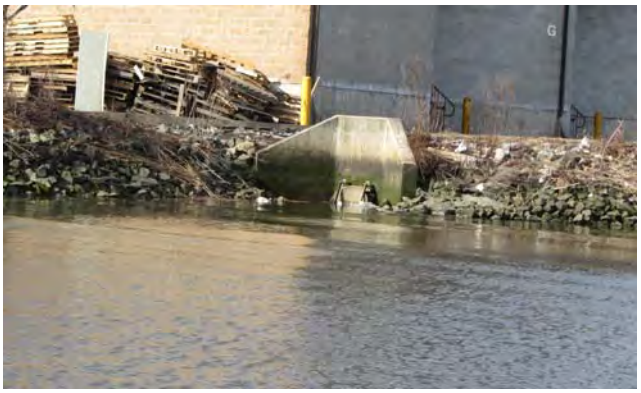
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 1' 53.577" W **EASTING** 40° 50' 42.390" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0230_108.04_1.02 **Township:** Litle Ferry **Block Number:** 108.04 **Lot Number:** 1.02

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/25/2016 **Inspection Time:** 12:57pm **Weather:** 50° windy and cloudy **Inspector:** Jei chon

PPIN: 0230_108.04_3 **TOWNSHIP** Little Ferry **Block Number:** 108.04 **Lot Number** 3

Property Owner's Information:

NAME: HOBBY WORLD DEV. INC, USP CO

MAILING ADDRESS: 4211 PLEASANT VALLEY RD

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope: YES

2. If "Yes", identity of waterfront Structure with physical descript

REVETMENT	Timber piers and dock in serious condition. Revetments in good condition
PIERS	

3. Is the waterfront structure existed prior to 1978? YES

4. Is there a record of existing waterfront structure permits? YES

If "Yes", permit description: Failed to pay NJDEP oversight cost in 2012

5. Waterfront structure condition rating: 2-SERIOUS

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 1' 57.603" W **EASTING** 40° 50' 45.717" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0230_108.04_3 **Township:** Little Ferry **Block Number:** 108.04 **Lot Number:** 3

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: | **Inspection Time:** 1:04 | **Weather:** 50° windy and cloudy | **Inspector:** Jei Chon

PPIN: 0230_111_11 **TOWNSHIP** Little Ferry **Block Number:** 111 **Lot Number** 11

Property Owner's Information:

NAME:

MAILING ADDRESS:

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope YES

2. If "Yes", identity of waterfront Structure with physical descript

BULKHEADS	Timber bulkhead critical. Revetment in poor condition.

3. Is the waterfront structure existed prior to 1978? NO

4. Is there a record of existing waterfront structure permits? NO

If "Yes", permit description

5. Waterfront structure condition rating

2-SERIOUS

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 1' 56.781" W **EASTING** 40° 50' 49.737" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0230_111_11 **Township:** Little Ferry **Block Number:** 111 **Lot Number:** 11

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/25/2016 **Inspection Time:** 1:01pm **Weather:** 50° windy and cloudy **Inspector:** Jei chon

PPIN: 0230_111_12 **TOWNSHIP** Little Ferry **Block Number:** 111 **Lot Number** 12

Property Owner's Information:

NAME: FURUTA, MOTOO & TOMI

MAILING ADDRESS: 37 RIVERSIDE AVE

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope: YES

2. If "Yes", identity of waterfront Structure with physical descript

BULKHEADS	Timber Bulkhead in critical condition. Timber pier is serious condition. Revetment in poor condition

3. Is the waterfront structure existed prior to 1978? NO

4. Is there a record of existing waterfront structure permits? NO

If "Yes", permit description: no permits

5. Waterfront structure condition rating

1-CRITICAL

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 1' 56.890" W **EASTING** 40° 50' 47.782" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0230_111_12 **Township:** Little Ferry **Block Number:** 111 **Lot Number:** 12

GIS MAP:



0 25 50 100 Feet

Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/25/2016 **Inspection Time:** 1:04 **Weather:** 50° windy and cloudy **Inspector:** Jei chon

PPIN: 0230_111_13.01 **TOWNSHIP** Litle Ferry **Block Number:** 111 **Lot Number** 13.01

Property Owner's Information:

NAME: SICLARI,JOSEPH & CATHERINA

MAILING ADDRESS: 29 RIVERSIDE AVE

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope

2. If "Yes", identity of waterfront Structure with physical descript

BULKHEADS
REVETMENT

Timber bulkhead critical. Revetment in poor condition.

3. Is the waterfront structure existed prior to 1978? NO

4. Is there a record of existing waterfront structure permits? NO

If "Yes", permit description

5. Waterfront structure condition rating

1-CRITICAL

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 1' 57.476" W **EASTING** 40° 50' 48.919" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0230_111_13.01 **Township:** Litle Ferry **Block Number:** 111 **Lot Number:** 13.01

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: 2/27/2016 **Inspection Time:** 1:15pm **Weather:** 35° sunny **Inspector:** Jei Chon

PPIN: 0237_70_12 **TOWNSHIP** Moonachie **Block Number:** 70 **Lot Number** 12

Property Owner's Information:

NAME: GABRIAN, CHARLES & R

MAILING ADDRESS: 310 FIRST ST

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope YES

2. If "Yes", identity of waterfront Structure with physical descript

OTHERS	Dam/Flood contorl, Riprap revetment

3. Is the waterfront structure existed prior to 1978? NO

4. Is there a record of existing waterfront structure permits? NA

If "Yes", permit description N/A

5. Waterfront structure condition rating

5-SATISFACTORY

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 4' 34.042" W **EASTING** 40° 50' 15.907" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0237_70_12 **Township:** Moonachie **Block Number:** 70 **Lot Number:** 12

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1

TERM CONTRACT TC-001

DPM PROJECT P 1131-00

Date: 2/25/2016 **Inspection Time:** 11:00am **Weather:** 50° windy and cloudy **Inspector:** Jei Chon

PPIN: 0259_106_3.01 **TOWNSHIP** South Hackensack **Block Number:** 106 **Lot Number** 3.01

Property Owner's Information:

NAME: MEADOWLANDS CONSERV TRUST

MAILING ADDRESS: 1 DEKORTE PK PLAZA, LYNDHURST

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope: YES

2. If "Yes", identity of waterfront Structure with physical descript

REVETMENT	Dike, Revetment, Fabric flood wall. Dam
OTHERS	

3. Is the waterfront structure existed prior to 1978? NO

4. Is there a record of existing waterfront structure permits?

If "Yes", permit description

5. Waterfront structure condition rating: 4-FAIR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted

5 - Satisfactory: Limited minor to moderate defects or deterioration

4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser

3 - Poor: Advanced deterioration observed on widespread portion of the structure

2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc

1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 2' 23.991" W **EASTING** 40° 49' 45.279" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0259_106_3.01 **Township:** South Hackensack **Block Number:** 106 **Lot Number:** 3.01

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: | **Inspection Time:** 11:00am | **Weather:** 50° windy and cloudy | **Inspector:** Jei Chon

PPIN: 0259_106_4.01 **TOWNSHIP** South Hackensack **Block Number:** 106 **Lot Number** 4.01

Property Owner's Information:

NAME: MEADOWLANDS CONSERV TRUST

MAILING ADDRESS: 1 DEKORTE PLAZA, LYNDHURST

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope YES

2. If "Yes", identity of waterfront Structure with physical descript

REVETMENT

Dike, Revetment, Fabric flood wall.

3. Is the waterfront structure existed prior to 1978? YES

4. Is there a record of existing waterfront structure permits? YES

If "Yes", permit description Flood Hazard Area, Mitigation Permit, Tidelands Grant, Tidelands License, Waterfront Development

5. Waterfront structure condition rating

4-FAIR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 2' 15.432" W **EASTING** 40° 49' 34.494" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0259_106_3.02 **Township:** Little Ferry **Block Number:** 106 **Lot Number:** 3.02

GIS MAP:



Additional Notes:

NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION REPORT

TASK ORDER 1
TERM CONTRACT TC-001
DPM PROJECT P 1131-00

Date: | **Inspection Time:** 11:00am | **Weather:** 50° windy and cloudy | **Inspector:** Jei Chon

PPIN: 0259_106_4.01 **TOWNSHIP** South Hackensack **Block Number:** 106 **Lot Number** 4.01

Property Owner's Information:

NAME: MEADOWLANDS CONSERV TRUST

MAILING ADDRESS: 1 DEKORTE PLAZA, LYNDHURST

Waterfront Structure Information:

1. Is there waterfront strucutre located on the prope YES

2. If "Yes", identity of waterfront Structure with physical descript

REVETMENT

Dike, Revetment, Fabric flood wall.

3. Is the waterfront structure existed prior to 1978? YES

4. Is there a record of existing waterfront structure permits? YES

If "Yes", permit description Flood Hazard Area, Mitigation Permit, Tidelands Grant, Tidelands License, Waterfront Development

5. Waterfront structure condition rating

4-FAIR

ASCE Waterfront Facilities Inspectionand Assessment Ratings:

6 - Good: No visible damage or minor damaged noted
5 - Satisfactory: Limited minor to moderate defects or deterioration
4- Fair: All primary structural elements are sound but minor to moderate defects or deterioration obser
3 - Poor: Advanced deterioration observed on widespread portion of the structure
2 - Serious: Advanced deterioration/breakage may have significantly affected load capacity of the struc
1 - Critical: Vary advanced deterioration/breakage resulted in localized failure of primary structure compo

6. Waterfront structure coordinate: **NORTHING** 74° 2' 15.432" W **EASTING** 40° 49' 34.494" N

Photograph 1:



Photograph 2:



NEW MEADOWLANDS
WATERFRONT STRUCTURE INSPECTION

TASK ORDER 1
TERM CONTRACT TC-001
DPMC PROJECT P 1131-00

PAMS PIN: 0259_106_4.01 **Township:** South Hackensack **Block Number:** 106 **Lot Number:** 4.01

GIS MAP:



Additional Notes:

Subappendix A3: Survey Coordination Support and Completion Process

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Table of Contents

1.0 Project Background A3-1
2.0 Storm Sewer Drainage Surveys A3-1
3.0 Utility Survey A3-2
4.0 Simplified Model Stream Surveys A3-3
5.0 Supplemental Storm Drainage Structure Survey A3-3
6.0 Detailed Model Stream Surveys A3-4
7.0 Attachments A3-5

Attachments

Attachment A3-1: Example of the GPS Field Survey Exhibits, Storm Sewer Drainage Surveys

Attachment A3-2: Example of the Professional Field Survey Exhibits, Storm Sewer Drainage Surveys

Attachment A3-3: Example of the Field Measurement Forms for Stream Cross Sections

Attachment A3-4: Example of the Field Inspection Forms for Catch Basins and Manholes

Acronyms and Abbreviations

CD	Compact Disc
CDBG-DR	Community Development Block Grant – Disaster Recovery
EIS	Environmental Impact Statement
GPS	Global Positioning System
HUD	Department of Housing and Urban Development
LiDAR	Light Detection and Ranging
NJ	New Jersey
NJDCA	New Jersey Department of Community Affairs
NJDEP	New Jersey Department of Environmental Protection
NJSEA	New Jersey Sports and Exposition Authority
PSE&G	Public Service Electric and Gas
RBD	Rebuild by Design
QCR	Quality Control Review

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1.0 Project Background

The New Jersey Department of Environmental Protection (NJDEP), as the Proposed Project sponsor, intends to complete Preliminary Planning and Design for the Rebuild by Design (RBD) Meadowlands Flood Protection Project (the Proposed Project), which includes the Boroughs of Little Ferry, Moonachie, Carlstadt, and Teterboro, and the Township of South Hackensack, in Bergen County, New Jersey (NJ) (the Project Area).

The Proposed Project was developed as a concept through the Hurricane Sandy Rebuilding Task Force's RBD competition. This competition promoted the development of innovative resilience projects in the Sandy-affected region. The Proposed Project is a proposal for the New Jersey Meadowlands that aims to reduce flooding risks in the Project Area, with potential ancillary benefits.

The Phase 1 Pilot Area was selected by Housing and Urban Development (HUD) through the RBD competition, and HUD Community Development Block Grant – Disaster Recovery (CDBG-DR) funds, totaling $150M, have been allocated to it.

The State of New Jersey through New Jersey Department of Community Affairs (NJDCA) is the Grantee of HUD (CDBG–DR) funds that have been appropriated under the Disaster Relief Appropriations Act of 2013 (Pub. L. 113–2, approved January 29, 2013) related to disaster relief, long-term recovery, restoration of infrastructure and housing, and economic revitalization in the most impacted and distressed areas resulting from a major disaster that was declared pursuant to the Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1974 (Stafford Act) in calendar year 2012 for Hurricane Sandy.

To complete the Feasibility Study for preparing the Environmental Impact Statement (EIS), the process was developed to perform three separate screenings. Screening 1 was a coarse screening to narrow down 30 design concepts to seven design concepts. Screening 2 increased the level of detail of these seven concepts, which were screened down to a total of six. These remaining six concepts were part of a Feasibility Study.

2.0 Storm Sewer Drainage Surveys

Moonachie (M1), Moonachie (M2), Carlstadt (C1), Indian Lake, Main Street, and Losen Slote Creek Areas

Preparation of Global Positioning System (GPS) Survey Exhibits and Field Survey

Topography and existing, public storm drainage structure data from the New Jersey Sports and Exposition Authority (NJSEA) were reviewed for each concept area (i.e., Moonachie (M1), Moonachie (M2), Carlstadt (C1), Indian Lake, Main Street, and Losen Slote Creek). Elevation information used to prepare the exhibits is Light Detection and Ranging (LiDAR) data collected in the spring of 2014 by Quantum Spatial, Inc. An interpretation of the existing drainage system configuration was developed using this incomplete data set. A set of GPS survey exhibits were developed for each concept area as suggested by the hydraulic modelers and civil engineers for use by the GPS field survey crew to identify the presence of the system and its configuration. An example of the GPS field survey exhibits is provided as **Attachment A3-1** of this memo. A complete set of all GPS field survey exhibits can be found on the compact disc (CD) included as part of this document.

Upon completion of the field survey, the GPS survey data (storm drainage structure locations and type) were reviewed for accuracy, completeness and post-processed into a tabular coded inventory of all storm drainage structures (i.e., catch basins, manholes, etc.). These data were imported into the pre-existing NJSEA geodatabase in ArcGIS and the combined storm sewer data was then reviewed by the hydraulic modeler to identify specific drainage structures to be surveyed. Based on this review, survey scoping exhibits were prepared for use by a NJ licensed surveyor for each concept area. An example of the professional field survey exhibits is provided as **Attachment A3-2** of this memo. A complete set of all GPS field survey exhibits can be found on the CD included as part of this document.

Drainage System Survey

A kickoff meeting was held with the NJ licensed surveyor to review the survey scope. Coordination activities with the surveyor and AECOM primarily included e-mail correspondence regarding schedule and status updates. Upon receipt of survey data from the surveyor, a quality control review (QCR) was performed by HDR engineers to confirm information on all structures identified on the survey exhibits was received. If the survey data were determined to be incomplete or if there were any questions, HDR engineers documented and coordinated with the surveyor to retrieve missing information, justified why the data are irretrievable, and addressed any questions. The QCR process was performed and documented after each submittal from the surveyor, and a final shapefile was prepared embodying the results of the QCR for use by HDR to update and supplementation of the pre-existing NJSEA geodatabase. The final step has been using automatic processes to supplement the geodatabase.

3.0 Utility Survey

Main Street Area

Preparation of GPS Survey Exhibits and Field Survey

Non-drainage utilities within the Main Street, Little Ferry, NJ area were located in order to identify potential conflicts with the proposed concept. The extents of potential temporary and permanent easements for Main Street and Main Street Extension concepts were established based on assumptions of what type of construction activity, equipment, access, and staging areas would be needed. Geospatial data representing certain electric and gas feature categories was obtained from Public Service Electric and Gas (PSE&G). A set of GPS survey exhibits were developed in the same manner as for storm drainage GPS survey for Carol Place, Indian Lake, Main Street, and Losen Slote Creek for use by the GPS field survey crew, and included the survey boundary (the maximum potential easement extent) and all known utility locations within that boundary based on data from NJSEA, as well as information from PSE&G. The features identified by the GPS surveyors included water, sanitary sewer, gas, electric, communications, as well as piping, manholes, valve boxes, hydrants, signs, utility poles, street and traffic light poles, etc. The GPS field survey crew used these exhibits as a guide to identify the presence of utility features.

Upon completion of the field survey, the GPS survey data (locations and types) were post-processed and converted into a tabular coded inventory of all utility features and incorporated into the geodatabase after internal QC review. Exhibits were then prepared from the combined data to assist in guiding a NJ licensed surveyor. The licensed surveyor returned a set of shapefiles that included features and lines in the designated utility categories in designated portions of the Main Street area. These data were examined and imported into the geodatabase.

Utility Survey

Coordination activities with surveyor and AECOM primarily included e-mail correspondence regarding schedule and status updates. Upon receipt of survey data, a QCR was performed to confirm all structures identified on the updated survey exhibits were received, as well as to check the completeness of the survey. If the survey data were determined to be incomplete after QCR, any discrepancies were documented and coordinated with the surveyor to retrieve missing information, or justify why the data are irretrievable.

4.0 Simplified Model Stream Surveys

East Riser Ditch, West Riser Ditch, DePeyster Creek, and Losen Slote Creek

Specific culverts and cross sections along channels (i.e., East Riser Ditch, West Riser Ditch. DePeyster Creek, and Losen Slote Creek) were identified as a need for the simplified model survey effort. Survey exhibits were developed for use by the NJ licensed surveyor. Upon receipt of the data, a QCR was performed in the same fashion as previous efforts which included a review to ensure that all structures and cross sections requested have been adequately surveyed. Any discrepancies or absences within the dataset collected were identified and the surveyor addressed such issues. An example of the field measurement forms for stream cross sections populated by the surveyor can be found as **Attachment A3-3** to this memo. A complete set of all stream survey measurement forms and associated photos can be found on the CD included as part of this document.

5.0 Supplemental Storm Drainage Structure Survey

Losen Slote Creek Residential Area and Moonachie (Carol Place) (M1)

Preparation of GPS Survey Exhibits & Field Survey

Upon review of the survey data received previously for these two areas, and in further developing hydraulic models, desktop analysis indicated the need to capture additional storm drainage structures for which subsurface survey was needed in order to develop a complete hydraulic model of the concept area (i.e., Losen Slote Creek Residential Area and Moonachie (Carol Place) (M1)). In the same fashion as the original Storm Drainage Structure Surveys, GPS Survey Exhibits were prepared and a GPS survey was performed. The data retrieved during the GPS survey were used to develop survey scoping exhibits for the NJ licensed surveyor. The licensed surveyor then performed the supplementary surveys by visiting, measuring and collecting subsurface data for the designated supplementary structures. Upon receipt of survey data from the surveyor, a QCR was performed by HDR to confirm information on all structures identified on the survey exhibits was received. If the survey data were determined to be incomplete or if there were any questions, HDR engineers documented and coordinated with the surveyor to retrieve missing information, justified why the data are irretrievable, and addressed any questions. An example of the field inspection forms for catch basins and manholes populated by the surveyor can be found as **Attachment A3-4** to this memo. A complete set of field inspection forms and associated photos can be found on the CD included as part of this document. A final shapefile was prepared embodying the results of the QCR for use by HDR to update and supplementation of the pre-existing NJSEA geodatabase. The final steps have been using automatic processes to supplement the comprehensive geodatabase.

Drainage Survey

Coordination activities with surveyor and AECOM primarily included e-mail correspondence regarding schedule and status updates. Upon receipt of survey data from the surveyor, a QCR was performed by HDR engineers to confirm all structures identified on the survey exhibits were received. If the survey data were determined to be incomplete or if there were any questions, HDR engineers documented and coordinated with the surveyor to retrieve missing information, justified why the data are irretrievable, and addressed any questions. The QCR process was performed and documented after each submittal from the surveyor.

6.0 Detailed Model Stream Surveys

East Riser Ditch, West Riser Ditch, DePeyster Creek, and Losen Slote Creek downstream reach (post-dredging)

Specific culverts and cross sections along channels that were missing or were incomplete during the simplified modeling survey were identified for detailed modeling survey (i.e., East Riser Ditch, West Riser Ditch, DePeyster Creek, and Losen Slote Creek downstream reach (post-dredging)). Survey exhibits were developed for use by the NJ licensed surveyor. Upon receipt of the data, a QCR was performed in the same fashion as previous efforts which included a review to ensure that all structures and cross sections requested have been adequately surveyed. Any discrepancies or absences within the dataset collected were identified and the surveyor addressed such issues.

7.0 Attachments

Attachment A3-1 (Example of the GPS Field Survey Exhibits, Storm Sewer Drainage Surveys),
Attachment A3-2 (Example of the Professional Field Survey Exhibits, Storm Sewer Drainage Surveys),
Attachment A3-3 (Example of the Field Measurement Forms for Stream Cross Sections), and
Attachment A3-4 (Example of the Field Inspection Forms for Catch Basins and Manholes) are provided on the following pages.

A complete set of survey data can be found on the CD included as part of this document.

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Attachment A3-1: Example of the GPS Field Survey Exhibits, Storm Sewer Drainage Surveys

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Attachment A3-1: Example of the GPS Field Survey Exhibits, Storm Sewer Drainage Surveys



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Attachment A3-2: Example of the Professional Field Survey Exhibits, Storm Sewer Drainage Surveys

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Attachment A3-2: Example of the Professional Field Survey Exhibits, Storm Sewer Drainage Surveys



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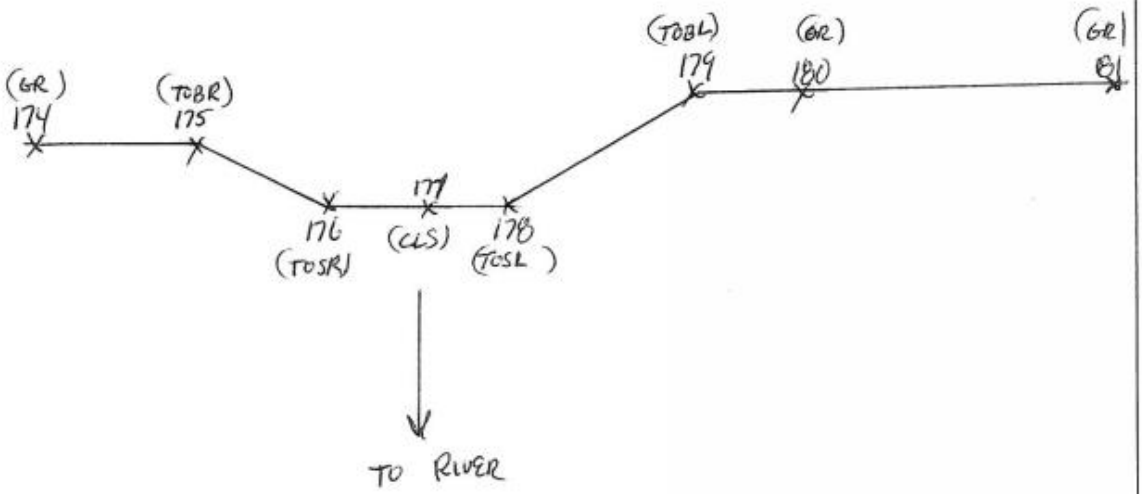
Attachment A3-3: Example of the Field Measurement Forms for Stream Cross Sections

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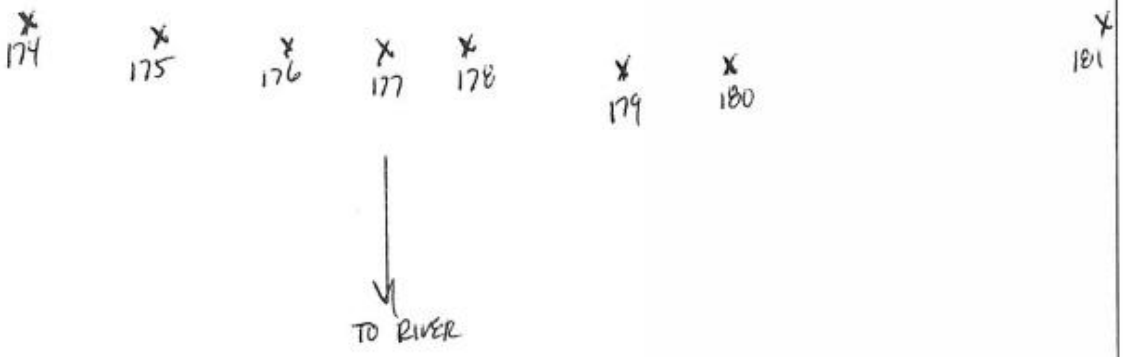
Attachment A3-3: Example of the Field Measurement Forms for Stream Cross Sections

Project: NJ Meadowlands Rebuild
Survey Date: 1/26/2017
Project No.: 15-838
ERM Elevation:
Crew: SE,BK
Stream Name: Fluvial Park Ditch
ERM Description:
Section Name: Fluvial 300'
Scale: Not To Scale

Profile View



Plan View



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Attachment A3-4: Example of the Field Inspection Forms for Catch Basins and Manholes

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Attachment A3-4: Example of the Field Inspection Forms for Catch Basins and Manholes

Field Inspection Form for Manholes and Catch Basins

SurveyID	Inspectors	Date and Time
IL-CB-101	SE/BK	1-27-17

Structure Type (X) Catch Basin ( ) Manhole

X,Y-Coordinate & Rim Elev of MH Center: 737526.0398, 620316.0611, 7.3226

Photo ID: 29

Obstruction: Car; Jammed Grate; Paved Over; Construction; Other

Depth to the invert (in): -2.70

Sediment in the structure? Yes (No)

If yes, approximate depth of sediment (in):

For Catch Basin Use Only

Type of inlet: (Grate) Curb Grate and Curb Other

Grate

L (in) 2', 3 x2

W (in) 4'

Condition

Curb

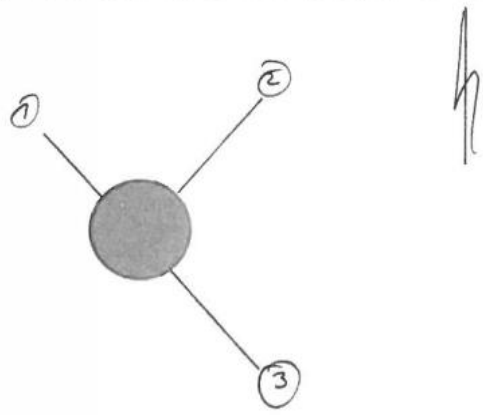
L (in)

W (in)

H (in)

Condition

Sketch



Notes

1) Place North arrow

2) Place Street names

3) Sketch all connections with Connection No. and connecting Structure ID

Outlet and laterals	Diameter (in)	Invert (in)	Connecting Structure	Discrepancy with Guide Map (T/F)
Connection 1	15" HDEP	-2.65	———	0.05 water flow to "3"
Connection 2	15" HDEP	-2.63	———	0.05 water flow to "3"
Connection 3	18" HDEP	-2.70	IL-D-09	
Connection 4				
Connection 5				
Connection 6				

Comments (e.g., structural condition, O&M condition, flood water mark, etc.)

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Subappendix A4

Detailed Survey

Table of Contents

Subappendix A4-1 - Locations with Storm Drainage Related Issues

Subappendix A4-2 - Existing Condition Data for Pump Stations and Tide Gates

Subappendix A4-3 - Historical Drainage Studies at Teterboro Airport

Subappendix A4-1: Locations with Storm Drainage Related Issues

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Acronyms and Abbreviations

BCMJAHMP	Bergen County Multi-Jurisdictional All Hazard Mitigation Plan
CAG	Citizen Advisory Group
EIS	Environmental Impact Statement
FMERC	Flood Mitigation Engineering Resource Center
HMFMP	Hackensack Meadowlands Floodplain Management Plan
HUD	Department of Housing and Urban Development
NJDEP	New Jersey Department of Environmental Protection
RBD	Rebuild by Design
SFRRVCP	Strategies for Flood Risk Reduction for Vulnerable Coastal Populations along Hackensack River at Little Ferry and Moonachie
SUFS	Stormwater Utility Feasibility Study

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1.0 Introduction

AECOM was awarded a contract by the New Jersey Department of Environmental Protection (NJDEP) to complete a Feasibility Study, Environmental Impact Statement (EIS), Proposed Project design and construction administration for the Rebuild by Design (RBD) Meadowlands Flood Protection Project (the Proposed Project). The Proposed Project was one of several award winners for a RBD competition sponsored by the United States Department of Housing and Urban Development (HUD). Funds for the Proposed Project are being provided to NJDEP by HUD. AECOM subsequently signed HDR to a subcontract to provide data management, engineering, and environmental sciences support throughout the Proposed Project. Engineering support for the Proposed Project included developed and screening of drainage improvement concepts, the first step of which was the identification of drainage improvement opportunities.

The HDR team identified drainage improvement opportunities in the five pilot area municipalities of the Project Area (the Boroughs of Little Ferry, Moonachie, Carlstadt, and Teterboro, and the Township of South Hackensack in Bergen County, New Jersey) through a combination of document review, stakeholder engagement meetings, and other meetings with municipality representatives. Drainage improvement opportunities identified fell into two general categories: (1) areas where new drainage infrastructure is needed and (2) areas where existing infrastructure is in need of upgrade. Existing infrastructure includes open-channels, storm pipes, tide gates, and pump stations. Approximately 20 drainage improvement areas were identified in this manner (**Figure A4-1**). These areas include residential, commercial, and industrial areas as well as local, State, and Federal roadways across all five municipalities. These drainage improvement areas provided the basis for development of drainage improvement concepts to be evaluated and screened as part of the Feasibility Study.

2.0 Document Review

The rainfall-induced flooding potential of the Project Area has been studied extensively over the years. HDR reviewed the following documents to gain an understanding of these locations and the likely causes of flooding:

1) Hackensack Meadowlands Floodplain Management Plan (HMFMP) (NJSEA 2005);
2) Stormwater Utility Feasibility Study (SUFS) (Rutgers University 2007);
3) Flood Mitigation Engineering Resource Center (FMERC) – Project EC 14-005 (NJIT 2014);
4) Strategies for Flood Risk Reduction for Vulnerable Coastal Populations along Hackensack River at Little Ferry and Moonachie (SFRRVCP) (Guo, et al. 2014); and
5) Bergen County Multi-Jurisdictional All Hazard Mitigation Plan (BCMJAHMP) ((Bergen County Office of Emergency Management 2015).

A prevailing theme in these documents is that the Project Area is prone to flooding caused by major coastal storms, major rainfall events, and smaller rainfall events under normal tidal conditions for a number of reasons including the following:

1) Low ground surface elevations (Elevation 1 to 5 feet NAVD 88);
2) High percentage of impermeable cover;
3) High groundwater table;
4) Partially engineered drainage systems (i.e., some designed and some developed over time in undeveloped corridors between developed properties);
5) Unmaintained drainage ditches, storm pipes, and tide gates; and
6) Missing pump stations at critical basin collection points.

A summary of some of the recommended storm drainage improvements in the Project Area is contained in **Table A4-1**.

Table A4-1: Examples of Recommended Drainage Improvements in Project Area

Recommend Improvement	Municipality	Reference Source
Installation of back-up generator for Willow Lake pump station	Little Ferry	HMFMP (project completed)
Upgrade pump capacity at Willow Lake	Little Ferry	HMFMP
Dredging and expansion of Willow Lake	Little Ferry	HMFMP
Upgrade of DePeyster Creek pump station to handle 25-yr storm	Little Ferry	HMFMP
Installation of self-cleaning trash rack at Losen Slote pump station	Little Ferry	HMFMP (scheduled for 2017)
Upgrade Losen Slote pump station to handle 25-yr event	Little Ferry	HMFMP
Dredging of 'open trenches'	Moonachie	SFRRVCP
Green Infrastructure installations– green roofs, swales, planter boxes, permeable pavement	Moonachie	SFRRVCP
Creation of new surface storage areas	Little Ferry and Moonachie	SFRRVCP
Cleaning and widening of ditches and waterways	Little Ferry and Moonachie	FMERC
Upgrades to existing subsurface drainage system at Main Street and Industrial Avenue	Little Ferry	FMERC
Pump station upgrades – Willow Lake and DePeyster Creek	Little Ferry	FMERC
Local, property-specific storage units	Carlstadt	SUFS
Increased pumping capacity and provision of back-up	Carlstadt	SUFS
Backflow protection on stormwater outfalls	Carlstadt	SUFS

3.0 Citizen Advisory Group Meetings

The AECOM and HDR team sought input from the Citizen Advisory Group (CAG) at meetings held in April, May, and June 2016. Attendees were provided municipality base maps and asked to identify locations experiencing flooding during 'regular rainfall events,' 'heavy rainfall events,' and 'major storm events.' They were also asked to identify locations having 'other issues and concerns related to flooding.' **Attachment A4-1-1** contains a summary of the input provided at the April meeting and figures in **Attachment A4-1-2** provides a graphical display of that information.

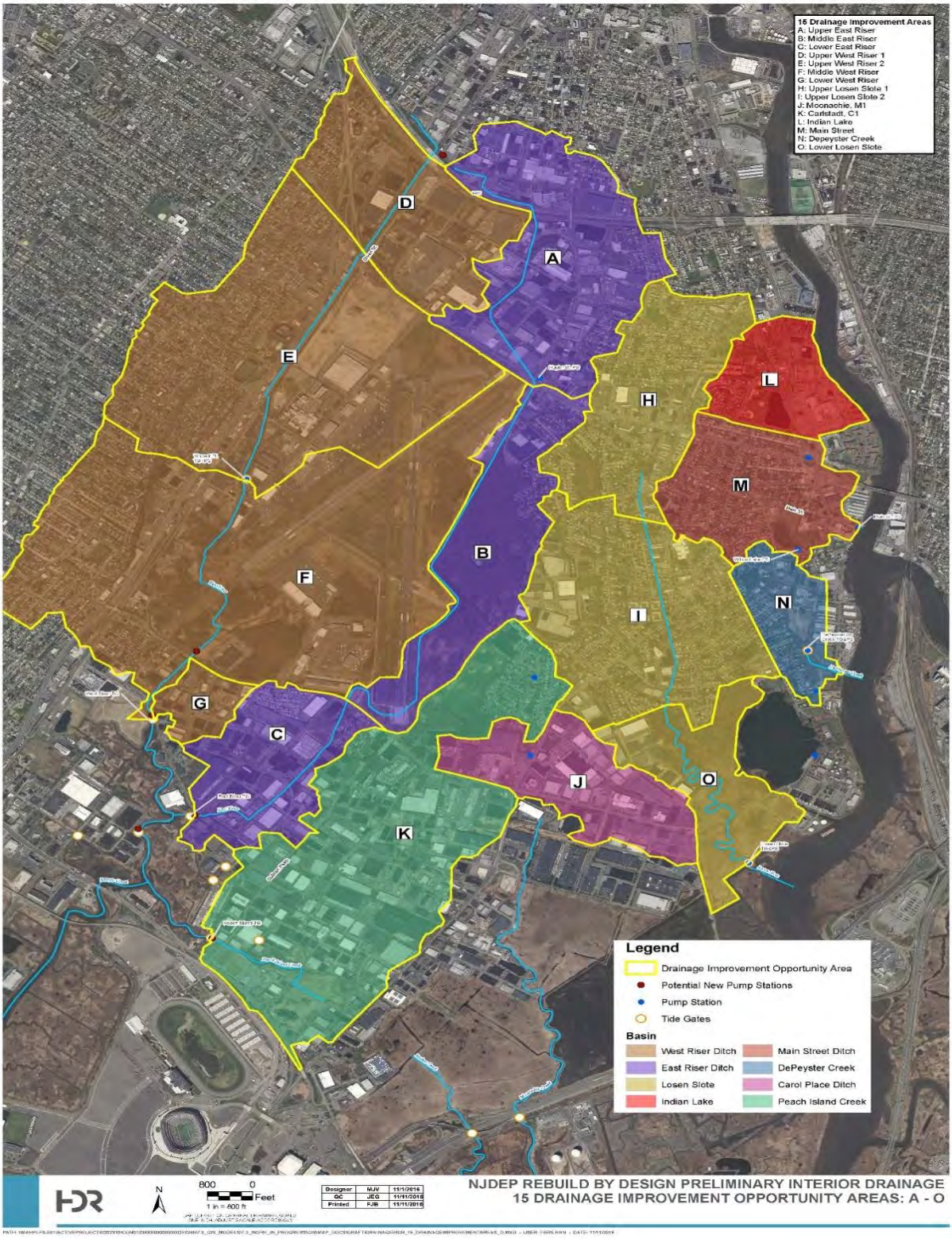


Figure A4-1: Drainage Improvement Areas

4.0 References

Bergen County Office of Emergency Management. *Bergen County Multi-Jurisdictional All Hazard Mitigation Plan.* 2015. http://www.co.bergen.nj.us/DocumentCenter/View/4506.

Guo, Qizhong, Robert Miskewitz, Manoj Raavi, and Carolyn Loudermilk. *Strategies for Flood Risk Reduction for Vulnerable Coastal Populations along Hackensack River at Little Ferry and Moonachie.* August 2014. http://www.nj.gov/dep/docs/flood/final-studies/rutgers-hackensack/hackensack-river-study-area-flood-mitigation-final-report.pdf.

NJIT. *Flood Mitigation Engineering Resource Center (FMERC) – Project EC 14-005.* June 18, 2014. http://www.nj.gov/dep/docs/flood/final-studies/njit-moonachie/njit-njdep-fmerc-finalreport-06182014.pdf.

NJSEA. "Hackensack Meadowlands Floodplain Management Plan." October 24, 2005. http://www.njsea.com/eg/flood/docs/Hackensack%20Meadowlands%20Floodplain%20Management%20Plan.pdf.

Rutgers University. "Stormwater Utility Feasibility Study." July 2007. http://cues.rutgers.edu/meadowlands-district-stormwater/pdfs/Stormwater-Utility_July-2007.pdf.

5.0 Attachments

Attachment A4-1-1 (CAG Input from April 26, 2016 Meeting) and **Attachment A4-1-2** (Exhibits Displaying CAG Input for Flood-Prone Areas) are provided in the following pages.

Attachment A4-1-1: CAG Input from April 26, 2016 Meeting

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Subject	**Meeting Minutes - Citizen Advisory Group (CAG) Meeting #2**
Meeting Date	**April 26, 2016**
Time	**6:00 pm – 8:00 pm ET**
Location	**Little Ferry Borough Hall, 215 Liberty Street, Little Ferry, NJ 07643**
Attendees	**Attendee list available, *for internal use only***

- The PowerPoint slide presentation utilized at the meeting is attached to the meeting minutes.
- A CAG meeting packet was provided to all attendees and is also attached to the meeting minutes.
- Introductions – Linda Fisher, NJDEP Project Manager, started the meeting by thanking the CAG members for their responses to Questionnaire #1. She provided an update on NJDEP's efforts to work with the Department of Public Works (DPW) in each town to identify Project Area ditches; current efforts are focused on those ditches draining to Berry's Creek in particular. The objective of this CAG Meeting is to obtain input on local flooding issues/concerns.
- Ms. Fisher concluded her meeting introductions and informed the attendees that the objective of this CAG Meeting is: (1) to obtain input on local flooding issues/concerns; and (2) to give CAG members an opportunity to introduce themselves. Meeting attendees proceeded to provide their name, town/affiliation, and any other relevant information.
- Mr. Christopher Benosky, AECOM Project Manager, provided an overview of the current project status since the last CAG meeting on March 23rd. This included reviewing the status of the alternatives development, data gathering efforts, and the ongoing drainage study, which has focused on existing pump stations, tide gates, and ditches.
- Mr. Brian W. Boose, AECOM NEPA Team Leader, provided the status of the Notice of Intent (NOI), Public Scoping Document (PSD), and the Public Scoping Process. He also provided a detailed overview of responses to Questionnaire #1.
- CAG members were requested to provide suggestions on: (1) potential public meeting venues; and (2) methods of announcement that could be used for holding and notifying the public of future meetings. The following ideas were provided:
    - Vineyard Church, Teterboro
    - TJ Sokol Hall, Main Street, Little Ferry
    - Use of signage in front of buildings
    - Use of town websites
    - Little Ferry and Moonachie school flyers
    - Use of Nixel system for calls, texts, and emails
- A dedicated email address at rbd-meadowlands@dep.nj.gov will be used to receive all public input throughout the duration of the Project.

- Mr. Boose provided an overview of the Break-out Session. The objective of this workshop is two-fold: (1) to validate (and supplement) existing data as mapped by AECOM (i.e., ditches, tie gates, pump stations) as shown on large maps provided at the meeting for each town; and (2) to identify specific locations of local flooding within each town, including frequency and nature of each location prone to flooding. This information will be used in further developing and refining Alternative 2, the local drainage improvement alternative.

- Meeting attendees were directed to Break-out Session tables based on their respective town. Individuals with information on more than one town were directed to share their input at all relevant tables.

- To facilitate the data gathering process, meeting attendees were asked to identify the location of local flooding concerns on the appropriate town map using colored dots. The following four categories of flooding hazard were considered: Regular Rainfall Events (Red), Heavy Rainfall Events (Yellow), Major Storm Events (Green), and Other Issues/Concerns (Blue).

- **Tables A4-1-2** through **A4-1-5** below provide a summary of the input received from the meeting attendees for Moonachie, Carlstadt, Little Ferry, and Teterboro, as generated during the Break-out Session. No data was gathered for South Hackensack; CAG members representing South Hackensack were not in attendance at this meeting. A copy of the maps used during this workshop showing the results of this exercise are included in **Attachment B**.

Table A4-1-2 - Borough of Moonachie

No.	Category	Location	Notes
1	Red	Austin, Sales, Spruce, and Helen Streets within the Metropolitan Mobile Home Park; from Caesar Place and Spruce/Sales Street	With 2 inches of rain, constantly running 3 pumps. Water comes from East, South, and West. Current owner has been there two years, and flooding has increased over that time.
2	Yellow	Jackson Place and Jubilee Place intersection (from ballpark and roads)	Lincoln Place Pump Station (2 pumps) put in ~ 18 months ago. Effectiveness still to be determined.
3	Red	Ballpark from parking lots	Clogged ditch at ballpark for 14 years. Floods parts of streets near Lincoln Place Pump Station.
4	Green	West Riser Tide Gate	At Moonachie Avenue
5	Green	At private home (basement)	Groundwater comes up in basement during heavy rainfall (~3-4 inches deep)
6	Green	Theresa Court	Heavy rain, flooding along fenceline at industry; and along sewer easement. School yard floods after regular rainfall.
7	Green	Sands Creek	Corrugated pipe is full/clogged; down to Daniel Street and Henry Street.
8	Green	State Street	Heavy rain flooding.
9	Green	Grand Street	Flooding during continuous rain.
10	Green	Commercial Moonachie	Heavy rain flooding; drains with no outlet; needs to be cleaned out.

No.	Category	Location	Notes
11	Green	Albert Street	Storm sewer does not drain.
12	Green	Sova Place	Heavy rain flooding.
13	Green	Jackson Place Ditch	Floods into Vanguard Mobile Home Park due to poor maintenance.
14	Green	Jefferson and Edison	Heavy rain flooding.
15	Green	Concord/Anderson Intersection	Needs cleaning. Heavy rain flooding.
16	Green	Woodridge and Park Avenue	Heavy rain flooding.
17	Green	Capital and State Streets	Heavy rain flooding.
	Other Notes	✓ A ditch has not been mapped south of Moonachie, south of Metropolitan Mobile Home Park. ✓ New homes are being proposed on a small wooded lot north of Moonachie in Little Ferry; concerns about increased impervious surfaces. ✓ A ditch has not been mapper in the northeastern section of Moonachie that drains to Losen Slote – might be named Sands Creek (see map). Clogged pipes exist along the length of this Sands Creek. ✓ Levees in Moonachie failed in 1989/1990. ✓ Inflow/Infiltration problems exist in sewer infrastructure throughout Moonachie.	

Table A4-1-3 - Borough of Carlstadt

No.	Category	Location	Notes
1	Blue	Washington Avenue near Commerce Road	Ponding.
2	Red	Commercial Avenue	Regular flooding at Commercial Moonachie/Carlstadt Ditch.
3	Red	Commercial Avenue	This location was suggested by Linda Fisher as a problem area identified by the Mayor.
4	Yellow	Commercial Avenue Extension	Roadway flooding.
5	Yellow	Commercial Avenue Extension	Black arrows included as extensions of this point towards Moonachie Avenue.
6	Red/Yellow	Secaucus	Flooding on Meadowlands Pkwy by the hospital.

Table A4-1-4 - Borough of Little Ferry

No.	Category	Location	Notes
1	Blue	Near Kinzley Street and Alsan Way; East Riser Ditch culvert	There are discrepancies with the Little Ferry boundary. This is an ongoing issue in one neighborhood in South Hackensack that is actually part of Little Ferry. The Little Ferry boundary follows Losen Slote, Kinzley Street, 1st Street, and Millo Court.
2	Blue	East Riser Ditch culvert	The East Riser Ditch culvert is "rotted out" leading to flooding at the end of 1st Street and Kinzley Street all the time because Losen Slote does not drain in this area. The water level was above the Losen Slote pump station.
3	Red/Blue *(3 total dots, 2 red, 1 blue)*	Bergan County Utilities Authority (BCUA) property	An open drainage ditch from the Hackensack River occurs within this property that drains to Mehrhof Pond (former clay pit, very deep). This area is flood prone (red dots) – 6 inches of water during a typical storm. There is a breach at the Mehrhof Pond end of the ditch (blue dot).
4	Red/Blue	2nd ditch north of 1st ditch from Hackensack to Maiden Lane	Both dots label pump station failures. Pump station at the end of this ditch fails occasionally (blue dot). It has old equipment and culverts have collapsed. During a nor'easter, the water is up to DePeyster Creek (red dot).
5	Green/Red/Blue (*4 green, 2 red, 1 blue dots*)	Main Street (up to Garden Street)	During Irene, Sandy, and nor'easters, this area is underwater (see green dots labeled Sandy and sandy breach, one red labeled Main Street, one unlabeled red dot, one blue dot is labeled pump station). The Main Street pump station on the old Tilcon property (on the Hackensack River) is a problem during Spring tide (otherwise it works "pretty good"). The Main St. pump station was eroded and breached from Sandy.
6	Green	Redneck Street between Sylvan Avenue and Main Street	Green dot labels arrow pointing toward Hackensack River. During Irene, flood water covered the area from to Hackensack River, up to and beyond Redneck Street.
7	Red/Blue *(5 red, 3 blue)*	DePeyster Creek behind the industrial buildings on Gates Road; DePeyster Creek to Louis Creek	Property being filled next to the Louis St. ditch and DePeyster Creek pump station. Fill is approximately 15 feet high and runs into ditch on north side of property and has filled in ditch. The fill has protected residential properties to the west of the commercial area from recent flooding. Construction of warehouses will occur on the fill site. Two of the red dots represent vacant buildings that are regularly flooded. Blue dots represent flood gate, spring tide, and creek to St. Louis. Industrial Avenue flooding is a regular occurrence and blocks street access to the commercial buildings. Businesses have been moved because employees cannot obtain access which has led to many vacancies. There has been a loss of rentals for the municipality. During spring

No.	Category	Location	Notes
			tide, the industrial area floods from the Hackensack River through the industrial park, up to Washington Avenue.
8	Blue	Losen Slote	Large sections of the Losen Slote has been encroached upon due to filling by property owners in their backyards. It has decreased from 15-20 feet wide to 3 feet wide in some areas.
9	Blue *(4 blue)*	Intersection of East Riser Ditch, Little Ferry, and South Hackensack borders	Blue dots include a pump station, stream capacity issue, and 1st time flooding issue starting now. The South Hackensack Route 46 pump station has a large capacity with 3 screw pumps, but does not alleviate flooding. It was designed to pump out this area. It should have never been put there. It pumps to the East Riser Ditch, but is not effective at high tide. East Riser Ditch does not have the capacity to handle the flow. The Teterboro pump station operation is essential for the South Hackensack Route 46 pump station to work. Homes on Couchon Drive are flooding from the Route 46 pump station. Need a new pump station down at the other end over Moonachie Avenue at the tide gate on Berry's Creek.
10	Blue *(4 blue)*	Nature preserve, Birch St Park, adjoining to Losen Slote Creek Park.	There is a five acre contaminated tract along the Losen Slote Creek near Mehrhof Pond. A commercial site off of State Street was pumping TCE into the Losen Slote Creek and contaminated the groundwater. The location is a nature preserve (Birch Street Park which adjoins the Losen Slote Creek Park). As part of the cleanup, they have been installing sheet pile across the Losen Slote Creek, which has led to sediment build up.
11	Blue	Open Space adjacent to Mehrhof Pond	Two BCUA security fences bisect the natural area adjacent to Mehrhof Pond, prohibiting public access, but the public doesn't want to lose the open space. Mitigation funding is available for Little Ferry to turn the BCUA property into park land. Mitigation is for the new tower at Teterboro airport. There are 800-1000 Little Ruddy Ducks in Mehrhof Pond.
12	Green/Blue	Old Mosquito Commission Dyke	The Old Mosquito Commission Dyke (blue dot) was overtopped and broke through at BCUA (green). Led to water flowing through the breaks during spring and full moon tide, and water pouring through the BCUA access road culvert. Breaches have been repaired; the dyke requires more frequent inspections through the use of drones.
14	Green/Blue	Area near Birch Street and Lamker Court	County installed new drainage pipe at Birch Street Park (blue dot) that was broken; there is now a water filled depression in place of the heavy equipment. The 2 green dots have arrows on the, and the blue dots are labeled pipe excavation and Birch Street Park.

Table A4-1-5 - Borough of Teterboro

No.	Category	Location	Notes
1	Green	Couchon Drive adjacent to the Airport	No flooding occurred during Sandy, but water rose out of the ditch and flooded the area up to Couchon Drive during Irene. No nuisance flooding during minor storm events has been observed in this area.

- In addition to the specific flooding concerns identified by location, the CAG members provided the following general comments:
    - Moonachie: Three years ago, $1.4 million was spent on the West Riser Tide Gate. Currently, the lack of maintenance causes flooding and failure to discharge at low tide. Improvements to the operation of this tide gate are critical to the whole area. Similarly, the East Riser Tide Gate is not maintained. Both of these tide gates are critical to the entire area and specifically affect Moonachie, Little Ferry, and Teterboro. Mobile home parks in the area also suffer from flooding due to tide gate failures. Current piping from mobile home parks is buried. The Losen Slote Pump Station located near Carol Place is considered critical infrastructure; it currently leads to flooding in nearby church (former Melnor) parking lots.
    - South Hackensack Township: This area was formed due to a surveying error when the original Lodi Township was divided into towns; it was not included in the Little Ferry or Moonachie municipalities.
    - Teterboro: The South Hackensack pump station on East Riser Ditch near the intersection of Route 46 (on the eastside of the Airport) would be better situated further south because the pump station appears to cause local flooding in the area. This ditch needs to be cleaned out and widened to its original dimensions. It used to be cleaned out every two years by the Mosquito Commission, but regular maintenance has ceased. Remediation work is underway on Losen Slote in Little Ferry near Capital Drive. Residents have observed steel cofferdam pilings being placed in Losen Slote and excavation activities occurring; there is concern that these pilings are causing a sediment build up in Losen Slote that could lead to future flooding.
    - Little Ferry: Drainage easements are no longer recognized, making enforcement of illegal filling and encroachment of Losen Slote difficult. Willow Lake Park has been filled in by “anything they could get their hands on”. Midnight dumping occurred, including the burial of 55-gallon drums that ignited and burned in front of the high school.
- After the Break-out Session, Ms. Linda Fisher reviewed upcoming activities and critical schedule dates. The next CAG meeting is tentatively scheduled for May 17, 2016.
- Prior to closing the meeting, Mr. Boose asked the CAG members if they had any further suggestions or information that they would like to share with the group. The following suggestions/information were provided:
    - Consider a semi-circle (round table) format for the next CAG meeting.

- A New Meadowlands Coalition Meeting will be held on May 4, 2016.
- Consider doing a field trip for a future CAG Meeting to assess shorelines; four pontoon boats are available that support up to 15 people (total 60 people).
- *Moonachie Messenger* was an effective tool for making folks aware of public involvement opportunities; several attendees learned of this CAG meeting through this newsletter.
- The following suggestions were also made to address flooding concerns:
  - Reinforce the Kane Mitigation Bank Dike: It currently has buckets of soil as a barrier and the adjoining commercial area has suffered from flooding. To do so, consider putting sheet pile into the dike, drive the sheet pile down the center of the Mosquito Commission Dyke, run it around BCUA to Route 46. This material is used as bulkhead at the Jersey Shore.
  - Construct a surge gate across Hackensack River.
  - Ditches in the area are being encroached upon and are being filled and/or reduced in size. Some ditches have been reduced from 10' wide to 2' wide. The towns should be clearing these ditches and maintaining the easements, but the towns have stated that they will not enforce the easements. In the past, Little Ferry was drained by ditches. However, they are currently filled and culverts are broken, which results in a lot of localized flooding.
  - Before an increase in development in the 1950-60s, there were open ditches along every road. These open ditches have been replaced with underground pipes that are undersized and of unknown condition, with potentially many failed sections. Now local roads convey the stormwater instead of the infrastructure.
  - Tide gates are stuck in the open position by debris, and there appears to be a lack of maintenance and repair by the municipalities, along with illegal fill/encroachment into the Losen Slote. Losen Slote is proposed for dredging in the near future. Permits are in place, but there has been a delay (possibly due to contaminated sediment).

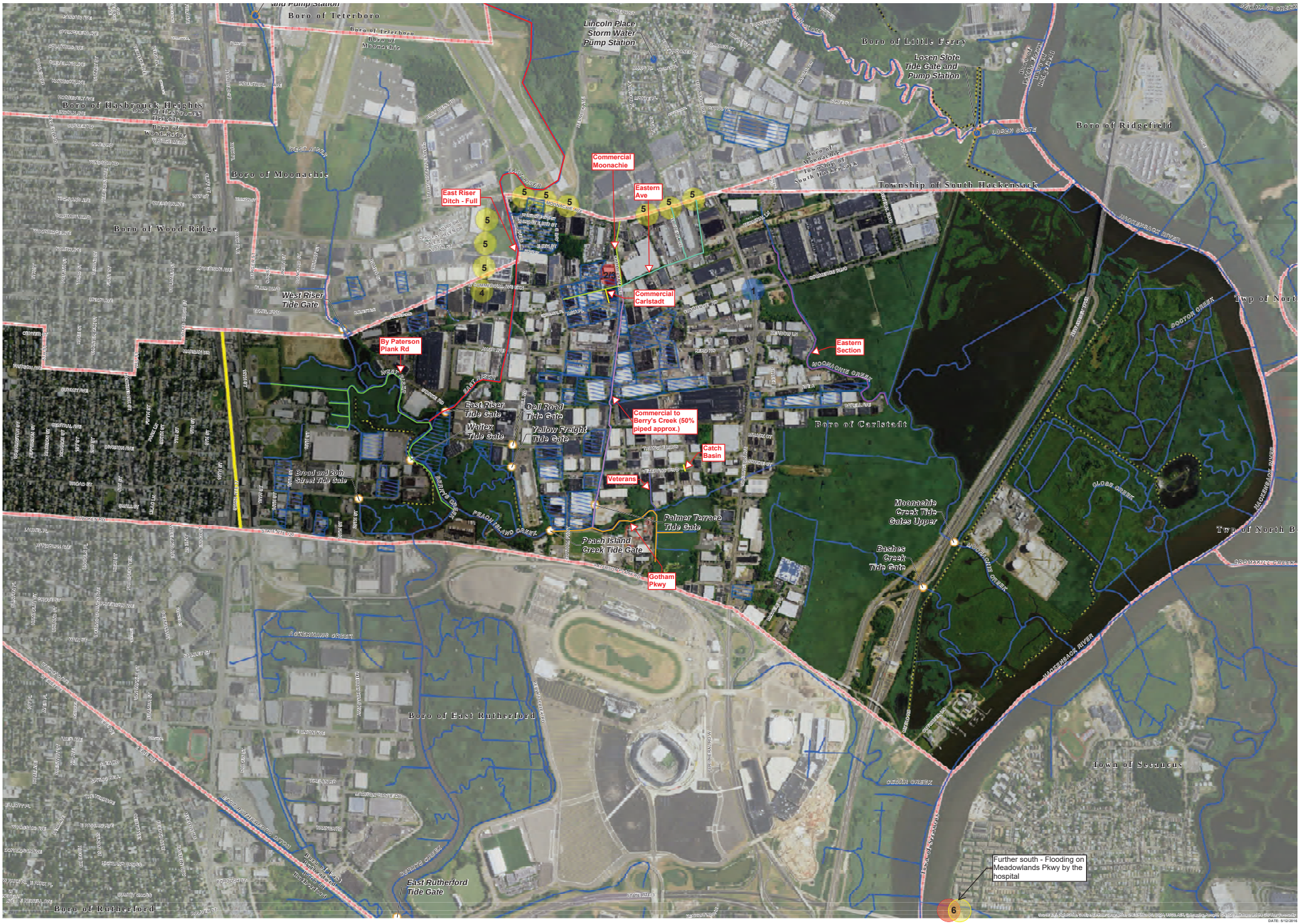
- Based on the closing discussion, it was determined that the next CAG meeting should cover the following three items: (1) review/discussion of the Preliminary Draft Public Scoping Document to facilitate CAG members' review; (2) a round table discussion of the findings generated during this Break-out Session; and (3) further discussion/determination of venues and other logistics related to the upcoming Public Scoping Meeting and Public Scoping Process.

Meeting adjourned at 8:10 p.m. ET.

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Attachment A4-1-2 - Exhibits Displaying CAG Input for Flood-Prone Areas

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LEGEND

Boundaries
- Pilot Area
- Municipality

Data Obtained from USGS National Hydrography Dataset
- Watercourse

Data Obtained from New Jersey Sports and Exposition Authority (NJSEA)
- Pump Station
- Tide Gate

Ditch Survey Published April 20, 2016
- By Paterson Plank Rd
- Catch Basin
- Commercial Carlstadt
- Commercial Moonachie
- Commercial to Berry's Creek (50% piped approx.)
- East Riser Ditch - Full
- Eastern Ave
- Eastern Section
- Gotham Pkwy
- Veterans

Interpreted from Topographic Data
- Legacy Berm

Data from the Hackensack Meadowlands Floodplain Management Plan (2005)
- Flood-Prone Areas

Information from CAG Meeting 4-26-2016
Flooding Concerns
- Regular Rainfall Event
- Heavy Rainfall Event
- Major Storm Event
- Other Issues

DATE: 5/12/2016

REBUILD BY DESIGN: MEADOWLANDS FLOOD PROTECTION PROJECT

BORO OF CARLSTADT

FIGURE 2

CITIZEN ADVISORY GROUP MEETING



LEGEND

Boundaries
- Pilot Area
- Municipality

Data Obtained from USGS National Hydrography Dataset
- Watercourse

Data Obtained from New Jersey Sports and Exposition Authority (NJSEA)
- Pump Station
- Tide Gate

Ditch Survey Published April 20, 2016
- East River Ditch - Full
- East River Ditch - Teterboro
- West River Ditch

Interpreted from Topographic Data
- Legacy Berm

Data from the Hackensack Meadowlands Floodplain Management Plan (2005)
- Flood-Prone Areas

Information from CAG Meeting 4-26-2016
Flooding Concerns
- Regular Rainfall Event
- Heavy Rainfall Event
- Major Storm Event
- Other Issues

N

0 500 1,000 Feet

DATE: 5/12/2016

REBUILD BY DESIGN: MEADOWLANDS FLOOD PROTECTION PROJECT

BORO OF TETERBORO

FIGURE 3

CITIZEN ADVISORY GROUP MEETING



LEGEND

Boundaries
- Pilot Area
- Municipality

Data Obtained from USGS National Hydrography Dataset
- Watercourse

Data Obtained from New Jersey Sports and Exposition Authority (NJSEA)
- Pump Station
- Tide Gate

Ditch Survey Published April 20, 2016
- East Riser Ditch - Full
- East Riser Ditch - Little Ferry
- Losen Slote Creek Ditch
- Louis Street Ditch
- Main Street

Interpreted from Topographic Data
- Legacy Berm

Data from the Hackensack Meadowlands Floodplain Management Plan (2005)
- Flood-Prone Areas

Information from CAG Meeting 4-26-2016

Flooding Concerns
- Regular Rainfall Event
- Heavy Rainfall Event
- Major Storm Event
- Other Issues
- Boundary Discrepancy
- Open Ditch

0 500 1,000 Feet

DATE: 5/12/2016

REBUILD BY DESIGN: MEADOWLANDS FLOOD PROTECTION PROJECT

BORO OF LITTLE FERRY

FIGURE 4

CITIZEN ADVISORY GROUP MEETING



LEGEND

Boundaries
- Pilot Area
- Municipality

Data Obtained from USGS National Hydrography Dataset
- Watercourse

Data Obtained from New Jersey Sports and Exposition Authority (NJSEA)
- Pump Station
- Tide Gate

Interpreted from Topographic Data
- Legacy Berm

Data from the Hackensack Meadowlands Floodplain Management Plan (2005)
- Flood-Prone Areas

Information from CAG Meeting 4-26-2016
Flooding Concerns
- Regular Rainfall Event
- Heavy Rainfall Event
- Major Storm Event
- Other Issues

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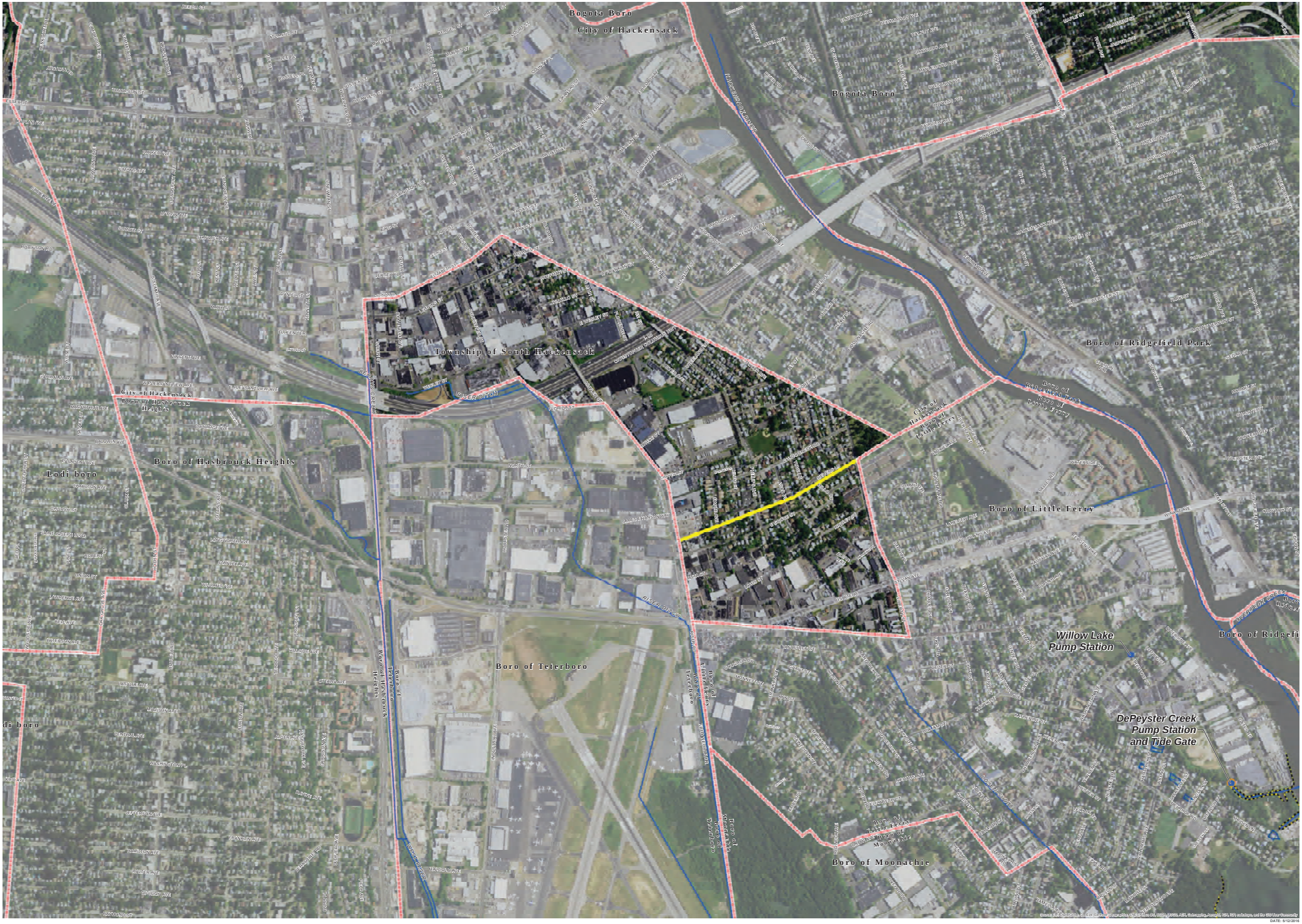
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REBUILD BY DESIGN: MEADOWLANDS FLOOD PROTECTION PROJECT

TOWNSHIP OF SOUTH HACKENSACK

FIGURE 5

CITIZEN ADVISORY GROUP MEETING



LEGEND

Boundaries
- Pilot Area
- Municipality

Data Obtained from USGS National Hydrography Dataset
- Watercourse

Data Obtained from New Jersey Sports and Exposition Authority (NJSEA)
- Pump Station
- Tide Gate

Interpreted from Topographic Data
- Legacy Berm

Data from the Hackensack Meadowlands Floodplain Management Plan (2005)
- Flood-Prone Areas

Information from CAG Meeting 4-26-2016
Flooding Concerns
- Regular Rainfall Event
- Heavy Rainfall Event
- Major Storm Event
- Other Issues

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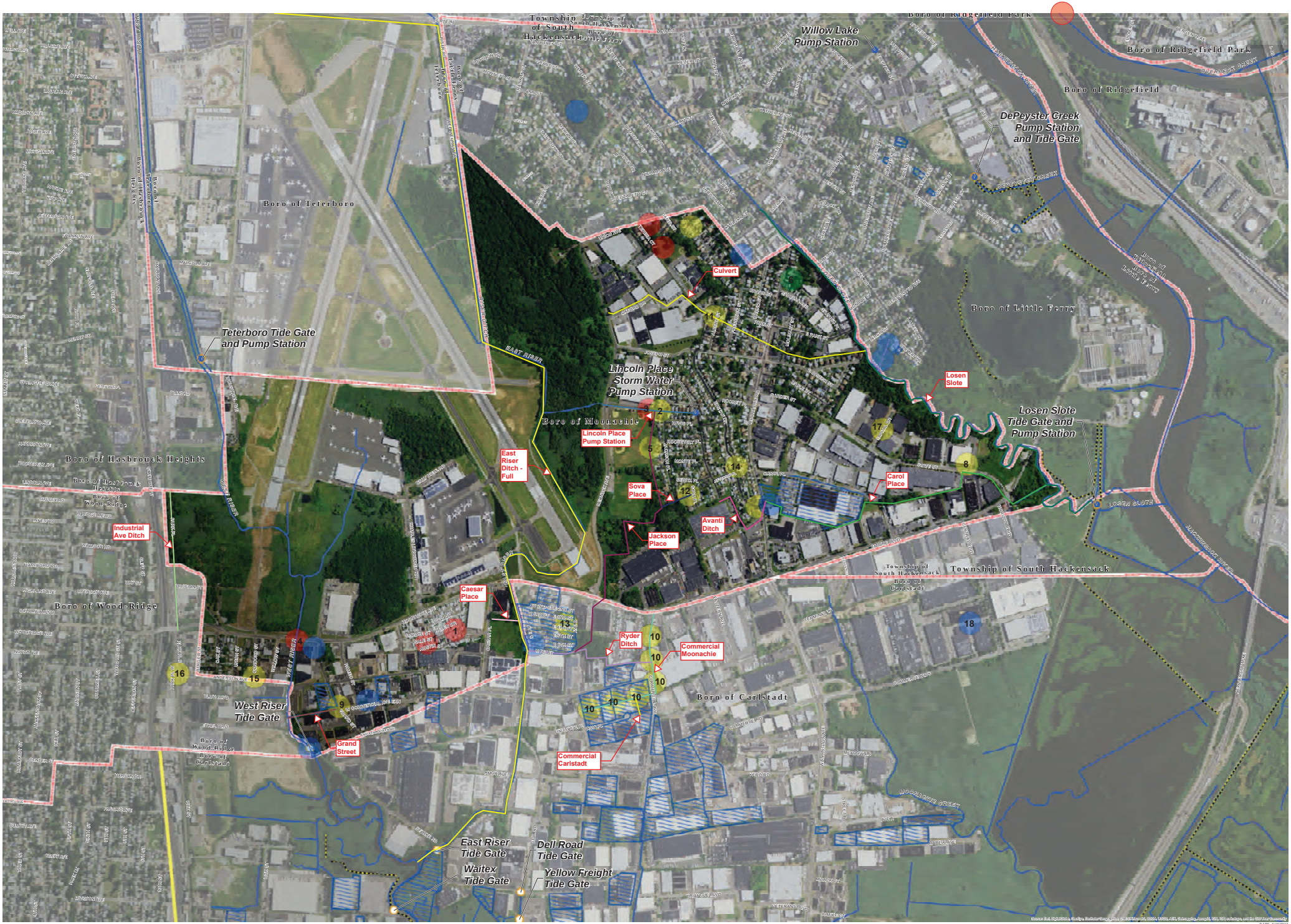
DATE: 5/12/2016

REBUILD BY DESIGN: MEADOWLANDS FLOOD PROTECTION PROJECT

TOWNSHIP OF SOUTH HACKENSACK

FIGURE 6

CITIZEN ADVISORY GROUP MEETING



LEGEND

Boundaries: Pilot Area; Municipality

Data Obtained from USGS National Hydrography Dataset: Watercourse

Data Obtained from New Jersey Sports and Exposition Authority (NJSEA): Pump Station; Tide Gate

Ditch Survey Published April 20, 2016: Avanti Ditch; Caesar Place; Carol Place; Commercial Carlstadt; Commercial Moonachie; Culvert; East Riser Ditch - Full; Grand Street; Industrial Ave Ditch; Jackson Place; Lincoln Place Pump Station; Losen Slote; Ryder Ditch; Sova Place

Interpreted from Topographic Data: Legacy Berm

Data from the Hackensack Meadowlands Floodplain Management Plan (2005): Flood-Prone Areas

Information from CAG Meeting 4-26-2016 — Flooding Concerns: Regular Rainfall Event; Heavy Rainfall Event; Major Storm Event; Other Issues; Missing Ditch

N

0 500 1,000 Feet

DATE: 5/12/2016

REBUILD BY DESIGN: MEADOWLANDS FLOOD PROTECTION PROJECT

BORO OF MOONACHIE

FIGURE 1

CITIZEN ADVISORY GROUP MEETING

Subappendix A4-2: Existing Condition Data for Pump Stations and Tide Gates

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2.0 Sources A4-4
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Attachments

Attachment A4-2-1: Survey Scope of Work

Attachment A4-2-2: Supplemental Guidance Documents

Attachment A4-2-3: Tide Gate and Pump Station Inventories

Attachment A4-2-4: Survey Files

Acronyms and Abbreviations

CAG	Citizen Advisory Group
PS	Pump Station
TG	Tide Gate
TO3	Task Order 3

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1.0 Introduction

Various sources (see **Section 2.0**) were used to compile information for the existing flood control infrastructure located within the five municipalities in the Project Area (the Boroughs of Little Ferry, Moonachie, Carlstadt, and Teterboro, and the Township of South Hackensack in Bergen County, New Jersey), including berms, tide gates (TGs), and stormwater pump stations (PSs). When sufficient information was not available in the form of as-built plans or reports, the survey data was requested from Robinson Aerial Survey, Inc. (Robinson).

The Task Order 3 (TO3) survey scope of work for the survey of berms, TGs, PSs, and supplemental guidance documents are included in **Attachment A4-2-1** and **Attachment A4-2-2**, respectively. **Figures 1** through **6** in **Attachment A4-2-3** shows a map and summary table of the TG and PS information by municipality. The survey files for the TG and PS structures and berms gathered for TO3, including photos, CAD and txt files, and sketches, are included in **Attachment A4-2-4**.

Information for the TGs and PSs that was unable to be obtained through report and plan review, and which was requested from the surveyors, but not obtained, is summarized below:

- **Borough of Moonachie**
  1. Burger King PS – The pump discharge invert elevation and pipe size were not obtained.
  2. West Riser TG – The invert of tide gates was not obtained.
- **Borough of Teterboro**
  1. Vincent Place PS – This PS was not surveyed. Missing information includes the number of pumps, pump intake/discharge pipe sizes, intake and discharge pipe invert elevations, wet well information, etc. A response from Steven Mazurek (Robinson) transmitted via email on December 7, 2016 stated: “brand new within 10 years re-done by Teterboro.”
- **Borough of Carlstadt**
  1. Yellow Freight TG – The invert, shape, and dimensions (diameter) of the downstream flow through structure were not obtained.
  2. Broad and 20th St TG – A response from Steven Mazurek (Robinson) transmitted via email on December 7, 2016 stated: “under constant water and collapsing.”
  3. Dell Road TG – The invert, shape, and dimensions (diameter) of the downstream flow through structure were not obtained.
  4. Peach Island Creek TG – The invert, shape, and dimensions (diameter) of the downstream flow through structure were not obtained. Additionally, the invert and dimensions of the upstream flow through structure and the bottom of TG elevation were not obtained.
  5. Waitex TG – The downstream flow through structure invert, verified dimensions of the downstream flow through structure, and the bottom of TG elevation were not obtained.
  6. Palmer Terrace – The top and bottom elevations of the TG and the downstream flow through structure invert and dimensions were not obtained.
  7. East Riser TG – The downstream flow through structure invert elevation was not verified.
- **Borough of Little Ferry**
  1. DePeyster Creek TG – The dimensions and inverts of the upstream flow through structure and the elevation of top of TG were not obtained.

2. DePeyster Creek PS – The intake pump size was not obtained.
3. Willow Lake PS – The intake pump size and the pump intake invert elevation were not obtained.
4. Limited information is available from the various sources listed for Maiden Lane PS, Main Street PS, and the Route 46 PS, also referred to as "Pump Bay Stormwater PS."

- **General**

1. The upstream and downstream channel cross sections at the structures are missing, as part of the scope. A response from Steven Mazurek (Robinson) transmitted via email on December 7, 2016 stated: "Going over missing section elevations—if I can put data on from field notes I will, maybe one more trip for missing."

2.0 Sources

This section lists the various sources used to compile information for the existing flood control infrastructure located within the five municipalities in the Project Area:

1. Robinson Aerial Survey, Inc. (Robinson) TG and PS survey (September-December 2016);
2. New Jersey Sports and Exhibition Authority (NJSEA) GIS Database (data received from NJSEA in March 2016);
3. Municipality-specific meetings attended by representatives from HDR, AECOM, NJDEP, and the specific municipality representatives (from the Boroughs of Carlstadt, Little Ferry, Moonachie, and Teterboro) (May 2016);
4. Feedback from the Citizen Advisory Group (CAG) during Public Meeting #2 (April 26, 2016);
5. T&M Associates Main Street Drainage Improvement Study, Borough of Little Ferry, Bergen County NJ – Drainage Evaluation Report (2014);
6. New Jersey Institute of Technology Report - Appendix F (2014);
7. NJDEP Flood Hazard Area Permit Engineers Report - East Riser Ditch Red Neck Avenue Ditch (prepared for Port Authority of NY&NJ by Jacobs Civil Consultants Inc. in 2009);
8. Uni Reality, LLC Hydraulic & Hydrologic Calculations for Proposed Stormwater Management Systems (prepared by Mianecki Consulting Engineers in 2007); and
9. NJSEA Hackensack Meadowlands Floodplain Management Plan (2005).

3.0 Attachments

Attachment A4-2-1 (Survey Scope of Work), **Attachment A4-2-2** (Supplemental Guidance Documents), and **Attachment A4-2-3** (Tide Gate and Pump Station Inventories) are provided in the following pages. **Attachment A4-2-4** (Survey Files) is provided on a compact disc (CD).

Attachment A4-2-1: Survey Scope of Work

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AECOM Project Number: 60481054
AECOM Project Name: New Meadowlands
MCSS Task / Purchase Order No.: 01

Attachment A4-2-1

Task Order Subcontracted Services, Schedule and Deliverables

1. Task Order Subcontracted Services:

Topographic surveys shall be completed for the existing berms, pump stations, and tide gates in each of the five project townships. All data will be reported in with reference to NAVD 88 and NAD 83. Temporary benchmarks will be established, as needed, for these purposes.
Data to be collected will include the following:

1) The centerline, berms crests, and berm toes will be surveyed at designated cross-section locations. In addition, points offset 10 feet from each toe will be surveyed. The endpoint where each berm segment ties into the surrounding terrain will be surveyed. A total of 69 cross-sections, including the berm endpoints, will be surveyed. See Table 1 and Figures 1 – 5.

2) Existing tide gate crest, at maximum width locations. Gate bottom and sill elevations, if applicable. Elevations and plan view extents of gate support structure. Eleven tide gates will be surveyed as summarized in Table 1 and shown on Figures 1 – 5.

3) Pump station wet well plan view extents and bottom elevations at corner/boundary points. Pump intake and discharge elevations. Top of pump discharge line(s) between pump and discharge point. Five pump stations will be surveyed as summarized in Table 1 and shown on Figures 1 – 5.

4) Plan view extents and corner point/boundary elevations of access, operation and maintenance surfaces associated with pump stations and tide gates. For purposes of this estimate it is assumed that each tide gate and pump station has paved access, operation and maintenance surfaces.

Refer to Table 1 below, and attached Figures 1 thru 5 for specific survey requirements.

Table 1 - Summary of Survey Requirements

Township	Tide Gates	Pump Stations	Berm Cross-Sections
Carlstadt (Figure 2)	7 Tide Gates: East Riser, Broad & 20th street, Dell Road, Waitex, Peach Island, Yellow Freight, Palmer Terrace	None	114-142
Little Ferry (Figure 4)	1 Tide Gate: Depeyster	2 Pump Stations: Willow Lake, Depeyster	93-113
Moonachie (Figure 1)	1 Tide Gate: West Riser	1 Pump Station: Lincoln Place	
South Hackensack (Figure 5)	1 Tide Gate: Losen Slote	1 Pump Station: Losen Slote	61-79
Teterboro (Figure 3)	1 Tide Gate: Teteroboro	1 Pump Station: Teterboro	

2. Task Order Schedule:.

Survey to be completed and transmitted to AECOM by May 31, 2016.

3. Task Order Deliverables:

The following deliverables will be provided:

1) A survey control report summarizing the methods applied, and relevant associated measurements and calculation required to establish temporary benchmarks in the field and to confirm the accuracy of the data collected. The survey control report shall meet the following requirements:
    a. Identifies what survey control was set (permanent, stable, protected);
    b. Identifies where it was set (how many points, what interval, data sheets containing full documentation of each control point);
    c. Contains information demonstrating that the surveying performed on this control meets the NGS standards for 2nd Order, Class II surveys as required by USACE.
    d. Contains information demonstrating that the surveying efforts meet the 2009 USACE-mandated CEPD (Comprehensive Evaluation of Project Datums) directive.

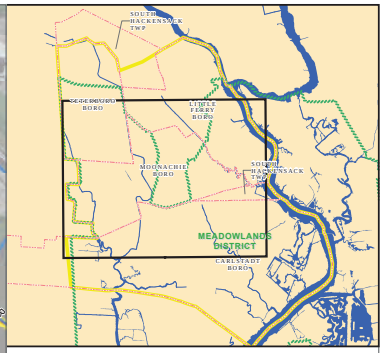
2) Five hard copy exhibits of the surveyed data, signed and sealed by a registered surveyor in the state of New Jersey. 3) Two compact disks containing AutoCAD files of the survey data presented in the hard copy exhibits, and electronic point data of the survey information.

4. Task Order Special Terms and Conditions for this Task Order:

None.

(End of page)





LEGEND

- Pilot Area Boundary
- Municipal Boundary
- Existing Berm
- Cross Section Location
- Pump Station
- Tide Gate
- Watercourse

THE
NEW MEADOWLANDS
REBUILD BY DESIGN FLOOD CONTROL PROJECT
SURVEY
EXISTING FLOOD CONTROL STRUCTURES

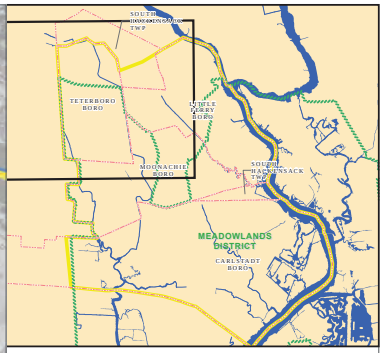
COMMUNITY:
BORO OF MOONACHIE

1" = 500'

			Date
Designer	JEG	4/12/2016
QC	MJV	4/21/2016
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Figure 1			DRAFT


Losen Slote Tide Gate and Pump Station
3 Screw Pumps & 3 Timber Flap Gates
West Riser Tide Gate
4 Metal Flap Gates
East Riser Tide Gate
4 Metal Flap Gates
Dell Road Tide Gate
1 Metal Flap Gate
Waitex Tide Gate
1 Metal Flap Gate
Yellow Freight Tide Gate
2 Cast Iron Gates
Palmer Terrace Tide Gate
1 Tideflex Check Valve
Peach Island Creek Tide Gate
4 Metal Flap Gates
Broad and 20th Street Tide Gate
1 Metal Flap Gate
Moonachie Creek Tide Gates Upper
Bashes Creek Tide Gate
Boro of Carlstadt
Boro of Moonachie
Boro of Wood-Ridge
Boro of Hasbrouck H
Boro of East Rutherford
Boro of Rutherford
Boro of Lyndhurst
Boro of Ridgefield
WEST RIVER
EAST RIVER
HACKENSACK RIVER
MOONACHIE CREEK
BERRYS CREEK
ACKERMANS CREEK
CEDAR CREEK
STATE RTE 120
PATERSON PLANK RD
HOBOKEN RD
EMPIRE BLVD
COMMERCE BLVD
W COMMERCIAL AVE EXT
BROAD ST
MEADOW LN
KERO RD
TRIANGLE BLVD
VETERANS BLVD
JONITE CT
BARELL AVE
AMOR AVE
ASIA PL
MARSAN DR
PASSAIC AVE
DIVISION AVE
ANDERSON AVE
BLUM BLVD
ETHEL BLVD
MOONACHIE AVE
WINDSOR RD
BILLY DIEHL RD
CAROL PL
MOONACHIE RD
ORTON AVE
GERMANY DR
HERMINA LN
EASTERN AVE
COMMERCE AVE
WASHINGTON AVE
STREET B
AVE A
NEW JERSEY TPKE
J-95
MERIDIAN RD
OLD WATER LN
PERIPHERAL RD W
E UNION AVE
UNION AVE
ORCHARD ST
STANLEY ST
WHELAN RD
MADISON CIRCLE DR
BRANCA RD
MURRAY HILL PKWY
STAKE RD
WEST RIVER DR
ADULT DR
SPRUCE ST
HELEN DR
AUSTIN ST
CHARLES LINDBERGH DR
RAILROAD ST
NORTRAN AVE
PARKER ST
BERGER ST
OAK ST
UNION ST
CONCORD ST
WILLOW ST
WOODLAND ST
JEFFERSON ST
GRAND ST
ROMEO ST
CHURCH ST
PARK ST
MAIN ST
1ST ST
2ND ST
3RD ST
4TH ST
5TH ST
6TH ST
7TH ST
8TH ST
9TH ST
10TH ST
11TH ST
12TH ST
13TH ST
14TH ST
15TH ST
16TH ST
17TH ST
18TH ST
19TH ST
20TH ST
21ST ST
STATE ST
WASHINGTON AVE
JANET LN
VREELAND AVE
PATERSON AVE
CORBELIM ST
HACKENSACK ST
FAIRVIEW AVE
RAILROAD AVE
DUBOIS ST
MEADOW RD
EASTERN WAY
Losen Slote Creek
Berrys Creek
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
LEGEND
Pilot Area Boundary
Municipal Boundary
Existing Berm
Cross Section Location
Pump Station
Tide Gate
Watercourse
MEADOWLANDS DISTRICT
SOUTH HACKENSACK TWP
TETERBORO BORO
LITTLE FERRY BORO
MOONACHIE BORO
CARLSTADT BORO
THE
NEW MEADOWLANDS
REBUILD BY DESIGN FLOOD CONTROL PROJECT
SURVEY
EXISTING FLOOD CONTROL STRUCTURES
COMMUNITY:
BORO OF CARLSTADT
1" = 600'
Designer JEG 4/12/2016
QC MJV 4/21/2016
Print Date JEG 4/22/2016
Figure 2
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LEGEND

- Pilot Area Boundary
- Municipal Boundary
- Existing Berm
- Cross Section Location
- Pump Station
- Tide Gate
- Watercourse

THE NEW MEADOWLANDS REBUILD BY DESIGN FLOOD CONTROL PROJECT

SURVEY

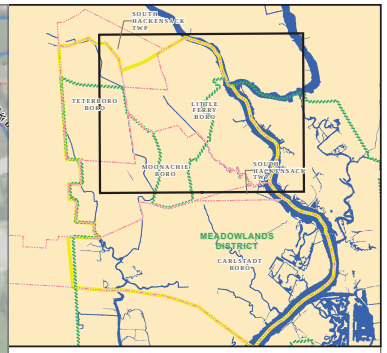
EXISTING FLOOD CONTROL STRUCTURES

COMMUNITY:
BORO OF TETERBORO

1" = 500'

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Figure 3			DRAFT





LEGEND

- Pilot Area Boundary
- Municipal Boundary
- Existing Berm
- Cross Section Location
- Pump Station
- Tide Gate
- Watercourse

THE NEW MEADOWLANDS REBUILD BY DESIGN FLOOD CONTROL PROJECT

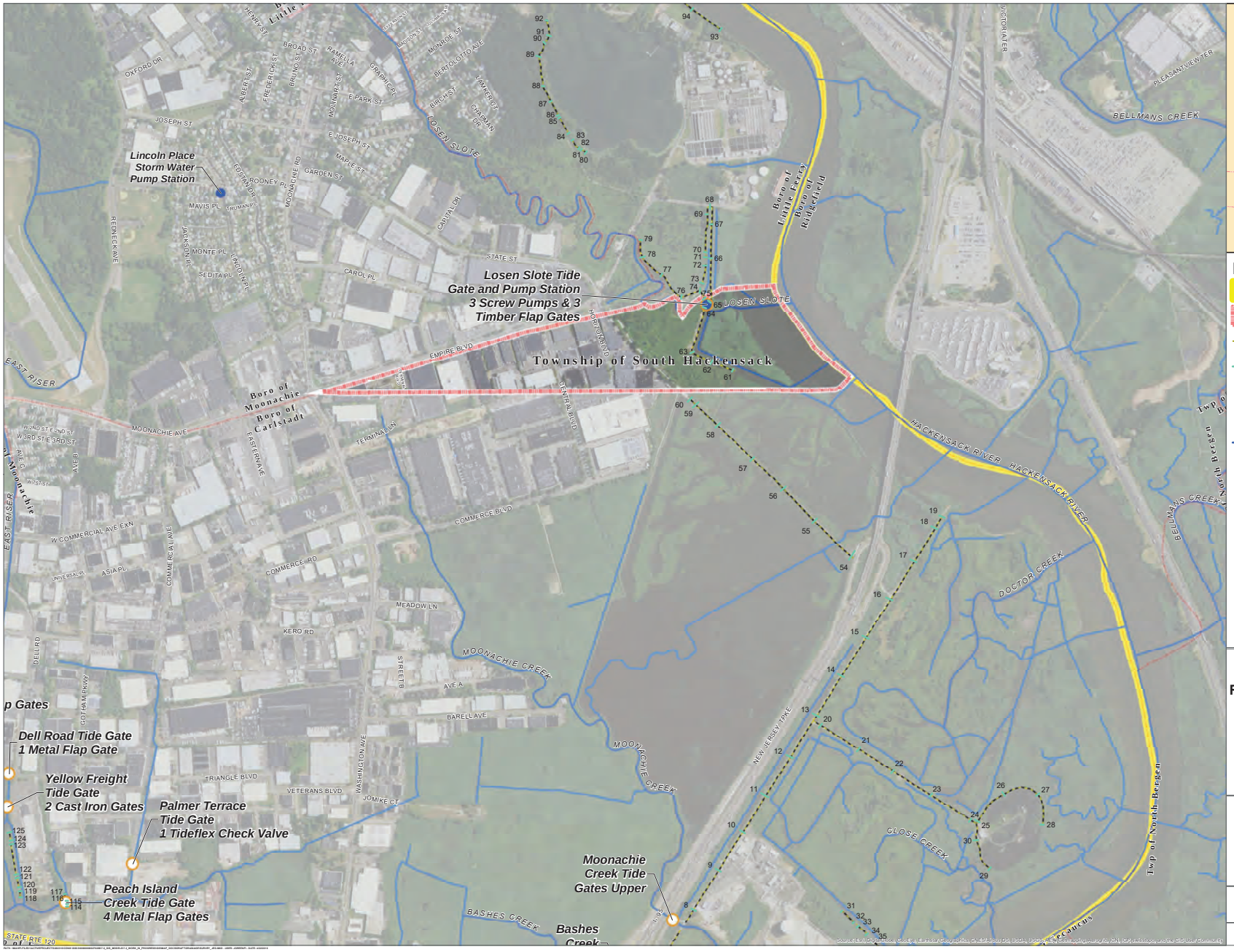
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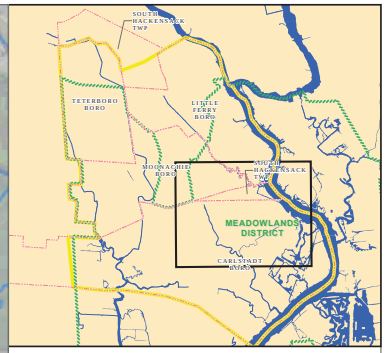
EXISTING FLOOD CONTROL STRUCTURES

COMMUNITY:
BORO OF LITTLE FERRY

1" = 500'

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Figure 4			DRAFT





LEGEND

- Pilot Area Boundary
- Municipal Boundary
- Existing Berm
- Cross Section Location
- Pump Station
- Tide Gate
- Watercourse

THE
NEW MEADOWLANDS
REBUILD BY DESIGN FLOOD CONTROL PROJECT

SURVEY
EXISTING FLOOD CONTROL STRUCTURES

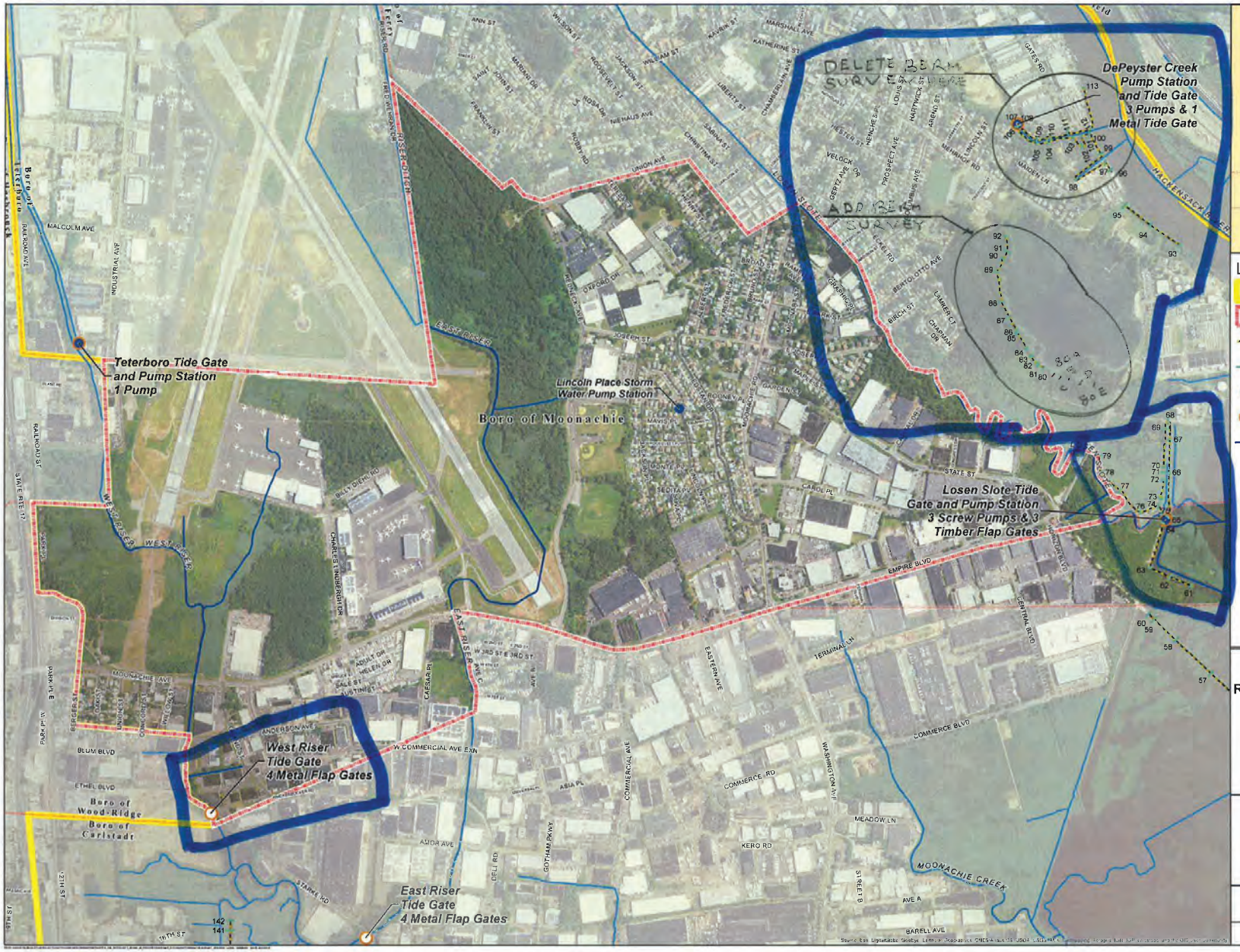
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TOWNSHIP OF SOUTH HACKENSACK

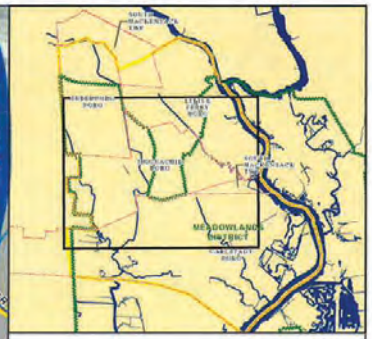
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DePeyster Creek Pump Station and Tide Gat
3 Pumps & 1 Metal Tide Gate
Dietrich St
Gates Rd
Maiden Ln
Crescent St
Oakdale
Added
Meinhof Rd
LITTLE FERRY BORO





LEGEND

- Pilot Area Boundary
- Municipal Boundary
- Existing Berm
- Cross Section Location
- Pump Station
- Tide Gate
- Watercourse
- SURVEY AREA

THE NEW MEADOWLANDS REBUILD BY DESIGN FLOOD CONTROL PROJECT

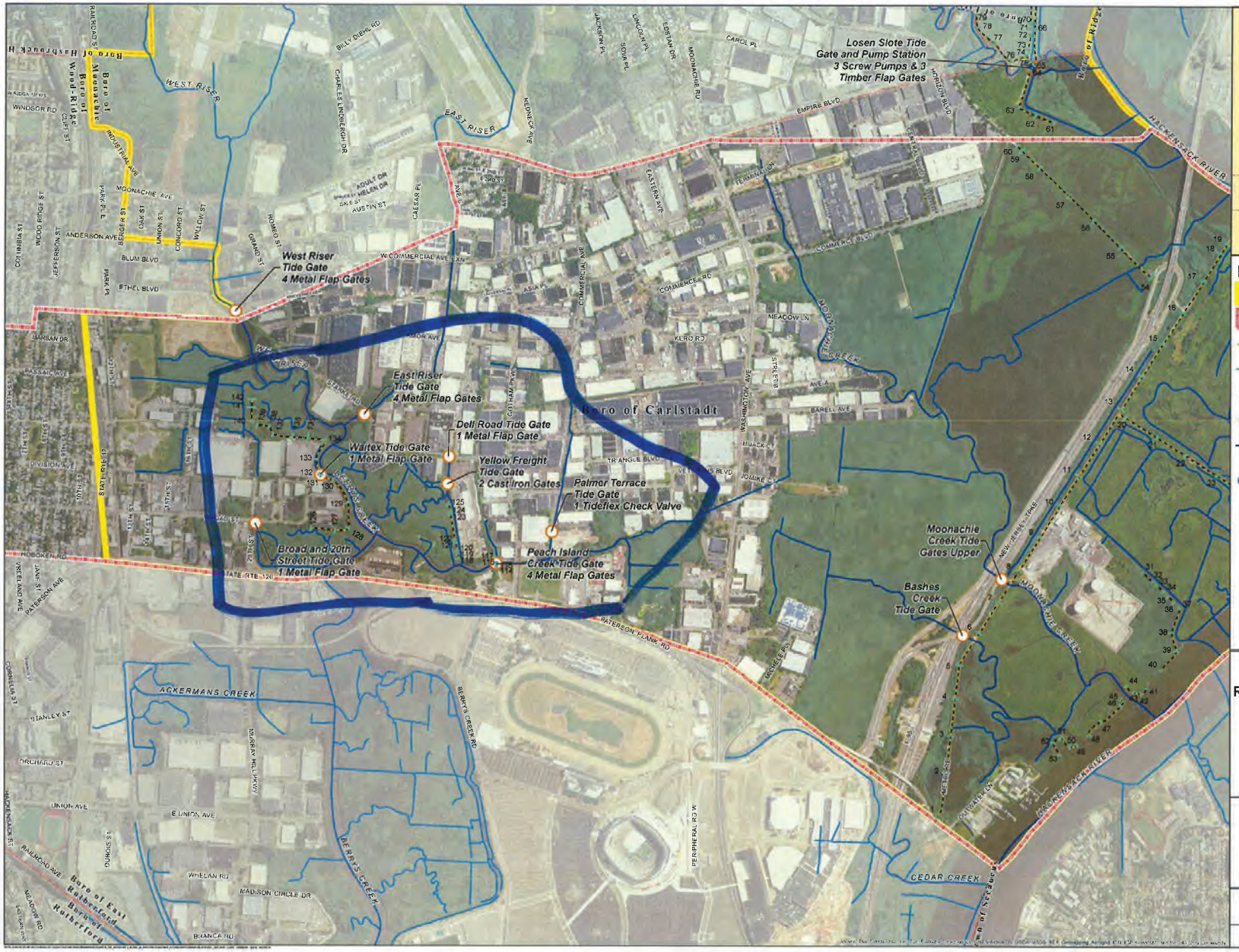
SURVEY

EXISTING FLOOD CONTROL STRUCTURES

COMMUNITY:
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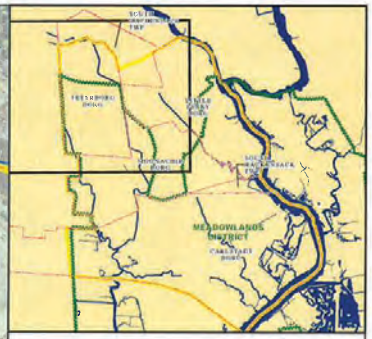
THE
NEW MEADOWLANDS
REBUILD BY DESIGN FLOOD CONTROL PROJECT
SURVEY
EXISTING FLOOD CONTROL STRUCTURES

COMMUNITY:
BORO OF CARLSTADT

1" = 600'

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Figure 2		DRAFT





LEGEND

- Pilot Area Boundary
- Municipal Boundary
- Existing Berm
- Cross Section Location
- Pump Station
- Tide Gate
- Watercourse
- Survey Area

THE NEW MEADOWLANDS REBUILD BY DESIGN FLOOD CONTROL PROJECT

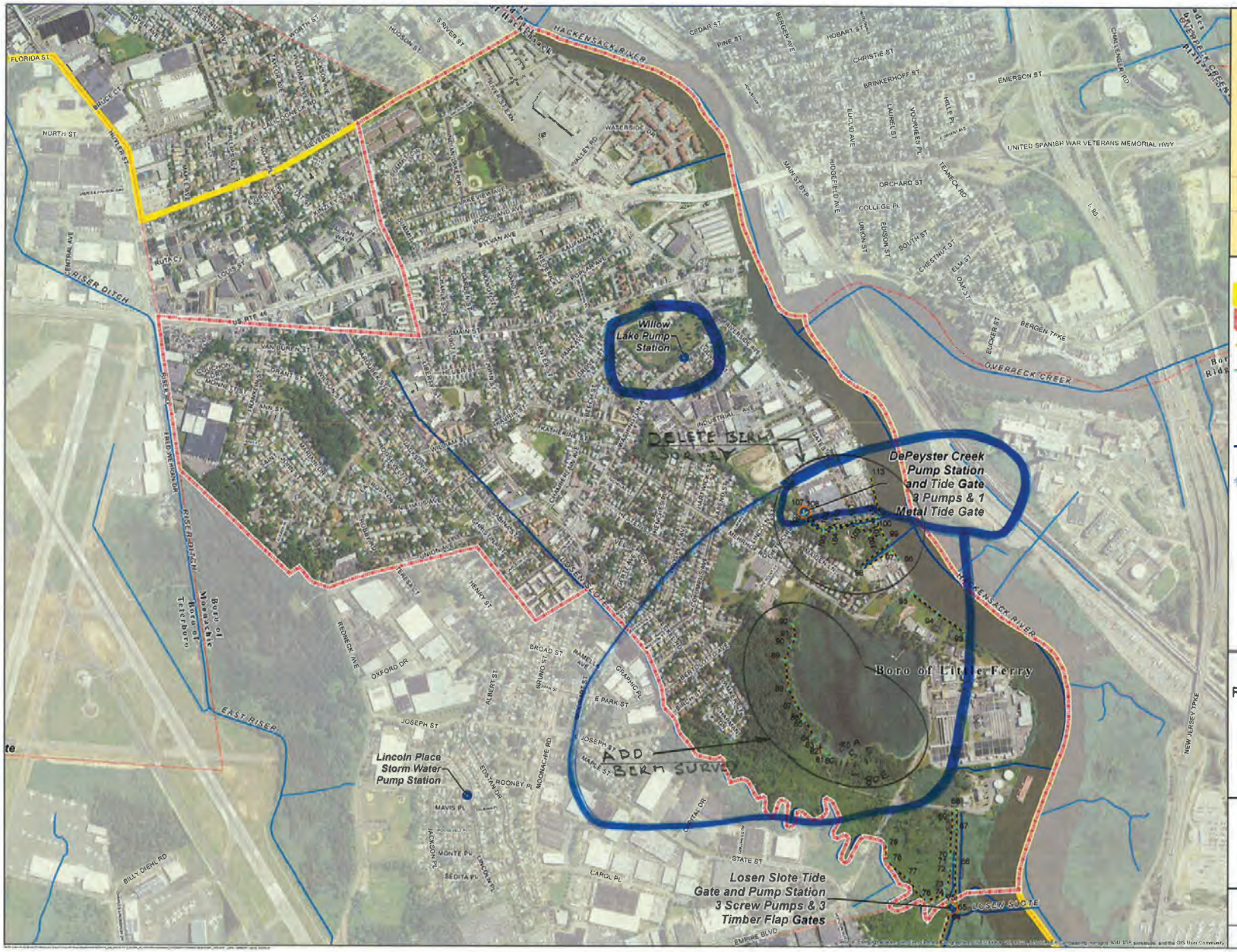
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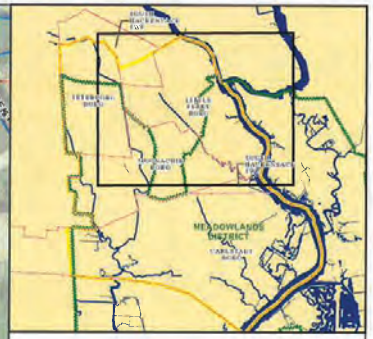
EXISTING FLOOD CONTROL STRUCTURES

COMMUNITY:
BORO OF TETERBORO

1" = 500'

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	Figure 3		DRAFT





LEGEND

- Pilot Area Boundary
- Municipal Boundary
- Existing Berm
- Cross Section Location
- Pump Station
- Tide Gate
- Watercourse
- SURVEY AREA

THE NEW MEADOWLANDS REBUILD BY DESIGN FLOOD CONTROL PROJECT

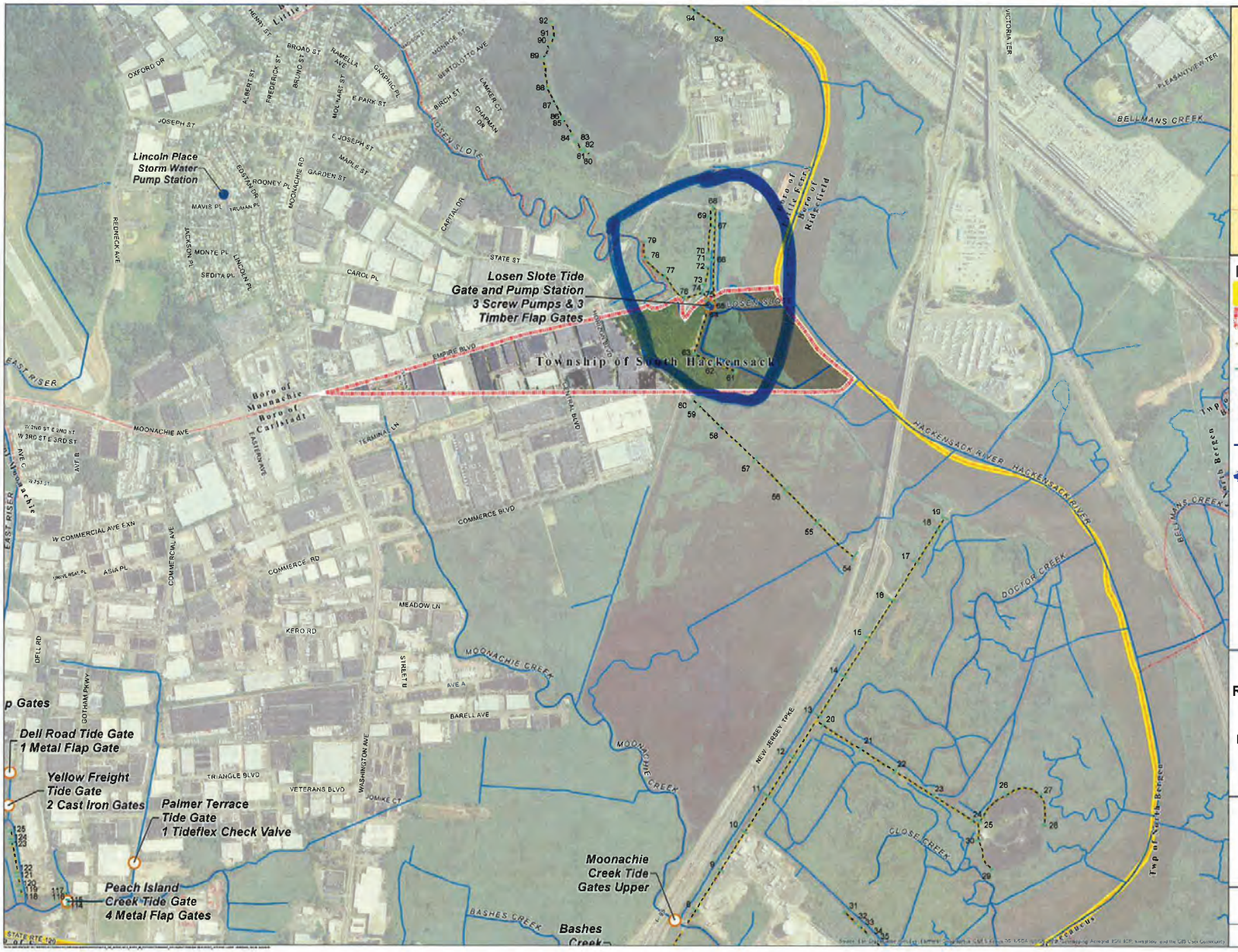
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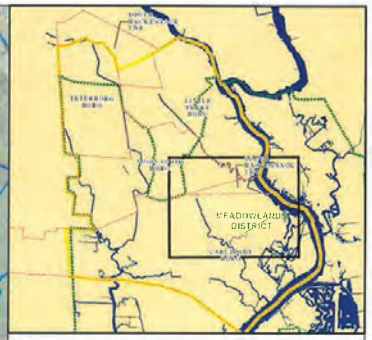
EXISTING FLOOD CONTROL STRUCTURES

COMMUNITY:
BORO OF LITTLE FERRY

1" = 500'

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	Figure 4		DRAFT





LEGEND

- Pilot Area Boundary
- Municipal Boundary
- Existing Berm
- Cross Section Location
- Pump Station
- Tide Gate
- Watercourse
- Survey Area

THE
NEW MEADOWLANDS
REBUILD BY DESIGN FLOOD CONTROL PROJECT

SURVEY
EXISTING FLOOD CONTROL STRUCTURES

COMMUNITY:
TOWNSHIP OF SOUTH HACKENSACK

1" = 500'

500'

		Date
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Print Date	JRG	4/22/2016
Figure 5		DRAFT

Attachment A4-2-2: Supplemental Guidance Documents

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Greenfield, Julie

From: Vecchio, Michael
Sent: Friday, June 17, 2016 4:10 PM
To: Steven Mazurek
Cc: Greenfield, Julie
Subject: 20160617 RBD Survey Coordination
Attachments: Annotated Tide Gate Pump Station Photos 06172016.pdf; Concept for tide gate surveys.pdf

Steve-

I've talked a few folks in Moonachie, Little Ferry, and Teterboro to provide access to the pump station and tide gate areas, where there isn't public access.

They are available from 7 AM – 3 PM. Let me know what days you would be available next week.

I've attached a few PDFs that I hope provide a better idea of what we want surveyed at the gates and pump stations. I made a concept sketch for the gates, and had a staf photos don't show the whole structure but they should be useful. We'll be available to meet you in the field most days next week.

I'd like to switch out the Lincoln Pump station in Moonachie with another one. I'll provide location.

My cell is 916-467-6038. Contact me and we can make a plan.

Thanks.

Michael

Michael J. Vecchio, PE (CA)
Senior Project Manager, Water Resources

HDR
1 International Boulevard, 10th Floor, Suite 1000
Mahwah, NJ 07495-0027
General 201-335-9300 **Direct** 201-335-9472
mvecchio@hdrinc.com

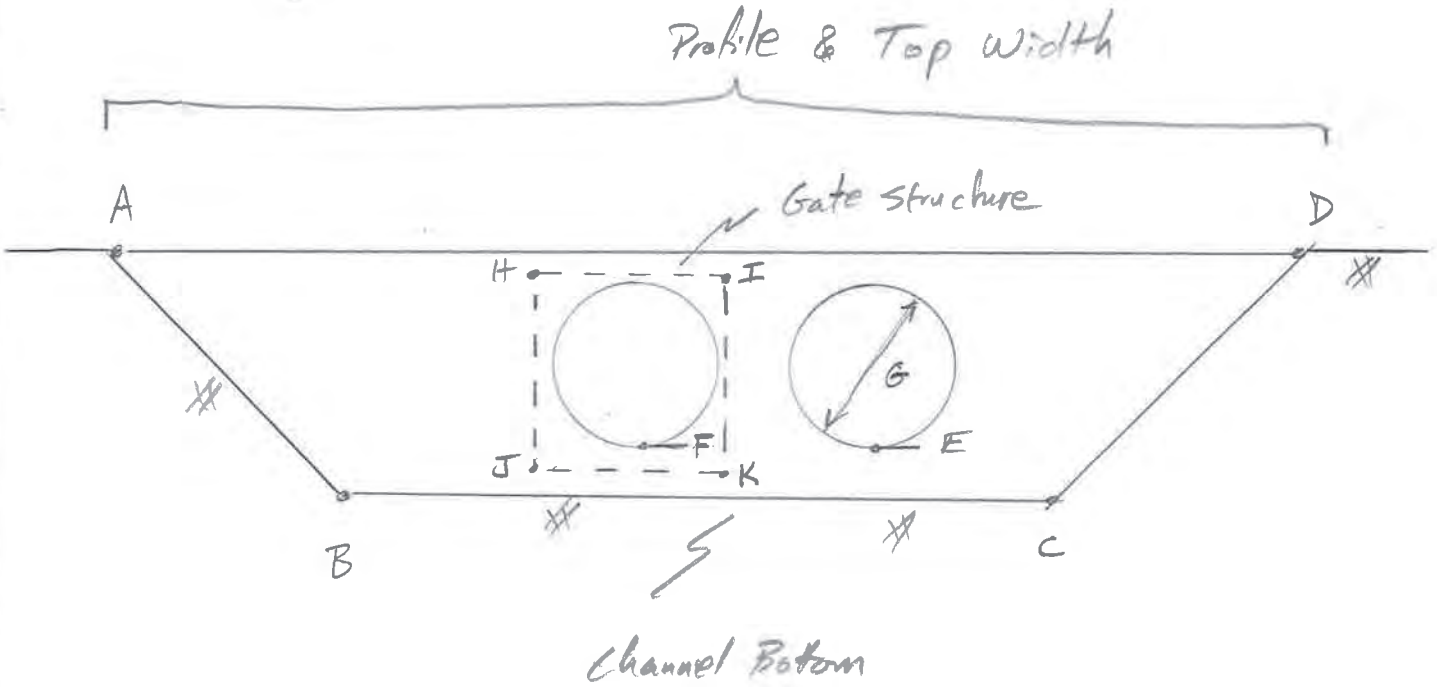
hdrinc.com/follow-us

Project: NM RBD | Computed: ZMU | Date: 6/17/16

Subject: Survey points for | Checked: | Date:

Task: Tide Gates - Conceptual | Page: | of:

Job #: | No:



* Survey all locations called out with letter. Survey trash rack locations & dimensions as well. If there are three outlets, shoot all three.

Drainage System Inspection Log

National Flood Insurance Program / Community Rating System

Site ID/Name: Broad Street and 20th Street Tide Gate

Location: Intersection of Broad Street and 20th Street - Carlstadt

File No.: SP-501 **Tide Conditions:** (Low, High)

Date: 12-8-05 **Time:** 10:10 AM / PM

Conditions: Clear (Rain, Snow, High Wind, High/Low Tide, etc.)

Inspected By: NJMC: Bob Segro, Frank Coppola, and John Enquist

---

Type of Inspection:

- ☒ Yearly
- ☐ Post-Storm
- ☐ Complaint

System Designation:

- ☒ Tide Gate
- ☐ Drainage Ditch
- ☐ Natural Stream
- ☐ Pump System
- ☐ Catch Basin
- ☐ Culvert
- ☐ Outfall
- ☐ Other

Overall Functionality:

- ☐ Fully Functional
- ☐ Functional with Restrictions
- ☒ Non-Functional

Notes On Condition/Problems:

The tide gate is not seating properly and is lodged open with sediment and debris. The silt is interfering with the functionality of the gate.

Maintenance Required:

- ☒ Immediate
- ☐ Repair
- ☐ Continued Upkeep

Notes on Maintenance

The tide gate currently does not have a trash rack system and is in need of one due to the amount of debris that the ditch has accumulated. The drainage ditch needs to be dredged in order to keep up with the amount of sediment that collects in front of the gate.

Other Notes:

Drainage System Inspection Log

National Flood Insurance Program / Community Rating System

Site ID/Name: Broad Street and 20th Street Tide Gate (Block: 120 Lot: 13)
Date: 12/08/05 **Time:** 10:10 AM **Tide Conditions:** Low



Photo 1 Description: 1 steel flap gate

Drainage System Inspection Log

National Flood Insurance Program / Community Rating System

Site ID/Name: Broad Street and 20th Street Tide Gate

Location: Intersection of Broad Street and 20th Street - Carlstadt

File No.: SP-501 **Tide Conditions:** (Low, High)

Date: 12-8-05 **Time:** 1:50 AM / PM

Conditions: Clear (Rain, Snow, High Wind, High/Low Tide, etc.)

Inspected By: NJMC: Bob Segro, Frank Coppola, and Wai Lee

Type of Inspection:

- ☒ Yearly
- ☐ Post-Storm
- ☐ Complaint

System Designation:

- ☒ Tide Gate
- ☐ Drainage Ditch
- ☐ Natural Stream
- ☐ Pump System
- ☐ Catch Basin
- ☐ Culvert
- ☐ Outfall
- ☐ Other

Overall Functionality:

- ☐ Fully Functional
- ☒ Functional with Restrictions
- ☒* Non-Functional

Notes On Condition/Problems:

The tide gate is malfunctioning due to a build up of debris around the opening.
* During low tide condition, the system was found to be non-functional. Please see attached low tide condition report.

Maintenance Required:

- ☐ Immediate
- ☒ Repair
- ☐ Continued Upkeep

Notes on Maintenance

The gate appears to be working during high tide conditions. The storm sewer in the area need to be maintained regularly due to the build up of sedimentation.

Other Notes:

Drainage System Inspection Log

National Flood Insurance Program / Community Rating System

Site ID/Name: Broad Street and 20th Street Tide Gate (Block: 120 Lot: 13)
Date: 12/08/05 **Time:** 1:50 PM **Tide Conditions:** High



Photo 1 Description: Location of steel flap gate

Drainage System Inspection Log

National Flood Insurance Program / Community Rating System

Site ID/Name: Dell Road Tide Gate

Location: Intersection of Starke Road and Dell Road - Carlstadt

File No.: SP-501 **Tide Conditions:** (Low, High)

Date: 12-8-05 **Time:** 9:25 AM / PM

Conditions: Clear (Rain, Snow, High Wind, High/Low Tide, etc.)

Inspected By: NJMC: Bob Segro, Frank Coppola, and John Enquist

---

Type of Inspection:

- ☒ Yearly
- ☐ Post-Storm
- ☐ Complaint

System Designation:

- ☒ Tide Gate
- ☐ Drainage Ditch
- ☐ Natural Stream
- ☐ Pump System
- ☐ Catch Basin
- ☐ Culvert
- ☐ Outfall
- ☐ Other

Overall Functionality:

- ☒ Fully Functional
- ☐ Functional with Restrictions
- ☐ Non-Functional

Notes On Condition/Problems:

No problems observed.

Maintenance Required:

- ☐ Immediate
- ☐ Repair
- ☒ Continued Upkeep

Notes on Maintenance

Make sure any debris and sediment remains clear of the tide gate structure.

Other Notes:

Drainage System Inspection Log

National Flood Insurance Program / Community Rating System

Site ID/Name: Dell Road Tide Gate (Block: 123.01 Lot: 28)
Date: 12/08/05 **Time:** 9:25 AM **Tide Conditions:** Low

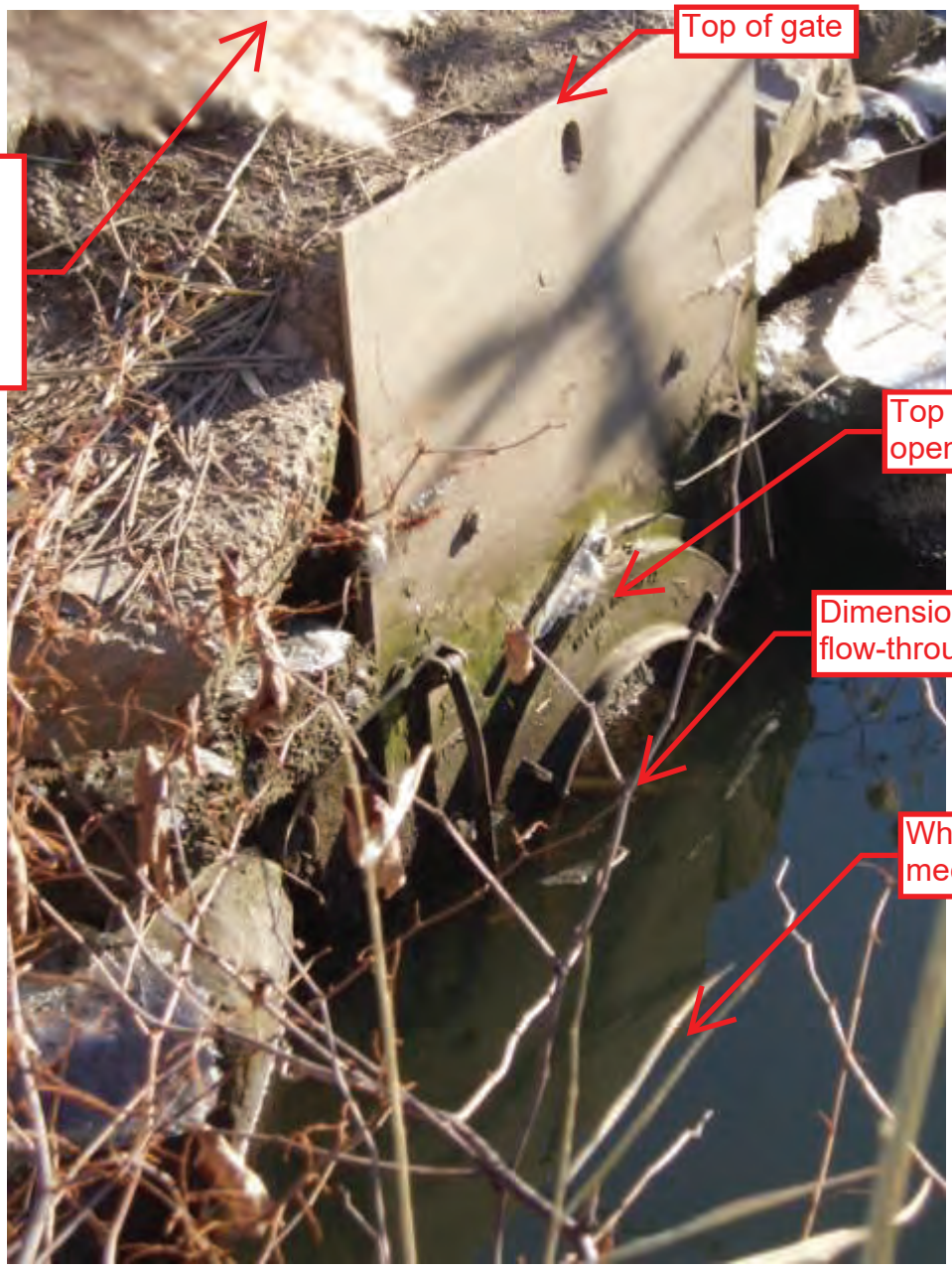


Photo 1 Description: Metal flap gate

Drainage System Inspection Log

National Flood Insurance Program / Community Rating System

Site ID/Name: Dell Road Tide Gate

Location: Intersection of Starke Road and Dell Road - Carlstadt

File No.: SP-501 **Tide Conditions:** (Low, High)

Date: 12-7-05 **Time:** 1:45 AM / PM

Conditions: Clear (Rain, Snow, High Wind, High/Low Tide, etc.)

Inspected By: NJMC: Bob Segro, Frank Coppola, and John Enquist

---

Type of Inspection:

- ☒ Yearly
- ☐ Post-Storm
- ☐ Complaint

System Designation:

- ☒ Tide Gate
- ☐ Drainage Ditch
- ☐ Natural Stream
- ☐ Pump System
- ☐ Catch Basin
- ☐ Culvert
- ☐ Outfall
- ☐ Other

Overall Functionality:

- ☒ Fully Functional
- ☐ Functional with Restrictions
- ☐ Non-Functional

Notes On Condition/Problems:

The tide gate appears to be working properly during high tide conditions.

Maintenance Required:

- ☐ Immediate
- ☐ Repair
- ☒ Continued Upkeep

Notes on Maintenance

The drainage ditch should be maintained regularly in order to keep the gate free from the build-up of sediment and debris.

Other Notes:

Drainage System Inspection Log

National Flood Insurance Program / Community Rating System

Site ID/Name: Dell Road Tide Gate (Block: 123.01 Lot: 28)
Date: 12/07/05 **Time:** 1:45 PM **Tide Conditions:** High

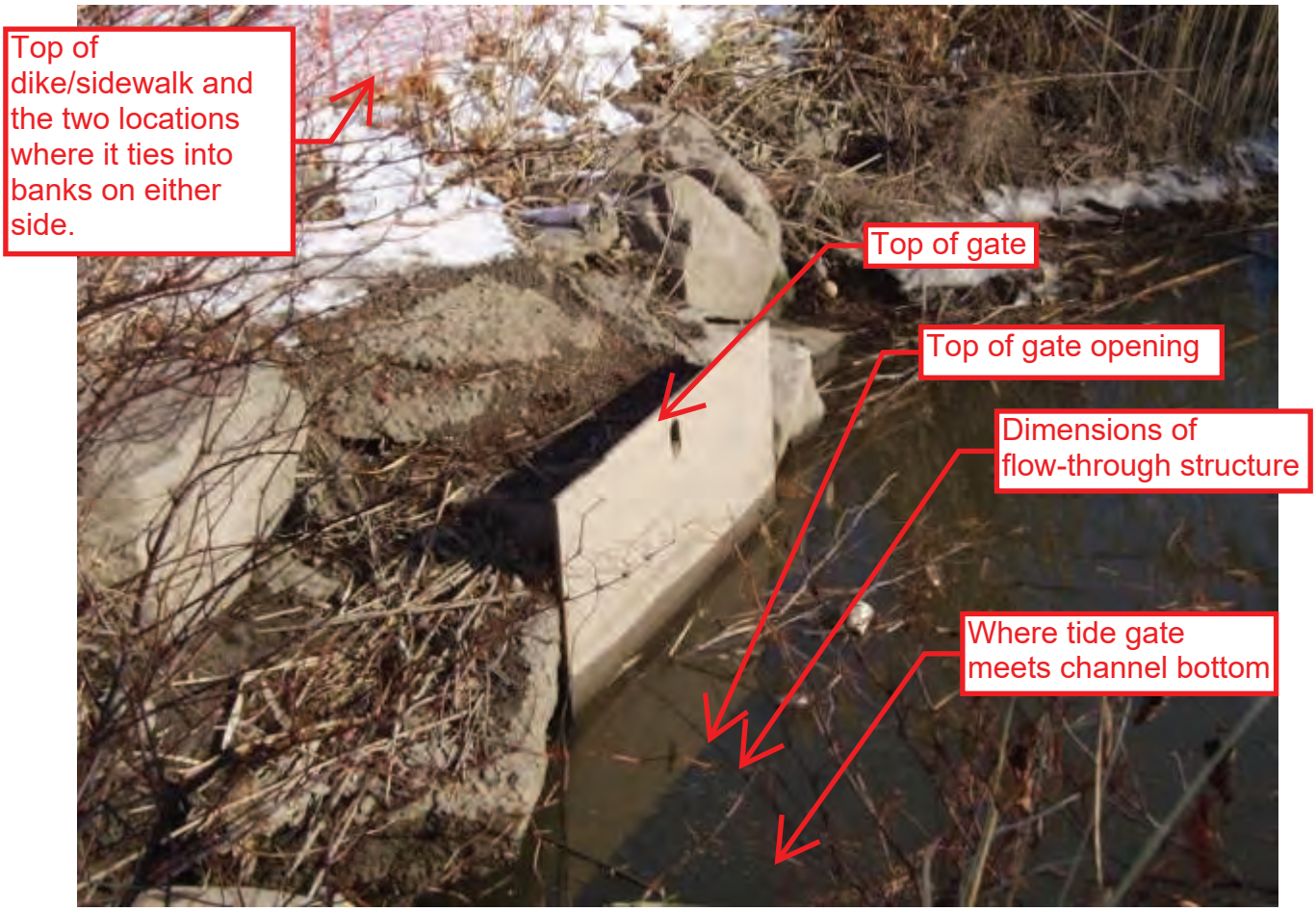


Photo 1 Description: Metal flap gate

Drainage System Inspection Log

National Flood Insurance Program / Community Rating System

Site ID/Name: East Riser Tide Gates

Location: Across the street from 368 Starke Road - Carlstadt

File No.: SP-501 **Tide Conditions:** (Low, High)

Date: 12-8-05 **Time:** 9:40 AM / PM

Conditions: Clear (Rain, Snow, High Wind, High/Low Tide, etc.)

Inspected By: NJMC: Bob Segro, Frank Coppola, and John Enquist

---

Type of Inspection:

- ☒ Yearly
- ☐ Post-Storm
- ☐ Complaint

System Designation:

- ☒ Tide Gate
- ☐ Drainage Ditch
- ☐ Natural Stream
- ☐ Pump System
- ☐ Catch Basin
- ☐ Culvert
- ☐ Outfall
- ☐ Other

Overall Functionality:

- ☐ Fully Functional
- ☒ Functional with Restrictions
- ☐ Non-Functional

Notes On Condition/Problems:

The tide gates are not seating properly and water is entering into the system through gates two and four.

Maintenance Required:

- ☒ Immediate
- ☐ Repair
- ☐ Continued Upkeep

Notes on Maintenance

The trash rack needs immediate repair and cleaning. Debris has collected and blocks the flow of water through the gates. The roadway is also in need of repair due to settling above the tide gates.

Other Notes:

Drainage System Inspection Log

National Flood Insurance Program / Community Rating System

Site ID/Name: East Riser Tide Gates (Block: 123 Lot: 16)
Date: 12/08/05 **Time:** 9:40 AM **Tide Conditions:** Low



Photo 1 Description: Tide gate structure

Drainage System Inspection Log

National Flood Insurance Program / Community Rating System

Site ID/Name: East Riser Tide Gates (Block: 123 Lot: 16)
Date: 12/08/05 **Time:** 9:40 AM **Tide Conditions:** Low

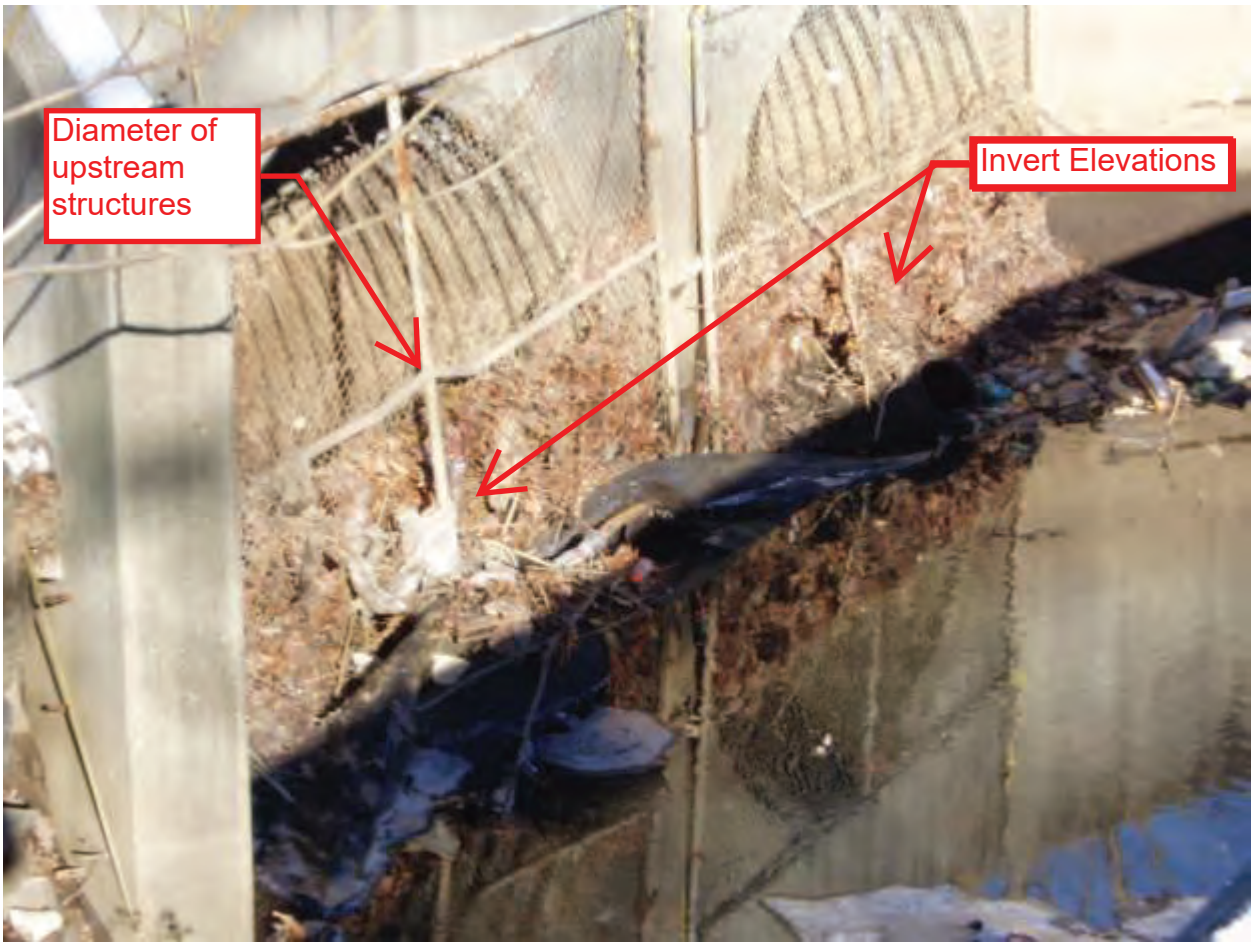


Photo 2 Description: Upstream end of the tide gates

Drainage System Inspection Log

National Flood Insurance Program / Community Rating System

Site ID/Name: East Riser Tide Gates (Block: 123 Lot: 16)
Date: 12/08/05 **Time:** 9:40 AM **Tide Conditions:** Low



Photo 3 Description: Upstream view from tide gates and view of the trash rack system

Drainage System Inspection Log

National Flood Insurance Program / Community Rating System

Site ID/Name: East Riser Tide Gates

Location: Across the street from 368 Starke Road - Carlstadt

File No.: SP-501 **Tide Conditions:** (Low, High)

Date: 12-7-05 **Time:** 1:55 AM / PM

Conditions: Clear (Rain, Snow, High Wind, High/Low Tide, etc.)

Inspected By: NJMC: Bob Segro, Frank Coppola, and John Enquist

---

Type of Inspection:

- ☒ Yearly
- ☐ Post-Storm
- ☐ Complaint

System Designation:

- ☒ Tide Gate
- ☐ Drainage Ditch
- ☐ Natural Stream
- ☐ Pump System
- ☐ Catch Basin
- ☐ Culvert
- ☐ Outfall
- ☐ Other

Overall Functionality:

- ☐ Fully Functional
- ☒ Functional with Restrictions
- ☐ Non-Functional

Notes On Condition/Problems:

The tide gates are malfunctioning and not seating properly, specifically tide gates two and four. The water is entering through the gates and entering the upstream system during high tide conditions.

Maintenance Required:

- ☒ Immediate
- ☐ Repair
- ☐ Continued Upkeep

Notes on Maintenance

The trash rack needs to be maintained regularly. There is a build up of debris and sediment that blocks the flow of water.

Other Notes:

Drainage System Inspection Log

National Flood Insurance Program / Community Rating System

Site ID/Name: East Riser Tide Gates (Block: 123 Lot: 16)
Date: 12/07/05 **Time:** 1:55 PM **Tide Conditions:** High



Photo 2 Description: Upstream view from tide gates and view of the trash rack system

Drainage System Inspection Log

National Flood Insurance Program / Community Rating System

Site ID/Name: East Riser Tide Gates (Block: 123 Lot: 16)
Date: 12/07/05 **Time:** 1:55 PM **Tide Conditions:** High

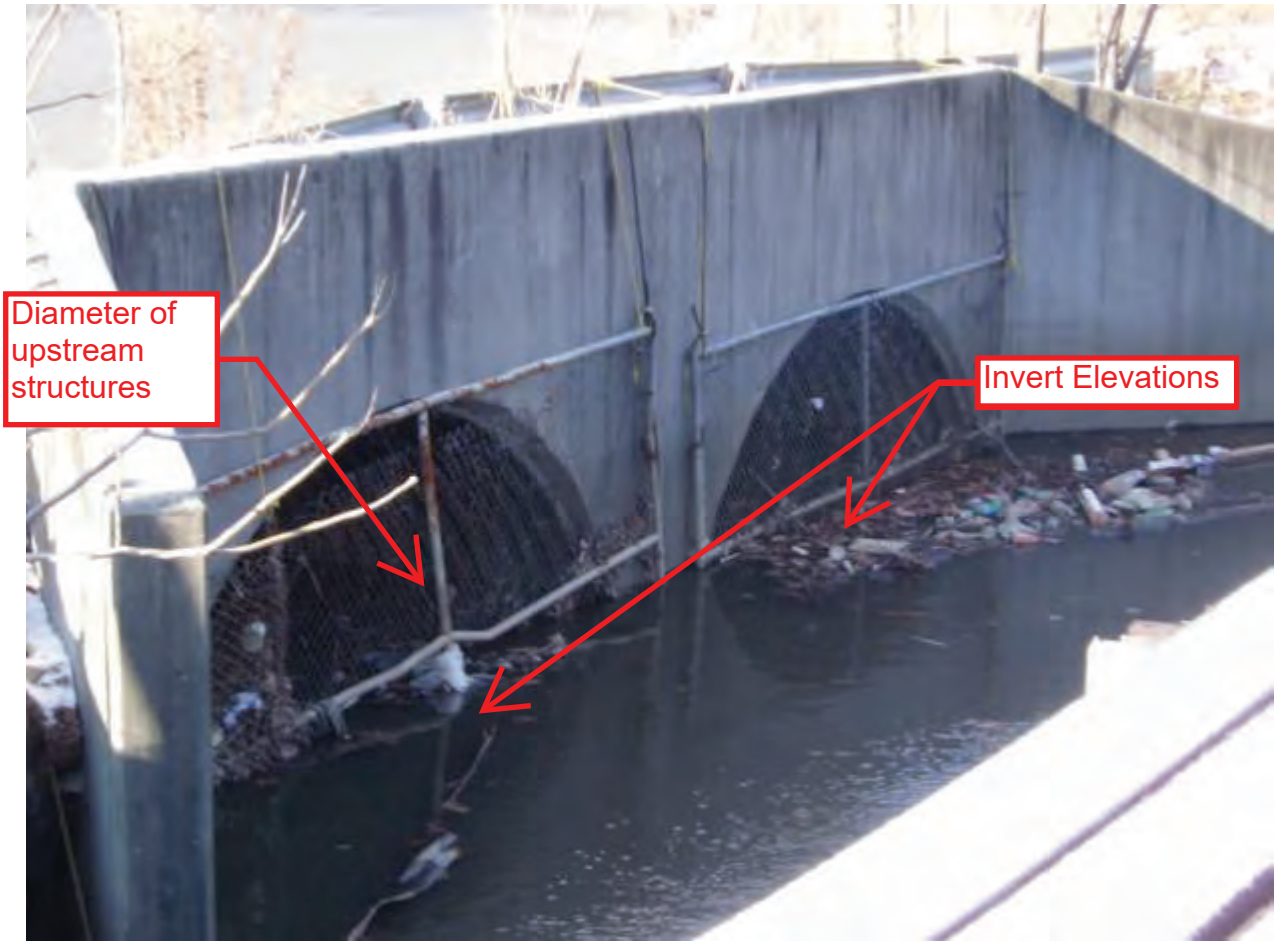


Photo 4 Description: Upstream end of the tide gates

Drainage System Inspection Log

National Flood Insurance Program / Community Rating System

Site ID/Name: Peach Island Creek Tide Gates

Location: Located next to 350 Gotham Parkway - Carlstadt

File No.: SP-501 **Tide Conditions:** (Low, High)

Date: 12-8-05 **Time:** 9:15 AM / PM

Conditions: Clear (Rain, Snow, High Wind, High/Low Tide, etc.)

Inspected By: NJMC: Bob Segro, Frank Coppola, and John Enquist

---

Type of Inspection:

- ☒ Yearly
- ☐ Post-Storm
- ☐ Complaint

System Designation:

- ☒ Tide Gate
- ☐ Drainage Ditch
- ☐ Natural Stream
- ☐ Pump System
- ☐ Catch Basin
- ☐ Culvert
- ☐ Outfall
- ☐ Other

Overall Functionality:

- ☐ Fully Functional
- ☒ Functional with Restrictions
- ☐ Non-Functional

Notes On Condition/Problems:

The tide gates are not seating properly due to sediment and debris that has built up around the brim of the gates

Maintenance Required:

- ☒ Immediate
- ☐ Repair
- ☐ Continued Upkeep

Notes on Maintenance

There is some debris that has collected in front of the trash rack and blocks the flow of water through the tide gates

Other Notes:

Drainage System Inspection Log

National Flood Insurance Program / Community Rating System

Site ID/Name: Peach Island Creek Tide Gates (Block: 123.01 Lot: 11)
Date: 12/08/05 **Time:** 9:15 AM **Tide Conditions:** Low

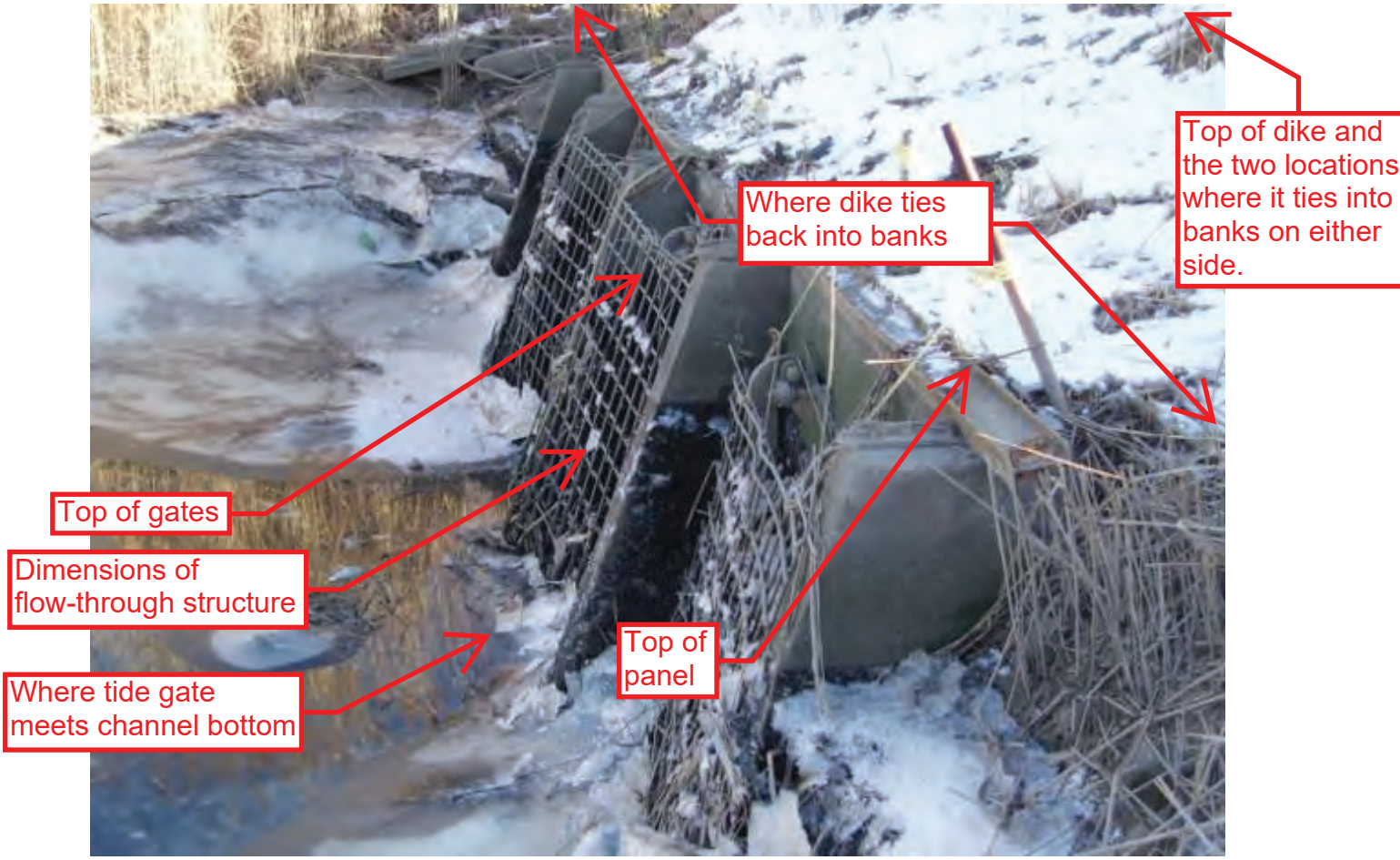


Photo 1 Description: 4 metal flap gates

Drainage System Inspection Log

National Flood Insurance Program / Community Rating System

Site ID/Name: Peach Island Creek Tide Gates

Location: Located next to 350 Gotham Parkway - Carlstadt

File No.: SP-501 **Tide Conditions:** (Low, High)

Date: 12-7-05 **Time:** 1:30 AM / PM

Conditions: Clear (Rain, Snow, High Wind, High/Low Tide, etc.)

Inspected By: NJMC: Bob Segro, Frank Coppola, and John Enquist

---

Type of Inspection:

- ☒ Yearly
- ☐ Post-Storm
- ☐ Complaint

System Designation:

- ☒ Tide Gate
- ☐ Drainage Ditch
- ☐ Natural Stream
- ☐ Pump System
- ☐ Catch Basin
- ☐ Culvert
- ☐ Outfall
- ☐ Other

Overall Functionality:

- ☐ Fully Functional
- ☒ Functional with Restrictions
- ☐ Non-Functional

Notes On Condition/Problems:

The tide gates do not seat properly during high tide conditions and a small amount of water continues to seep through and into the upstream system.

Maintenance Required:

- ☒ Immediate
- ☐ Repair
- ☐ Continued Upkeep

Notes on Maintenance

There is a build-up of some sediment and debris located along the trash rack that blocks the flow of water.

Other Notes:

Drainage System Inspection Log

National Flood Insurance Program / Community Rating System

Site ID/Name: Peach Island Creek Tide Gates (Block: 123.01 Lot: 11)
Date: 12/07/05 **Time:** 1:30 PM **Tide Conditions:** High

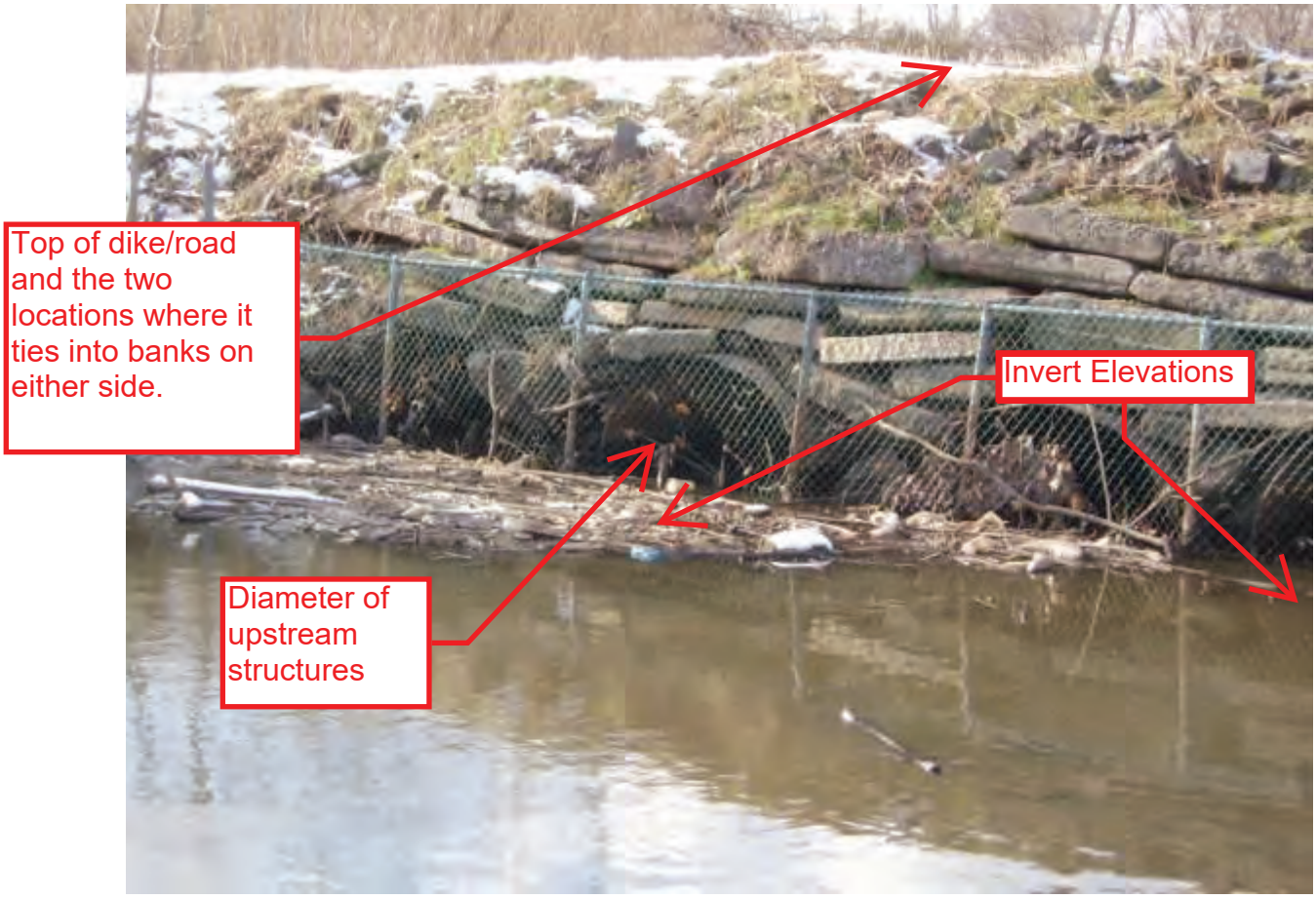


Photo 1 Description: Trash rack on upstream side of the tide gates

Drainage System Inspection Log

National Flood Insurance Program / Community Rating System

Site ID/Name: Waitex Tide Gate

Location: 50 Broad Street – Carlstadt

File No.: SP-501 **Tide Conditions:** (Low, High)

Date: 12-8-05 **Time:** 10:20 AM / PM

Conditions: Clear (Rain, Snow, High Wind, High/Low Tide, etc.)

Inspected By: NJMC: Bob Segro, Frank Coppola, and John Enquist

---

Type of Inspection:

- ☒ Yearly
- ☐ Post-Storm
- ☐ Complaint

System Designation:

- ☒ Tide Gate
- ☐ Drainage Ditch
- ☐ Natural Stream
- ☐ Pump System
- ☐ Catch Basin
- ☐ Culvert
- ☐ Outfall
- ☐ Other

Overall Functionality:

- ☒ Fully Functional
- ☐ Functional with Restrictions
- ☐ Non-Functional

Notes On Condition/Problems:

The tide gate appeared to be functioning properly at the time of the inspection.

Maintenance Required:

- ☐ Immediate
- ☐ Repair
- ☒ Continued Upkeep

Notes on Maintenance

Debris that has collected in front of the trash rack needs to be removed.

Other Notes:

Drainage System Inspection Log

National Flood Insurance Program / Community Rating System

Site ID/Name: Waitex Tide Gate (Block: 120 Lot: 18)
Date: 12/08/05 **Time:** 10:20 AM **Tide Conditions:** Low

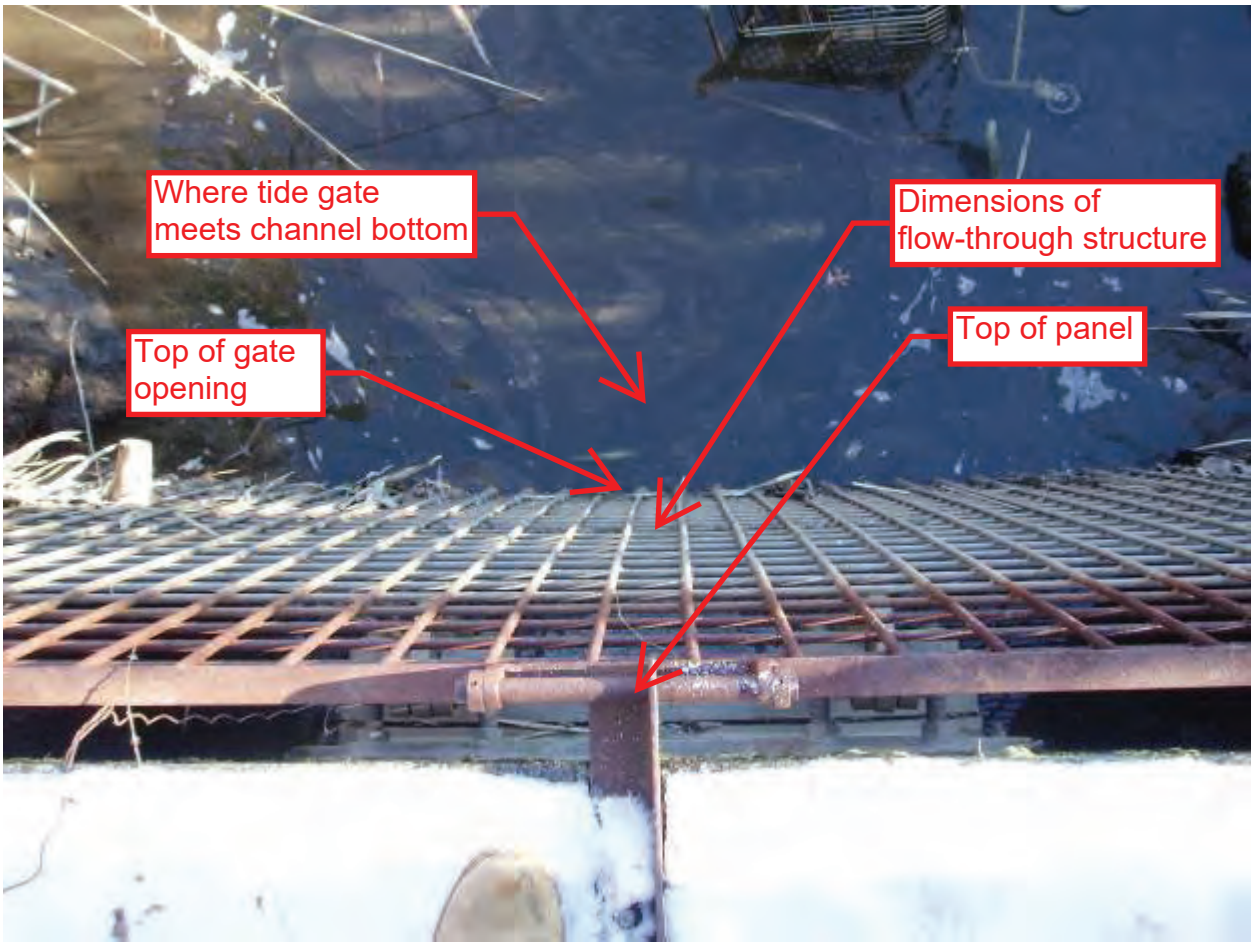


Photo 1 Description: Metal flap gate with a trash rack

Drainage System Inspection Log

National Flood Insurance Program / Community Rating System

Site ID/Name: Waitex Tide Gate

Location: 50 Broad Street - Carlstadt

File No.: SP-501 **Tide Conditions:** (Low, High)

Date: 12-7-05 **Time:** 2:15 AM / PM

Conditions: Clear (Rain, Snow, High Wind, High/Low Tide, etc.)

Inspected By: NJMC: Bob Segro, Frank Coppola, and John Enquist

---

Type of Inspection:

- ☒ Yearly
- ☐ Post-Storm
- ☐ Complaint

System Designation:

- ☒ Tide Gate
- ☐ Drainage Ditch
- ☐ Natural Stream
- ☐ Pump System
- ☐ Catch Basin
- ☐ Culvert
- ☐ Outfall
- ☐ Other

Overall Functionality:

- ☒ Fully Functional
- ☐ Functional with Restrictions
- ☐ Non-Functional

Notes On Condition/Problems:

The tide gate appeared to functioning properly at the time of the inspection.

Maintenance Required:

- ☐ Immediate
- ☐ Repair
- ☒ Continued Upkeep

Notes on Maintenance

Other Notes:

Drainage System Inspection Log

National Flood Insurance Program / Community Rating System

Site ID/Name: Waitex Tide Gate (Block: 120 Lot: 18)
Date: 12/07/05 **Time:** 2:15 PM **Tide Conditions:** High

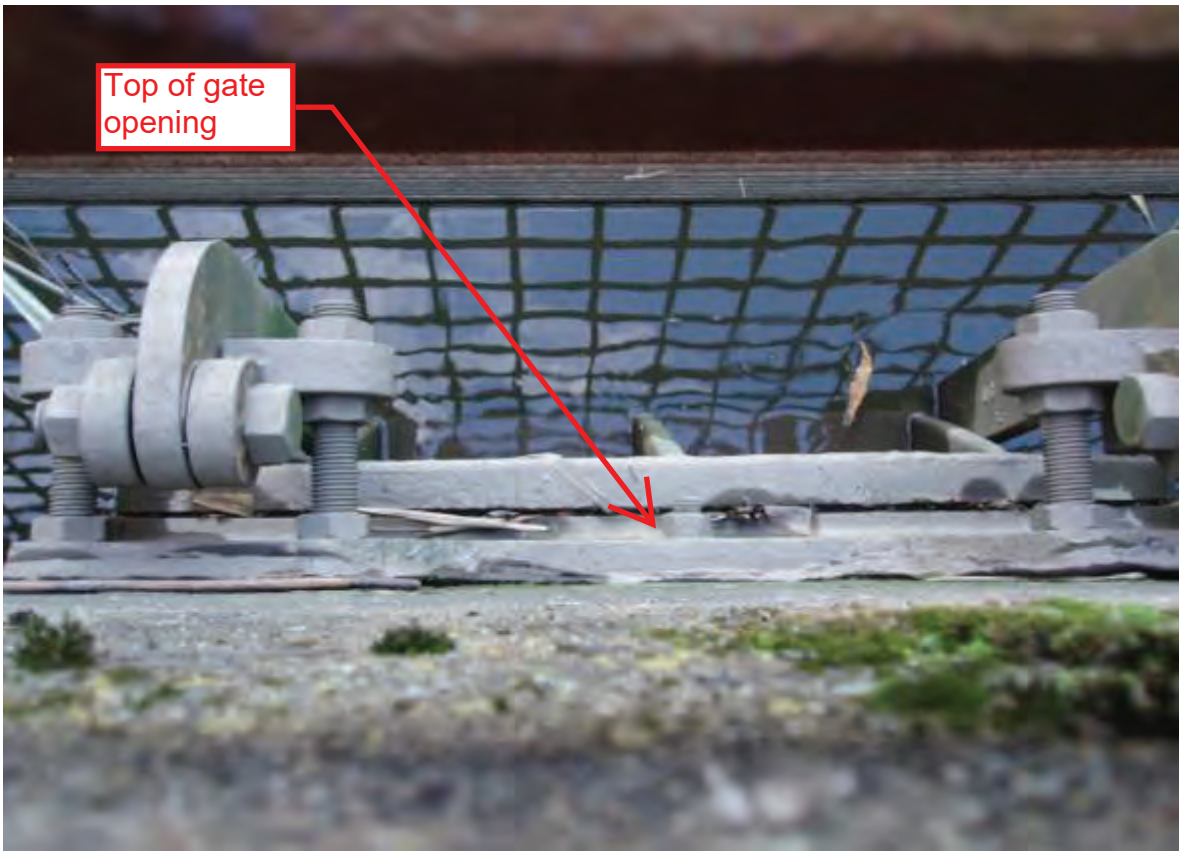


Photo 1 Description: Metal flap gate

Drainage System Inspection Log

National Flood Insurance Program / Community Rating System

Site ID/Name: Yellow Freight Tide Gates

Location: Located next to 390 Starke Road - Carlstadt

File No.: SP-501 **Tide Conditions:** (Low, High)

Date: 12-8-05 **Time:** 1:55 AM / PM

Conditions: Clear (Rain, Snow, High Wind, High/Low Tide, etc.)

Inspected By: NJMC: Bob Segro, Frank Coppola, and Wai Lee

Type of Inspection:

- ☒ Yearly
- ☐ Post-Storm
- ☐ Complaint

System Designation:

- ☒ Tide Gate
- ☐ Drainage Ditch
- ☐ Natural Stream
- ☐ Pump System
- ☐ Catch Basin
- ☐ Culvert
- ☐ Outfall
- ☐ Other

Overall Functionality:

- ☐ Fully Functional
- ☒ Functional with Restrictions
- ☐ Non-Functional

Notes On Condition/Problems:

The tide gates are not seating properly and debris has accumulated in front of the tide gates. A feasibility study will be initiated in 2006 to investigate the overall functionality of the tide gates and the need for repairs and/or replacement.

Maintenance Required:

- ☐ Immediate
- ☒ Repair
- ☐ Continued Upkeep

Notes on Maintenance

There is a build-up of debris that has collected in front of the trash rack system and needs to be removed.

Other Notes:

Drainage System Inspection Log

National Flood Insurance Program / Community Rating System

Site ID/Name: Yellow Freight Tide Gates (Block: 123.01 Lot: 28)
Date: 12/08/05 **Time:** 1:55 PM **Tide Conditions:** High

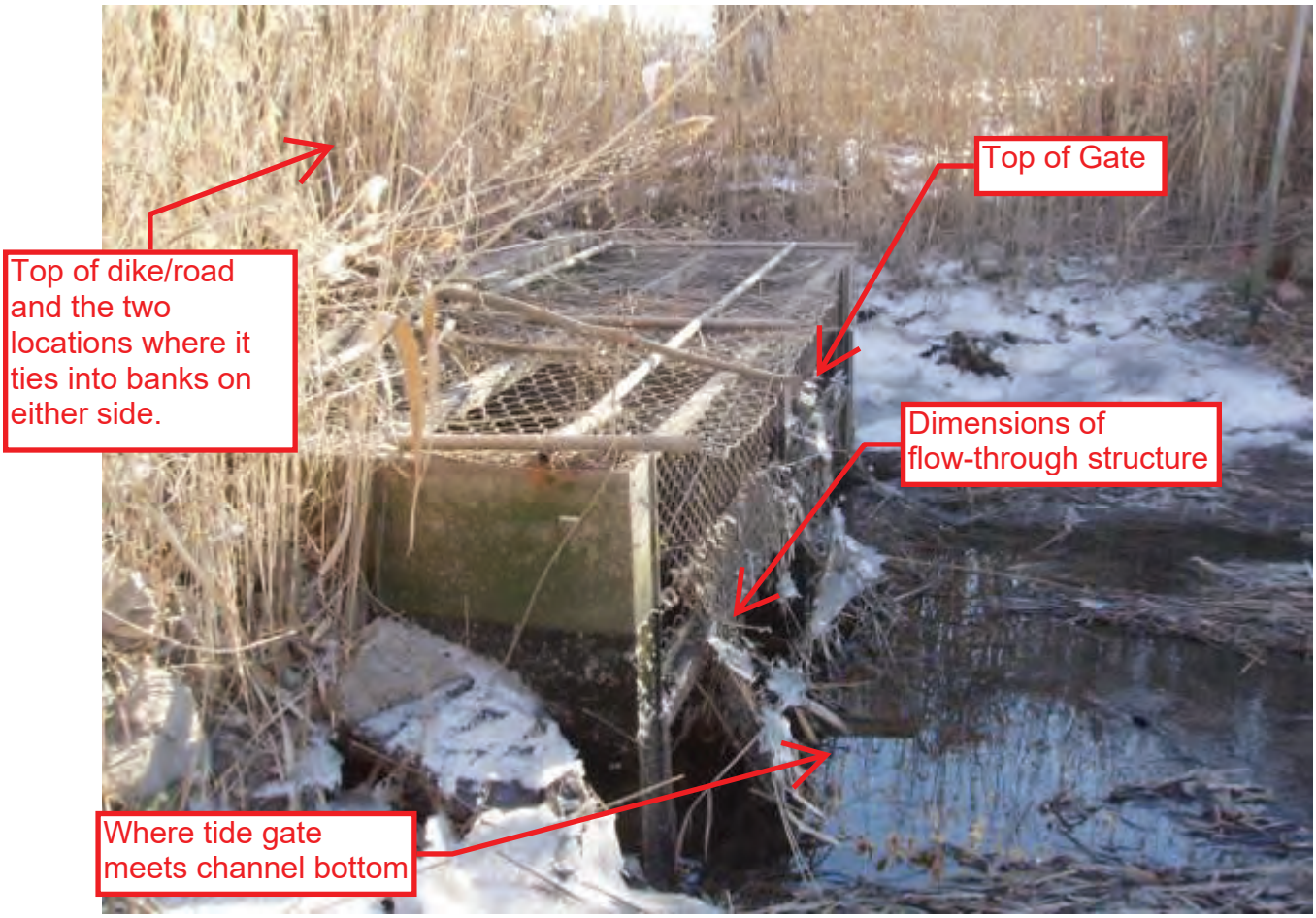


Photo 1 Description: Tide gate structure

Drainage System Inspection Log

National Flood Insurance Program / Community Rating System

Site ID/Name: DePeyster Creek Pump Station and Tide Gate

Location: Located at the end of Dietrich Street – Little Ferry

File No.: SP-501 **Tide Conditions:** (Low, High)

Date: 12-21-05 **Time:** 9:30 AM / PM

Conditions: Clear (Rain, Snow, High Wind, High/Low Tide, etc.)

Inspected By: NJMC: Nicholas Agnoli and Wai Lee

Little Ferry DPW: Mike

Type of Inspection:

- ☒ Yearly
- ☐ Post-Storm
- ☐ Complaint

System Designation:

- ☒ Tide Gate
- ☐ Drainage Ditch
- ☐ Natural Stream
- ☒ Pump System
- ☐ Catch Basin
- ☐ Culvert
- ☐ Outfall
- ☐ Other

Overall Functionality:

- ☒ Fully Functional
- ☐ Functional with Restrictions
- ☐ Non-Functional

Notes On Condition/Problems:

DePeyster Pump Station has been completely refurbished by J. Fletcher Creamer.

Maintenance Required:

- ☐ Immediate
- ☐ Repair
- ☒ Continued Upkeep

Notes on Maintenance

A regular debris removal schedule has been followed by the Little Ferry DPW.

Other Notes:

Drainage System Inspection Log

National Flood Insurance Program / Community Rating System

Site ID/Name: DePeyster Creek Pump Station and Tide Gate (Block: 107 Lot: 2.01)
Date: 12/21/05 **Time:** 9:30 AM **Tide Conditions:** Low

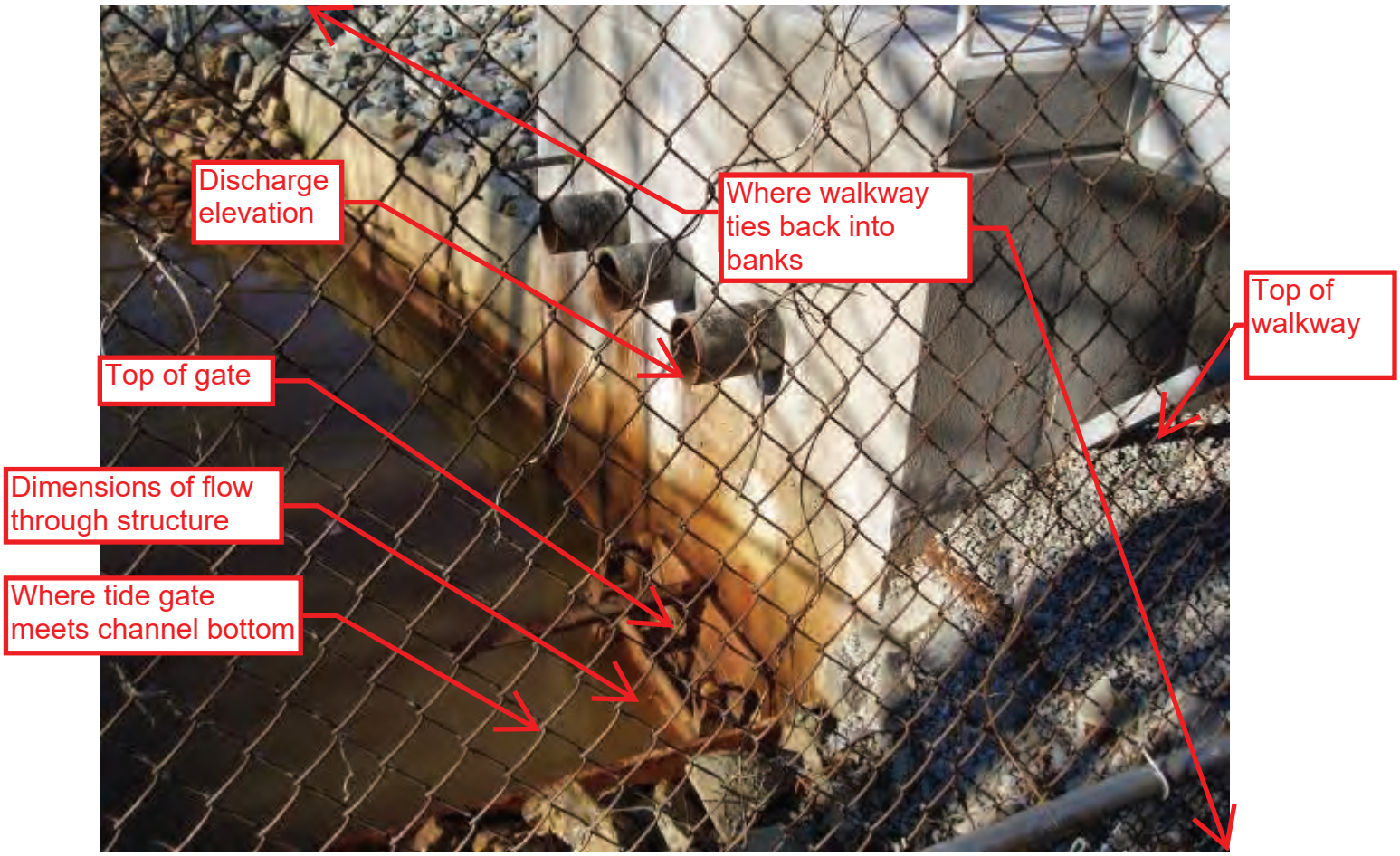


Photo 1 Description: View of tide gate and the outlet pipes for the pump station

Drainage System Inspection Log

National Flood Insurance Program / Community Rating System

Site ID/Name: DePeyster Creek Pump Station and Tide Gate (Block: 107 Lot: 2.01)
Date: 12/21/05 **Time:** 9:30 AM **Tide Conditions:** Low

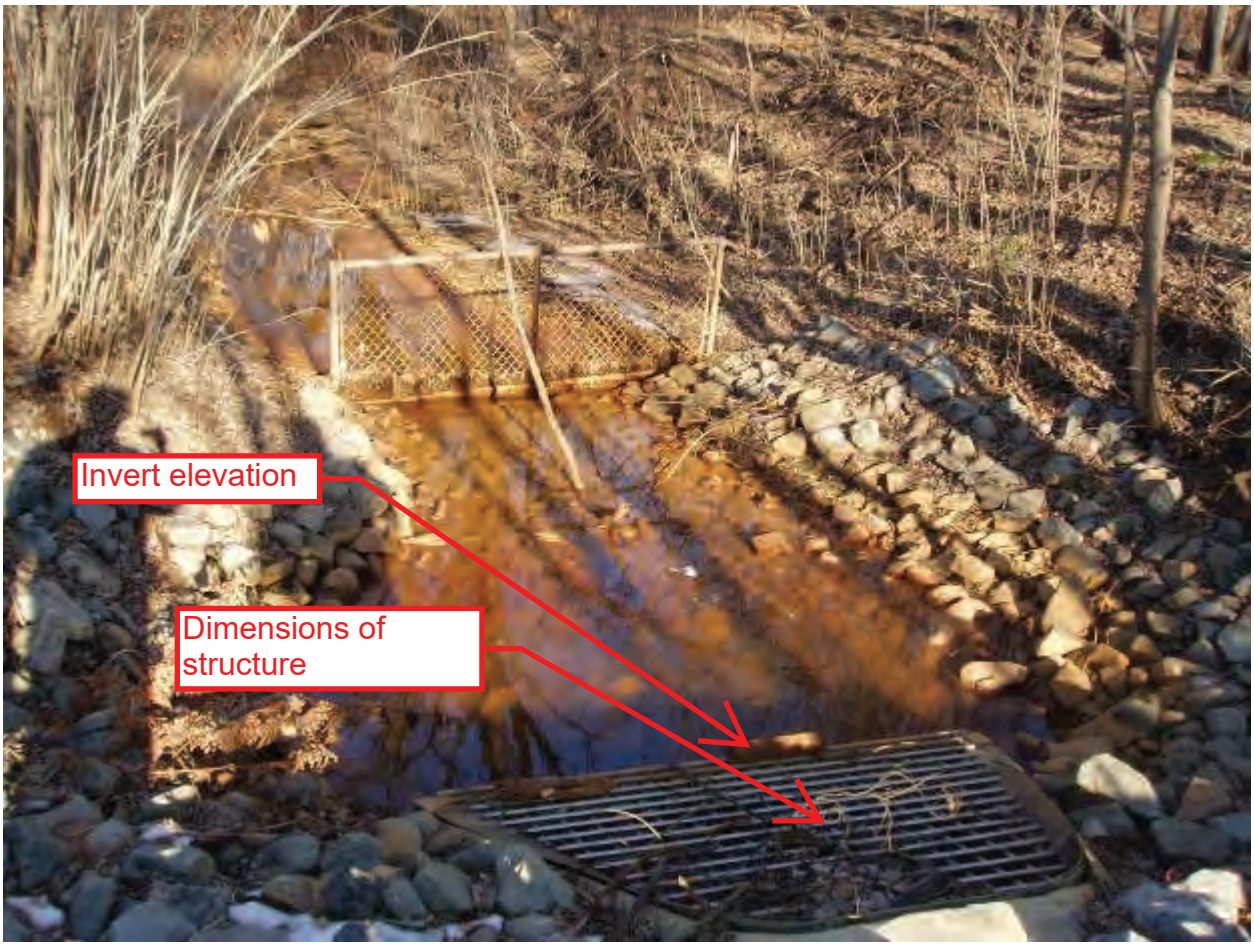


Photo 3 Description: Upstream view from pump station

Drainage System Inspection Log

National Flood Insurance Program / Community Rating System

Site ID/Name: DePeyster Creek Pump Station and Tide Gate (Block: 107 Lot: 2.01)
Date: 12/21/05 **Time:** 9:30 AM **Tide Conditions:** Low



Photo 4 Description: View of generator system

Drainage System Inspection Log

National Flood Insurance Program / Community Rating System

Site ID/Name: Losen Slote Pump Station and Tide Gates

Location: Empire Boulevard (Block 106, Lot 3.01) – Little Ferry

File No.: SP-501 **Tide Conditions:** (Low, High)

Date: 12-21-05 **Time:** 10:00 AM / PM

Conditions: Clear (Rain, Snow, High Wind, High/Low Tide, etc.)

Inspected By: NJMC: Nicholas Agnoli and Wai Lee

Little Ferry DPW: Mike

Type of Inspection:

- ☒ Yearly
- ☐ Post-Storm
- ☐ Complaint

System Designation:

- ☒ Tide Gate
- ☐ Drainage Ditch
- ☐ Natural Stream
- ☒ Pump System
- ☐ Catch Basin
- ☐ Culvert
- ☐ Outfall
- ☐ Other

Overall Functionality:

- ☒ Fully Functional
- ☐ Functional with Restrictions
- ☐ Non-Functional

Notes On Condition/Problems:

Currently there is a removal of debris 6-7 times a year. Maintenance on generators is performed 3 times a year. The Little Ferry DPW performs a system check every Tuesday for an hour. The pump system needs an aerator system due to problems with ice in the winter.

Maintenance Required:

- ☐ Immediate
- ☒ Repair
- ☐ Continued Upkeep

Notes on Maintenance

Make sure that the debris is routinely removed. Install aerator system per DPW recommendation.

Other Notes:

Drainage System Inspection Log

National Flood Insurance Program / Community Rating System

Site ID/Name: Losen Slote Pump Station and Tide Gates (Block: 106 Lot: 3.01)
Date: 12/21/05 **Time:** 10:00 AM **Tide Conditions:** Low

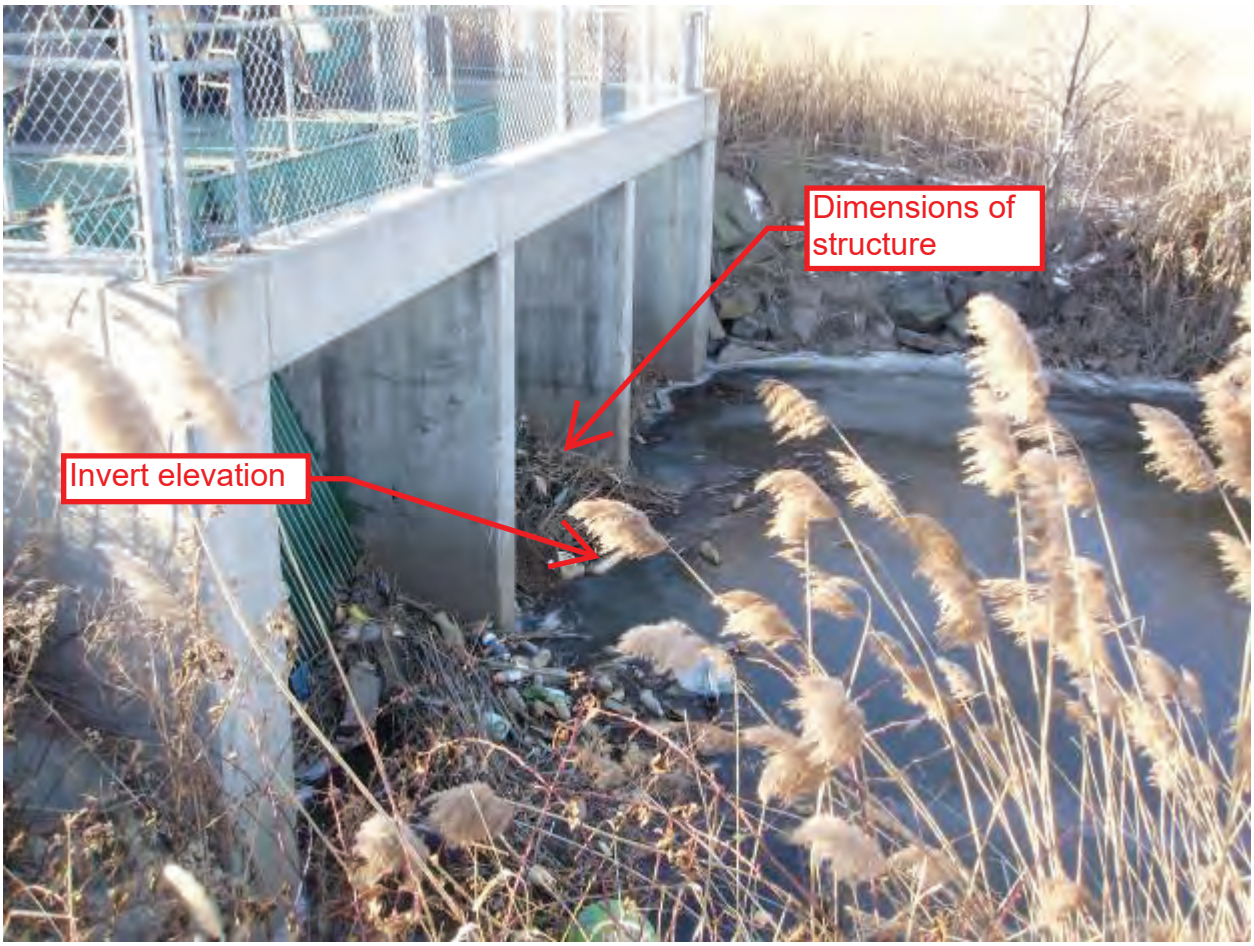


Photo 1 Description: View of trash racks at in-take structure

Drainage System Inspection Log

National Flood Insurance Program / Community Rating System

Site ID/Name: Losen Slote Pump Station and Tide Gates (Block: 106 Lot: 3.01)
Date: 12/21/05 **Time:** 10:00 AM **Tide Conditions:** Low

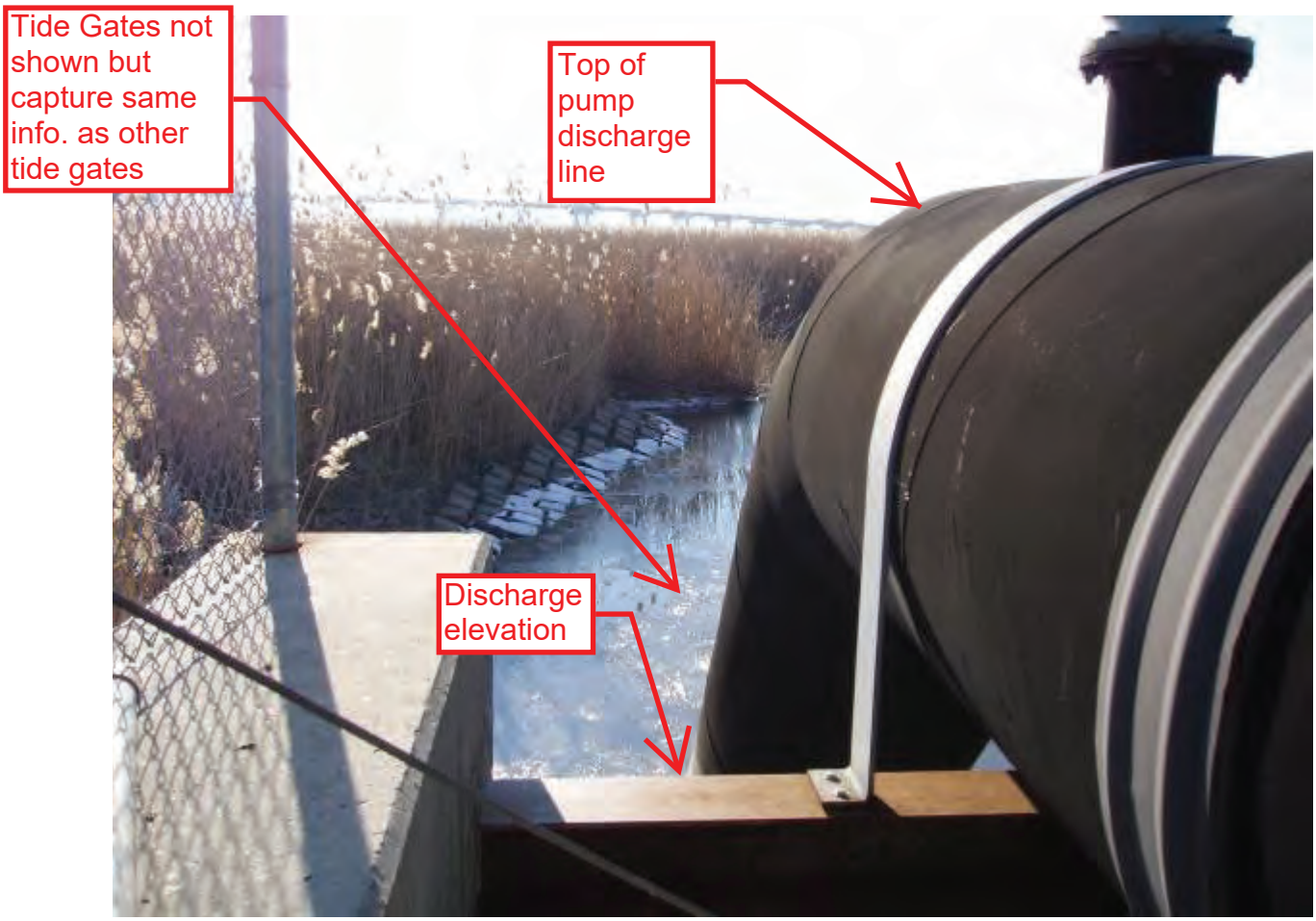


Photo 2 Description: Looking downstream at pump system

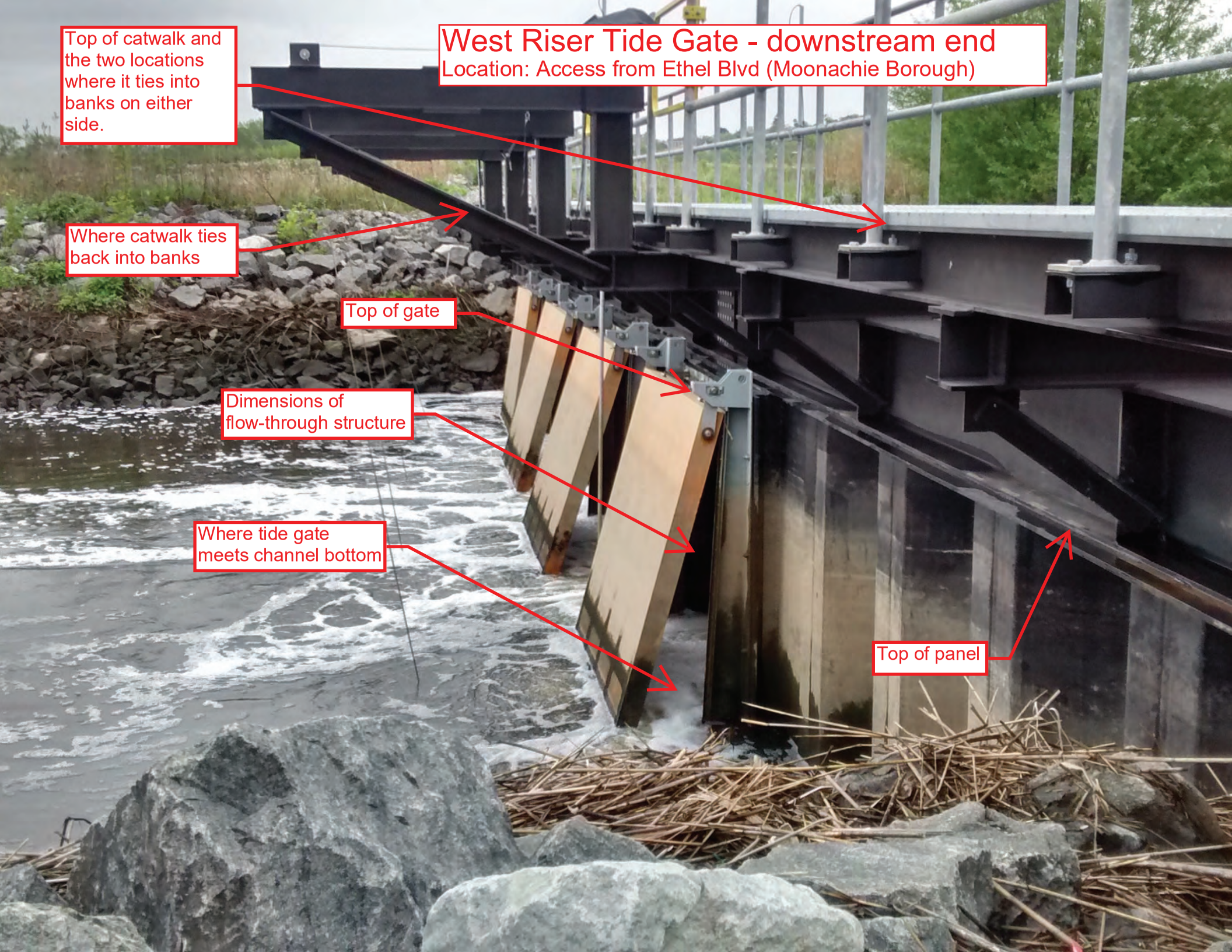
Drainage System Inspection Log

National Flood Insurance Program / Community Rating System

Site ID/Name: Losen Slote Pump Station and Tide Gates (Block: 106 Lot: 3.01)
Date: 12/21/05 **Time:** 10:00 AM **Tide Conditions:** Low



Photo 4 Description: View of pumps


West Riser Tide Gate - downstream end
Location: Access from Ethel Blvd (Moonachie Borough)
Top of catwalk and the two locations where it ties into banks on either side.
Where catwalk ties back into banks
Top of gate
Dimensions of flow-through structure
Where tide gate meets channel bottom
Top of panel


West Riser Tide Gate - upstream end
Location: Access from Ethel Blvd (Moonachie Borough)
Where catwalk ties back into banks
Width of catwalk
Invert
Dimensions


"Burger King" Pump Station Inlet
Location: Corner of Moonachie Rd & Burger King Parking lot (Moonachie Borough)
Dimensions
Invert Elevation


"Burger King" Pump Station Outlet
Location: Moonachie Rd, Across from Edstan Dr.
(Moonachie Borough)
Dimensions
Invert Elevation

Drainage System Inspection Log

National Flood Insurance Program / Community Rating System

Site ID/Name: Teterboro Pump Station

Location: Located at the end of Vincent Place - Teterboro

File No.: SP-501 **Tide Conditions:** (Low, High)

Date: 12-21-05 **Time:** 9:00 AM / PM

Conditions: Clear (Rain, Snow, High Wind, High/Low Tide, etc.)

Inspected By: NJMC: Nicholas Agnoli and Wai Lee

Teterboro DPW: John Fantacone

Type of Inspection:

- ☒ Yearly
- ☐ Post-Storm
- ☐ Complaint

System Designation:

- ☐ Tide Gate
- ☐ Drainage Ditch
- ☐ Natural Stream
- ☒ Pump System
- ☐ Catch Basin
- ☐ Culvert
- ☐ Outfall
- ☐ Other

Overall Functionality:

- ☐ Fully Functional
- ☒ Functional with Restrictions
- ☐ Non-Functional

Notes On Condition/Problems:

A new pump station is currently being constructed. The current conditions are: 3 out of 4 pumps function, 1 out of 4 tide gates function. The two tide gates that function at discharge are seating properly.

Maintenance Required:

- ☐ Immediate
- ☐ Repair
- ☒ Continued Upkeep

Notes on Maintenance

Trash racks are clean and are in good condition. The construction by-pass appears to be undersized. The pump house is in good condition with a functional alarm system. Access needs to be cleared to all system components. The pumps were maintained as follows: pump #1 in 2006, pump # 2 in 2005 and pump #3 in 2000.

Other Notes: The current system is to be taken out of service in 2006.

Drainage System Inspection Log

National Flood Insurance Program / Community Rating System

Site ID/Name: Teterboro Pump Station (Block: 201 Lot: 12)
Date: 12/21/05 **Time:** 9:00 AM **Tide Conditions:** Low

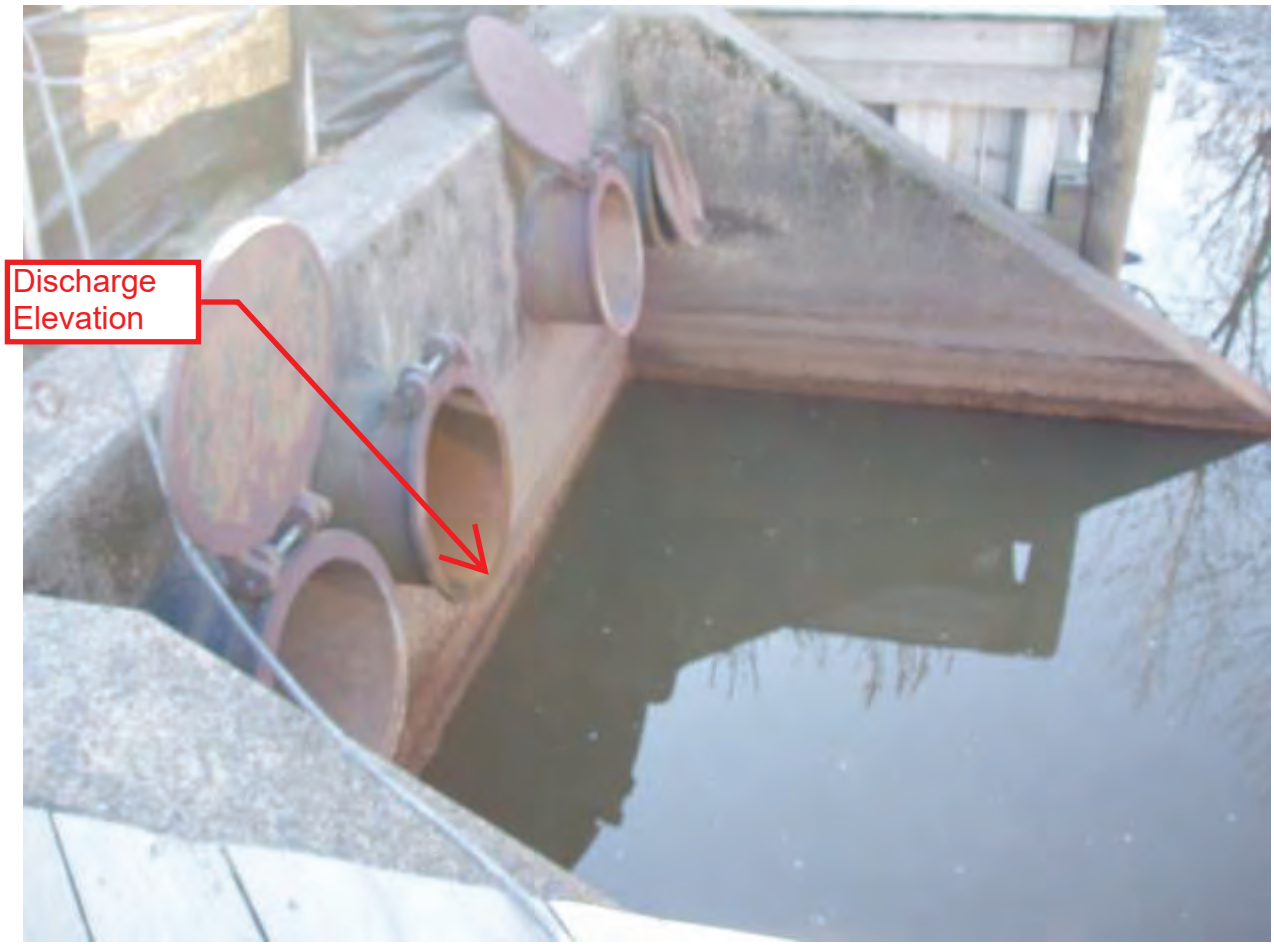


Photo 1 Description: Flap gates shown on outlet structure

Drainage System Inspection Log

National Flood Insurance Program / Community Rating System

Site ID/Name: Teterboro Pump Station (Block: 201 Lot: 12)
Date: 12/21/05 **Time:** 9:00 AM **Tide Conditions:** Low

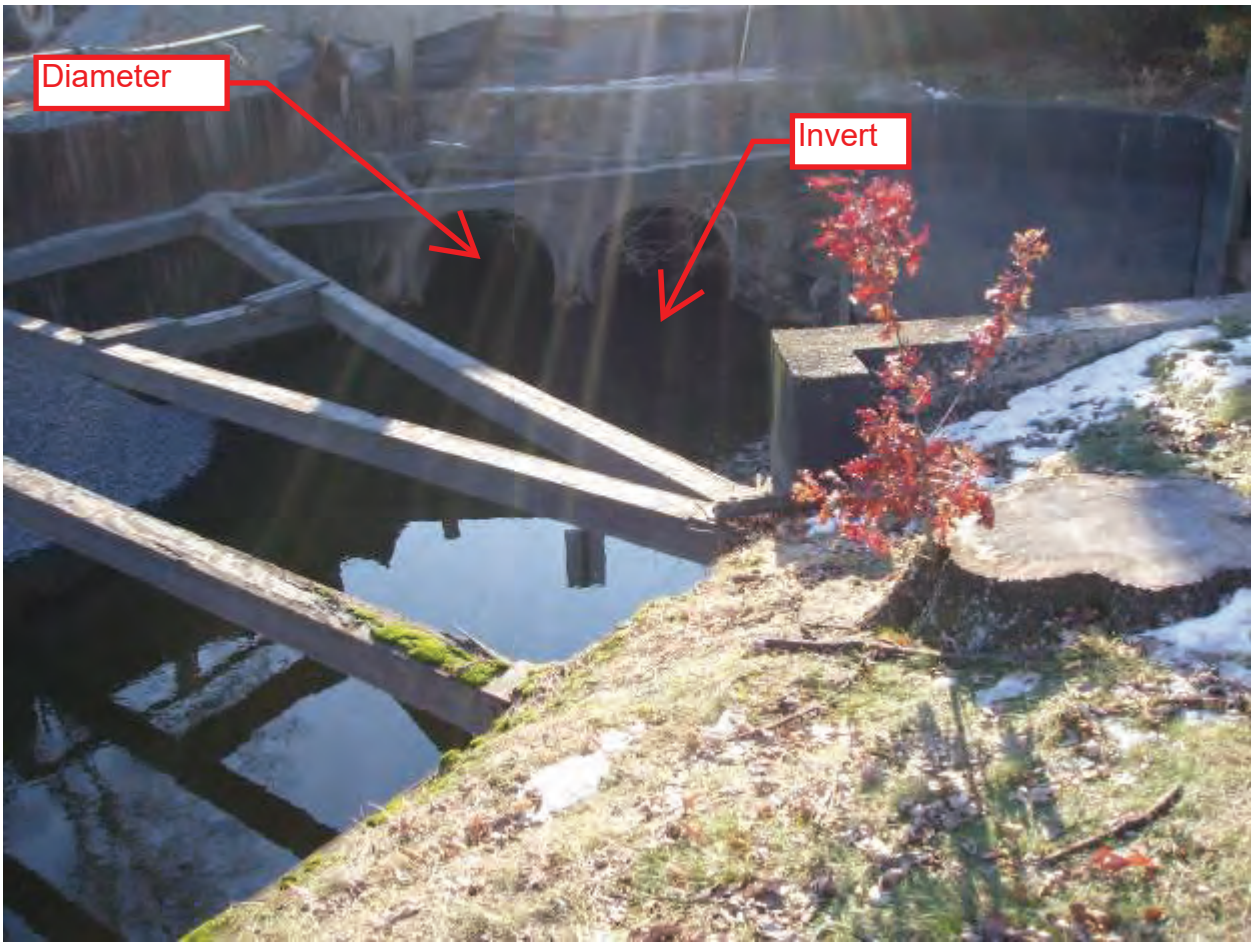


Photo 2 Description: In-flow at pump station

Willow Lake Pump Station

Location: Washington Ave & Treptow St. (Little Ferry Borough)

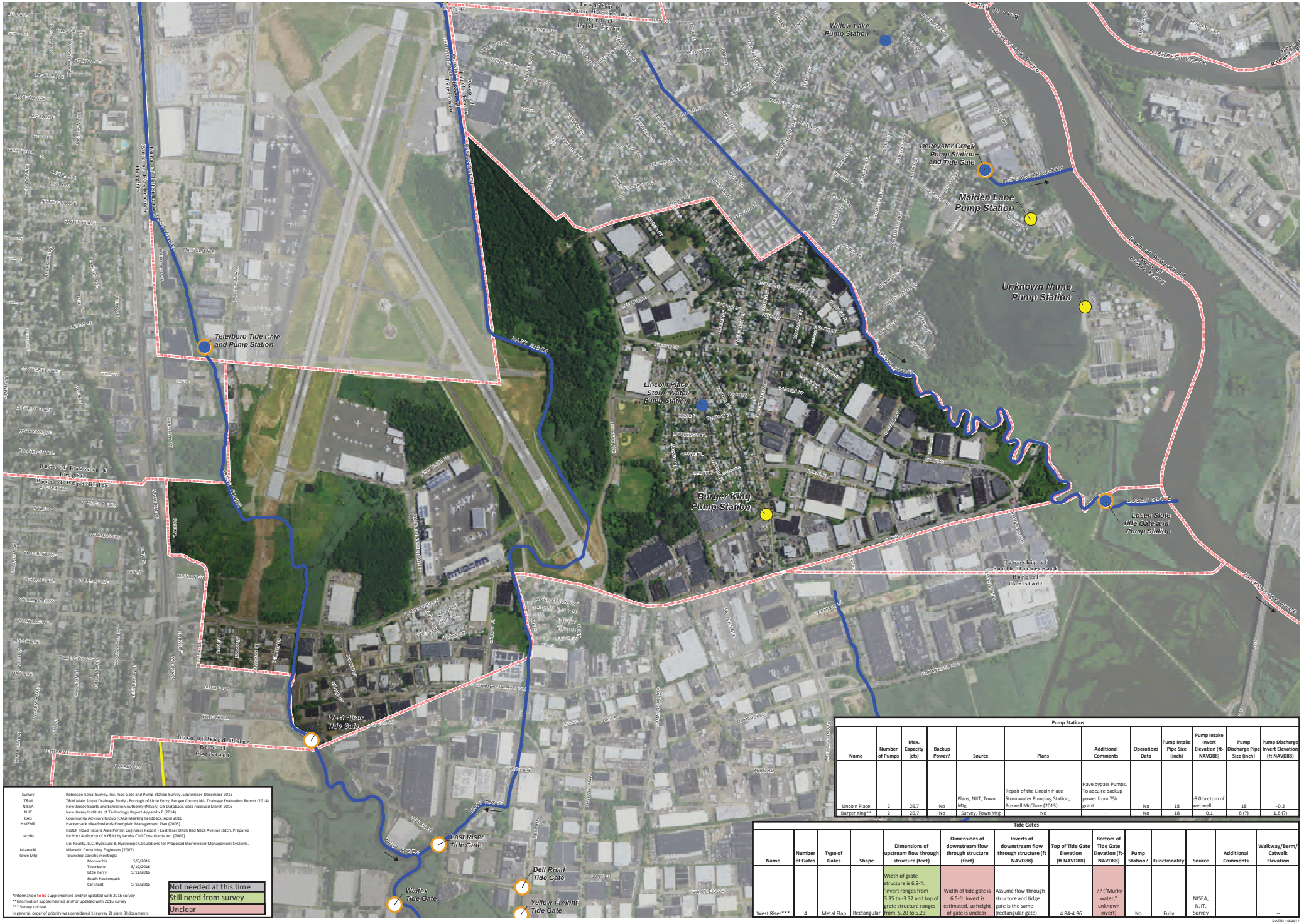


Figure 10 Willow Lake Pump Station

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Attachment A4-2-3: Tide Gate and Pump Station Inventories

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Pump Stations

Name	Number of Pumps	Max. Capacity (cfs)	Backup Power?	Source	Plans	Additional Comments	Operations Data	Pump Intake Pipe Size (inch)	Pump Intake Invert Elevation (ft-NAVD88)	Pump Discharge Pipe Size (inch)	Pump Discharge Invert Elevation (ft NAVD88)
Lincoln Place	2	26.7	No	Plans, NJIT, Town Mtg	Repair of the Lincoln Place Stormwater Pumping Station, Boswell McClave (2013)	Have bypass Pumps. To acquire backup power from 75k grant.	No	18	-8.0 bottom of wet well	18	-0.2
Burger King**	2	26.7	No	Survey, Town Mtg	No	--	No	18	0.1	8 (?)	1.8 (?)

Tide Gates

Name	Number of Gates	Type of Gates	Shape	Dimensions of upstream flow through structure (feet)	Dimensions of downstream flow through structure (feet)	Inverts of downstream flow through structure (ft NAVD88)	Top of Tide Gate Elevation (ft NAVD88)	Bottom of Tide Gate Elevation (ft-NAVD88)	Pump Station?	Functionality	Source	Additional Comments	Walkway/Berm/ Catwalk Elevation
West Riser***	4	Metal Flap	Rectangular	Width of grate structure is 6.3-ft. Invert ranges from -3.35 to -3.32 and top of grate structure ranges from 5.20 to 5.23	Width of tide gate is 6.5-ft. Invert is estimated, so height of gate is unclear.	Assume flow through structure and tidge gate is the same (rectangular gate)	4.84-4.96	?? ("Murky water," unknown invert)	No	Fully	NJSEA, NJIT, Survey	--	--

DATE: 1/3/2017

Survey	Robinson Aerial Survey, Inc. Tide Gate and Pump Station Survey, September-December 2016
T&M	T&M Main Street Drainage Study - Borough of Little Ferry, Bergen County NJ - Drainage Evaluation Report (2014)
NJSEA	New Jersey Sports and Exhibition Authority (NJSEA) GIS Database, data received March 2016
NJIT	New Jersey Institute of Technology Report Appendix F (2014)
CAG	Community Advisory Group (CAG) Meeting Feedback, April 2016
HMPMP	Hackensack Meadowlands Floodplain Management Plan (2005)
Jacobs	NJDEP Flood Hazard Area Permit Engineers Report - East Riser Ditch Red Neck Avenue Ditch, Prepared for Port Authority of NY&NJ by Jacobs Civil Consultants Inc. (2009)
	Uni Reality, LLC, Hydraulic & Hydrologic Calculations for Proposed Stormwater Management Systems,
Mianecki	Mianecki Consulting Engineers (2007)
Town Mtg	Township-specific meetings:
	Moonachie 5/6/2016
	Teterboro 5/10/2016
	Little Ferry 5/11/2016
	South Hackensack
	Carlstadt 5/18/2016

*Information to be supplemented and/or updated with 2016 survey
**Information supplemented and/or updated with 2016 survey
*** Survey unclear
In general, order of priority was considered 1) survey 2) plans 3) documents

Not needed at this time
Still need from survey
Unclear

LEGEND

Boundaries: Pilot Area; Municipality; Key project tributaries to Hackensack River

Data Obtained from USGS National Hydrology Dataset

Data Obtained from New Jersey Sports and Exposition Authority (NJSEA): Tide Gate; Pump Station

Township-Specific Meetings: Pump Station

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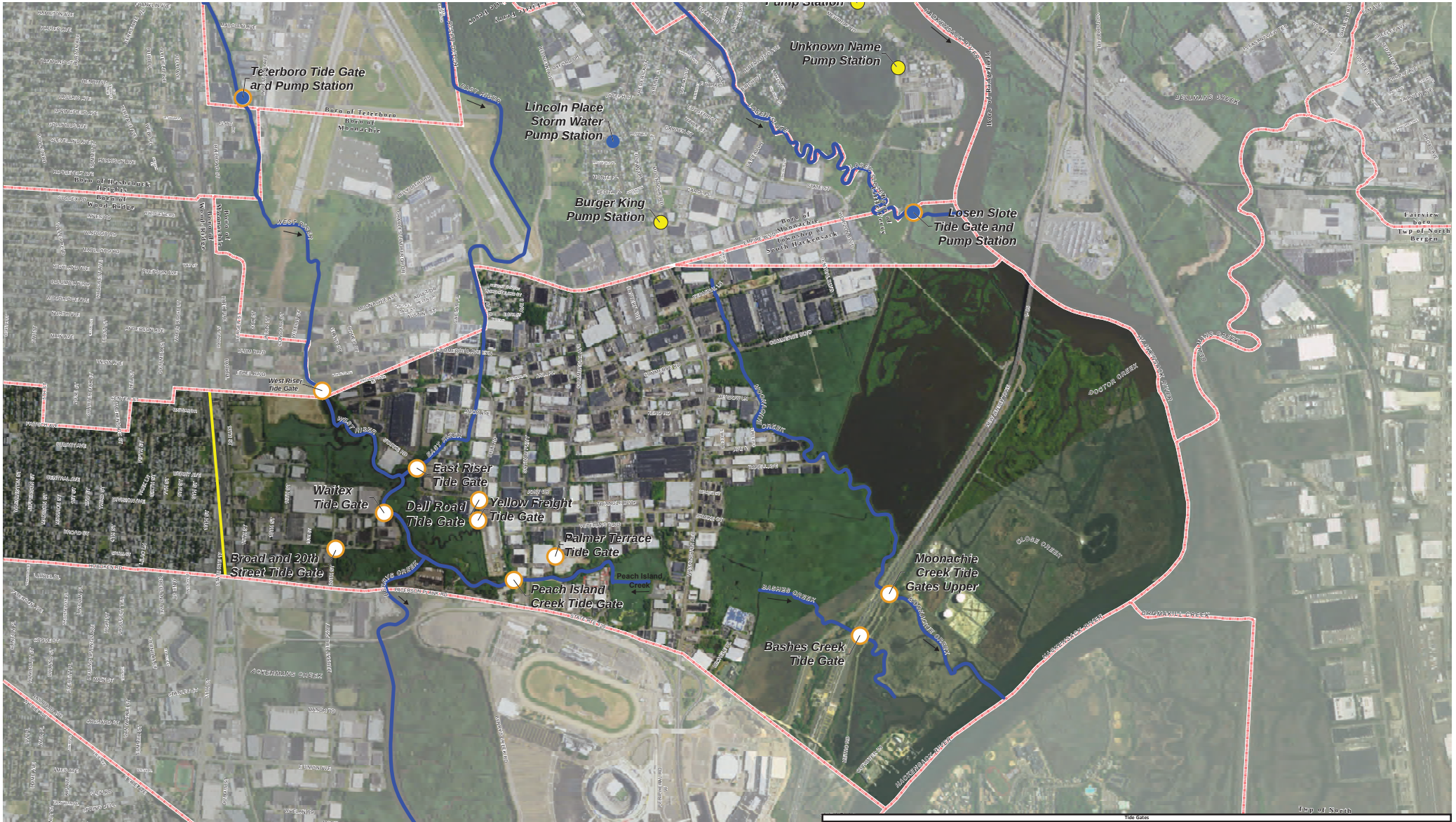
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REBUILD BY DESIGN: MEADOWLANDS FLOOD PROTECTION PROJECT

BORO OF MOONACHIE

FIGURE 1

TIDE GATE AND PUMP STATION INVENTORY



Survey	Robinson Aerial Survey, Inc. Tide Gate and Pump Station Survey, September-December 2016
T&M	T&M Main Street Drainage Study - Borough of Little Ferry, Bergen County NJ - Drainage Evaluation Report (2014)
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	Uni Reality, LLC, Hydraulic & Hydrologic Calculations for Proposed Stormwater Management Systems,
Mlanecki	Mlanecki Consulting Engineers (2007)
Town Mtg	Township-specific meetings:
	Moonachie 5/6/2016
	Teterboro 5/10/2016
	Little Ferry 5/11/2016
	South Hackensack
	Carlstadt 5/18/2016

*Information to be supplemented and/or updated with 2016 survey
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*** Survey unclear
In general, order of priority was considered 1) survey 2) plans 3) documents

Not needed at this time
Still need from survey
Unclear

Tide Gates

Name	Number of Gates	Type	Shape	Dimensions of upstream flow through structure	Dimensions of downstream flow through structure	Inverts of upstream flow through structure (ft NAVD88)	Inverts of downstream flow through structure (ft NAVD88)	Top of Tide Gate Elevation (ft NAVD88)	Bottom of Tide Gate Elevation (ft-NAVD88)	Pump Station?	Functionality	Source	Additional Comments	Walkway/Berm/Catwalk Elevation
Yellow Freight**	2	Cast Iron	Circular	N/A		N/A		-0.4	-4.3	No	Restrictions	Survey, NJSEA	--	see cad/txt files
Broad and 20th Street*	1	Metal Flap				"Under water, no survey"				No	Restrictions	NJSEA	--	"Under water, no survey"
Dell Road***	1	Metal Flap	Circular	N/A		N/A		-0.2	-4.2	No	Fully	Survey, NJSEA	--	see cad/txt files
Peach Island Creek***	4 (one is bolted shut)	Metal Flap	Circular		36-inch hand measured by AECOM personnel, need to verify by surveyors			varies: see cad/txt files		No	Restrictions	Survey, NJSEA	--	see cad/txt files
Waitex***	1	Metal Flap	Circular	N/A	54-inch (outside dia)	N/A		2.2		No	Fully	Survey, NJSEA	--	see cad/txt files
Palmer Terrace***	1	Tideflex Check Valve	Circular	N/A	60-inch, assuming "bottom of concrete" is same as invert, need to verify	N/A	Unclear	Unclear	Unclear	No	Fully	Survey, NJSEA	--	see cad/txt files
East Riser**	4	Metal Flap	Rectangular	10 x 16.2 ft	8.7ft x 6ft	-5.4	-4.5, unclear	1.5	-4.5	No	Restrictions	Survey, NJSEA, HMPMP	--	--
Moonachie Creek	Unknown	Unknown								No	Fully	NJSEA		
Bashes Creek	Unknown	Unknown								No	Fully	NJSEA		

DATE: 1/3/2017

LEGEND

Boundaries: Pilot Area; Municipality
Data Obtained from USGS National Hydrology Dataset: Key project tributaries to Hackensack River
Data Obtained from New Jersey Sports and Exposition Authority (NJSEA): Tide Gate; Pump Station
Township-Specific Meetings: Pump Station

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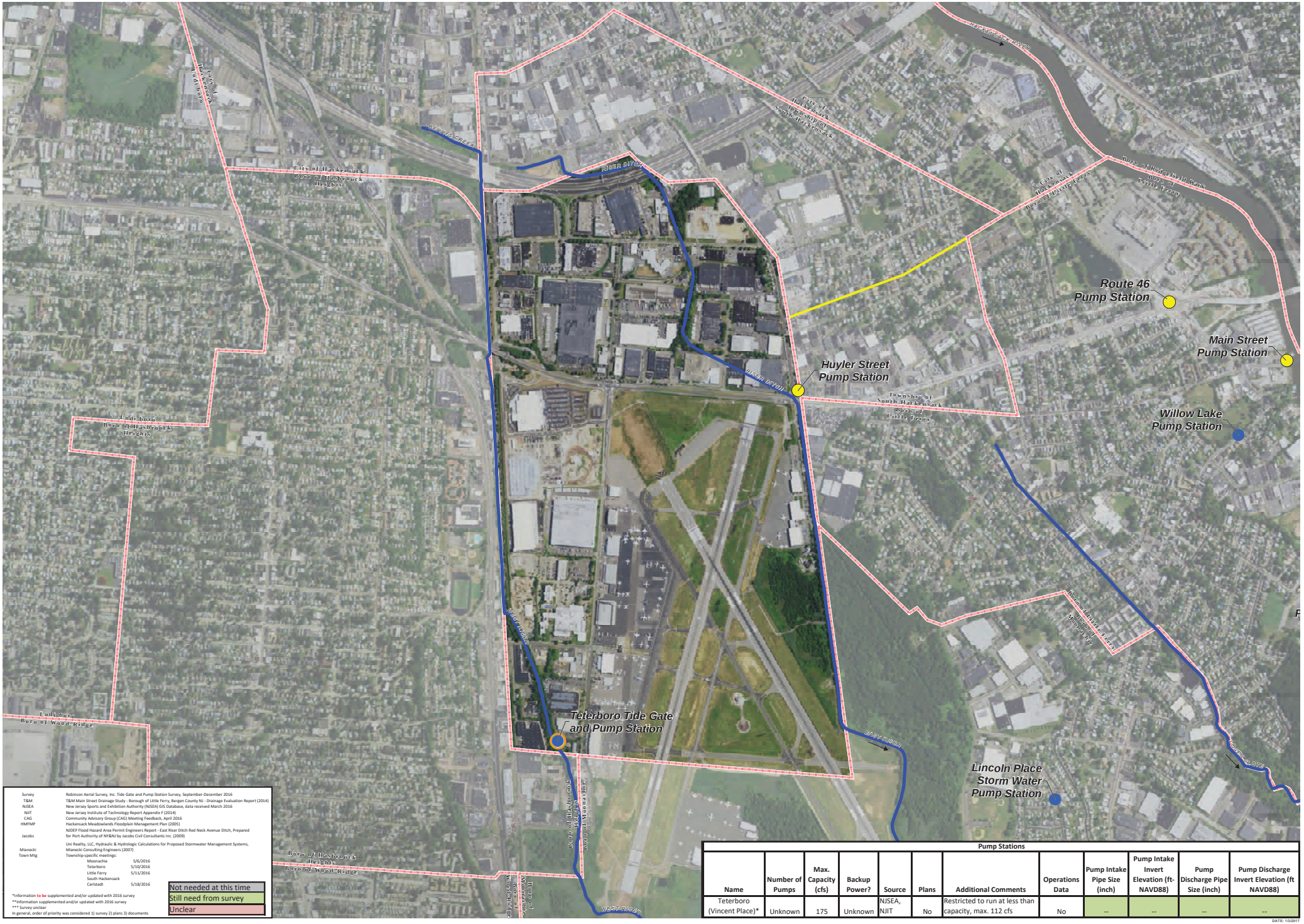
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BORO OF CARLSTADT

FIGURE 2

TIDE GATE AND PUMP STATION INVENTORY



Survey	Robinson Aerial Survey, Inc. Tide Gate and Pump Station Survey, September-December 2016
T&M	T&M Main Street Drainage Study - Borough of Little Ferry, Bergen County NJ - Drainage Evaluation Report (2014)
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Mianecki	Uni Reality, LLC, Hydraulic & Hydrologic Calculations for Proposed Stormwater Management Systems, Mianecki Consulting Engineers (2007)
Town Mtg	Township-specific meetings: Moonachie 5/6/2016; Teterboro 5/10/2016; Little Ferry 5/11/2016; South Hackensack 5/18/2016; Carlstadt 5/18/2016

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**Information supplemented and/or updated with 2016 survey
*** Survey unclear
In general, order of priority was considered 1) survey 2) plans 3) documents

Not needed at this time
Still need from survey
Unclear

Pump Stations

Name	Number of Pumps	Max. Capacity (cfs)	Backup Power?	Source	Plans	Additional Comments	Operations Data	Pump Intake Pipe Size (inch)	Pump Intake Invert Elevation (ft-NAVD88)	Pump Discharge Pipe Size (inch)	Pump Discharge Invert Elevation (ft NAVD88)
Teterboro (Vincent Place)*	Unknown	175	Unknown	NJSEA, NJIT	No	Restricted to run at less than capacity, max. 112 cfs	No	--	--	--	--

DATE: 1/3/2017

LEGEND

Boundaries: Pilot Area; Municipality; Key project tributaries to Hackensack River

Data Obtained from USGS National Hydrology Dataset

Data Obtained from New Jersey Sports and Exposition Authority (NJSEA): Tide Gate; Pump Station

Township-Specific Meetings: Pump Station

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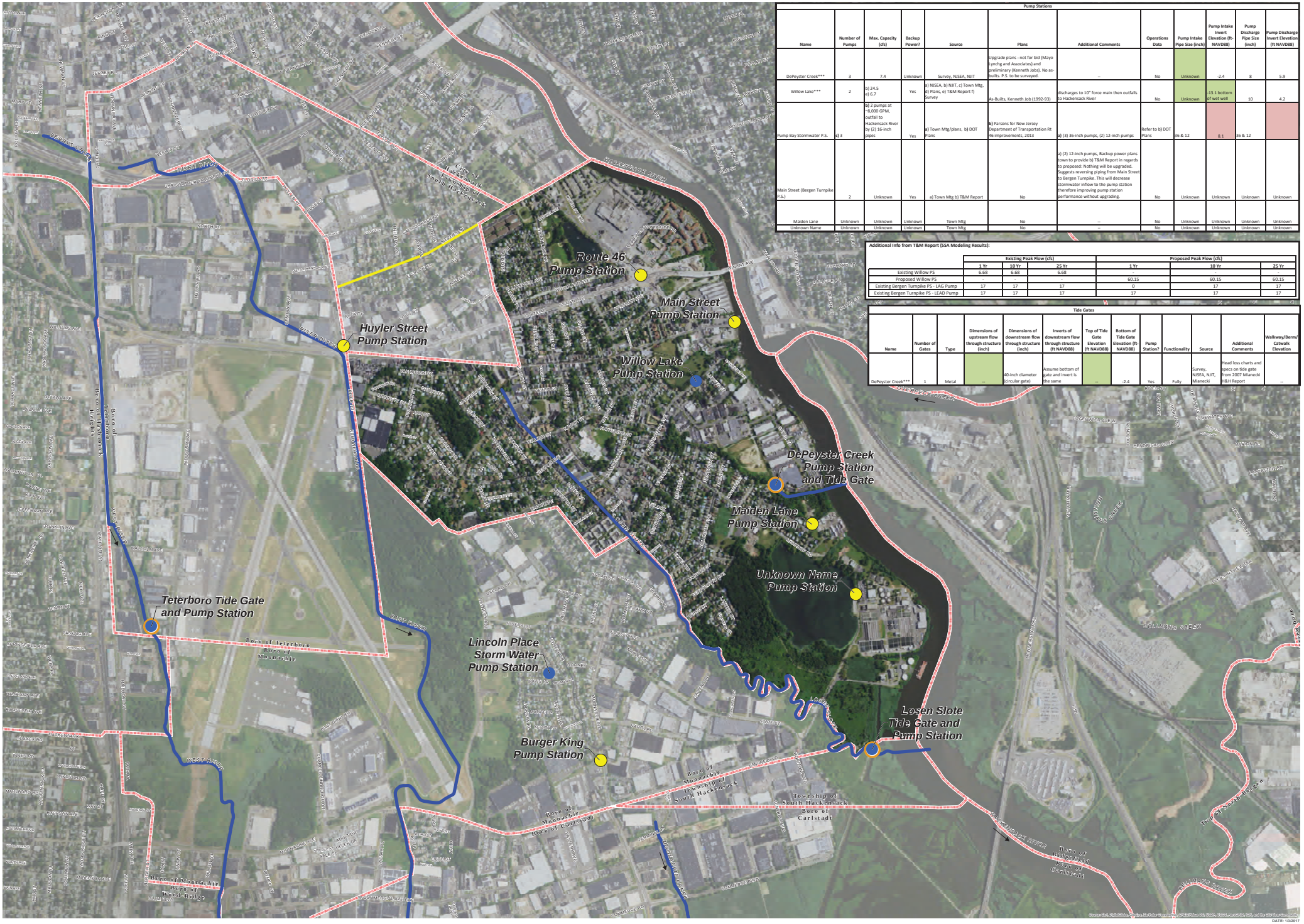
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REBUILD BY DESIGN: MEADOWLANDS FLOOD PROTECTION PROJECT

BORO OF TETERBORO

FIGURE 3

TIDE GATE AND PUMP STATION INVENTORY



Pump Stations

Name	Number of Pumps	Max. Capacity (cfs)	Backup Power?	Source	Plans	Additional Comments	Operations Data	Pump Intake Pipe Size (inch)	Pump Intake Invert Elevation (ft-NAVD88)	Pump Discharge Pipe Size (inch)	Pump Discharge Invert Elevation (ft NAVD88)
DePeyster Creek***	3	7.4	Unknown	Survey, NJSEA, NJIT	Upgrade plans - not for bid (Mayo Lynchy and Associates) and preliminary (Kenneth Jobs). No as-built. P.S. to be surveyed.	--	No	Unknown	-2.4	8	5.9
Willow Lake***	2	b) 24.5 e) 6.7	Yes	a) NJSEA, b) NJIT, c) Town Mtg, d) Plans, e) T&M Report f) Survey	As-Builts, Kenneth Job (1992-93)	discharges to 10" force main then outfalls to Hackensack River	No	Unknown	13.1 bottom of wet well	10	4.2
Pump Bay Stormwater P.S.	a) 3	b) 2 pumps at ~8,000 GPM, outfall to Hackensack River by (2) 16-inch pipes	Yes	a) Town Mtg/plans, b) DOT Plans	b) Parsons for New Jersey Department of Transportation Rt 46 improvements, 2013	a) (3) 36-inch pumps, (2) 12-inch pumps	Refer to b) DOT Plans	36 & 12	8.1	36 & 12	
Main Street (Bergen Turnpike P.S.)	2	Unknown	Yes	a) Town Mtg b) T&M Report	No	a) (2) 12-inch pumps, Backup power plans town to provide b) T&M Report in regards to proposed: Nothing will be upgraded. Suggests reversing piping from Main Street to Bergen Turnpike. This will decrease stormwater inflow to the pump station therefore improving pump station performance without upgrading.	No	Unknown	Unknown	Unknown	Unknown
Maiden Lane	Unknown	Unknown	Unknown	Town Mtg	No	--	No	Unknown	Unknown	Unknown	Unknown
Unknown Name	Unknown	Unknown	Unknown	Town Mtg	No	--	No	Unknown	Unknown	Unknown	Unknown

Additional Info from T&M Report (SSA Modeling Results):

	Existing Peak Flow (cfs)			Proposed Peak Flow (cfs)		
	1 Yr	10 Yr	25 Yr	1 Yr	10 Yr	25 Yr
Existing Willow PS	6.68	6.68	6.68	-	-	-
Proposed Willow PS		-		60.15	60.15	60.15
Existing Bergen Turnpike PS - LAG Pump	17	17	17	0	17	17
Existing Bergen Turnpike PS - LEAD Pump	17	17	17	17	17	17

Tide Gates

Name	Number of Gates	Type	Dimensions of upstream flow through structure (inch)	Dimensions of downstream flow through structure (inch)	Inverts of downstream flow through structure (ft NAVD88)	Top of Tide Gate Elevation (ft NAVD88)	Bottom of Tide Gate Elevation (ft-NAVD88)	Pump Station?	Functionality	Source	Additional Comments	Walkway/Berm/ Catwalk Elevation
DePeyster Creek***	1	Metal	--	40-inch diameter (circular gate)	Assume bottom of gate and invert is the same	--	-2.4	Yes	Fully	Survey, NJSEA, NJIT, Mianecki	Head loss charts and specs on tide gate from 2007 Mianecki H&H Report	--

LEGEND

Boundaries: Pilot Area; Municipality

Data Obtained from USGS National Hydrology Dataset: Key project tributaries to Hackensack River

Data Obtained from New Jersey Sports and Exposition Authority (NJSEA): Tide Gate; Pump Station

Township-Specific Meetings: Pump Station

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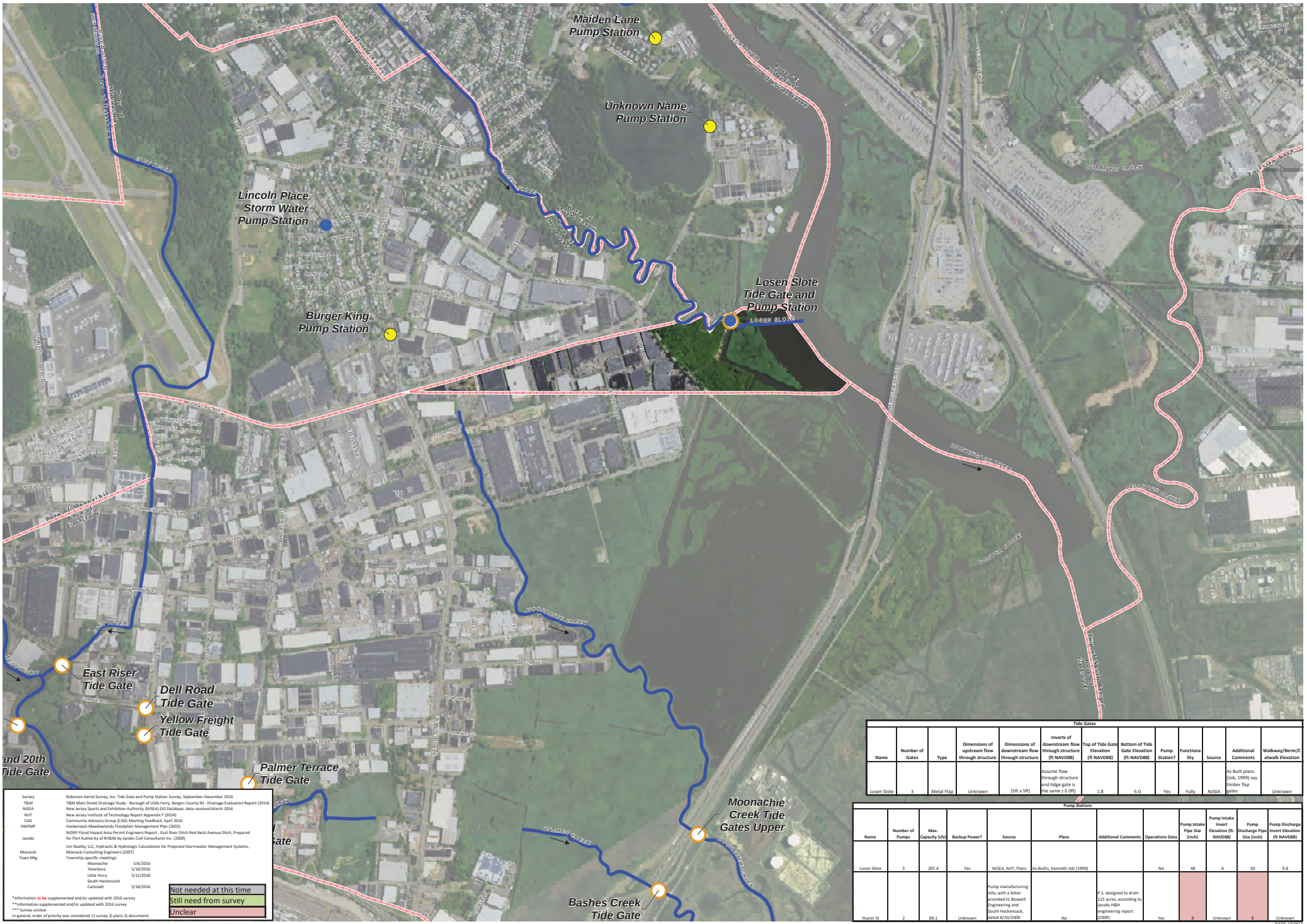
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BORO OF LITTLE FERRY

FIGURE 4

TIDE GATE AND PUMP STATION INVENTORY



Tide Gates

Name	Number of Gates	Type	Dimensions of upstream flow through structure	Dimensions of downstream flow through structure	Inverts of downstream flow through structure (ft NAVD88)	Top of Tide Gate Elevation (ft NAVD88)	Bottom of Tide Gate Elevation (ft-NAVD88)	Pump Station?	Functionality	Source	Additional Comments	Walkway/Berm/Catwalk Elevation
Losen Slote	3	Metal Flap	Unknown	(5ft x 5ft)	Assume flow through structure and tidge gate is the same (-5.0ft)	1.8	-5.0	Yes	Fully	NJSEA	As Built plans (Job, 1999) say timber flap gates	Unknown

Pump Stations

Name	Number of Pumps	Max. Capacity (cfs)	Backup Power?	Source	Plans	Additional Comments	Operations Data	Pump Intake Pipe Size (inch)	Pump Intake Invert Elevation (ft-NAVD88)	Pump Discharge Pipe Size (inch)	Pump Discharge Invert Elevation (ft NAVD88)
Losen Slote	3	287.4	Yes	NJSEA, NJIT, Plans	As-Builts, Kenneth Job (1999)		No	48	-4	50	9.8
Huyler St	2	89.1	Unknown	Pump manufacturing info, with a letter provided to Boswell Engineering and South Hackensack, dated 8/10/2000	No	P.S. designed to drain 123 acres, according to Jacobs H&H engineering report (2009)	Yes	8	Unknown	8	Unknown

DATE: 1/3/2017

Survey	Robinson Aerial Survey, Inc. Tide Gate and Pump Station Survey, September-December 2016	
T&M	T&M Main Street Drainage Study - Borough of Little Ferry, Bergen County NJ - Drainage Evaluation Report (2014)	
NJSEA	New Jersey Sports and Exhibition Authority (NJSEA) GIS Database, data received March 2016	
NJIT	New Jersey Institute of Technology Report Appendix F (2014)	
CAG	Community Advisory Group (CAG) Meeting Feedback, April 2016	
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	Uni Reality, LLC, Hydraulic & Hydrologic Calculations for Proposed Stormwater Management Systems,	
Mianecki	Mianecki Consulting Engineers (2007)	
Town Mtg	Township-specific meetings:	
	Moonachie	5/6/2016
	Teterboro	5/10/2016
	Little Ferry	5/11/2016
	South Hackensack	
	Carlstadt	5/18/2016

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Not needed at this time
Still need from survey
Unclear

LEGEND

Boundaries: Pilot Area; Municipality
Data Obtained from USGS National Hydrology Dataset: Key project tributaries to Hackensack River
Data Obtained from New Jersey Sports and Exposition Authority (NJSEA): Tide Gate; Pump Station
Township-Specific Meetings: Pump Station

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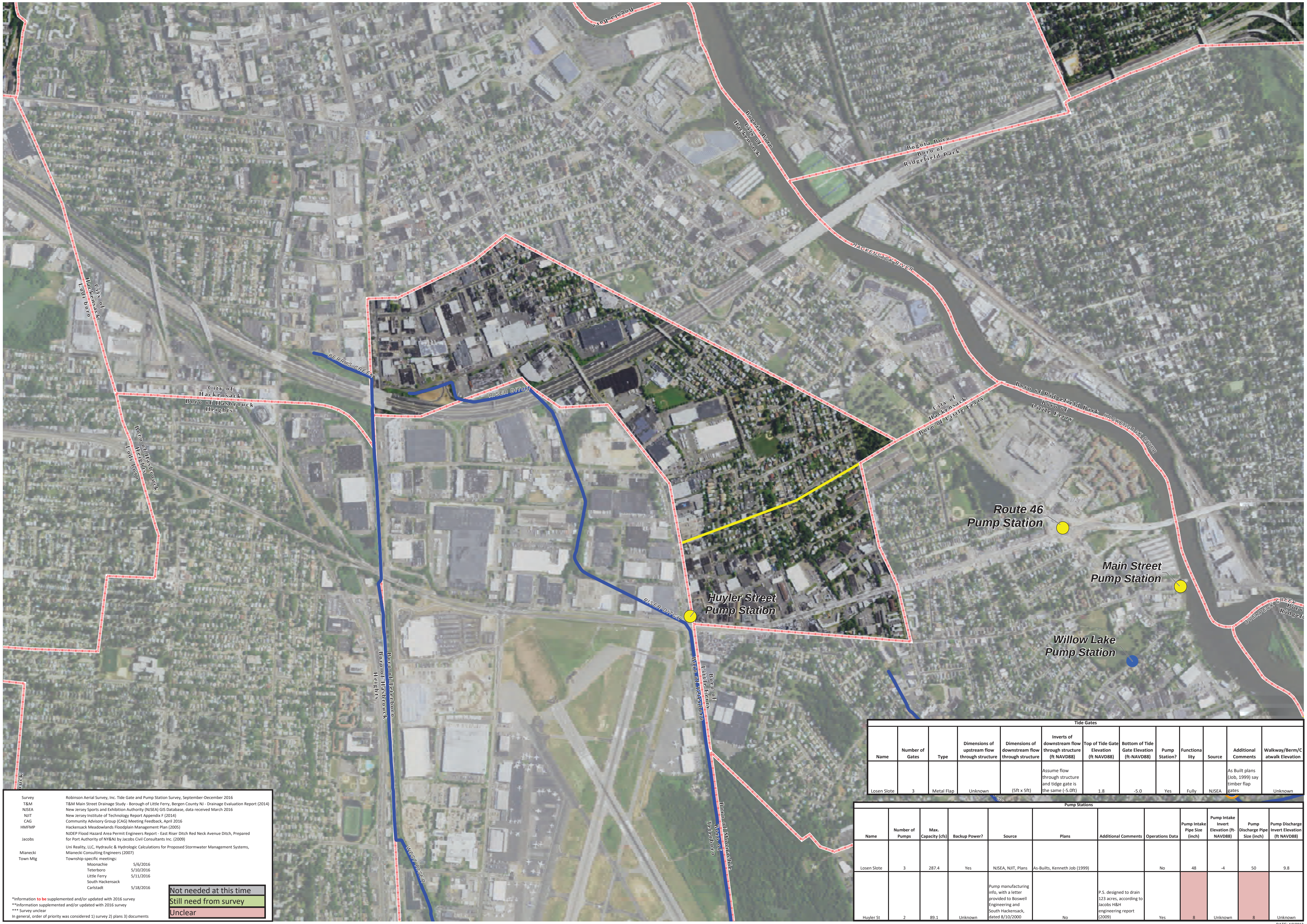
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Print Date	JEG	1/4/2017

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TOWNSHIP OF SOUTH HACKENSACK

FIGURE 5

TIDE GATE AND PUMP STATION INVENTORY



Tide Gates												
Name	Number of Gates	Type	Dimensions of upstream flow through structure	Dimensions of downstream flow through structure	Inverts of downstream flow through structure (ft NAVD88)	Top of Tide Gate Elevation (ft NAVD88)	Bottom of Tide Gate Elevation (ft-NAVD88)	Pump Station?	Functiona lity	Source	Additional Comments	Walkway/Berm/C atwalk Elevation
Losen Slote	3	Metal Flap	Unknown	(5ft x 5ft)	Assume flow through structure and tidge gate is the same (-5.0ft)	1.8	-5.0	Yes	Fully	NJSEA	As Built plans (Job, 1999) say timber flap gates	Unknown

Pump Stations											
Name	Number of Pumps	Max. Capacity (cfs)	Backup Power?	Source	Plans	Additional Comments	Operations Data	Pump Intake Pipe Size (inch)	Pump Intake Invert Elevation (ft-NAVD88)	Pump Discharge Pipe Size (inch)	Pump Discharge Invert Elevation (ft NAVD88)
Losen Slote	3	287.4	Yes	NJSEA, NJIT, Plans	As-Builts, Kenneth Job (1999)		No	48	-4	50	9.8
Huyler St	2	89.1	Unknown	Pump manufacturing info, with a letter provided to Boswell Engineering and South Hackensack, dated 8/10/2000	No	P.S. designed to drain 123 acres, according to Jacobs H&H engineering report (2009)	Yes	8	Unknown	8	Unknown

Survey	Robinson Aerial Survey, Inc. Tide Gate and Pump Station Survey, September-December 2016
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Town Mtg	Township-specific meetings:

Moonachie	5/6/2016
Teterboro	5/10/2016
Little Ferry	5/11/2016
South Hackensack	
Carlstadt	5/18/2016

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Still need from survey
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LEGEND

Boundaries
Pilot Area
Municipality

Data Obtained from USGS National Hydrology Dataset
Key project tributaries to Hackensack River

Data Obtained from New Jersey Sports and Exposition Authority (NJSEA)
Tide Gate
Pump Station

Township-Specfic Meetings
Pump Station

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DATE: 1/3/2017

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TOWNSHIP OF SOUTH HACKENSACK

FIGURE 6

TIDE GATE AND PUMP STATION INVENTORY

Subappendix A4-3: Historical Drainage Studies at Teterboro Airport

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Attachments

Attachment A4-3-1: Teterboro Airport Stormwater Drainage Study

Attachment A4-3-2: Teterboro Airport Traffic Control Tower Facility Flood Hazard Area Individual Permit Engineering Report (East Riser Ditch)

Attachment A4-3-3: Stormwater Management Report for First Aviation Services Expansion

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Attachment A4-3-1:
Teterboro Airport Stormwater Drainage Study

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Executive Summary
and
Final Submission Report

THE PORT AUTHORITY OF NY & NJ

Prepared for
The Port Authority of NY & NJ
Engineering Department

Prepared by
Jacobs Civil Consultants

April 2013

JACOBS

Teterboro Airport Stormwater Drainage Study

Executive Summary

Prepared for
The Port Authority of NY & NJ
Engineering Department

Prepared by
Jacobs Civil Consultants

Final Submission

April 2013

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Exhibit 3 – 25 Year Tidal Flooding Limits

Exhibit 4 – 25 Year Proposed Pipe Replacement Plan

1.0 Introduction

The Airport has been inundated with more than one foot of water several times. Most recently, the Airport experienced flooding during Hurricane Sandy that occurred in October of 2012 and Hurricane Irene that occurred in August 2011. Similarly, major flooding occurred in the Nor'easter storm of April 17, 2007. Based on the review of the photographs the approximate flood elevation was 4.0 feet. The flooding at the airport is caused by both tidal and rainfall (Fluvial) conditions, depending on the type of meteorological event.

The Study included the following:

- Evaluation of the regional characteristics of the watershed.
- Evaluation of the capacity of the West and East Riser Ditches.
- Evaluation of the Airport drainage system.
- Develop a hydrologic and hydraulic (H&H) model of the Airport's drainage system, including the West and East Riser Ditches.
- Identify potential conceptual solutions to mitigate the flooding problems. Since the Airport is a critical facility and the majority is located within the floodplain, the conceptual solutions considered a 25 year design storm compared to the standard design storm frequency of the FAA 5 year design storm.

It is noted that due to the scope of work and schedule issues, the study did not reflect any results or improvements based on Hurricane Sandy impacts.

Supportive documentation is included in the separate Technical Report and Appendices.

2.0 Federal Emergency Management Agency (FEMA)

As part of the Study, the FEMA Flood Insurance Study for Bergen County communities dated September 2005 was reviewed with data incorporated into the Study. It is important to note that the FEMA Study shows a 100 year flood elevation of 7.2 feet downstream of Moonachie Avenue and a flood elevation of 4.3 feet upstream of Moonachie Avenue. The significant change in elevations downstream (7.2) and upstream of Moonachie Avenue (4.3) is in question since the roadway elevation is below elevation 7.2 and varies from approximately elevation 3.5 to 6.0 within the subject area. Future studies will need to resolve this apparent discrepancy.

3.0 Watershed and Factors Affecting Stormwater Drainage at Teterboro Airport

The airport is situated within a 2400 acres (3.75 square miles) watershed draining towards Moonachie Avenue at the south end of the Airport. Teterboro Airport encompasses approximately 35 % (840 acres or 1.31 square miles) of the overall 2,400 acre watershed. Additionally, the Airport is in an overall low area with the bounding areas and surrounding roadways generally at higher elevations. Moonachie Avenue is approximately at elevation 3.5 to 7.0 feet and Route 46 is approximately at elevation 6.0 to 8.0 feet (NAVD 1988). Key hydrologic and hydraulic characteristics are outlined below:

- The majority (600 acres) of the Airport's drainage drains to West Riser Ditch (WRD) and is controlled by Vincent Place Pumping Station which is owned and operated by the Borough of Teterboro. The pumping station has a capacity of approximately 175 cfs and discharges storm water runoff to the WRD. The pumping station is required since most storm sewers, ditches and grades surrounding the Airport are lower than the normal water level in the WRD and would not otherwise drain into the WRD in a timely manner. While the pumping station has a capacity of 175cfs, the current maximum permissible pumping rate is 112 cfs for a storm exceeding a 10-year frequency. This restriction was set by the New Jersey Department of

Environmental Protection (NJDEP) during the permit application when the pumping station was rebuilt in 2003. One of the recommended improvements is to maximize the pump station capacity, coupled with other improvements to offset any downstream impacts as a result in the increase in flows.

- The remaining 30-percent (240 acres) of the Airport's drainage is controlled by the East Riser Ditch (ERD).

- At Moonachie Avenue, the total drainage area of WRD is 1640 acres (600 acres Airport + 1040 acres off Airport) and the drainage area of ERD is about 760 acres (240 acres Airport + 520 off Airport).

- WRD and ERD combine downstream of the East Riser Tide Gate and becomes Berry's Creek. Berry's Creek, which is a tributary of the Hackensack River, continues about 4 miles to the Hackensack River.

- The function of the ERD and WRD tide gates is to limit tidal flow/influence into upstream regions of the watershed, including the Airport property, for tidal storms less than a 3-year frequency (elev. 4.0). Without the ERD and WRD tide gates, the watershed area would be entirely controlled by the tidal water of Berry's Creek. As such, the tide gates must function properly. Otherwise, flooding of the Airport property and off Airport properties will be exacerbated. It is noted that the WRD tide gate is currently leaking which is contributing to the flooding on the Airport. In addition to the compromised operational status of the WRD the ERD also has operational issues that also must be addressed.

- At the ERD and WRD tide gates, mean high water elevation is 2.81 feet and mean high water spring elevation is approximately 3.22 feet. The ERD tide gate has an overflow elevation of 4.7 feet (even though the top of the tide gate is at elev. 9.0 feet) because the lowest surrounding bank elevation is approximately at elevation 4.0 feet which is about a 2.5-year tide frequency. Similarly, the WRD tide gate has an overflow elevation of 5.2 feet and surrounding lowest bank elevation is approximately at elevation 4.0 feet. As such, tidal flood waters over elevation 4.0 feet, will overtop the surrounding banks at each tide gate, and find its way to upstream locations, including the Airport property.

- Portions of Industrial Avenue near the Airport area are lower than approximately elevation 4. At times, flood/tidal waters overflow from the drainage systems and the Lower WRD and result in flooding of the airport area. Among all piped systems, the most critical deficiency is the flooding condition of the existing 48" RCP drainage system along the Industrial Avenue. The undersized system results in flooding of Industrial Avenue with floodwater overflowing to the airport and backing up the airport drainage systems. The cause of the flooding at this location is the combination of the undersize system, improper roadway profile/ elevations and tidal backup. Even though the system is officially under the jurisdiction of the Borough of Teterboro, improvements to the system will greatly benefit the entire airport drainage systems and will reduce flooding.

4.0 Conceptual Solutions to Mitigate Flooding

The combined H&H analysis indicates that the airport region drainage facilities currently have capacity to convey less than the 3-year storm event. The ERD and WRD Tide Gates generally have the capacity to prevent flooding of the Airport from less than a 3 year tidal event.

The following table identifies conceptual solutions to mitigate flooding for a fluvial and tidal storm event up to approximately a 25 year design. Refer to the attached conceptual Exhibits for the general locations of the potential solutions (Exhibit 1), estimated existing and proposed flooding limits (Exhibits 2 and 3), and a plan showing the proposed drainage pipe replacement locations (Exhibit 4).

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Table 1
ON-PROPERTY AND OFF-PROPERTY CAPITAL IMPROVEMENTS

	CONCEPT	DESCRIPTION	ORDER OF MAGNITUDE CONSTRUCTION COST	PROS	CONS
		GENERAL ENHANCEMENTS			
ON-PROPERTY	1	Remove and replace existing stormwater pipes and drainage structures including Industrial Avenue Drainage System to provide adequate capacity.	$7.2 Million (Say 4 Million without Industrial Ave system)	• Meets FAA Criteria • Limited wetland impacts	• Still affected by area flooding
ON-PROPERTY	2	Install “Flood Break" type wall (or equal) to protect a critical facility (e.g. the electrical vault) and access areas. The cost is based on 650 linear feet of wall, approximately 2 feet high or the equivalent of say 13 driveways of 50 feet long.	$600,000	• Passive flood protection (i.e. power or manual operation is not required) • Quick to implement	• Focused Solutions • Site Impacts
		EAST RISER DITCH ENHANCEMENTS			
ON-PROPERTY	3	At Moonachie Avenue, replace the existing trash rack with a sloped trash rack.	$5,000	• Minimizes clogging • Facilitates required maintenance	• Nominal Flood Improvement
ON-PROPERTY	4	Construct an underground stormwater storage detention system in the parking lot of the Red Neck Ave Athletic Fields.	$1.6 Million	• Minimize bird hazards • Maximizes usable space • Low wetland impacts • Not Airside	• Park Impact • Pump and Force mains required at ERD and Athletic Fields
ON-PROPERTY	5	Construct an underground stormwater storage system at Runway 1-19/Taxiway Q Area.	$3.1 Million	• Minimize bird hazards • Maximizes usable space	• Wetland Impacts
ON-PROPERTY	6	Dredge 7500 linear feet of the East Riser Ditch. The dredging would be approximately 2 feet deep to create a 10 foot bottom and 2:1 side slopes.	$700,000	• Provides 4.8 acre-feet of storm water storage • Reduces standing water	• Env./Disposal issues • Nominal Flood Improvement • Temp. Wetland Impacts
ON-PROPERTY	7	Replace the Gate B - Access Road Twin Culverts with a Bridge	$ 1.0 Million	• Reduces upstream Fluvial Flooding	• Wetland Impacts • Need to Combine with other Flood Improvements
OFF-PROPERTY	8	Construct a pump station /force main at the location of the East Riser Ditch Tide Gate. Discharge will be directed to downstream side of the tide gate.	$2.5 Million	• Direct flood mitigation • Chamber Exists	• Extensive coordination • Site Impacts • Wetland Impacts • No Tidal Benefit
OFF-PROPERTY	9	Expand storage at the Huyler Street Pump Station.	$1.1 Million	• Existing facility • No impact to wetlands • Alleviates Rt 46 and Fred Wehren Drive Flooding	• Controlled by others • Site Impacts • May need drainage collection

Table 1
ON-PROPERTY AND OFF-PROPERTY CAPITAL IMPROVEMENTS

CONCEPT		DESCRIPTION	ORDER OF MAGNITUDE CONSTRUCTION COST	PROS	CONS
OFF-PROPERTY	10	Construct a pump station /force main at Redneck Avenue and Joseph Street. Discharge will directed to Losen Slofe in Little Ferry, a tributary to Hackensack River.	$2.6 Million	• Effective Fluvial Flood Control	• Extensive coordination & Offsite Infrastructure Impacts • Diversion of drainage areas • No Tidal Benefit • Site Impacts • Wetland Impacts • Force Main Required
	11	Raise the East Riser Tide Gate Overflow.	$800,000	• Better Controls Tidal Flooding	• Extensive coordination & Offsite Impacts • Wetland Impacts
	12	Replace the two(2) Fred Wehran Drive Bridges	$1.5 Million	• Reduces upstream Fluvial Flooding • Reduces/Eliminates diversion to WRD	• Wetland Impacts • Need to Combine with other Flood Improvements
	13	Divert Flow at Route 46 to Hackensack River	$ 35 Million	• Reduces onsite impacts • More developable land onsite • Reduced Industrial Avenue Improvements	• Extensive collection system needed • Diversion of drainage areas • Impacts to Route 46 • Unknown impacts to Hackensack River
		WEST RISER DITCH ENHANCEMENTS			
ON-PROPERTY	14	Construct an underground stormwater storage detention system at Runway 24/Industrial Ave	$3.7 Million	• Minimize bird hazard • Helps VPPS Increase	• High Wetland Impacts
	15	Construct small earth berms in several critical locations: • south of Taxiway G, west of Runway 24 • south of the Fuel Farm/Maintenance Area to prevent the Lower West Riser Ditch from backing up onto Industrial Avenue • A series of berms at low areas on the east side of Industrial Avenue	$400,000	• Targeted Improvements • Minor Wetland Impacts	• Floodplain fill • Site impacts • May need pumps & check valves
	16	Dredge 4500 linear feet of the West Riser Ditch. The dredging would be approximately 2 feet deep to create a 10 foot bottom and 2:1 side slopes.	$450,000	• Provides 2.9 acre-feet of storm water storage • Reduces standing water	• Env./Disposal issues • Nominal Flood Improvement • Temp. Wetland Impacts

Table 1
ON-PROPERTY AND OFF-PROPERTY CAPITAL IMPROVEMENTS

	CONCEPT	DESCRIPTION	ORDER OF MAGNITUDE CONSTRUCTION COST	PROS	CONS
OFF-PROPERTY	17	Dredge the entire length (approximately 5000 linear feet) of the Lower West Riser Ditch. The dredging would be approximately 2 feet deep to create a 10 foot bottom and 2:1 side slopes.	$500,000	• Provides 3.2 acre-feet of storm water storage • Reduces standing water	• Env./Disposal issues • Nominal Flood Improvement • Temp. Wetland Impacts
	18	Install a small earth berm or “Flood Break” wall along the Lower WRD	$200,000	• Targeted Area • Minor Wetland Impacts	• Floodplain Fill • Site Impacts • May need pumps & check valves • Wetland Impacts
	19	Construct an underground stormwater storage detention system at Hollister Road/Route 46	$4.0 Million	• Minimize bird hazards • Alleviate Industrial Ave. flooding • No Wetland Impacts	• May impact the Lower West Riser Ditch • Park Impact
	20	Construct an underground stormwater storage detention system at Route 17/Franklin Avenue	$1.6 Million	• Minimize bird hazards • Maximize usable space • No Wetland Impacts	• Park Impact
	21	Increase the Vincent Place Pump Station Flow Rate	$40,000	• No Wetland Impacts	• Nominal Flood Improvement • Controlled by others
	22	Construct a pump station/force main at WRD upstream of the Moonachie Avenue crossing. Discharge with a long force main will be directed to downstream of the WRD Tide Gate.	$4.6 Million	• Effective Fluvial Flood Control • Helps VPPS Increase	• Extensive coordination & Offsite Infrastructure Impacts • No Tidal Benefit • Site Impacts • Wetland Impacts • Long Force Main Length
	23	Raise the West Riser Tide Gate Overflow areas	$800,000	• Better Controls Tidal Flooding	• Extensive coordination & Offsite Impacts • Wetland Impacts
	24	Construct a pump station /force main at WRD Tide Gate. Discharge will be directed to downstream side of the tide gate.	$2.5 Million	• Direct flood mitigation • Small Force Main Length • No onsite impacts	• Extensive coordination • Site Impacts • Wetland Impacts • No Tidal Benefit
	25	Install a Check Valve on the Airport 84 inch Trunk Line	$75,000	• Minimize flooding on Industrial Ave • Quick to implement	• Not 100% without raising roadway profile • Hydraulic impact/head loss • Only Effective in higher Tidal events
	26	Replace Moonachie Ave Twin Culverts with a Bridge	$ 1.5 Million	• Reduces upstream Fluvial Flooding	• Extensive coordination • Site Impacts • Wetland Impacts • Need to Combine with other Flood Improvements
	27	Divert Flow at Route 46 to Hackensack River	$ 29 Million	• Reduces onsite impacts • More developable land onsite	• Extensive collection system needed • Diversion of drainage areas • Impacts to Route 46 • Unknown impacts to Hackensack River

1. ROW/Maintenance/Operation/Environmental Contaminated costs excluded.

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5.0 Conclusions

More detailed analysis is required to determine the exact combination of the conceptual solutions that will mitigate flooding of the Airport and ensure that there are no adverse impacts to properties downstream and upstream of the Airport. However, some general observations can be made base on the effort performed to date.

The potential conceptual solutions can be combined into two (2) overall general options. Option A includes the selected improvement options without the diversion of the ERD and WRD to the Hackensack River. Option B includes the diversion of the ERD and WRD to the Hackensack River, along with other improvements that are warranted based on judgment and due to the fact that Option B will not solve all the flooding issues as a result of the Tidal Flooding and other unique site conditions such as the downstream tributary flows and flat areas. The main benefit of Option B is that it allows for more onsite development in the future since some of the onsite impacts under Option A can be reduced or eliminated.

Refer to the table below for additional information.

Revised 04-2-2013
Table 2
Conceptual Solutions

Option	Improvements	Order of Magnitude Construction Cost	Comments
A	1-12,14-26	$43 Million	• Improvements without diversion of ERD/WRD to the Hackensack River.
B	1,3,6-7,11,13,15-18,21, 23-27	$77 Million	• Option includes diversion of ERD/WRD to the Hackensack River which is a significant concern. • ERD and WRD diversions should be done together and the cost reflects the savings. • Cost reflects reduction in the proposed Industrial Ave drainage system.

Note: ROW/Maintenance/Operation/Environmental Contaminated costs excluded

The general locations of the potential Options evaluated are shown on the attached Exhibit 1. The estimated existing and proposed flooding limits for the Tidal and Fluvial conditions are shown on the attached Exhibits 2 and 3. Exhibit 4 provides the locations of the recommended pipe replacements.

Exhibits 2 and 3 illustrate the estimated existing 25 year flooding limits and proposed reduction in flooding limits if all the potential options are implemented. The extent of the flooding may vary, depending on the type and/or combination of the flooding event (Fluvial and/or Tidal).

The following is also a suggested outline of which Improvements should be advanced first.

1. West Riser Tide Gate – Encourage the owner to complete the construction of the new tide gate as soon as possible (In-Progress).
2. Install “Flood Break” type walls and/or other type flood walls to protect critical facilities (Concept 2) if the overall improvements are delayed or not pursued. Flood Break walls are passive type walls that activate and rise based on buoyant forces without the need for power.

3. Perform drainage system upgrades (Concept 1), focusing on Industrial Ave and other frequent flooding locations, particularly if Concept 27 is not pursued.
4. Further Study of raising the berms at ERD and WRD (Concepts 11 and 23).
5. Further Study Concept 19, particularly if Concept 27 is not pursued.
6. Further Study of Concept 9 with Concept 12, if Concept 13 is not pursued.
7. Dredging of ERD and WRDs (Concepts 6, 16, and 17), assuming the environmental issues are manageable.

The other improvements should be advanced based on the PA NY&NJ budgets and needs.

The overall benefit of the implementation of the improvements includes but is not limited to reduced flooding and associated damages, reduced airport closures and loss of revenue, reduced loss of power, and increased safety. There would also be benefits for properties located off airport property that would see a reduction in flooding.

PORT AUTHORITY PROPERTY LIMITS

WEST RISER DITCH WATERSHED DRAINAGE BOUNDARY

TETERBORO VINCENT PLACE PUMP STATION

WEST RISER TIDE GATE

HUYLER STREET PUMP STATION

EAST RISER TIDE GATE

RED NECK AVENUE DITCH

RED NECK AVENUE DITCH WATERSHED DRAINAGE BOUNDARY

EAST RISER DITCH WATERSHED DRAINAGE BOUNDARY

CONCEPT	DESCRIPTION
1	Drainage System Upgrade
2	"Flood Break" type wall (or equal)
3	New ERD Trash Rack
4	ERD - Underground Storage at Red Neck Ave Athletic Fields
5	ERD - Underground Storage at Runway 1-19/Taxiway Q
6	Dredge ERD
7	Replace Gate B Access Rd Bridge
8	ERD Pump Station at ERD Tide Gate
9	Expand Storage at the Huyler Street Pump Station
10	ERD Pump Station /Force Main at Redneck Avenue and Joseph Street
11	Raise the East Riser Tide Gate Overflow
12	Replace 2 Fred. Wheran Dr. Bridges
13	Divert ERD to Hackensack River
14	WRD – Underground Storage – Runway 24/Industrial Ave
15	WRD Berms
16	Dredge WRD
17	Dredge Lower WRD
18	Install Small Berm/Flood Break Wall – Lower WRD
19	WRD – Underground Storage – Hollister Road/Route 46
20	WRD – Underground Storage – Route 17/Franklin Avenue
21	Increase Vincent Place Pump Station Flow Rate
22	WRD Pump Station/Force Main at Moonachie Ave
23	Raise the West Riser Tide Gate Overflow
24	WRD Pump Station at WRD Tide Gate
25	Check Valve on Airport 84 inch Trunk Line
26	Replace WRD Moonachie Ave Structure
27	Divert WRD to Hackensack River

THE PORT AUTHORITY OF NY & NJ

Jacobs Civil Consultants Inc.
2 Penn Plaza
New York, NY 10121

No.	Date	Revision	Approved

ENGINEERING DEPARTMENT

CIVIL

EXHIBIT 1
CONCEPTUAL DRAINAGE IMPROVEMENT PLAN

REFERENCE:
2011 USGS HACKENSACK & WEEHAWKEN QUADS

NOT TO SCALE

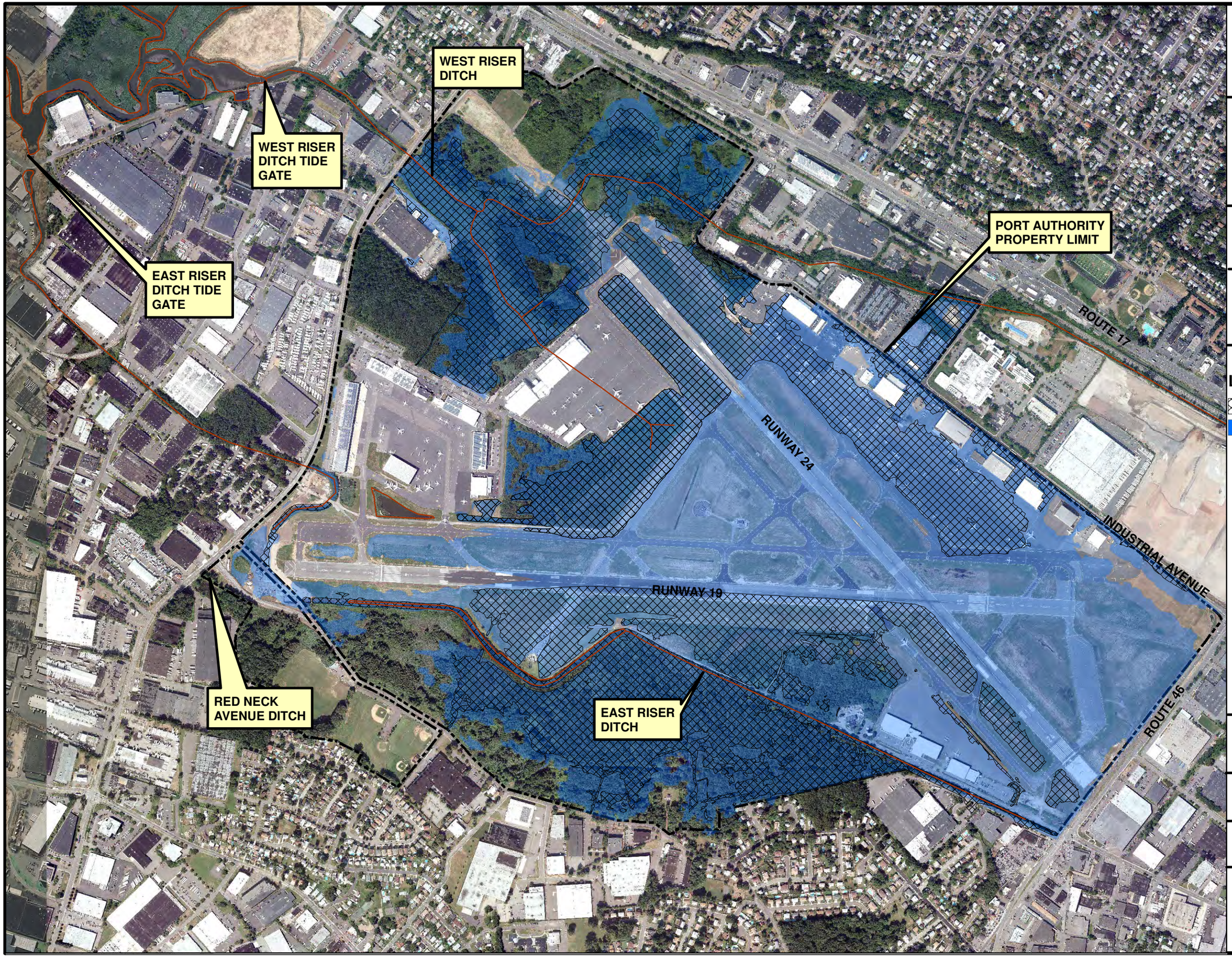
SH/TD	BM	TD
Designed by	Drawn by	Checked by

Date 12/2012

Contract Number

Drawing Number

PID# NUMBER



TETERBORO AIRPORT PRE-STAGE 1 STORMWATER MANAGEMENT STUDY

THE PORT AUTHORITY OF NY & NJ

THE PORT AUTHORITY OF NEW YORK AND NEW JERSEY

SOURCE: FLOWN AUG 2011 AERIAL

N

Legend

- Proposed 25 yr Fluvial Flooding Limits
- Existing 25 yr Fluvial Flooding Limits

Note: Only Estimated Flooding Within Port Authority Property Shown.

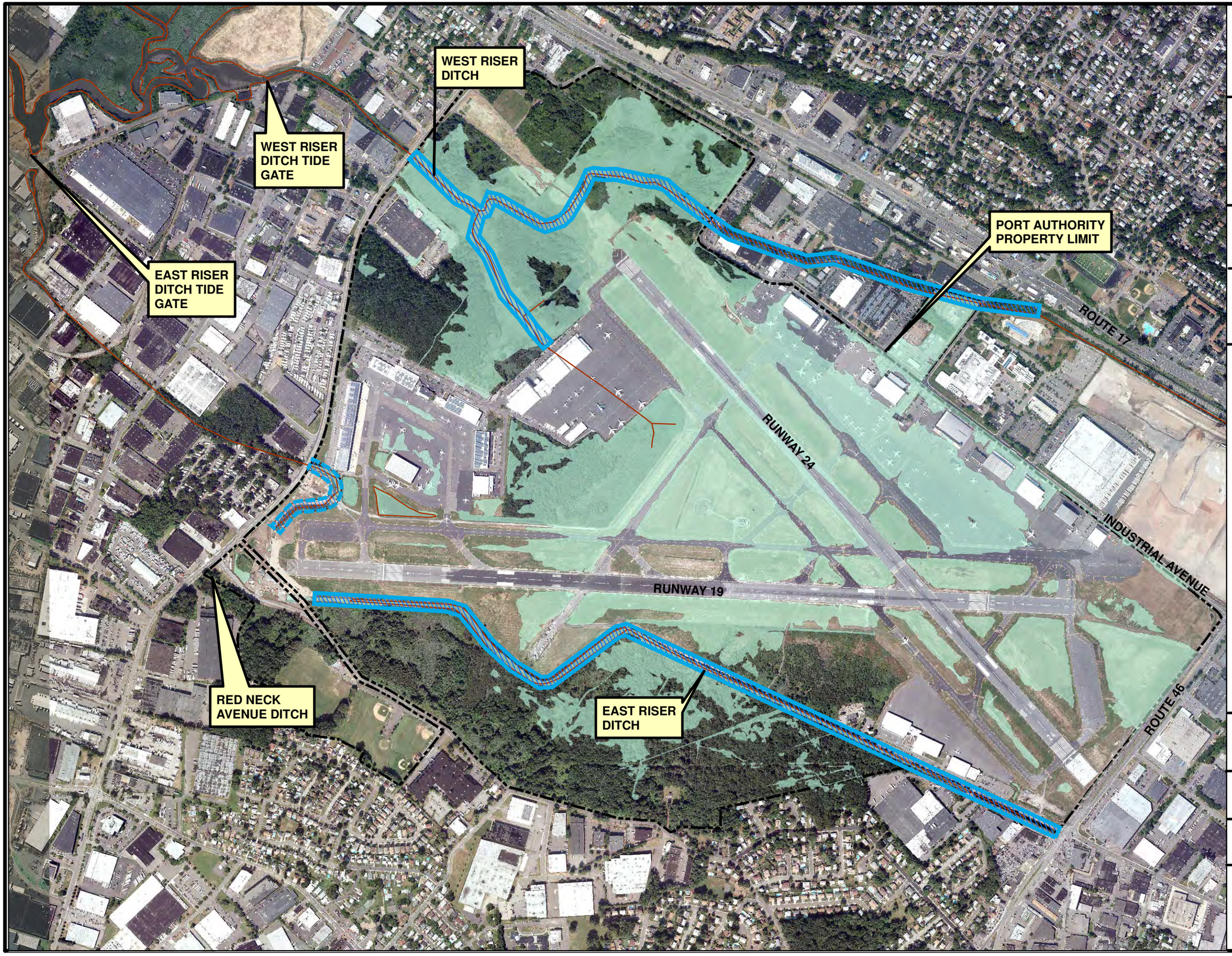
N.T.S.

EXHIBIT 2 25 YEAR FLUVIAL FLOODING LIMITS

DATE
DECEMBER 4, 2012

CHECKED BY:	MADE BY:
TD	BTM

JACOBS
299 Madison Ave
Morristown, NJ 07962



TETERBORO AIRPORT PRE-STAGE 1 STORMWATER MANAGEMENT STUDY

THE PORT AUTHORITY OF NY & NJ

THE PORT AUTHORITY OF NEW YORK AND NEW JERSEY

SOURCE: FLOWN AUG 2011 AERIAL

N

Legend

- Proposed 25 Year Tidal Flooding Limits
- Existing 25 Year Tidal Flooding Limits

Note: Only Estimated Flooding Within Port Authority Property Shown.

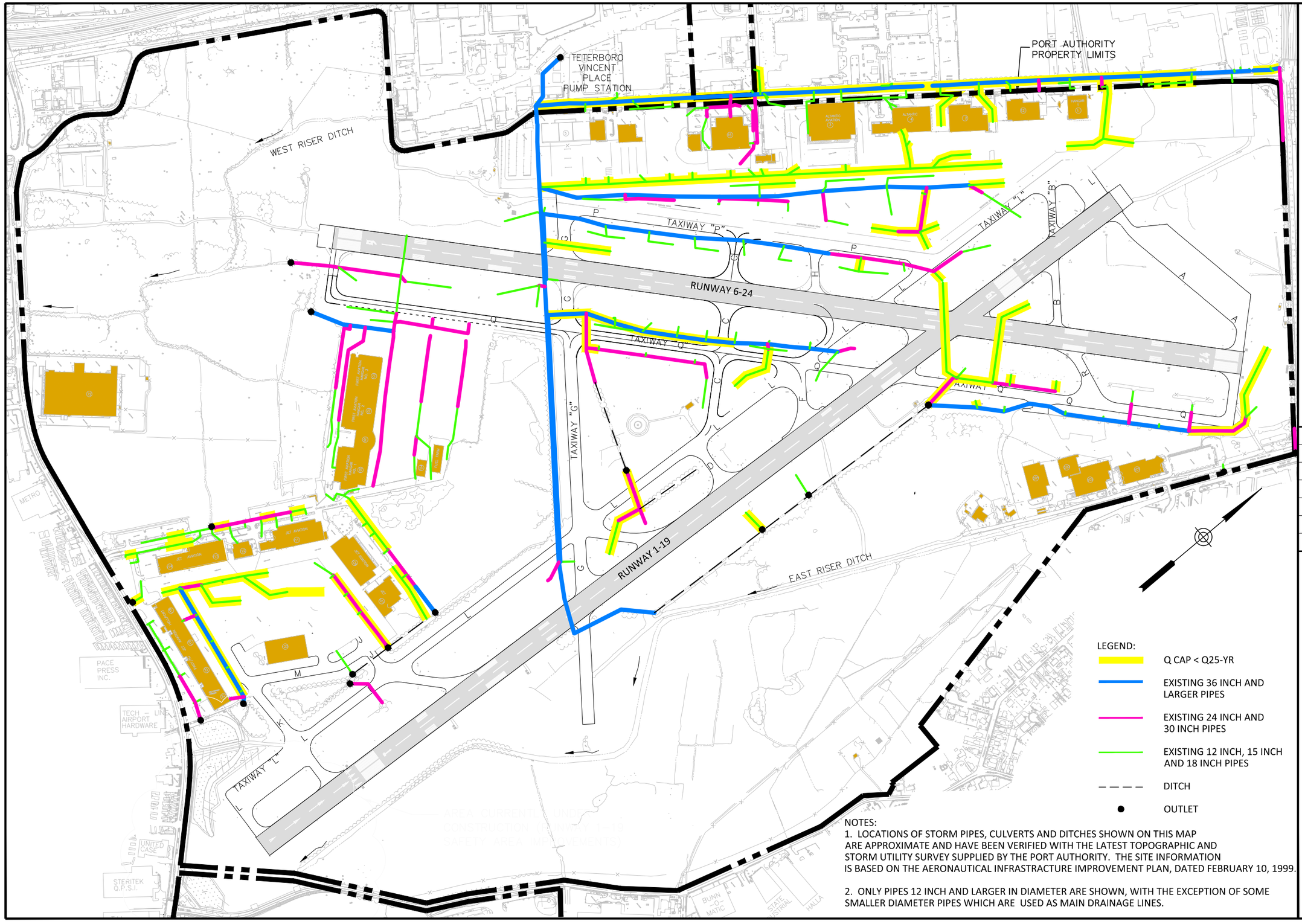
N. T. S.

EXHIBIT 3 25 YEAR TIDAL FLOODING LIMITS

DATE
DECEMBER 4, 2012

CHECKED BY:	MADE BY:
TD	BTM

JACOBS
299 Madison Ave
Morristown, NJ 07962



NOTES:

1. LOCATIONS OF STORM PIPES, CULVERTS AND DITCHES SHOWN ON THIS MAP ARE APPROXIMATE AND HAVE BEEN VERIFIED WITH THE LATEST TOPOGRAPHIC AND STORM UTILITY SURVEY SUPPLIED BY THE PORT AUTHORITY. THE SITE INFORMATION IS BASED ON THE AERONAUTICAL INFRASTRUCTURE IMPROVEMENT PLAN, DATED FEBRUARY 10, 1999.

2. ONLY PIPES 12 INCH AND LARGER IN DIAMETER ARE SHOWN, WITH THE EXCEPTION OF SOME SMALLER DIAMETER PIPES WHICH ARE USED AS MAIN DRAINAGE LINES.

THE PORT AUTHORITY OF NY & NJ

Jacobs Civil Consultants Inc.
2 Penn Plaza
New York, NY 10121

No.	Date	Revision	Approved

ENGINEERING DEPARTMENT

TETERBORO AIRPORT

CIVIL

PRE–STAGE I
STORMWATER MANAGEMENT STUDY

EXHIBIT 4
25 YEAR PROPOSED PIPE REPLACEMENT PLAN

N.T.S.

SH	BM	TD
Designed by	Drawn by	Checked by

Date 12/2012

Contract Number

Drawing Number

PID# NUMBER

Attachment A4-3-2:
Teterboro Airport Traffic Control Tower Facility Flood Hazard Area Individual Permit Engineering Report (East Riser Ditch)

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TETERBORO AIRPORT

AIRPORT TRAFFIC CONTROL TOWER FACILITY

FLOOD HAZARD AREA INDIVIDUAL PERMIT

ENGINEERING REPORT

EAST RISER DITCH

Submitted by

Federal Aviation Administration
Department of Transportation
Teterboro Airport,
Teterboro, New Jersey

December 20, 2013

Prepared by

1255 Broad Street, Suite 201
Clifton, New Jersey 07013-3398
973-883-8500

John Dromsky-Reed
N.J. Professional Engineer
License No. 24GE04512400

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1. INTRODUCTION

In an effort to increase safety at Teterboro Airport (TEB), the Federal Aviation Administration (FAA) is proposing to construct a new Airport Traffic Control Tower (ATCT) at the north-east corner of the airport. The control tower site and facilities will be constructed in the flood fringe area of the East River Ditch (ERD). In order to facilitate access to the ATCT site, Fred Wehran Drive will be improved and a crossing from Fred Wehran Drive to the facility will be constructed.

The proposed project is located adjacent to the East Riser Ditch, approximately 5,000 feet upstream from the concrete box culvert at southern end of East Runway #1-19 of Teterboro Airport near the intersection of Moonachie Avenue and Redneck Avenue, and is contained on Teterboro Airport property. The project involves work/fill in the north-east portion of flood fridge area of and channel improvements to the ERD. Approximately 400 feet of channel excavation/improvement is proposed for this project.

This report presents the existing and proposed conditions hydrologic and hydraulic (H&H) analyses associated with the impacts to the floodplains and the ERD channel. The Environmental and Alternative Analyses' issues are addressed in separate documents.

The project's vertical Datum is NAVD 1988. The formula for datum conversion for this site is NGVD 1929 = NAVD88 + 1.06 feet.

2. PROJECT DESCRIPTION

The Teterboro ATCT complex will replace the existing control tower to provide a facility that includes modern technology and provides for safer airport operations. The proposed ATCT site will encompass approximately 2.73 acres and is shown in Figure 1. The primary features of the new site will include:

- A new ATCT,
- A new two-story base building,
- 58 standard parking spaces and three handicap parking spaces,
- A perimeter security fence,
- Access roads to accommodate tractor trailers and emergency vehicles (e.g., fire trucks),
- Access road crossing over East Riser Ditch.
- Improvements to Fred Wehran Drive

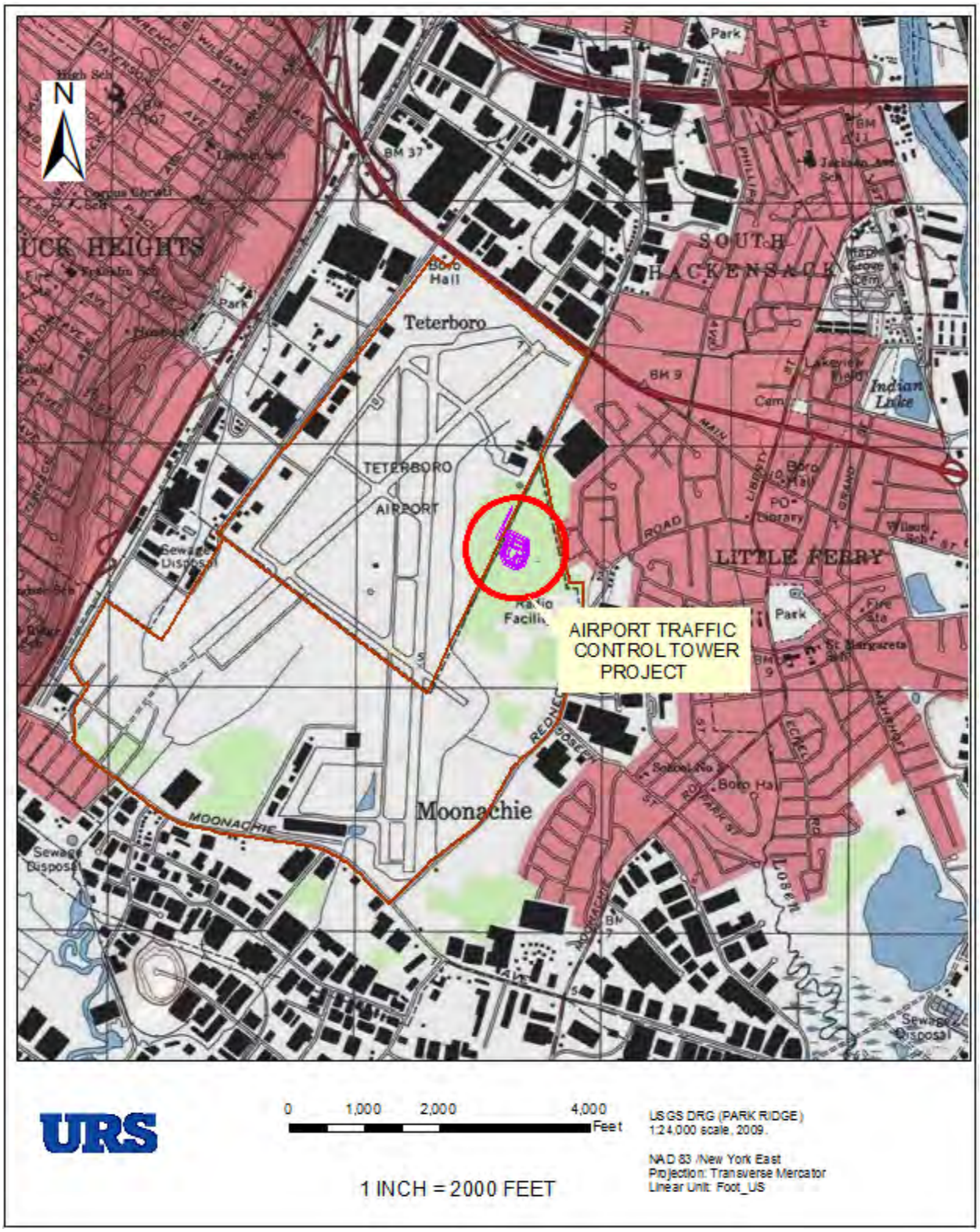


Figure 1 – Site Location Map

As an ancillary project component, which is necessary in order to eliminate any induced flooding from the new bridge construction and meet NJ Flood Hazard Area Control Act (FHACA) regulations, a portion of East Riser Ditch downstream of bridge, between Fred Wehran Drive and the project site, will be widened.

Additional description of the proposed ATCT and associated features are provided in the following paragraphs. Detailed project plans are provided as part of the permit application.

- A total of 61 parking spaces are proposed, along with associated driveways, which are located the minimum distance from the buildings to meet FAA safety requirements. Concrete walkways will be provided between the buildings and parking areas. The extent of new impervious surface area proposed is shown on the project plans.

- A new crossing over East Riser Ditch will be constructed to access the site from Fred Wehran Drive. There is currently no means for vehicular access across East Riser Ditch in this portion of the airport property and no means to access the proposed ATCT site. Details on the proposed crossing are provided on the project plans.

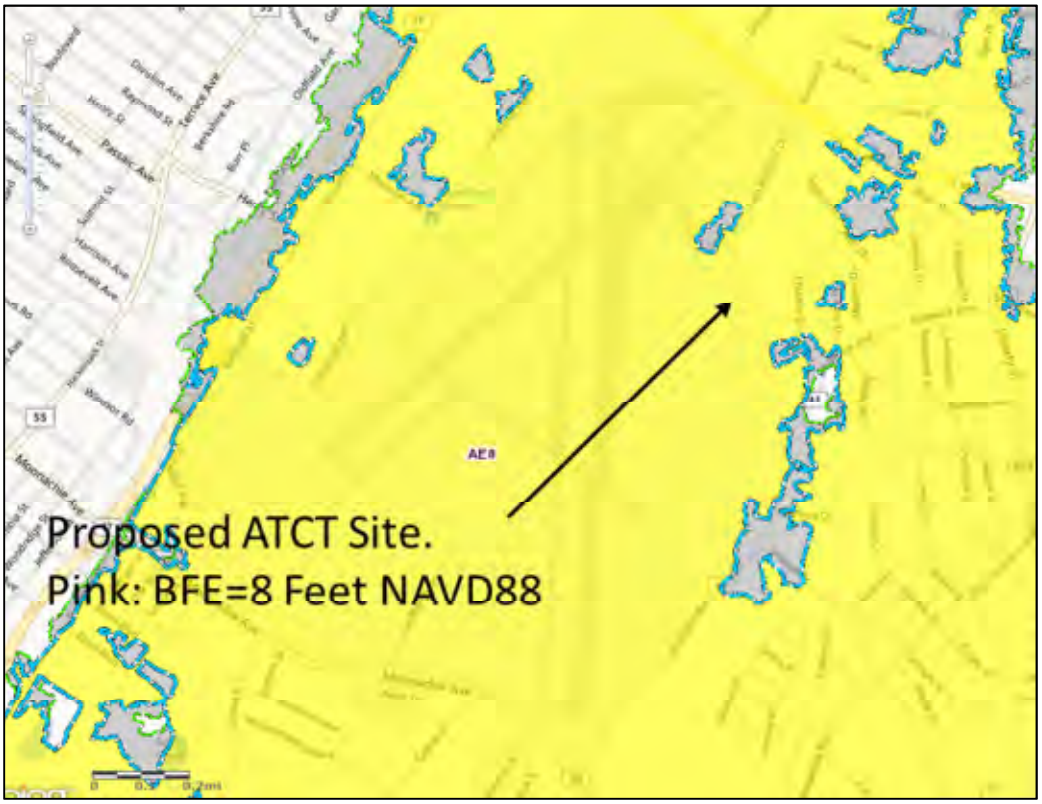
- Improvements to approximately 450 linear feet of Fred Wehran Drive would be required. Improvements would consist of widening the existing 12-foot wide roadway, which is a combination of gravel and pavement, to 25-feet to accommodate two-way traffic. The improved Fred Wehran Drive would have an asphalt paved surface for ease of maintenance.

3. NJDEP STORMWATER MANAGEMENT RULES

The construction of the tower facility will affect approximately 2.73 acres (0.0043 mi^2); therefore, NJ Stormwater Management Rules apply to this project. The requirements in 7:8-5.4, Runoff Quantity Standards - specifically, 'no increase in runoff downstream' of the airport property - apply to this project. Stormwater quality rules also apply. Compliance with the stormwater management rules is addressed in Section 10.

4. NJDEP FLOOD HAZARD AREA CONTROL ACT RULES

With the recent publication of FEMA's Preliminary Work Maps for Bergen County, which contain new Advisory Base Flood Elevations (ABFE's) (see Figure 2.), the new regulatory tidal base flood elevation and Flood Hazard Area Design Flood (FHADF) elevation for the proposed tower site is 8 feet NAVD88. This is above the fluvial 100-year base flood elevation of 5.7 feet NAVD88 described later in this report. Because the tidal base flood elevation exceeds the fluvial base flood elevation for the ERD, the site is considered within a tidal area and net fill computation is not required per 7:13-10.4(d) of the FHACA Rules. Crossing construction and flood elevation requirements of the FHACA Rules still apply.



Source: http://fema.maps.arcgis.com/home/webmap/

Figure 2 – FEMA ABFE Map, Teterboro Area

5. TOPOGRAPHY

The information from two sources: Light Detection and Ranging (LIDAR) and Field Survey were combined to create an accurate representation of the ground surface within the floodplain area for hydraulic analysis and floodplain delineation purposes. These sources are further described in the following sections.

Light Detection and Ranging (LiDAR)

LiDAR data used was collected in 2006 for northern New Jersey and provided by the NJ Department of Environmental Protection (NJDEP). The LiDAR data was considered the best available data. The LiDAR data vertical accuracy is in compliance with the National Standard for Spatial Data Accuracy (NSSDA) RMSE estimation of elevation data in support of 2-foot contour mapping products. The Sanborn Map Company has performed a data accuracy validation and found this data to be in compliance. No additional quality control of the data was conducted other than a standard comparison of LiDAR elevations with survey point elevations.

Terrain Development

The bare-earth LiDAR data in ASCII comma delimited .txt and .las formats were used to develop a digital terrain model in the form of a Triangulated Irregular Network (TIN) using ArcGIS. The ASCII comma delimited .txt files were in State Plane coordinates, North American Datum of 1983 (NAD83) horizontal datum, and NAVD88 vertical datum with elevation in feet.

No further processing of the ASCII comma delimited .txt files was required. All data were imported into ArcGIS for digital terrain model development. The resulting TIN surface was used in HEC-GeoRAS as the source of ground elevations for the hydraulic models' preparation and mapping work.

Field Survey Data

Natural cross-sections along the ERD were surveyed in accordance with Appendix M of FEMA Guidelines and Specifications for Flood Hazard Mapping Partners, dated March 2009, and incorporated into the hydraulic model's cross-sections.

6. PRE-CONSTRUCTION HYDROLOGIC ANALYSIS

Methodology

The analysis of peak runoff for the project location was adopted from the NJDEP Flood Hazard Area Permit Engineering Report, East Riser Ditch, Red Neck Avenue Ditch for the Port Authority of NY & NJ prepared by Jacobs Civil Consultants, Inc. dated February 20, 2009. That report included a detailed hydrologic model of the ERD drainage area utilizing the U.S. Army Corps of Engineer's HEC-HMS software. Model parameters included contributing drainage areas, runoff coefficients, Time of Concentration and routing. URS recreated the HEC-HMS model described in the Jacobs report.

For that analysis, peak runoff and hydrographs were computed utilizing the Natural Resources Conservation Services (NRCS) methodology with a Type III storm. Times of concentration were determined in accordance with the procedures in the NCRS TR-55 Manual. Curve numbers for use in the hydrologic computations were based on the Bergen County Soil Survey and assumed ultimate development land use. The Soil Map indicated mostly urban land. A Hydrological Soil Group (HSG) Type B was used in the analysis based on a review of the surrounding soil types and engineering judgment. The 24-hour 2, 10, 25, and 100-year storm event precipitation depth data for Bergen County were used in the HEC-HMS model.

The drainage areas were established using USGS mapping, available topographic mapping for the airport areas, and supplemented by off-airport storm sewer system maps obtained from Boswell Engineering. The existing drainage areas outside the airport are essentially fully developed, consisting of commercial/business areas and residential properties. The land use evaluations were based on use of zoning maps, lot schedules, municipal ordinance information, and a review of available mapping.

There is an existing pump station located near Route 46 and Huyler Street. The pump station is designated as the "Huyler Street Pump Station." Data for the pump station was obtained from Boswell Engineering, the designer and engineer for the Township of South Hackensack. The pump station was designed for a maximum pump capacity of 85.5 cfs. The drainage area to the pump station is approximately 123 acres. The design information on the pump routings of the on/off levels was not available; therefore, the 123 acre drainage area was subtracted from the total overall drainage area to Route 46 and a constant pump rate of 85.5 cfs was added to the downstream runoff for all storm frequencies. The constant pump outflow was combined with the remaining offsite hydrographs to obtain the total flow downstream of Route 46. Because the inflow from the pump station at higher frequency flood events (i.e., 2yr, 10yr, etc.) was

unknown, the maximum inflow of 85.5 cfs may be considered conservative for the higher frequency events.

The backup data for the HEC-HMS model used in the Jacobs analysis is included in Appendix G.

The contributing drainage areas to the site are shown in Figure 3. The hydrologic parameters used for the HEC-HMS model are summarized in Table 1.

Table 1: HEC-HMS Model Parameters

Drainage Area	Size (Acres)	Pervious RCN*	Percent Impervious	Time of Concentration (Hours)
1	439	61	63	1.67
2	123	Pump Station Capacity = 85.5 cfs		
3	60	60	64	0.57
4 (a-c)	140	56	14	2.05
Total	**762**			

*RCN: Runoff Curve Number

The total drainage area to the downstream concrete box culvert (CBC) is approximately 762 acres. The analysis was conducted to the CBC because this represented the approximate downstream end of the airport property where stormwater management rules would apply.

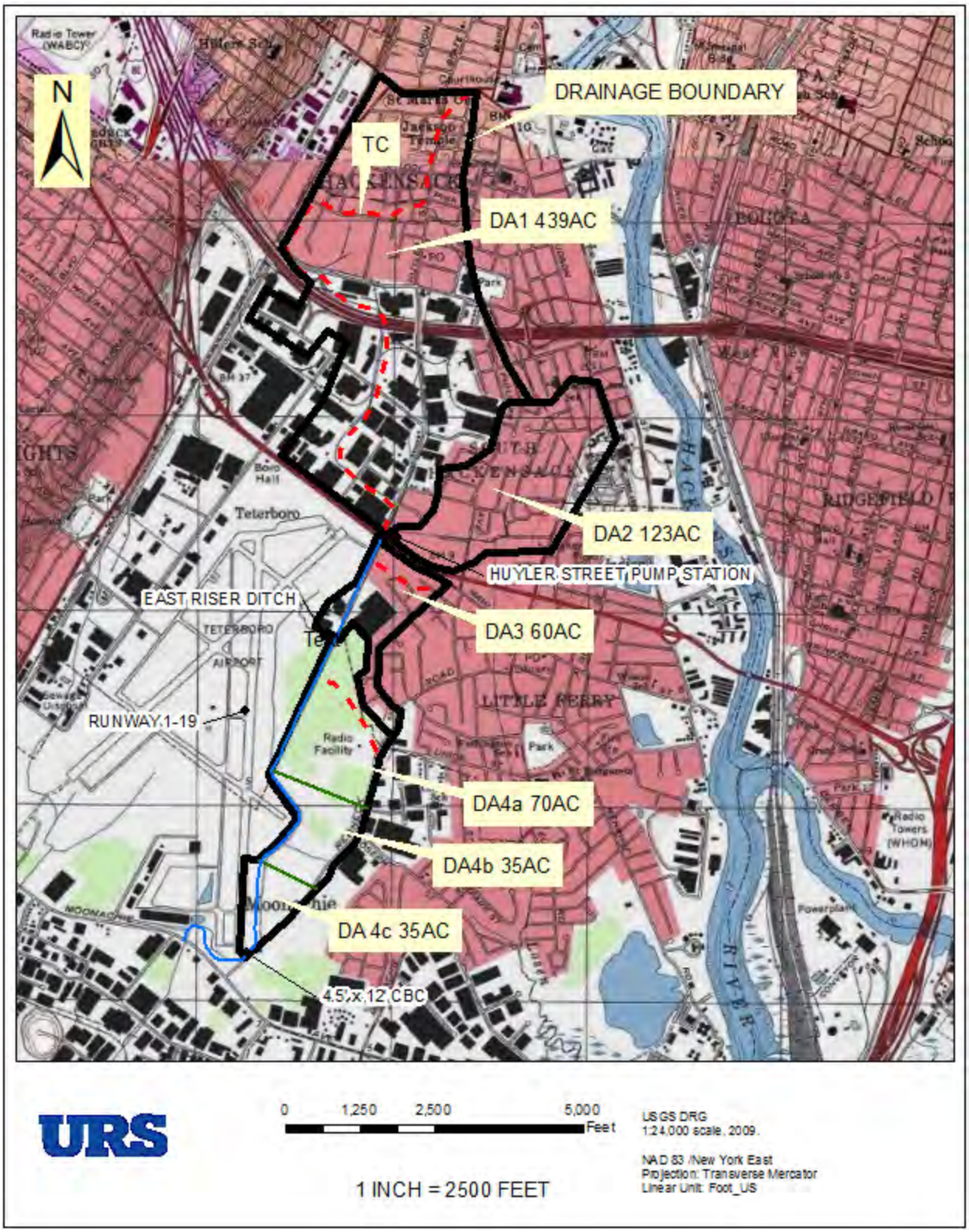
Computed Runoff

Flows from 2 to 100-year flood event were calculated using the HEC-HMS model. The results of the hydrologic analysis are presented in Table 2 below. The ERD Existing Conditions HEC-HMS model data is provided in Appendix A.

Table 2: HEC-HMS Computed Flows

Drainage Area	Drainage Area (Acres)	Frequency Discharge (cfs)			
		2 Yr (50%*)	10 Yr (10%*)	25 Yr (4%*)	100 Yr (1%*)
1	439	285.3	482.6	624.5	883.1
2 (PUMP)	123	85.5	85.5	85.5	85.5
3	60	65.9	111.7	144.5	204.3
4	140	22.3	57.4	88.0	150.3

*Percent Annual Chance Exceedance



(Recreated from Jacobs Civil Consultants Inc. Report)

Figure 3 – Drainage Areas

Lateral Weir Methodology

The hydraulic analysis of the ERD completed by Jacobs Civil Consultants for the new runway culvert resulted in water surface elevations (WSELs) upstream of the culvert which exceeded the maximum overbank elevations along Fred Wehran Drive and the runway area. In reality, when the WSEL reaches the right bank (west side) or roadway crest along the ERD, flow would spill over and be diverted westward toward the airport runways, which are typically at or below the roadway crest.

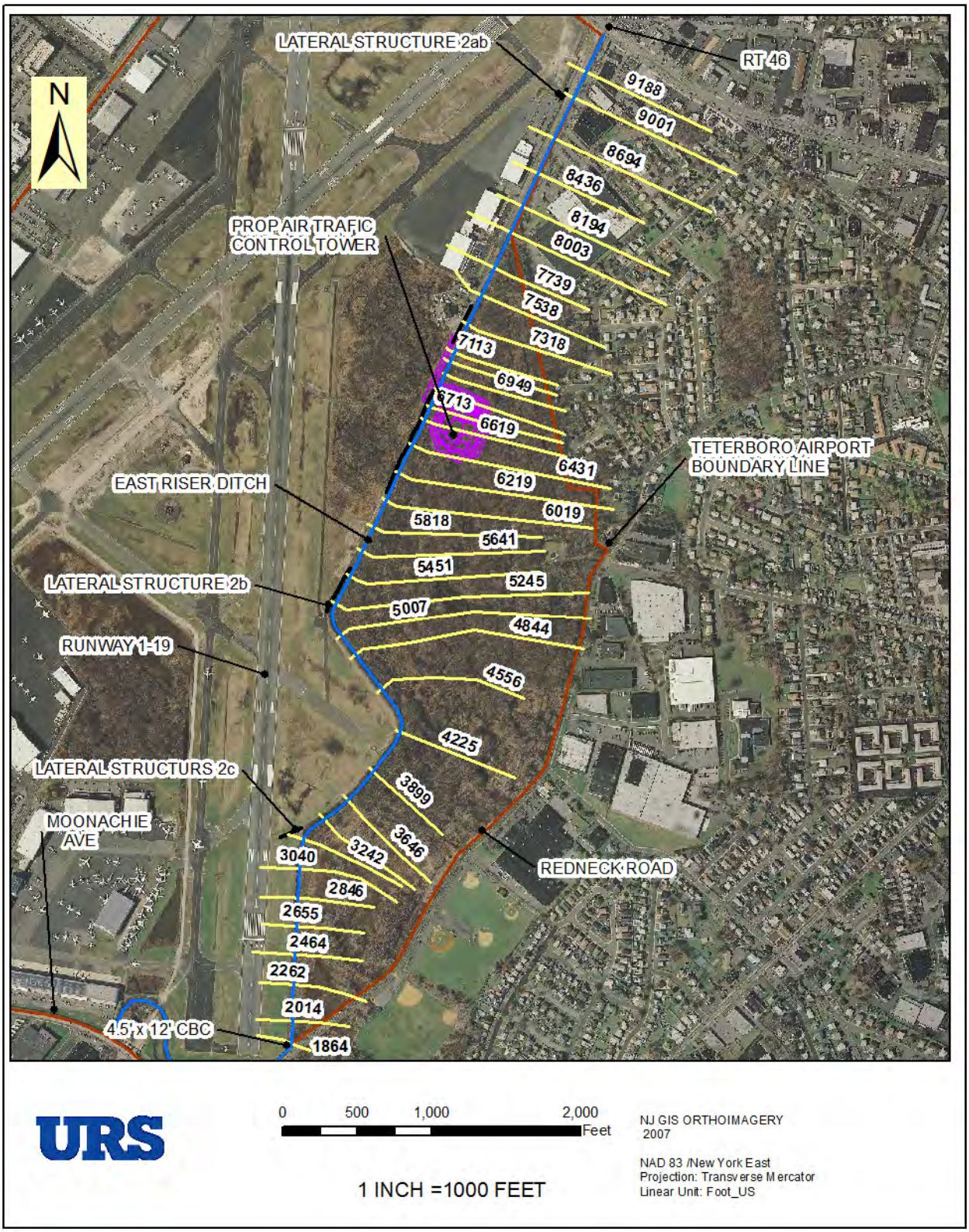
Once in the vicinity of the runways, stormwater would drain to adjacent swales and eventually be conveyed towards the far side of the airport. The size and extend of the airport in relation to the ERD flow make computation of the resultant WSEL on the airport as a result of ERD overtopping extremely difficult. Likely, overtopping of the ERD into the airport would result in very shallow sheet flow and a detailed H&H analysis of the fate of the diverted flow would be excessively cumbersome and provide no real value to the analysis of the ERD. Therefore, flow leaving the floodplain was considered lost (diverted) from the ERD hydraulic model.

To model this occurrence, the low spots of Fred Wehran Drive were modeled using the "Lateral Structure" option in the HEC-RAS hydraulic model. Using the associated Lateral Weir and Optimization options, a dynamic balance between the ERD discharges and corresponding elevations was established within the HEC-RAS model.

In order to accurately distribute discharges at the lateral weir locations, Drainage Area 4 was subdivided into subareas 4a (50%), 4b (25%) and 4c (25%), as shown in Figure 3. An additional a low spot along Fred Wehran Drive was identified upstream of the project site, approximately 500 feet downstream from Rt. 46 crossing. This low spot (Weir 2ab) was incorporated into the HEC-RAS model to reflect the weir influence on discharges upstream of the site.

The lateral weir locations and model cross-sections are shown in Figure 4.

The resultant hydrologic input locations and values for ERD existing conditions are summarized in Table 3.



Red: Teterboro Airport Property Boundary

Figure 4 – East Riser Ditch Lateral Weir and Cross-Section Locations

Table 3: East Riser Ditch Input Discharges at Fred Wehran Drive – Pre-Construction

Location and Flow	Frequency Discharge (cfs)			
	2-yr (50%)	10-yr (10%)	25-yr (4%)	100-yr (1%)
Rt 46 – HEC-RAS	371	568	710	969
Total Flow at upstream end of Project Site	437	680	855	1173
Downstream of Low Spot 2b including DA4a	448	709	899	1248
Downstream of Low Spot 2c including DA4b	453	723	921	1286
Upstream Face of runway culvert including DA4c	459	737	943	1323

7. PRE-CONSTRUCTION HYDRAULIC ANALYSIS

As noted previously, Teterboro Airport and the proposed ATCT site are located within a tidal zone with a Base Flood Elevation of 8 feet NAVD88. Therefore, in accordance with the FHACA Rules (N.J.A.C. 7:13) fluvial Flood Hazard discharge and floodway calculations are not required other than to show whether the fluvial Flood Hazard Area Design Flood is below the tidal BFE.

Model and Computer Tools Used

HEC-RAS, Version 4.1, was used for the hydraulic analysis. HEC-GeoRAS was used as a pre-processor for inputs to the hydraulic model and as a post-processor for delineation of the floodplains.

Starting Conditions

The starting point for the hydraulic analysis is the upstream face of the runway culvert at Moonachie Avenue and Redneck Avenue, a 4.5 feet x 12 feet CBC located at southern end of Runway 1-19. The model ending point is approximately 7,350 feet upstream of the culvert at the State Highway Route 46 bridge.

As noted earlier, URS was concerned with the results presented by Jacobs Civil Consultants for the hydraulic model of the new runway culvert, specifically, that due to the limit of their study being only about 1,000 feet upstream of the culvert that the resultant upstream WSELs were at unrealistic heights compared with the existing overbank conditions and that the WSELs did not reflect flow lost into the main airport property. However, the hydrologic analysis presented by Jacobs was reasonable; therefore, it was assumed that the resultant inflow to the runway culvert at the downstream end of the hydrologic model was acceptable and was replicated in the H&H analysis.

For continuity, URS sought to calibrate the flow at the runway culvert for the new lateral weir hydraulic model using Jacobs' proposed conditions hydrology. This flow, and resultant WSEL, became the starting flow and WSELs in the hydraulic analysis. Identification of a matching flow and its associated WSELs was achieved by iteration, and balancing of water depths and discharge of HEC-RAS model. The results for depth and discharge at the runway culvert are summarized in Table 4.

Table 4: Depth and Discharge at Runway Culvert

Location	Profile					
	2 YR (50%)		10 YR (10%)		100 YR (1%)	
	Depth (ft)	Discharge (cfs)	Depth (ft)	Discharge (cfs)	Depth (ft)	Discharge (cfs)
Jacobs' Civil model upstream face of culvert	5.74	216.2	5.85	220.3	6.06	229.0
Starting WSEL for ATCT study	4.90	207.4	5.01	216.1	5.20	225.3

Existing Conditions Hydraulic Analysis

The NJ FHADF elevation is the regulatory elevation for construction. For the ATCT site, this is 8 feet NAVD88 based on the current FEMA tidal ABFE. Because the ERD is not a previously studied stream, a determination is required as to whether the tidal BFE is the regulatory elevation or whether a fluvial FHADF exists that is greater than the tidal BFE at the site location. This comes into play in areas where the tidal BFE transitions to the fluvial BFE. The elevation of the fluvial 100-year WSEL for ERD is 5.7 feet NAVD (at cross-section 6949). Since the 100-year flood elevation was over 2 feet below the tidal BFE, the fluvial FHADF or elevation based on 125% of the 100-year flow, was not calculated as it was expected to be well below the tidal elevation. The existing conditions hydraulic computations and results are shown in Appendices B and C, respectively. The tidal BFE of 8 feet NAVD88 is confirmed as the FHADF elevation for the site.

With the tidal BFE as the FHADF for design height purposes, the 100-year flood becomes the design flood for hydraulic improvements on ERD. To assist in the analysis of induced flooding, the 100-year existing floodplain was mapped to identify the extent of flooding from the ERD outside of the airport property. A shown in Figure 5, flooding from the ERD, while significantly lower than the tidal BFE shown in Figure 2, does extend to properties outside the airport. The impact of flooding to the west of the ERD is not shown in Figure 5 due to the unique conditions described earlier; however, it is assumed that ERD flooding impacts to the west of the stream are limited to the airport property. FHACA Rules mandate that improvements to the ATCT site may not induce additional flooding outside the airport property.

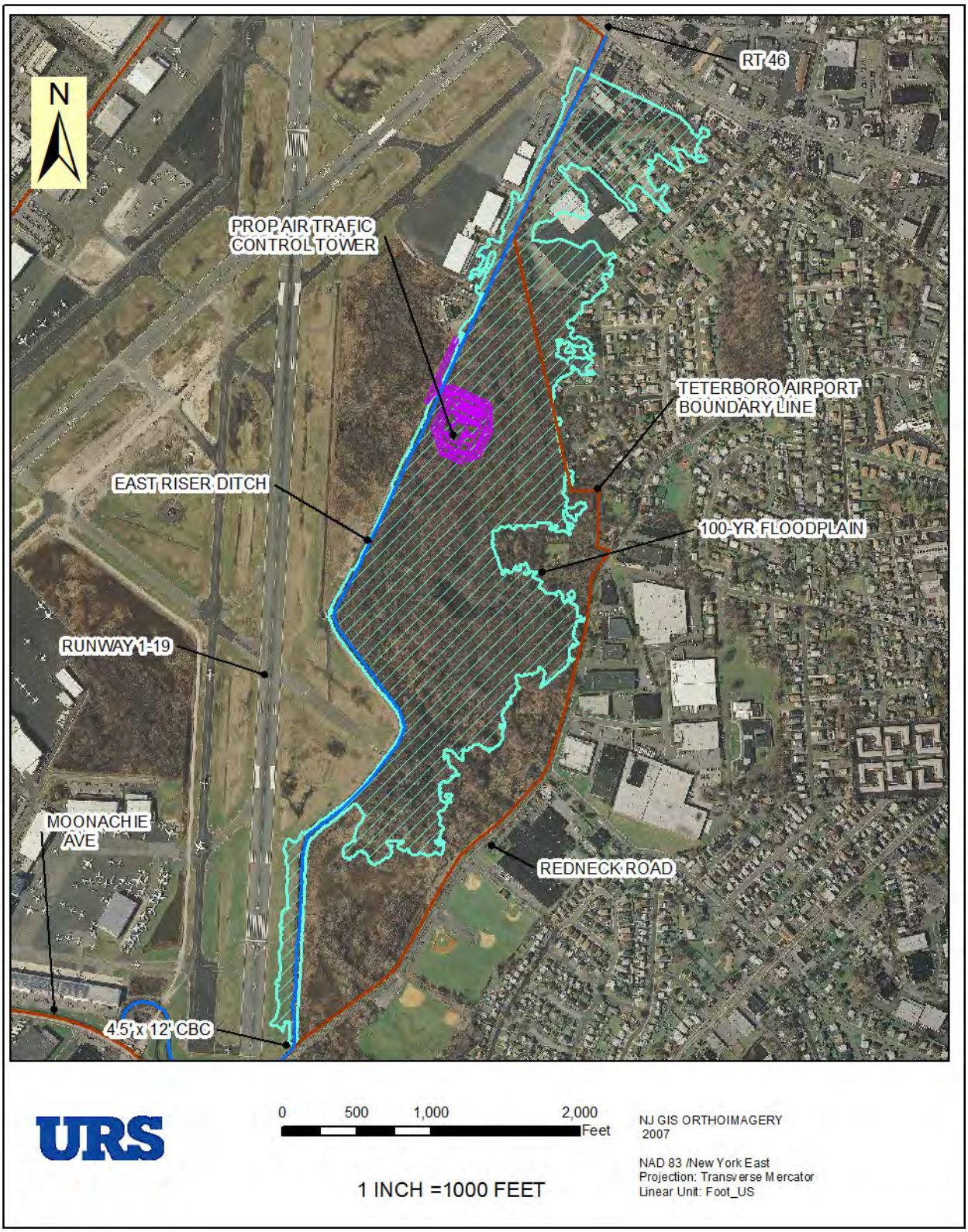


Figure 5 – Extent of Fluvial Flooding (100yr/1% Annual Chance) on East Riser Ditch

8. POST-CONSTRUCTION H&H ANALYSES

The proposed conditions include fill to create an approximately 300 feet by 380 feet site with a 45-foot long crossing over ERD to Fred Wehran Drive. This site is located approximately 5,000 feet upstream from East Runway #1-19 culvert, along the left flood fringe area of the ERD. The proposed site will have 3:1 side slopes and grass maintenance will be provided in a 30-foot zone from the edge of the cleared area to the access roadway around the building and tower. The proposed site plan is shown in Figure 6.

Proposed Conditions Hydrology

Drainage Area 4a of the ERD is the only drainage area altered by introduction of the proposed ATCT site. As shown in Appendix A, Drainage Area 4a is 0.1094 mi^2. The Runoff CN is 56, and the drainage area is 14% impervious area (IA) or 0.0153 mi^2.

The following are surface characteristics for the proposed site:

Grass = 1.2725 Ac = 0.0020mi^2

For Grass on HSG Type B (adopted from Jacobs report) Open Space (lawns, parks) good conditions, the CN = 61 (Assuming local soil will be used for fill).

The new proposed CN number for Drainage Area 4a is calculated as follows:

[56*(0.1094 – 0.0020) + 61*0.0020] / 0.1094 = CN = 56.09. This revised CN value is used in the post-construction HEC-HMS model.

(New) Impervious Area =1.4575 Ac = 0.0023mi^2 , with a corresponding CN = 98

The post-construction Impervious Area for Drainage Area 4a is calculated as follows:

Exist IA + Prop Island = 0.0153 + 0.0023 = 0.0176 mi^2, which is 16.09% of DA4a. This revised value is used in the post-construction HEC-HMS model.

Post-construction discharges are shown in Table 5.

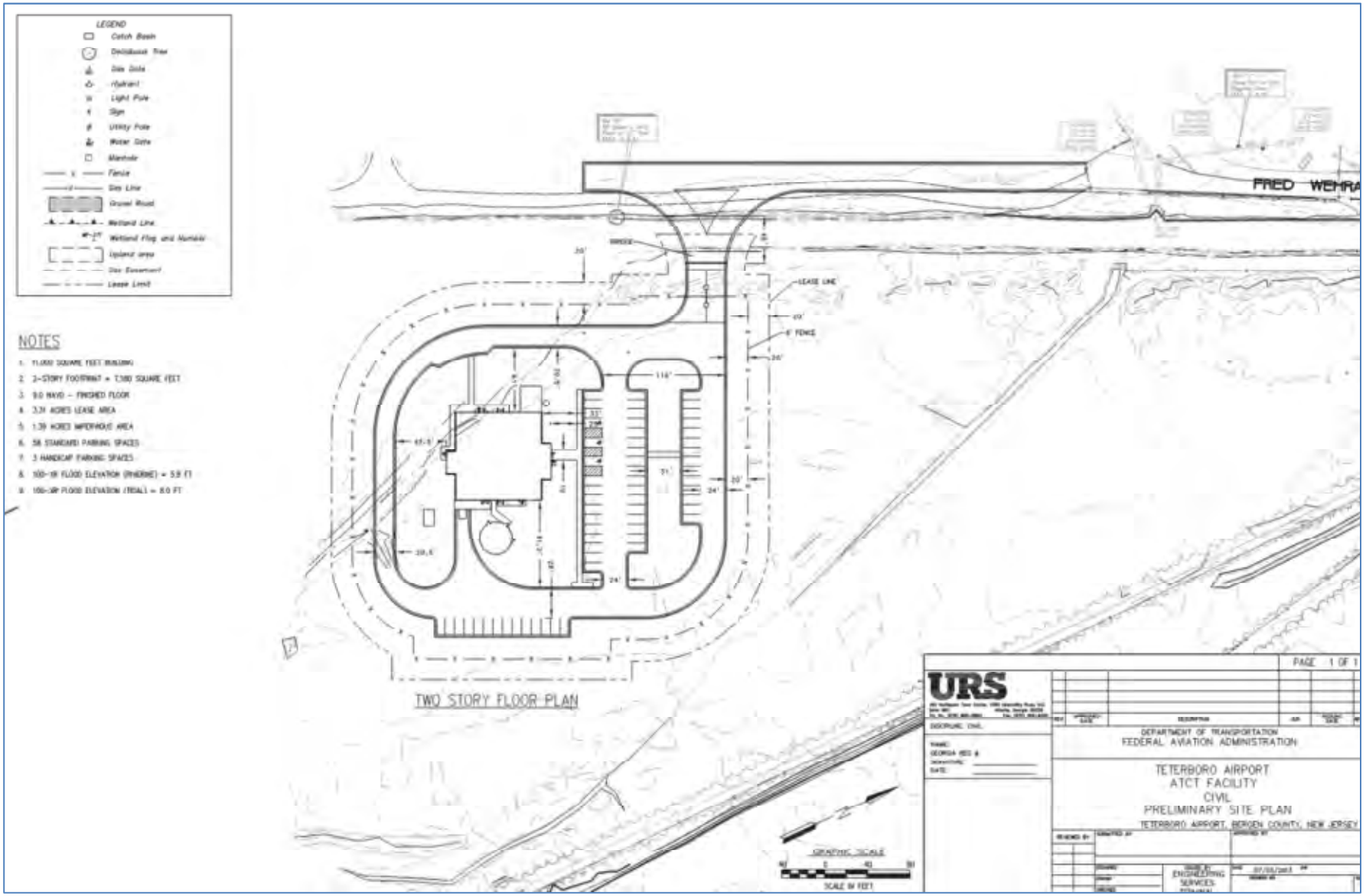


Figure 6 – Proposed Site Plan

Table 5: East Riser Ditch Input Discharges at Fred Wehran Drive – Post-Construction

Location and Flow	Frequency Discharge (cfs)			
	2-yr (50%)	10-yr (10%)	25-yr (4%)	100-yr (1%)
Rt 46 – HEC-RAS	371	568	710	969
Total Flow at upstream end of Project Site	437	680	855	1,173
Downstream of Low Spot 2b including DA4a	449	710	900	1,250
Downstream of Low Spot 2c including DA4b	455	724	922	1,288
Upstream Face of runway culvert including DA4c	460	739	944	1,325

Proposed Conditions Hydraulic Analysis

Manning's "n" values for the site reflect the grassed slopes, walkways, and parking lot.

The site elevation was set at 7 feet NAVD88 which is just over 1 foot above the ERD 100-year flood event of 5.7 feet NAVD. Any further increase in the site surface elevation above 7 feet would not have a measurable effect on the hydraulics of the site as long as the elevation was above the 100-year ERD flood event.

The ERD crossing will be a 45-foot wide span with a low chord elevation of 6.0 feet NAVD88, which is approximately 0.3 foot above the 100-year fluvial flood elevation. Figures 7 and 8 show the change in the existing and proposed cross-section geometry at the site/bridge location. Figure 7 depicts Station 6949 as it currently exists. This section becomes the upstream section to the site and bridge at Station 6861, depicted in Figure 8.

No elevation changes are expected to Fred Wehran Drive. As shown in Figure 2, the entire airport and much of the surrounding community is expected to be inundated with the tidal FHADF of 8 feet NAVD88. Therefore, it is unreasonable to design and improve one stretch of roadway above the BFE only to have it become an island during the 100-year tidal surge event. Likewise, the parking lot for the ATCT site will not be designed to be 1 foot above the tidal BFE. It is expected that with the approach of a storm which could cause the area to experience a tidal BFE that the airport will be closed and the ATCT facility evacuated. However, the building and ATCT will be designed in accordance to the requirements outlined in the FHACA Rules; namely, the main floor will be 1 foot above the tidal BFE. The design requirements are discussed in Section 11.

In order to eliminate any induced flooding upstream or downstream of the ATCT site, minor channel excavation and widening is required at the proposed bridge and approximately 350 feet downstream from bridge, adjacent to the site. The channel widening will include restoration of the channel banks to a favorable environmental condition.

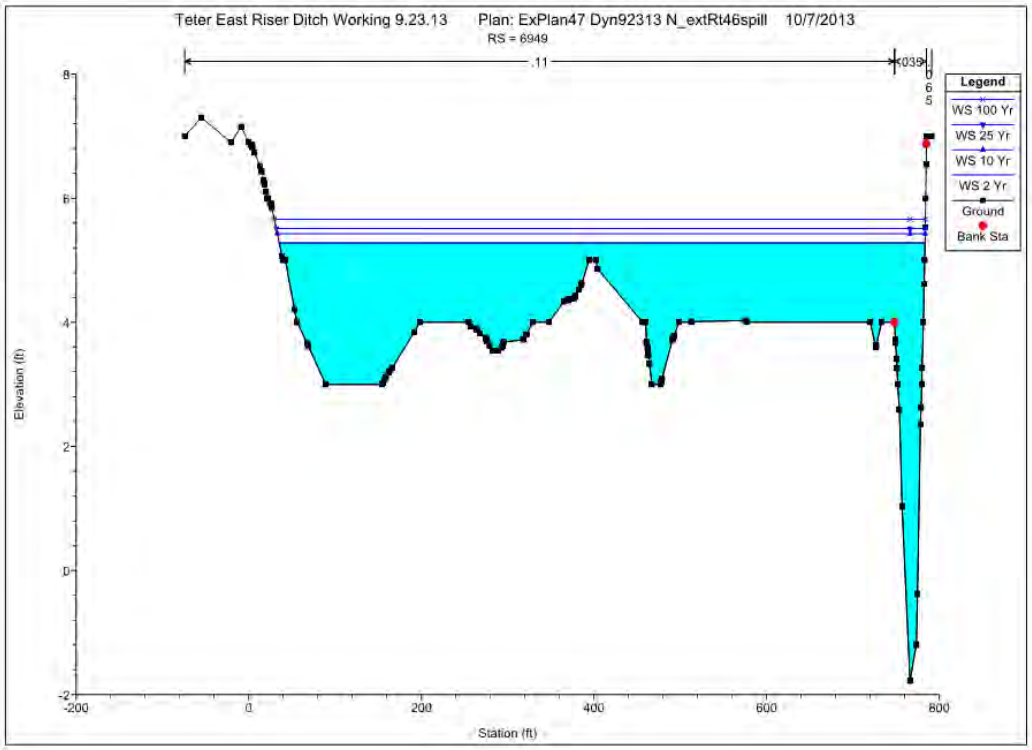


Figure 7 – Station 6949, Existing/Pre-Construction Conditions

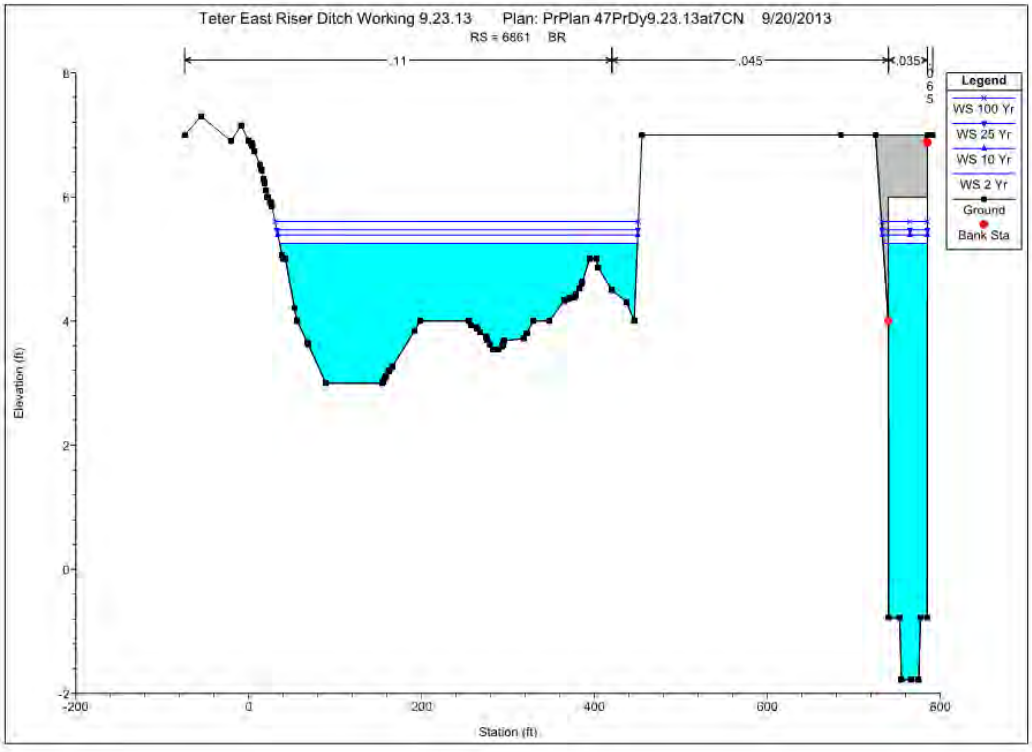


Figure 8 – Station 6861, Site and Bridge Geometry

9. RESULTS OF THE POST-CONSTRUCTION H&H ANALYSES

The use of lateral weirs in the hydraulic model results a unique interaction between the hydrology and hydraulics of the ERD and the project site: the slight decrease in WSEL as a result of the channel improvement immediately downstream of the bridge results in higher in-channel discharges due to less loss of flow over the lateral weir structures. However, these increases are small (up to 4 cfs) compared to the size of the overall subbasin drainage area (140 acres). The additional runoff from the post-construction site of 2 cfs at the 100-year event is combined with this slight increase, which increases the WSEL downstream. This slight increase is then further balanced by a slight increase in the amount of discharge lost over the downstream lateral weir. The results of the post-construction hydraulic analysis are shown in Appendices D and E.

The analysis shows that the slight increases in flow and/or WSEL within the airport property are mitigated by diverted flow west into the airport property. Therefore, construction of the site will not cause an increase in flooding upstream or downstream of the site (net change of zero feet), or outside of the Teterboro Airport property. Furthermore, any increase is runoff from the ATCT is mitigated by the lateral weir structures downstream on ERD such that there is no increase in runoff (less than 1 cfs) downstream of the Teterboro Airport property. A comparison of the pre- and post-construction WSELs and discharges is shown in Appendix F.

10. STORMWATER MANAGEMENT

Classification/Assumptions

The Municipal Stormwater Management Plan for the Township of South Hackensack states that East Riser Ditch is classified as FW2-NT/SE2. This classification signifies a general water classification that does not support trout production or maintenance. Based on this classification, additional stormwater quality measures will not be required.

The proposed site consists of two separate areas, one being the tower site and adjacent parking lot and the other an improved roadway. The total area of the tower site is approximately 2.01 acres with a total impervious area of 1.26 acres. The improved roadway is assumed to be impervious and covers 0.33 acres. Each area was considered and will be treated separately as shown in Figure 9.

The drainage system design for both the main tower site and the improved roadway follow both N.J.A.C. 7:8 Stormwater Management and N.J.A.C. 5:21-7 of the Residential Site Improvement Standards. The network components listed in Table 6 include 15-inch, 18-inch, and 24-inch pipes, Type E inlets, 4-foot diameter manholes, and manufactured treatment devices. In order to follow the N.J.A.C. 5:21-7 regulations a minimum pipe diameter of 15 inches was used, increasing to 24 inches where required. Requirements for full pipe flow velocity of 3 fps and 11” cover were also met as per the Residential Site Improvement Standards. The capacity requirements of the 25 year storm event were also met as required.

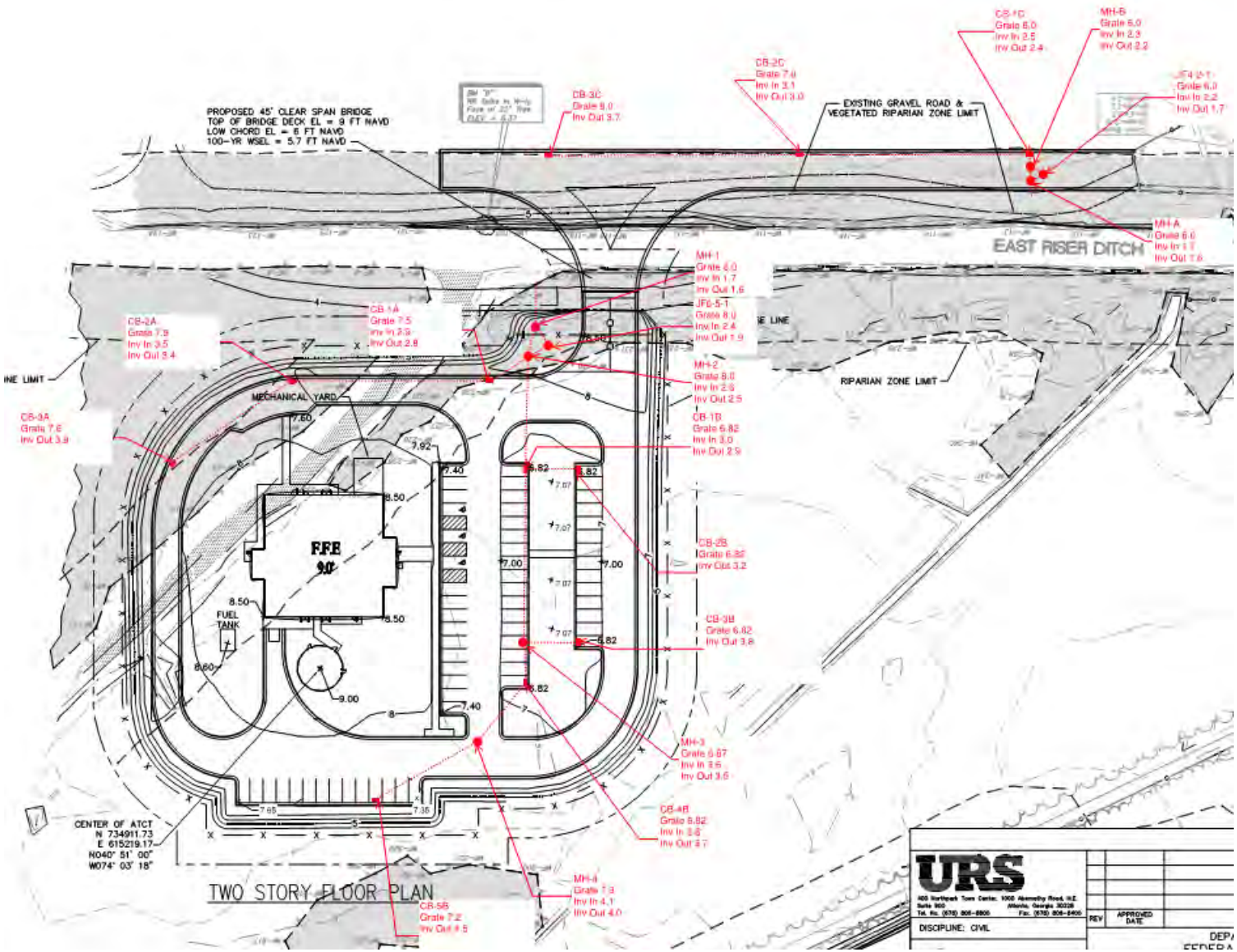


Figure 9 – Site Drainage Design

Table 6: Proposed Site Drainage System Components

STRUCTURE		RUNOFF DATA									SEWER DESIGN DATA					
UP	DN	AREA (AC)	C	INLET A * C (AC)	TOTAL A * C (AC)	Tc (MIN)	PIPE Tp (MIN)	Tc (MIN)	RAINFALL INTENSITY (IN/HOUR)	PEAK Q (CFS)	PIPE SIZE (IN)	PIPE LENGTH (FT)	USE SLOPE (%)	CAPACITY (CFS)	VEL. FULL (FPS)	VEL. ACTUAL (FPS)
MH-2	MH-1	0.07	0.99	0.07	0.07	10	0.24	10.00	6.70	0.5	24	20	0.20	10.11	3.22	1.4
CB-1A	MH-2	0.69	0.58	0.40	0.40	10	0.13	10.00	6.70	2.7	18	25	0.30	5.75	3.25	3.2
CB-2A	CB-1A	1.37	0.72	0.98	0.98	10	0.50	10.00	6.70	6.6	24	130	0.38	13.93	4.43	4.3
CB-3A	CB-2A	0.18	0.84	0.15	0.15	10	0.54	10.00	6.70	1.0	15	95	0.52	4.67	3.80	2.9
CB-1B	MH-2	1.37	0.72	0.98	0.98	10	0.26	10.00	6.70	6.6	24	75	0.53	16.45	5.24	4.9
CB-2B	CB-1B	0.18	0.84	0.15	0.15	10	0.19	10.00	6.70	1.0	15	35	0.57	4.88	3.98	3.0
MH-3	CB-1B	0.07	0.99	0.07	0.07	10	0.85	10.00	6.70	0.5	15	115	0.52	4.67	3.80	2.2
CB-3B	MH-3	0.16	0.75	0.12	0.12	10	0.21	10.00	6.70	0.8	15	35	0.57	4.88	3.98	2.8
CB-4B	MH-3	0.16	0.75	0.12	0.12	10	0.13	10.00	6.70	0.8	15	25	0.80	5.79	4.72	3.2
MH-4	CB-4B	0.07	0.99	0.07	0.07	10	0.36	10.00	6.70	0.5	15	50	0.60	5.01	4.08	2.3
CB-5B	MH-4	0.47	0.72	0.34	0.34	10	0.33	10.00	6.70	2.3	15	75	0.53	4.71	3.84	3.8
MH-B	MH-A	0.07	0.99	0.07	0.07	10	0.01	10.00	6.70	0.5	15	3	12.50	22.87	18.64	6.5
CB-1C	MH-B	1.37	0.72	0.98	0.98	10	0.00	10.00	6.70	6.6	15	3	16.60	26.36	21.48	17.2
CB-2C	CB-1C	0.18	0.84	0.15	0.15	10	0.99	10.00	6.70	1.0	15	150	0.33	3.72	3.03	2.5
CB-3C	CB-2C	0.16	0.75	0.12	0.12	10	1.13	10.00	6.70	0.8	15	165	0.36	3.88	3.16	2.4

For both the main tower site and the roadway, a manufactured treatment device will be used to achieve the Total Suspended Solid removal rate required for general water quality. Each treatment device was sized for the site. After treatment through the devices, the water will be discharged through two flap gates into East Riser Ditch. As stated in Section 9, there will be no increase in runoff off the site and detention devices will not be required.

Groundwater Recharge

Groundwater recharge was not calculated for this site. As this area is classified as wetland area, the groundwater level is within 2 feet of the ground surface. Therefore, no groundwater recharge is assumed to occur in the pre-construction condition. A similar condition will exist post-construction; therefore, drainage features to facilitate groundwater recharge are not practical or required.

Comparison of Stormwater Discharge

As shown in Section 9 and Appendix F, the increase in peak runoff for the two, 10, and 100-year storm events for ERD is negligible (less than 1 cfs). Due to precision of the HEC-RS model, a value of zero increase in discharge cannot be reached. A minute change (lowering by 1 tenth of a foot) of the lateral weir elevation would result in a decrease in peak runoff for the proposed condition, which is an unreasonable result. Therefore, the less than 1 cfs increase is most precise measurement not less than zero that can be achieved with the HEC-RAS model. There is no associated increase in WSELs upstream or downstream of the site.

Meeting Water Quality Standards

N.J.A.C. 7:8-5.5(a) states stormwater measures shall be designed to reduce the post-construction load of total suspended solids (TSS) in stormwater runoff generated from the water quality design storm (1.25 inch of rainfall over a two hour period) by 80 percent of the anticipated load from the developed site, expressed as an annual average. In order to achieve this level of TSS removal for the site, a manufactured treatment device has been selected. As per N.J.A.C. 7:8-5.5(b) and 5.7(c) the use of manufactured treatment devices may be used as long as they meet the requirements of TSS removal and are verified by the New Jersey Corporation for Advanced Technology and certified by the NJ Department of Environmental Protection (NJDEP).

A Jellyfish Filter System by Imbrium® Systems has been selected to achieve 80 percent required TSS removal for this site. This system was approved for use by the NJDEP in a letter dated May 14, 2012 to Imbrium® Systems.

The specific units selected for this site and the adjacent parking lot is the 6 foot diameter Jellyfish JF6-5-1, and for the roadway improvements the JF4-2-1 4 foot diameter manhole. The JF6-5-1 consists of 5-54 inch Hi-Flow Cartridges and 1-Draindown Cartridge designed to treat a total maximum flow of 0.98 cfs from the site. The Jellyfish Filter Technical Manual is provided in Appendix H.

Total flow off the site for the stormwater quality storm is 0.96 cfs. This system is designed with two manholes: a diversion manhole and a return manhole, to handle higher flows through the system. The JF4-2-1 consists of 2-54 inch Hi-Flow Cartridges and 1-Draindown Cartridge for a maximum flow rate of 0.40 cfs. The total flow off the improved roadway site is 0.20 cfs for the design storm. Both outlets discharge into East Riser Ditch. Each outlet pipe requires the use of a

Tideflex® valve to prevent flow from East Riser Ditch back into the filter system. Backup calculations are shown in Appendix I.

11. BUILDING DESIGN

N.J.A.C. 7:13-11.5 of the Flood Hazard Area Control Act Rules outlines the requirements for construction of a new building within the Flood Hazard Area. The new ATCT and administrative building will be constructed with the lowest flood a minimum of 1 foot above the tidal base flood elevation of 8.0 feet NAVD88. In each structure, the space below the first floor shall be a crawl space properly vented to limit flood water impacts, in accordance with the rules.

APPENDICES

A. Hydrologic Analysis Computations

B. Hydraulic Analysis – Existing Conditions: HEC-RAS Input

C. Hydraulic Analysis – Existing Conditions: HEC-RAS Output

D. Hydraulic Analysis - Proposed Conditions: HEC-RAS Input

E. Hydraulic Analysis – Proposed Conditions: HEC-RAS Output

F. Comparison of Pre- and Post-Construction Flood Elevations and Discharges

G. Original Hydrologic and Hydraulic Analyses – Jacobs Civil Consultants, Inc.

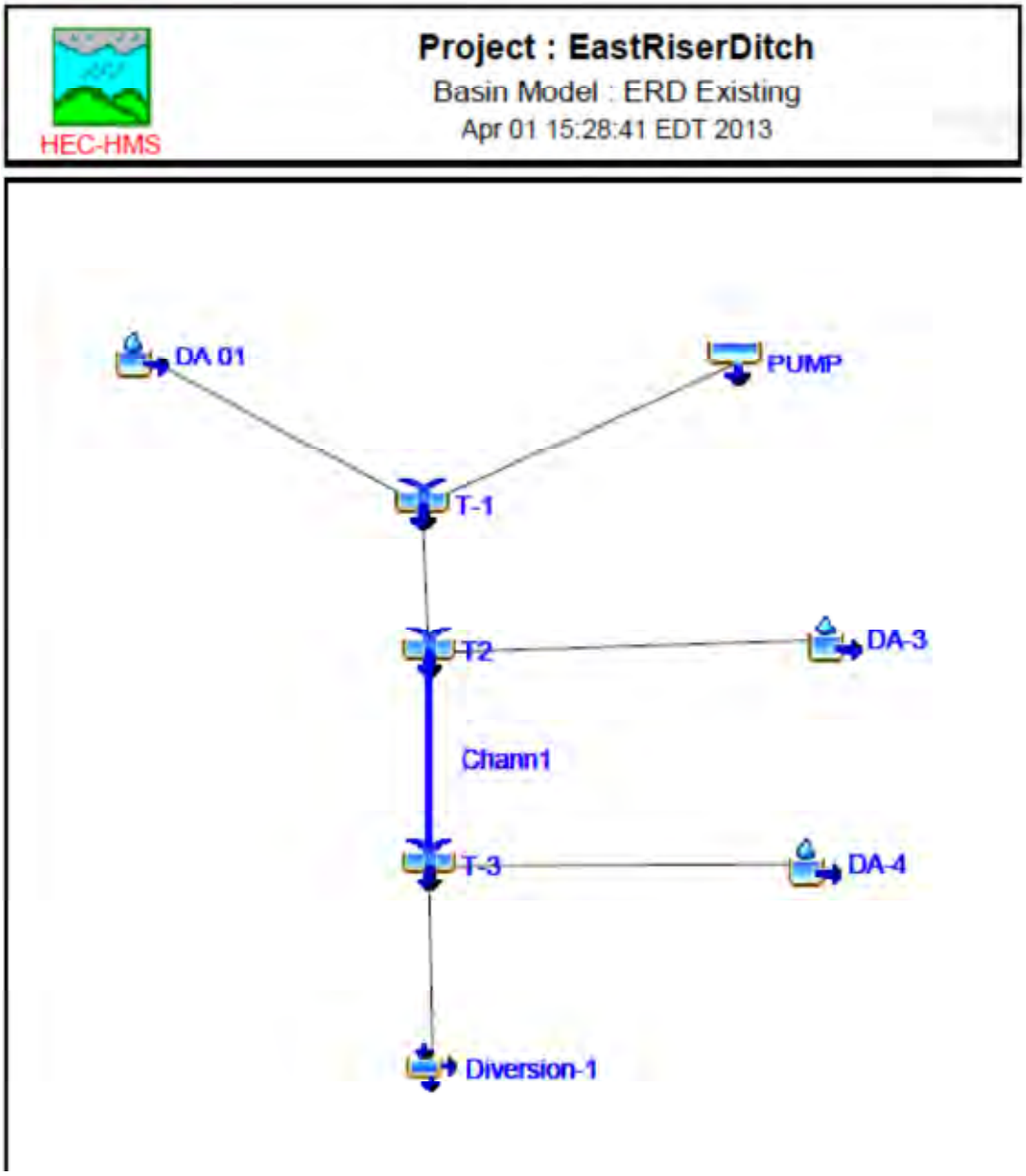
H. Imbrium Systems - Jellyfish Filter Technical Manual

I. Water Quality Calculations

APPENDIX A

HYDROLOGIC ANALYSIS COMPUTATIONS

A. Hydrologic Analysis Computations – Pre-Construction



HEC-HMS Input Data Report

BASIN MODEL: "ERD Existing"

Subbasin Table

Subbasin	Area (Sq.Mi.)	Loss	% Imp	CN	Init Loss	Init Abst	Const Loss	Trans-form	Tc (min.)	LAG (min.)	Stor-Coeff	Base Flow	Rcn Fact	Flow Area	Flow Peak	Down Stream
DA 01	0.686	SCS	63	61	-	-	-	SCS	- - -	60	- - -	None	-	-	-	T-1
DA-3	0.0938	SCS	64	60	-	-	-	SCS	- - -	20.4	- - -	None	-	-	-	T2
DA-4	0.2188	SCS	14	56	-	-	-	SCS	- - -	73.8	- - -	None	-	-	-	T-3

Junction Table

Junction	Downstream
Chann1	T-3

Reach Table

Reach	Route Meth.	Lag	Ch Loss	No. Reachs	init flow equal	storage outflw table	Musk. k	Musk. x	Musk. Steps	Downstream

Chann1	Kine. Wave	-	None	1	Yes	Chann1A	- - -	- - -	- - -	T-3

Diversion Table			
Diversion	**Downstream**	**Divert To**	**Diversion Method**
Diversion-1			Inflow-Diversion Table

Current as of 1 April 2013 at 18:53:03

HEC-HMS Simulation Report
2 Year

- Description : Basin: ERD Existing & Met: 2_year & Control: Control 1
- Basin Model : ERD Existing
- Meteorological Model : 2_year
- Control Conditions : Control 1
- Simulation Start: 05Jan2012, 24:00 End: 07Jan2012, 12:00
- Compute Time: 02Apr2013, 11:23:20

Subbasin Table

Basin Element	Area (SqMi)	Precip. (in)	Loss (in)	Exc. Dpth. (in)	Peak Qout (cfs)	Time of peak
DA 01	0.6860	3.30	1.04	2.26	285.3	06Jan2012, 13:00
DA-3	0.0938	3.30	1.03	2.27	65.9	06Jan2012, 12:20
DA-4	0.2188	3.30	2.57	0.73	22.3	06Jan2012, 13:30

Junction Table

Junction Name	Area (SqMi)	Pk Outflow (cfs)	Pk Time Time
T-1	NaN	370.8	06Jan2012, 13:00
T2	NaN	396.6	06Jan2012, 13:00
T-3	NaN	302.0	06Jan2012, 13:50

Reach Table

Reach Name	Pk Inflow (cfs)	Pk Inflow Time	Pk Outflow (cfs)	Pk Outflow Time
Chann1	396.6	06Jan2012, 13:00	281.5	06Jan2012, 13:50

Diversion Table

Reach Name	Pk Inflow (cfs)	Pk Inflow Time	Pk Outflow (cfs)	Pk Outflow Time	Pk Diversion (cfs)	Pk Diversion Time
Diversion-1	302.0	06Jan2012, 13:50	213.8	06Jan2012, 13:50	88.2	06Jan2012, 13:50

End of Simulation Report: 2 Year 2.7.12 w/o calib

Project: EastRiserDitch Simulation Run: 2 Yaer 2.7.12 w/o calib

Start of Run: 06Jan2012, 00:00 Basin Model: ERD Existing
End of Run: 07Jan2012, 12:00 Meteorologic Model: 2_year
Compute Time: 02Apr2013, 11:23:20 Control Specifications: Control 1

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
DA 01	0.6860	285.3	06Jan2012, 13:00	2.26
PUMP	Not Specified	85.5	06Jan2012, 00:00	
T-1	Not Specified	370.8	06Jan2012, 13:00	
DA-3	0.0938	65.9	06Jan2012, 12:20	2.27
T2	Not Specified	396.6	06Jan2012, 13:00	
Chann1	Not Specified	281.5	06Jan2012, 13:50	
DA-4	0.2188	22.3	06Jan2012, 13:30	0.73
T-3	Not Specified	302.0	06Jan2012, 13:50	
Diversion-1	Not Specified	213.8	06Jan2012, 13:50	

HEC-HMS Simulation Report
10 Year

- Description : Basin: ERD Existing & Met: 10_year & Control: Control 1
- Basin Model : ERD Existing
- Meteorological Model : 10_year
- Control Conditions : Control 1
- Simulation Start: 05Jan2012, 24:00 End: 07Jan2012, 12:00
- Compute Time: 02Apr2013, 10:52:06

Subbasin Table

Basin Element	Area (SqMi)	Precip. (in)	Loss (in)	Exc. Dpth. (in)	Peak Qout (cfs)	Time of peak
DA 01	0.6860	5.10	1.36	3.74	482.6	06Jan2012, 13:00
DA-3	0.0938	5.10	1.35	3.75	111.7	06Jan2012, 12:20
DA-4	0.2188	5.10	3.45	1.65	57.4	06Jan2012, 13:30

Junction Table

Junction Name	Area (SqMi)	Pk Outflow (cfs)	Pk Time Time
T-1	NaN	568.1	06Jan2012, 13:00
T2	NaN	612.0	06Jan2012, 13:00
T-3	NaN	428.4	06Jan2012, 13:40

Reach Table

Reach Name	Pk Inflow (cfs)	Pk Inflow Time	Pk Outflow (cfs)	Pk Outflow Time
Chann1	612.0	06Jan2012, 13:00	374.9	06Jan2012, 14:00

Diversion Table

Reach Name	Pk Inflow (cfs)	Pk Inflow Time	Pk Outflow (cfs)	Pk Outflow Time	Pk Diversion (cfs)	Pk Diversion Time
Diversion-1	428.4	06Jan2012, 13:40	220.7	06Jan2012, 13:40	207.7	06Jan2012, 13:40

End of Simulation Report: 10 Year 2.7.12 w/o calib

Project: EastRiserDitch Simulation Run: 10 Year 2.7.12 w/o calib

Start of Run: 06Jan2012, 00:00 Basin Model: ERD Existing
End of Run: 07Jan2012, 12:00 Meteorologic Model: 10_year
Compute Time: 02Apr2013, 10:52:06 Control Specifications: Control 1

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
DA 01	0.6860	482.6	06Jan2012, 13:00	3.74
PUMP	Not Specified	85.5	06Jan2012, 00:00	
T-1	Not Specified	568.1	06Jan2012, 13:00	
DA-3	0.0938	111.7	06Jan2012, 12:20	3.75
T2	Not Specified	612.0	06Jan2012, 13:00	
Chann1	Not Specified	374.9	06Jan2012, 14:00	
DA-4	0.2188	57.4	06Jan2012, 13:30	1.65
T-3	Not Specified	428.4	06Jan2012, 13:40	
Diversion-1	Not Specified	220.7	06Jan2012, 13:40	

HEC-HMS Simulation Report
25 Year

- Description : Basin: ERD Existing & Met: 25_year & Control: Control 1
- Basin Model : ERD Existing
- Meteorological Model : 25_year
- Control Conditions : Control 1
- Simulation Start: 05Jan2012, 24:00 End: 07Jan2012, 12:00
- Compute Time: 02Apr2013, 10:36:37

Subbasin Table

Basin Element	Area (SqMi)	Precip. (in)	Loss (in)	Exc. Dpth. (in)	Peak Qout (cfs)	Time of peak
DA 01	0.6860	6.30	1.51	4.79	624.5	06Jan2012, 13:00
DA-3	0.0938	6.30	1.50	4.80	144.5	06Jan2012, 12:20
DA-4	0.2188	6.30	3.89	2.41	88.0	06Jan2012, 13:30

Junction Table

Junction Name	Area (SqMi)	Pk Outflow (cfs)	Pk Time Time
T-1	NaN	710.0	06Jan2012, 13:00
T2	NaN	766.5	06Jan2012, 13:00
T-3	NaN	489.3	06Jan2012, 13:40

Reach Table

Reach Name	Pk Inflow (cfs)	Pk Inflow Time	Pk Outflow (cfs)	Pk Outflow Time
Chann1	766.5	06Jan2012, 13:00	410.8	06Jan2012, 14:10

Diversion Table

Reach Name	Pk Inflow (cfs)	Pk Inflow Time	Pk Outflow (cfs)	Pk Outflow Time	Pk Diversion (cfs)	Pk Diversion Time
Diversion-1	489.3	06Jan2012, 13:40	223.9	06Jan2012, 13:40	265.5	06Jan2012, 13:40

End of Simulation Report: 25 Year 2.7.12 w/o calib

Project: EastRiserDitch Simulation Run: 25 Year 2.7.12 w/o calib

Start of Run: 06Jan2012, 00:00 Basin Model: ERD Existing
End of Run: 07Jan2012, 12:00 Meteorologic Model: 25_year
Compute Time: 02Apr2013, 10:36:37 Control Specifications: Control 1

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
DA 01	0.6860	624.5	06Jan2012, 13:00	4.79
PUMP	Not Specified	85.5	06Jan2012, 00:00	
T-1	Not Specified	710.0	06Jan2012, 13:00	
DA-3	0.0938	144.5	06Jan2012, 12:20	4.80
T2	Not Specified	766.5	06Jan2012, 13:00	
Chann1	Not Specified	410.8	06Jan2012, 14:10	
DA-4	0.2188	88.0	06Jan2012, 13:30	2.41
T-3	Not Specified	489.3	06Jan2012, 13:40	
Diversion-1	Not Specified	223.9	06Jan2012, 13:40	

HEC-HMS Simulation Report
100 Year

- Description : Exist Cond w/o calibration
- Basin Model : ERD Existing
- Meteorological Model : 100_year
- Control Conditions : Control 1
- Simulation Start: 05Jan2012, 24:00 End: 07Jan2012, 12:00
- Compute Time: 02Apr2013, 09:05:09

Subbasin Table

Basin Element	Area (SqMi)	Precip. (in)	Loss (in)	Exc. Dpth. (in)	Peak Qout (cfs)	Time of peak
DA 01	0.6860	8.40	1.72	6.68	883.1	06Jan2012, 13:00
DA-3	0.0938	8.40	1.71	6.69	204.3	06Jan2012, 12:20
DA-4	0.2188	8.40	4.49	3.91	150.3	06Jan2012, 13:20

Junction Table

Junction Name	Area (SqMi)	Pk Outflow (cfs)	Pk Time Time
T-1	NaN	968.6	06Jan2012, 13:00
T2	NaN	1047.9	06Jan2012, 13:00
T-3	NaN	615.3	06Jan2012, 13:50

Reach Table

Reach Name	Pk Inflow (cfs)	Pk Inflow Time	Pk Outflow (cfs)	Pk Outflow Time
Chann1	1047.9	06Jan2012, 13:00	491.3	06Jan2012, 14:20

Diversion Table

Reach Name	Pk Inflow (cfs)	Pk Inflow Time	Pk Outflow (cfs)	Pk Outflow Time	Pk Diversion (cfs)	Pk Diversion Time
Diversion-1	615.3	06Jan2012, 13:50	228.4	06Jan2012, 13:50	387.0	06Jan2012, 13:50

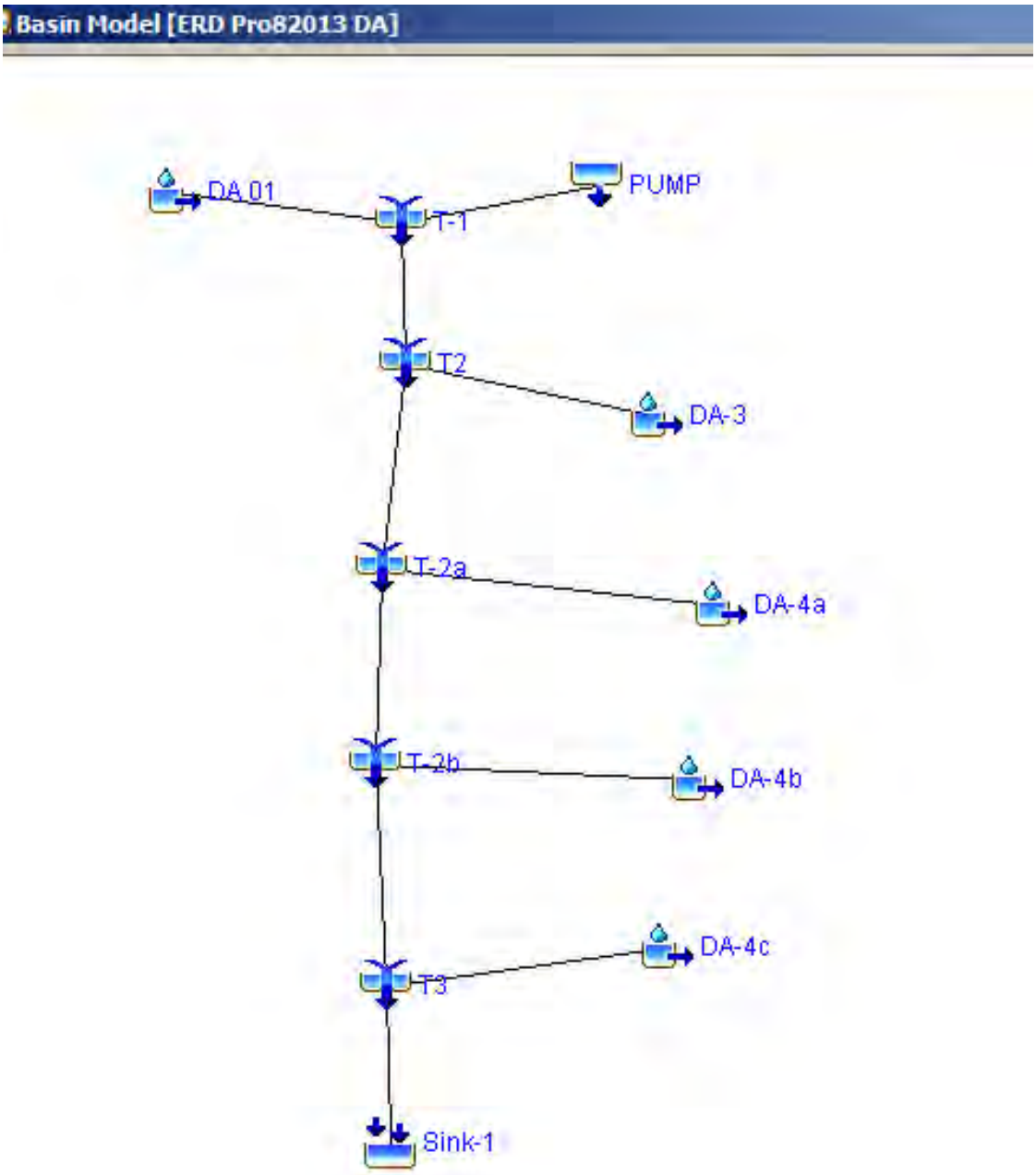
End of Simulation Report: 100 Year 2.7.12 w/o calib

Project: EastRiserDitch Simulation Run: 100 Year 2.7.12 w/o calib

Start of Run: 06Jan2012, 00:00 Basin Model: ERD Existing
End of Run. 07Jan2012, 12:00 Meteorologic Model: 100_year
Compute Time: 02Apr2013, 09:05:09 Control Specifications: Control 1

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
DA 01	0.6860	883.1	06Jan2012, 13:00	6.68
PUMP	Not Specified	85.5	06Jan2012, 00:00	
T-1	Not Specified	968.6	06Jan2012, 13:00	
DA-3	0.0938	204.3	06Jan2012, 12:20	6.69
T2	Not Specified	1047.9	06Jan2012, 13:00	
Chann1	Not Specified	491.3	06Jan2012, 14:20	
DA-4	0.2188	150.3	06Jan2012, 13:20	3.91
T-3	Not Specified	615.3	06Jan2012, 13:50	
Diversion-1	Not Specified	228.4	06Jan2012, 13:50	

B. Hydrologic Analysis Computations – Post-Construction



Global Summary Results for Run "2Yr PropDA"

Project: EastRiserDitch Simulation Run: 2Yr PropDA

Start of Run: 06Jan2012, 00:00
End of Run: 07Jan2012, 12:00
Compute Time: 19Sep2013, 11:52:18

Basin Model: ERD Pro82013 DA
Meteorologic Model: 2_year
Control Specifications: Control 1

Show Elements: All Elements Volume Units: IN AC-FT Sorting: Hydrologic

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
DA 01	0.6860	285.3	06Jan2012, 13:00	2.26
PUMP	Not Specified	85.5	06Jan2012, 00:00	
T-1	Not Specified	370.8	06Jan2012, 13:00	
DA-3	0.0938	65.9	06Jan2012, 12:20	2.27
T2	Not Specified	396.6	06Jan2012, 13:00	
DA-4a	0.1094	12.3	06Jan2012, 13:20	0.79
T-2a	Not Specified	407.5	06Jan2012, 13:00	
DA-4b	0.0547	5.6	06Jan2012, 13:30	0.73
T-2b	Not Specified	412.4	06Jan2012, 13:00	
DA-4c	0.0547	5.6	06Jan2012, 13:30	0.73
T3	Not Specified	417.3	06Jan2012, 13:00	
Sink-1	Not Specified	417.3	06Jan2012, 13:00	

Global Summary Results for Run "10Yr PropDA"

Project: EastRiserDitch Simulation Run: 10Yr PropDA

Start of Run: 06Jan2012, 00:00
End of Run: 07Jan2012, 12:00
Compute Time: 19Sep2013, 11:50:12

Basin Model: ERD Pro82013 DA
Meteorologic Model: 10_year
Control Specifications: Control 1

Show Elements: All Elements Volume Units: IN AC-FT Sorting: Hydrologic

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
DA 01	0.6860	482.6	06Jan2012, 13:00	3.74
PUMP	Not Specified	85.5	06Jan2012, 00:00	
T-1	Not Specified	568.1	06Jan2012, 13:00	
DA-3	0.0938	111.7	06Jan2012, 12:20	3.75
T2	Not Specified	612.0	06Jan2012, 13:00	
DA-4a	0.1094	30.3	06Jan2012, 13:30	1.74
T-2a	Not Specified	638.1	06Jan2012, 13:00	
DA-4b	0.0547	14.3	06Jan2012, 13:30	1.65
T-2b	Not Specified	650.3	06Jan2012, 13:00	
DA-4c	0.0547	14.3	06Jan2012, 13:30	1.65
T3	Not Specified	662.5	06Jan2012, 13:00	
Sink-1	Not Specified	662.5	06Jan2012, 13:00	

Global Summary Results for Run "25Yr PropDA"

Project: EastRiserDitch Simulation Run: 25Yr PropDA

Start of Run: 06Jan2012, 00:00
End of Run: 07Jan2012, 12:00
Compute Time: 08Oct2013, 16:20:29

Basin Model: ERD Pro82013 DA
Meteorologic Model: 25_year
Control Specifications: Control 1

Show Elements: All Elements Volume Units: (•) IN ( ) AC-FT Sorting: Hydrologic

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
DA 01	0.6860	624.5	06Jan2012, 13:00	4.79
PUMP	Not Specified	85.5	06Jan2012, 00:00	
T-1	Not Specified	710.0	06Jan2012, 13:00	
DA-3	0.0938	144.5	06Jan2012, 12:20	4.80
T2	Not Specified	766.5	06Jan2012, 13:00	
DA-4a	0.1094	45.8	06Jan2012, 13:20	2.51
T-2a	Not Specified	806.4	06Jan2012, 13:00	
DA-4b	0.0547	22.0	06Jan2012, 13:30	2.41
T-2b	Not Specified	825.4	06Jan2012, 13:00	
DA-4c	0.0547	22.0	06Jan2012, 13:30	2.41
T3	Not Specified	844.5	06Jan2012, 13:00	
Sink-1	Not Specified	844.5	06Jan2012, 13:00	

Global Summary Results for Run "100Yr PropDA"

Project: EastRiserDitch Simulation Run: 100Yr PropDA

Start of Run: 06Jan2012, 00:00
End of Run: 07Jan2012, 12:00
Compute Time: 19Sep2013, 11:07:02

Basin Model: ERD Pro82013 DA
Meteorologic Model: 100_year
Control Specifications: Control 1

Show Elements: All Elements Volume Units: (•) IN ( ) AC-FT Sorting: Hydrologic

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
DA 01	0.6860	883.1	06Jan2012, 13:00	6.68
PUMP	Not Specified	85.5	06Jan2012, 00:00	
T-1	Not Specified	968.6	06Jan2012, 13:00	
DA-3	0.0938	204.3	06Jan2012, 12:20	6.69
T2	Not Specified	1047.9	06Jan2012, 13:00	
DA-4a	0.1094	77.3	06Jan2012, 13:20	4.02
T-2a	Not Specified	1116.3	06Jan2012, 13:00	
DA-4b	0.0547	37.6	06Jan2012, 13:20	3.91
T-2b	Not Specified	1149.5	06Jan2012, 13:00	
DA-4c	0.0547	37.6	06Jan2012, 13:20	3.91
T3	Not Specified	1182.6	06Jan2012, 13:00	
Sink-1	Not Specified	1182.6	06Jan2012, 13:00	

APPENDIX B

HYDRAULIC ANALYSIS – EXISTING CONDITIONS: HEC-RAS INPUT

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X      X   X     X  X    X
X     X  X        X           X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X           X  X     X    X        X
X     X  X        X    X      X   X    X    X        X
X     X  XXXXXX    XXXX       X    X   X    X   XXXXX
```

****

PROJECT DATA
Project Title: Teter East Riser Ditch Working 9.23.13
Project File : ERD92313.prj
Run Date and Time: 10/7/2013 2:21:27 PM

Project in English units

****

PLAN DATA

Plan Title: ExPlan47 Dyn92313 N_extRt46spill
Plan File : k:\TETERBORO\URS H&H\Teterboro\HEC RAS Final 92313\ERD92313.p50

Geometry Title: ExisGeo Weir modif N extRt46 spill92313
Geometry File : k:\TETERBORO\URS H&H\Teterboro\HEC RAS Final 92313\ERD92313.g29

Flow Title : Exist Dyn 4Q4.3.13extenRt46
Flow File : k:\TETERBORO\URS H&H\Teterboro\HEC RAS Final 92313\ERD92313.f23

Plan Description:
Model for on Project Site Existing Conditions with Q reduced by weirs up to Rt46

Plan Summary Information:
Number of: Cross Sections = 37 Multiple Openings = 0
Culverts = 0 Inline Structures = 0
Bridges = 0 Lateral Structures = 6

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

****

FLOW DATA

Flow Title: Exist Dyn 4Q4.3.13extenRt46
Flow File : k:\TETERBORO\URS H&H\Teterboro\HEC RAS Final 92313\ERD92313.f23

Flow Data (cfs)

```
*****************************************************************************************************
*************
* River           Reach           RS      *            2 Yr           10 Yr           25 Yr
100 Yr *
* East Riser DitchMiddle          9188    *           370.8           568.1             710
968.6 *
* East Riser DitchMiddle          7739    *           436.7           679.8           854.5
1172.9 *
* East Riser DitchMiddle          5007    *           447.8           708.5           898.5
1248 *
* East Riser DitchMiddle          3040    *           453.4           722.9           920.5
1285.6 *
* East Riser DitchMiddle          1864    *             459           737.2           942.5
1323.2 *
*****************************************************************************************************
*************

Boundary Conditions
*****************************************************************************************************
********
* River           Reach           Profile          *            Upstream
Downstream    *
*****************************************************************************************************
********
* East Riser DitchMiddle          2 Yr             *                                    Known WS
= 4.9 *
* East Riser DitchMiddle          10 Yr            *                                   Known WS
= 5.01 *
* East Riser DitchMiddle          25 Yr            *                                   Known WS
= 5.08 *
* East Riser DitchMiddle          100 Yr           *                                    Known WS
= 5.2 *
*****************************************************************************************************
********

*************************************************************************

GEOMETRY DATA

Geometry Title: ExisGeo Weir modif N extRt46 spill92313
Geometry File : k:\TETERBORO\URS H&H\Teterboro\HEC RAS Final 92313\ERD92313.g29

CROSS SECTION


RIVER: East Riser Ditch
REACH: Middle             RS: 9188

INPUT
Description:
Station Elevation Data    num=     149
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*************************************************************************
       0    8.73   11.51       9   23.07       9   30.15     8.6   32.37    8.59
   33.14    8.59   33.95    8.58   45.28    8.47   45.41    8.47   68.77       8
   92.88       8   95.67    8.36   95.83    8.36   101.1       9  102.54       9
  102.65    8.98  104.37    8.92  118.54       8  120.71    8.46  121.57    8.25
  121.63    8.25  124.19       8  129.13       8  134.83    7.61  135.75    7.67
  136.38    7.64  137.25    7.53   137.9     7.4  139.54       7  140.98       7
  152.18    6.34  152.81    6.32  154.78    6.11  154.96     6.1  155.61    6.13
  155.65    6.14  156.12    6.01  156.36       6  250.85       6   263.9    5.72
  264.57    5.72  266.22    5.71   266.6    5.71  290.46    5.63  293.49    5.64
   295.9    5.63  310.67    5.67  311.28    5.68  317.75    5.72  325.48    5.78
  326.26    5.78  327.12    5.79  332.67    5.81  338.68    5.84  340.32    5.85
  341.53    5.85  342.23    5.86  343.44    5.86  361.29    5.99  362.04       6
  362.42       6  365.75    6.05  368.56    6.09  369.76    6.11  376.49    6.21
  379.37    6.24  381.81    6.27  382.22    6.28  384.25    6.32  385.15    6.34
  388.45    6.42  389.02    6.41  417.25       6  443.41       6  446.69    5.93
  466.35    5.56  467.66    5.55  475.91    5.42  478.34    5.41  483.36    5.38
  505.85    5.27  508.87    5.27  510.17    5.28  511.68    5.28  514.47     5.3
  518.41    5.31  521.18    5.33  521.99    5.34  523.18    5.35  527.64    5.38
```

528.48	5.39	536.22	5.46	550.5	5.59	551.14	5.6	552.51	5.61
555.79	5.64	557.09	5.65	559.7	5.68	560.92	5.69	561.17	5.7
562.14	5.71	563.2	5.73	563.52	5.73	577.45	5.81	592.83	6
607.49	6	611.18	6.03	621.18	6	712.82	6	732.21	5.62
766.97	5	770.38	5	770.84	5	776.93	4.13	777.63	3.99
777.7	3.96	778.7	.1	781.1	-.77	782.95	.1	784.57	2.5
785.6	3.57	787.21	4	787.97	4.06	790.27	4.19	790.95	4.23
791.33	4.24	793.23	4.36	798.5	4.78	800.14	5	800.57	5
815.89	5.32	822.57	5.47	847.87	6	858.25	6	881.7	6.86
883.08	7	883.17	7	883.63	7.21	885.42	8	887.43	9
888.2	9.35	889.18	9.81	890.3	10.36	891.51	11	893.6	12
894.23	12.24	894.71	12.43	896.01	13	902.47	13		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.08	770.38	.035	800.14	.065

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
770.38	800.14	188.07	187.35	187.01	.1	.3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
550	706	9

LATERAL STRUCTURE

RIVER: East Riser Ditch
REACH: Middle RS: 9049

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS =
Deck/Roadway Width = 20
Weir Coefficient = 2.6
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6.76	5.99	6.63	18.85	6	44.34	6	45.78	5.99
48.7	5.97	73.33	5	97.78	5	108.37	5.47	109.11	5.53
113.13	5.82	115.69	6	120.2	6.48	125	7		

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #100 Yr Lat Struct

E.G. US. (ft)	6.98	Weir Sta US (ft)	0.00
W.S. US. (ft)	6.84	Weir Sta DS (ft)	125.00
E.G. DS (ft)	6.82	Min El Weir Flow (ft)	5.00
W.S. DS (ft)	6.68	Wr Top Wdth (ft)	122.07
Q US (cfs)	968.60	Weir Max Depth (ft)	1.71
Q Leaving Total (cfs)	367.70	Weir Avg Depth (ft)	1.04
Q DS (cfs)	601.37	Weir Flow Area (sq ft)	127.16
Perc Q Leaving	37.91	Weir Coef (ft^1/2)	2.600
Q Weir (cfs)	367.70	Weir Submerg	0.00
Q Gates (cfs)		Q Gate Group (cfs)	
Q Culv (cfs)	0.00	Gate Open Ht (ft)	
Q Lat RC (cfs)		Gate #Open	
		Gate Area (sq ft)	
Q Breach (cfs)		Gate Submerg	
Breach Avg Velocity (ft/s)		Gate Invert (ft)	
Breach Flow Area (sq ft)		Gate Weir Coef	

Warning: Divided flow computed for this cross-section.

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 9001

INPUT
Description:
Station Elevation Data num= 148

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	8.56	.41	8.56	1.94	8.52	8.66	8	19.27	8
22.25	7.87	23.5	7.83	27.06	7.67	36.51	7.37	47.62	7
216.84	7	236.68	6.35	239.2	6.33	242.17	6.28	242.91	6.26
257.36	6.29	260.88	6.32	261.34	6.32	263.06	6.34	293.52	6
362.02	6	364.13	5.99	365.02	5.97	366	5.96	374.55	5.82
374.71	5.81	382.92	5.75	384.82	5.68	387.02	5.67	390.43	5.64
391.87	5.62	395.37	5.6	400.37	5.54	402.08	5.48	402.89	5.46
409.36	5.37	415.82	5.16	417.27	5.14	421.87	5.01	422.92	5
509.26	5	510.1	5.09	513	5.33	515.88	5.55	515.94	5.55
521.44	6	528.48	5.31	529.61	5.33	537.59	6	561.53	6
562.89	6.41	562.94	6.4	563.7	6.54	564.13	6.66	564.74	6.76
564.78	6.75	570.08	6	601.96	6	642.96	6.86	645.65	6.9
647.05	6.93	648.96	6.96	651.27	7	753.38	7	758.04	6.89
758.86	6.89	760.36	6.88	762.86	6.81	763.75	6.79	764.21	6.79
765.89	6.75	769.5	6.63	770.58	6.6	770.96	6.58	778.64	7
807.49	7	808.6	6.84	810.04	7	820.13	7	825.06	6.5
825.7	6.48	826.7	6.46	827.8	6.46	828.32	6.47	829.37	6.47
830.76	6.46	831.52	6.47	833.5	6.43	833.68	6.42	835.3	6.38
843.8	6.46	844.35	6.47	844.52	6.49	846.22	6.53	846.88	6.56
848.92	6.62	849.57	6.63	850.11	6.65	850.33	6.64	850.86	6.66
853.02	6.62	853.49	6.64	854.35	6.62	855.86	6.69	873.24	6.45
874.1	6.46	898.36	7	919.44	7	920.69	7.02	934.99	7.03
936.65	7	962	7	963.58	6.97	963.96	6.95	964.71	6.94
966.68	6.88	974.17	6.68	978.13	6.53	978.53	6.52	980.97	6.42
982.58	6.35	984.21	6.3	990.26	6	992.29	6	993.5	5.84
993.93	5.77	995.17	5.55	998.24	5	999.06	4.85	1001.13	4.48
1001.8	4.35	1003.34	4.12	1004.09	4	1006.49	.1	1009.11	-.86
1011.84	.8	1014.87	2	1019.02	3.78	1019.1	3.76	1020.18	4
1022.61	4.31	1023.38	4.4	1024.71	4.64	1026.65	5	1026.99	5
1031.75	5.1	1064.36	5.56	1069.54	5.62				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.08	998.24	.035	1026.65	.065

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
998.24 1026.65 309.59 307.19 307.22 .1 .3
Blocked Obstructions num= 1

Sta L	Sta R	Elev
700	930	8.8

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 8694

INPUT
Description:
Station Elevation Data num= 150

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	9.71	.69	9.72	4.5	9.37	7.06	9.04	7.42	9
10.54	9	21.94	8.73	27.68	8.65	29.16	8.62	30.73	8.6
32.88	8.56	39.8	8.45	40.22	8.44	61.13	8	135.24	8
150	7.71	152.72	7.56	152.91	7.56	154.8	7.46	155.22	7.45
156.77	7.37	158.86	7.25	160.46	7.17	163.56	7	200.21	7
217.49	6.72	218.64	6.74	219.81	6.74	221.58	6.77	222.16	6.77
224.72	6.82	225.12	6.82	226.39	6.85	228.55	6.89	229.2	6.91

230.5	6.93	233.4	7	259.18	7	259.93	6.99	261.94	6.95
262.32	6.95	263.81	6.91	267.25	6.85	268.81	6.83	274.84	6.72
276.12	6.7	279.93	6.63	282.41	6.58	288.58	6.54	292.57	6.4
292.97	6.38	297.33	6.27	298.82	6.22	300.14	6.19	300.73	6.16
302.41	6.13	305.93	6.09	310.97	6.04	313.17	6	365.39	6
403.24	5.14	404.33	5.1	404.71	5.11	405.84	5.08	407.72	5.04
411	5	440.47	5	476.33	5.81	477.67	5.84	488.2	6
498.22	6	527.82	5.3	554.87	5.39	555.71	5.39	578.74	5.36
580.79	5.35	594.64	5.42	596.78	5.42	625.41	6	627.91	6
658.07	5.44	661.54	5.38	662.51	5.37	683.16	5	699.13	5
701.07	5.12	701.48	5.14	736.62	6	795.18	6	801.62	6.05
802.63	6.05	803.53	6.04	804.93	6.06	817.64	6.05	820.89	6.02
821.09	6.03	823.01	6	825.13	5.92	826.81	6	857.3	6
864.56	5.05	864.81	5.06	870.51	5	905.13	5	910.6	5.22
910.7	5.23	916.15	5.34	943.81	5.08	945.85	5	948.33	4.85
953.59	4.52	955.11	4.43	958.25	4.22	960.07	4.12	961.68	4
961.76	4	969.5	3.09	970.07	2.3	980.25	-.9	988.4	-1
990.72	.5	991.74	3	992.01	3.12	993.35	4	994.45	4.7
994.94	5	996.96	5	997.72	5.11	998.09	5.22	999.07	5.31
999.41	5.34	999.69	5.59	1000.13	5.8	1000.8	6	1002.23	6
1030.11	6.85	1030.57	6.86	1033.2	6.95	1034.52	7	1035.88	7
1038.05	7.2	1038.21	7.19	1038.8	7.26	1064.91	7.52	1071.55	7.41
1072.2	7.39	1092.28	7	1095.85	7	1100.2	6.95	1135.07	6.51

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.08	948.33	.035	997.72	.065

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

Left	Right	Left	Channel	Right	Coeff Contr.	Expan.
948.33	997.72	263.03	257.77	257.21	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	490	9	F

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 8436

INPUT
Description:
Station Elevation Data num= 146

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	8.53	4.05	8.45	6.98	8.36	11.1	8.24	15.69	8.09
15.99	8.09	18.55	8	19.34	7.97	22.04	7.85	22.66	7.84
23.22	7.8	53.58	7	91.06	7	106.79	7.61	108.09	7.61
109.1	7.62	112.25	7.62	112.69	7.63	113.62	7.63	175.16	7.56
176.31	7.56	177.07	7.55	178.16	7.55	179.33	7.54	181.41	7.54
207.23	7	319.6	7	321.34	6.94	321.46	6.93	323.79	6.85
324.85	6.82	330.01	6.64	330.88	6.62	331.64	6.59	332.37	6.57
335.66	6.46	336.81	6.43	338.92	6.36	339.67	6.34	342.7	6.25
343.08	6.23	344.42	6.2	347.53	6.1	347.7	6.1	349.09	6.06
349.28	6.05	351.12	6	352.62	5.97	353.95	5.95	357.5	5.89
357.74	5.88	358.6	5.87	360.46	5.84	361.49	5.82	364.34	5.78
364.67	5.77	366.17	5.75	367.01	5.73	367.43	5.73	368.93	5.71
370.82	5.68	371.24	5.67	374.21	5.63	375.51	5.61	375.9	5.61
377.01	5.59	379.75	5.56	380.79	5.54	381.38	5.54	383.7	5.51
384.24	5.51	385.97	5.48	386.8	5.48	388.45	5.46	389.34	5.46
390.39	5.44	390.97	5.44	392.49	5.42	393.52	5.42	393.86	5.41
394.85	5.41	395.84	5.39	397.06	5.38	398.51	5.38	399.93	5.36
402.27	5.34	403.08	5.34	404.26	5.33	405.2	5.31	406.37	5.3
407.69	5.3	408.73	5.28	410.4	5.27	411.65	5.25	413.17	5.24
414.37	5.22	414.79	5.22	416.01	5.2	416.4	5.2	417.81	5.18
420.28	5.13	420.51	5.13	423.28	5.08	424.47	5.05	425.06	5.04
426.48	5	427.12	5	450.12	4.72	472.22	4.46	482.05	4.34
493.35	4.2	497.88	4.15	508.56	4	510.71	4	510.98	4.01
538.38	5	540.74	5	544.82	5.06	545.89	5.06	566.44	5
631.13	5	634.04	4.84	639.55	4.54	649.35	4	652.22	3

657.98	-1.12	668.81	-1	678.04	3.89	678.59	3.94	679.39	4
681.34	4.29	682.18	4.42	683.72	4.54	684.77	4.79	685.42	5
685.58	5	689.4	5.65	690.22	5.78	691.56	6	731.41	6
732.01	6.03	736.56	6.3	737.85	6.38	749.19	6.99	749.45	7
824.25	7								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.08	634.04	.035	689.4	.065

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
634.04	689.4	236.17	241.64	242.83	.1	.3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
0	463	9

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 8194

INPUT
Description:
Station Elevation Data num= 144

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	7	20.99	7	29.63	6.65	36.82	6.38	41.68	6.17
43.44	6.1	45.45	6	75.01	6	77.87	6.11	79.56	6.18
91.18	6.53	104.42	7	146.58	7	191.02	6.09	191.1	6.09
198.3	6	236.04	6	292.09	6.35	294.33	6.35	373.85	6.41
374.62	6.4	378.13	6.4	378.65	6.39	379.36	6.39	380.6	6.38
380.76	6.38	381.59	6.39	381.71	6.39	382.98	6.38	383.77	6.38
384.28	6.37	387.01	6.37	388.03	6.36	392.14	6.36	393.11	6.35
398.22	6.35	398.83	6.34	409.57	6.34	457.2	6.74	458.2	6.75
458.48	6.76	459.15	6.76	461.41	6.79	461.49	6.79	462.28	6.8
463.17	6.8	477.87	7	701.61	7	701.86	7.03	702.14	7
702.45	7	705.27	6.86	706.15	6.82	706.2	6.82	710.93	6.6
712.09	6.57	714.16	6.41	715.33	6.33	718.38	6.09	719.03	6.03
719.12	6.03	719.44	6	719.49	6	723.29	5.9	726.89	5.82
728.78	5.76	729.81	5.74	737.28	5.56	737.83	5.55	747.46	5.49
747.97	5.48	749.04	5.48	749.45	5.49	750.16	5.49	751.25	5.5
751.78	5.5	752.29	5.51	752.31	5.51	753.94	5.54	754.58	5.55
758.34	5.47	760.39	5.51	760.85	5.5	763.35	5.45	763.86	5.46
766.37	5.51	766.79	5.51	769.69	5.47	770.25	5.48	771.13	5.46
771.17	5.46	772.01	5.48	776.54	5.43	796.81	5	892.87	5
894.23	5	895.44	4.72	895.6	4.68	897.87	4	899.3	3.74
899.69	3.66	900.77	3.4	902.33	3	905.52	.5	913.93	-.5
915.43	-1.24	917.71	.1	919.17	1	919.52	2.28	920.82	2.61
921.18	2.69	921.88	3	923.6	3	923.82	3.09	923.9	3.13
924.42	3.37	925.54	3.88	925.72	4	926.34	4.25	928.14	5
928.81	5.15	931.18	5.69	932.74	6	1016.43	6	1020.9	6.44
1023.77	6.83	1024.35	6.9	1025.07	7	1025.49	7	1027.71	7.18
1027.76	7.18	1028.01	7.19	1030.3	7.34	1032.43	7.47	1032.58	7.47
1033.26	7.51	1034.67	7.61	1038.45	7.8	1040.06	7.9	1040.08	7.9
1041.09	7.95	1044	8	1073.76	8	1074.21	7.99		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.08	894.23	.035	928.81	.065

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
894.23	928.81	198.33	191.32	190.19	.1	.3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
270	716	9

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 8003

INPUT
Description:
Station Elevation Data num= 147

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	5.24	21.39	5.12	23.28	5.14	26.63	5.12	47.74	6
126.77	6	128.14	6.02	144.99	6.28	149.02	6.32	155.8	6.37
163.71	6.41	164.52	6.42	167.33	6.43	174.59	6.43	183.33	6.46
188.97	6.47	190.93	6.45	192.16	6.46	195.59	6.42	252.43	7
289.74	7	293.9	6.86	299.21	6.67	300.67	6.64	322.56	6
328.15	5.79	328.48	5.77	331.22	5.67	336.37	5.46	350.41	5
366.44	5	371.65	5.11	376.38	5.15	378.76	5.16	380.86	5.19
382.22	5.22	382.82	5.22	384.21	5.25	388.96	5	396.96	5
423.38	5.88	424.69	5.89	425.25	6	432.38	6	452.62	5.15
454.62	5.15	502.82	5.35	507.92	5.35	508.83	5.36	513.61	5.36
514.86	5.37	518.09	5.37	587.66	5.41	594.6	5.41	595.49	5.4
607.53	5.4	607.99	5.41	649.96	5.41	680.71	5.32	685.13	5.32
691.67	5.33	695.32	5.33	702.99	5.37	707.04	5.39	708.54	5.41
712.89	5.43	713.66	5.44	716.23	5.44	716.31	5.45	727.48	5.42
728.7	5.42	730.57	5.44	732.11	5.44	734.18	5.46	735.85	5.46
739.07	5.48	756.29	5.46	758.65	5.47	759.14	5.48	762.19	5.48
775.6	5.39	776.63	5.4	782.14	5.32	786.44	5.35	788.96	5.35
789.49	5.36	793.15	5.37	793.55	5.38	796.67	5.39	806.98	5.41
808.54	5.41	810.88	5.43	815.36	5.44	817.41	5.44	818.12	5.45
824.88	5.42	827.63	5.44	828.47	5.43	830.16	5.45	833.21	5.46
835.77	5.48	851.52	5	858.59	5	860.47	5.05	869.4	5.19
876.45	5.34	883.69	5.51	884.8	5.53	886.62	5.59	906.18	6
928.29	6	930.4	5.1	930.78	5	934.22	4	934.82	4.03
935.69	4.15	937.1	4.2	937.33	4.24	938.13	4.29	939.1	3.94
939.48	3.73	940.22	3.5	941.66	2.65	942.24	2.27	943.02	2
947.01	1	947.11	-1	968.24	-1.33	984.77	1	986.73	2
989.51	2.8	990.23	3	992.72	4	994.51	5	995.23	5.48
996.02	6	1060.12	6	1068.83	6.33	1071.25	6.46	1072.88	6.54
1076.46	6.74	1078.12	6.82	1081.2	7	1081.37	7	1084.19	7.31
1090.16	8	1232.86	8						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.08	930.4	.035	995.23	.065

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
930.4	995.23	265.16	264.17	263.66	.1	.3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
427	820	9

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 7739

INPUT
Description:
Station Elevation Data num= 150

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	7	23.58	7	46.5	6.49	46.72	6.49	47.09	6.48
50.04	6.42	57.72	6.2	57.82	6.2	58.91	6.17	60.62	6.11
64.1	6	64.39	6	68.27	5.86	73.02	5.7	76.5	5.58
90.78	5	91.52	5	128.76	4.22	133.55	4.12	138.04	4.03
139.45	4	148.56	4	166.27	4.27	166.48	4.27	169.64	4.23
172.79	4.17	175.85	4.1	181.23	4	183.82	4	184.16	3.97

186.22	3.8	191.11	4	244.99	4	245.95	4.02	247.02	4.04
248.2	4.07	248.86	4.08	249.95	4.11	255.54	4.15	255.73	4.15
256.04	4.13	258.4	4.19	260.22	4.21	277.8	5	286.61	5
287.23	4.96	287.42	4.96	329.39	4.73	330.98	4.76	332.84	4.79
342.06	5	343.76	5	388.68	5.75	393.48	5.83	400.23	5.93
400.48	5.93	403.07	5.99	403.47	6	475.32	6	476.78	5.35
477.39	5	479.24	4.59	480.03	4.43	480.7	4.33	481.1	4.34
481.28	4.34	482.03	4.32	482.17	4.33	482.49	4.39	482.52	4.39
483.32	4.67	490.64	4	588.54	4	591.73	4.12	591.98	4.12
593.4	4.19	593.79	4.2	595.1	4.26	595.74	4.25	600.51	4.58
624.93	5	631.31	5	633.59	5.26	637.14	5.66	641.51	6
657.55	6.01	661.22	5.37	664.36	5.11	665.48	5	666.36	5
667.57	4.83	668.65	4.69	669.93	4.51	670.07	4.47	670.36	4.46
670.47	4.45	671.36	4	672.37	3.58	674.08	2.89	674.55	2.8
677.14	2.01	677.89	2	678.45	.9	683.27	-.81	694.29	-1.45
697.31	-.7	698.34	.9	699.52	3	701.13	3.66	701.86	4
702.65	4.09	705.1	4.35	705.22	4.37	707.21	4.58	708.25	4.69
709.62	4.84	710.94	5	711.71	5.03	712.03	5.04	721.73	5.35
722.59	5.38	724.18	5.43	740.82	6.01	804.4	6	817.65	6.87
819.69	7	821.19	7.63	821.7	7.78	822.57	8	824.18	8
825.37	8.16	827.51	8.03	828.61	7.94	828.86	7.93	831.06	7.78
832.24	7.67	833.35	7.58	835.19	7.37	836.1	7.28	838.31	7
839.19	7	841.14	6.75	845.08	6	853.31	6	860.5	6.58
866.08	7	866.38	7	866.52	7.01	877.78	8	1048.06	8

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.105	667.57	.035	707.21	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

667.57	707.21	195.55	200.78	201.98	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	475	8	F

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 7538

INPUT
Description:
Station Elevation Data num= 154

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-120	8.1	-58	7	-38	6.85	-12.9	7.5	0	6.66
4.35	6.45	6.38	6.33	8.82	6.23	10.92	6.16	14.1	6.03
15.58	6	100.61	6	103.03	6.24	106.25	6.62	110.45	7
113.46	7	116.7	6.9	131.75	6	140.06	6	146.24	5.87
149.12	5.8	155.27	6	171.14	6	182.68	5.89	185.94	5.87
188.15	5.83	199.42	5.49	201.57	5.42	208.65	5	216.91	5
223.4	4.85	239.3	4.49	247.88	4.29	251.34	4.22	256.22	4.16
258.52	4.08	260.35	4.08	261.21	4.11	264.14	4.15	266.86	4.25
270.39	4.36	278.26	4.44	283.93	4.33	285.82	4.3	290.05	4.2
291.52	4.15	295.02	4	399.57	4	402.55	3.65	409.11	3
448.2	3	455.86	3.39	456.1	3.39	467.13	3	473.7	3.51
476.04	3.57	491.99	4	496.76	4	498	3.87	499.24	4
511.54	4	511.91	3.91	514.67	3	519.02	3	520.68	3.28
522.09	3.2	543.58	4	554.19	4	571.98	4.79	575.71	5
661.11	5	667.95	4.23	669.02	4.27	671.67	4.19	672.71	4.21
675.96	4.44	685.77	5	686.26	5	688.23	5.09	691.19	5.09
693.9	5.03	694.66	5	710.92	5	722.38	4.78	724.16	5
730.07	6	730.97	6	732.96	5.92	735.53	5.94	736.3	5.84
739.84	5.2	741.07	5	749.11	4.2	751.02	4	751.46	4
752.73	3.26	753.53	3	754.56	2.56	756.07	1.57	758.19	-.9
776.54	-1	778.17	-.6	778.71	1.09	780.63	2	783.15	3
785.31	4	787.18	5	788.05	5.5	789.5	5.97	789.61	6
826.97	6	829.41	6.06	834.59	6.13	835.96	6.2	836.92	6.3
838.15	6.34	840.79	6.59	844.81	7	848.1	7.6	849.19	7.78

850.27	8	873.63	8	879	8.31	879.35	8.31	904.9	8
907.02	8	910.48	7.67	913.14	7.43	918.25	7	920.51	6.87
924.01	6.7	930.84	7	931.83	7	941.84	6.46	943.42	6.51
943.9	6.5	945.82	6.56	948.89	6.71	952.13	6.58	952.42	6.52
954.21	6.51	954.72	6.48	956.26	6.32	957.16	6.34	960.95	7
990.54	7	997.9	7.33	1000.13	7.44	1001.87	7.51	1003.63	7.55
1008.63	7.86	1010.44	7.96	1012.22	8	1025.36	8		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-120	.105	751.02	.035	789.5	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

Left	Right	Left	Channel	Right	Coeff Contr.	Expan.
751.02	789.5	215.06	219.69	217.71	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
-120	360	8	F

LATERAL STRUCTURE

RIVER: East Riser Ditch
REACH: Middle RS: 7445

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS =
Deck/Roadway Width = 20
Weir Coefficient = 2.6
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 141

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6.18	11.22	6	11.6	6	12.72	6	14.47	6
14.7	6	33.77	6	34.38	6	36.05	6	36.67	6
37.1	6	37.84	6	39.25	6	45.79	6	45.94	6
46.6	6	49.23	6	50.47	6	51.1	6	53.44	6
54.77	6	55.66	6	59.11	6	60.67	6	62.33	6
63.07	6	63.83	6	67.15	6	68.72	6	69.21	6
69.95	6	70.05	6	70.51	6	70.75	6	77.3	6
77.92	6	78.94	6	79.06	6	79.18	6	82.84	6
83.69	6	84.4	6	86.16	6	90.35	6	90.8	6
94.09	6	96.39	6	97.81	6	98.75	6	99.73	6
101.28	6	101.77	6	102.43	6	102.97	6	103.31	6
103.43	6	103.53	6	105.37	5.94	105.49	5.94	107.84	6
109.37	6	162.12	5.58	162.25	5.58	162.41	5.58	162.53	5.58
165.09	5.5	165.42	5.49	165.6	5.49	165.84	5.49	166.19	5.48
167.3	5.46	173.57	5.46	174.01	5.45	174.48	5.44	174.8	5.44
176.23	5.44	176.39	5.43	176.45	5.43	182.67	5.45	183.83	5.48
183.84	5.48	183.93	5.48	185.11	5.49	185.13	5.49	186.11	5.5
186.22	5.5	197.69	6	198.11	6	198.5	6	198.95	6
200.45	6	200.58	6	202.48	6	203.24	6	203.6	6
204.33	6	204.44	6	204.47	6	204.61	6	211.79	6
212.32	6	214.44	6	218.14	6	220.3	6	220.58	6
222.8	6	225.54	6	225.56	6	225.84	6	232.7	6
234.34	6	235.42	6	235.61	6	236.78	6	236.86	6
237.69	6	238.96	5.93	239.95	5.87	241.96	5.77	242.91	5.73
243.57	5.74	243.99	5.72	244.15	5.72	244.17	5.72	245.89	5.76
263.87	5.61	264.67	5.63	265.39	5.65	266.17	5.68	267.43	5.72
268.2	5.74	268.57	5.75	273.52	5.93	273.62	5.93	274.06	5.94
275.86	6	275.88	6	276.28	6	276.58	6	277.48	6
280.29	6								

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #100 Yr Lat Struct

E.G. US. (ft)	5.89	Weir Sta US (ft)	109.37

* W.S. US. (ft)	* 5.83	* Weir Sta DS (ft)	* 268.57	*
* E.G. DS (ft)	* 5.77	* Min El Weir Flow (ft)	* 5.43	*
* W.S. DS (ft)	* 5.74	* Wr Top Wdth (ft)	* 80.02	*
* Q US (cfs)	* 805.67	* Weir Max Depth (ft)	* 0.34	*
* Q Leaving Total (cfs)	* 14.77	* Weir Avg Depth (ft)	* 0.15	*
* Q DS (cfs)	* 790.99	* Weir Flow Area (sq ft)	* 12.09	*
* Perc Q Leaving	* 1.82	* Weir Coef (ft^1/2)	* 2.600	*
* Q Weir (cfs)	* 14.77	* Weir Submerg	* 0.00	*
* Q Gates (cfs)	*	* Q Gate Group (cfs)	*	*
* Q Culv (cfs)	* 0.00	* Gate Open Ht (ft)	*	*
* Q Lat RC (cfs)	*	* Gate #Open	*	*
*	*	* Gate Area (sq ft)	*	*
* Q Breach (cfs)	*	* Gate Submerg	*	*
* Breach Avg Velocity (ft/s)	*	* Gate Invert (ft)	*	*
* Breach Flow Area (sq ft)	*	* Gate Weir Coef	*	*

Warning: Divided flow computed for this cross-section.

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 7318

INPUT
Description:
Station Elevation Data num= 151

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-140	6.8	-83	6.4	-21.3	7	0	7.55	.11	7.55
.68	7.53	1.7	7.47	2.73	7.4	3.4	7.35	5.66	7.16
6.7	7.06	7.19	7	8.3	6.95	9.53	6.9	30.15	6
173.39	6	190.22	5.89	195.49	5.84	195.75	5.84	196.57	5.83
196.83	5.82	218.57	5.76	219.57	5.76	228.68	5.58	230.11	5.57
231.1	5.55	231.26	5.55	232.9	5.53	242.76	5.54	244.44	5.47
246.46	5.53	246.79	5.51	247.16	5.52	249.71	5.64	250.04	5.67
250.23	5.65	250.86	5.61	251.1	5.62	251.66	5.6	251.91	5.6
253.07	5.55	254.58	5.57	255.32	5.53	256.2	5.51	257.37	5.47
259.17	5.4	260.75	5.29	261.09	5.26	262.69	5.21	264.45	5.1
264.62	5.1	266.34	5	266.72	4.99	267.3	4.99	267.46	4.98
268.78	4.95	268.89	4.95	270.61	4.91	272.64	4.86	273.41	4.84
277.77	4.71	277.91	4.7	297.79	4	319.27	4	354.42	3.05
358.93	3	377.77	3	378.59	3.13	379.38	3.08	380.31	3.07
380.43	3.08	381.33	3.12	382.04	3.21	383.03	3.1	447.05	4
458.89	4	460.98	3.53	462.34	3.22	462.42	3.2	463.7	3
486.52	3	487.55	3.03	487.69	3.03	488.67	3.05	490.52	3.09
490.84	3.1	497.37	3.23	515.87	3.95	517.01	4	725.52	4
728.11	4.13	728.55	4.14	731.83	4.31	732.44	4.31	744.34	4.81
758.95	5	764.26	5	786.25	4.28	787.18	4.3	788.18	4.33
806.39	4.9	808.33	5	808.75	5	813.67	5.34	814.1	5.36
814.71	5.42	817.31	5.55	821.43	5.71	821.53	5.71	824.19	5.96
824.54	6	829.66	6	832.17	5.9	837.83	5.52	845.62	5
846.67	5	848.24	4.74	851.09	4.27	851.45	4.23	853.46	4
853.88	3.89	854.81	3.76	855.28	3.7	855.69	3.64	857.14	3.41
857.55	3.35	859.02	3.27	859.07	3.26	861.25	3.11	861.96	3.03
862.04	3.01	862.74	2.95	864.86	.8	865.24	-.86	865.93	-1.2
881.96	-.79	882.23	1.05	885.21	3	886.27	3.59	886.7	3.7
887.18	4	888.88	4.47	889.69	4.67	890.08	4.76	891.29	5
892.39	5	892.55	5	893.17	5.06	909.02	6	911.78	6
916.66	5.87								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-140	.11	848.24	.035	892.39	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
848.24	892.39	195.98	205.4	206.71	.1	.3

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 7113

INPUT
Description:
Station Elevation Data num= 145

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	7.04	1.42	7	6.19	7	9.43	6.84	9.72	6.82
10.51	6.75	11.02	6.71	13.96	6.45	14.43	6.41	18.86	6
26.17	6	51.23	5.43	51.45	5.42	65.62	5	77.57	5
78.17	4.98	78.18	4.98	79.74	4.93	80.14	4.92	82.44	4.84
110.73	4	112.55	4	112.7	3.99	112.71	3.99	115.68	3.87
132.1	3.2	134.03	3.12	135.73	3.05	135.91	3.04	136.07	3.04
136.17	3.03	136.33	3.03	137.73	3	140.78	3	161.61	3.61
161.9	3.62	162.69	3.62	188.3	3.05	189.11	3	251.25	3
255.16	3.01	255.76	3.01	256.35	3.02	257.02	3.03	257.11	3.03
261.69	3.09	270.38	3.3	275.03	3.4	277.04	3.45	278.36	3.49
279.93	3.52	281.75	3.58	296.66	4	297.7	4	325.5	3.11
325.59	3.11	335.39	3.3	339.54	3.48	340.9	3.54	344.55	3.68
352.48	4	456.44	4	466.73	3.82	472.42	3.75	474.05	3.73
475.58	3.72	502.62	3.46	506.02	3.43	510.89	3.38	513.59	3.36
515.32	3.34	550.88	3	564.98	3	574.32	3.33	575.47	3.35
576.43	3.37	580.48	3.48	581.59	3.51	582.99	3.53	587.29	3.64
587.6	3.64	592.36	4	660.05	4	660.95	4.23	661.97	4.47
662.05	4.49	662.12	4.51	662.85	4.68	663.36	4.79	664.19	5
665.57	5.64	666.86	6	671.12	6	671.81	5.78	672.86	5.56
673.97	5.24	674.63	5.07	674.89	5	675.34	4.91	676.13	4.81
681.86	4.06	682.48	4.09	682.6	4.11	682.99	4.15	685.09	4.41
687.07	4.65	689.83	5	697.46	5	698.45	4.68	699.11	4.49
699.63	4.33	700.69	4	702.81	3.02	702.82	3.01	702.85	3
702.86	3	702.88	2.99	705.77	2.41	706.2	2.35	706.88	2.26
707	2.25	707.25	2.24	708.99	2.19	709.07	2.17	709.37	1.82
711.94	-.7	714.25	-1.75	727.34	-1.33	734.25	1.16	734.75	3.17
736.88	4	737.65	4.39	738.6	5	740.09	5.68	740.97	6
741.45	6	741.51	6	741.64	6.01	751.95	6.41	765.47	7
779.55	7	780.24	7	784.26	7	784.35	7	791.8	6.56

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.11	699.63	.035	741.45	.065

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
699.63	741.45	65.29	71.33	73.51	.1	.3

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 7042

INPUT
Description:
Station Elevation Data num= 142

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	7.42	5.1	7.02	5.32	7	7.56	7	13.03	6.68
14.75	6.61	26.46	6	33.34	6	48.49	5.25	53.2	5.03
53.85	5	64.18	4.35	66.57	4.2	69.03	4.06	70.01	4
72.27	4	92.9	3.66	94.63	3.64	116.53	3	166.43	3
183.58	3.42	204.78	3.91	205.23	3.91	205.82	3.93	208.09	4
216.69	4	241.95	3.86	242.4	3.86	248.94	3.89	270.82	3.91
275.04	4	277.77	4	300.45	3.15	301.46	3.13	302.77	3.09
303.1	3.09	303.19	3.08	305.88	3.01	306.16	3	405.08	3
416.29	3.08	416.69	3.07	417.34	3.09	417.38	3.1	417.87	3.09
420.18	3.08	420.36	3.07	420.97	3.08	421.83	3.1	422.29	3.12
422.48	3.12	422.62	3.13	423.35	3.14	440.75	4	498.22	4
498.66	3.98	498.83	3.98	500.62	3.97	501.51	3.95	502.77	3.94

503.01	3.93	523.86	3	524.1	3	529.34	3.27	529.87	3.27
530.21	3.29	531.48	3.26	531.88	3.26	533.63	3.23	534.44	3.27
535.05	3.27	535.59	3.28	539.26	3.52	541.5	3.71	544.46	4
558.89	4	560.13	3.82	560.35	3.81	560.87	3.75	562.34	3.6
568.91	3	569.52	3	569.94	3.1	570.27	3.11	570.64	3.13
570.8	3.13	570.94	3.14	573.1	3.28	573.92	3.41	574.13	3.42
575.5	3.7	575.62	3.72	576.72	4	609.85	4	613.65	3.94
615.56	3.96	617.62	3.98	619.09	4	653.65	4	657.68	4.09
661.35	4.18	662.21	4.2	687.52	5	712.7	5	714	4.85
721.8	4	721.95	4	722.57	3.87	723.71	3.63	726.72	3
728	.9	729.67	-.51	732.31	-1.5	735.3	-1.4	738.7	1.06
739.58	3	740.7	3.18	745.76	4	747.4	4.27	751.69	5
755.95	5.96	756.15	6	756.82	6	758.6	6.29	759.85	6.45
761.11	6.59	761.23	6.59	761.78	6.65	762.18	6.69	762.46	6.7
763.93	6.72	766.54	6.87	767.67	6.86	768.89	6.84	769.02	6.83
770.2	6.81	775.07	6	789.29	6	790.54	6.05	791.49	6.02
792.2	6	800.49	6						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.11	712.7	.035	751.69	.065

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

Left	Right	Left	Channel	Right		
712.7	751.69	94.37	92.36	91.56	.1	.3

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 6949

INPUT
Description:
Station Elevation Data num= 148

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-74	7	-55	7.3	-20.5	6.9	-8.7	7.15	0	6.91
2.65	6.86	3.46	6.86	3.49	6.85	4.31	6.83	4.47	6.82
6.61	6.73	13.22	6.52	13.29	6.52	14.77	6.44	15.19	6.42
17.45	6.28	18.17	6.23	18.45	6.22	20.11	6.1	21.6	6
22.69	6	24.58	5.92	25.87	5.89	26.46	5.86	26.68	5.85
38.68	5.06	39.53	5	42.57	5	52.95	4.21	56	4
56.17	4	67.71	3.66	68.66	3.63	69.04	3.62	89.3	3
154.52	3	155.46	3.02	157.49	3.07	158.86	3.11	162.05	3.19
162.47	3.19	163	3.21	165.8	3.26	166.33	3.27	191.82	3.84
198.23	4	254.91	4	256.73	3.93	263.59	3.9	263.63	3.9
263.96	3.89	264.04	3.89	264.39	3.88	267.74	3.82	274.57	3.75
275.09	3.73	275.26	3.72	276.23	3.69	279.1	3.62	279.15	3.62
282.28	3.54	289.2	3.54	292.84	3.59	294.01	3.62	294.06	3.62
294.95	3.66	295.29	3.68	317.87	3.72	321.28	3.8	321.92	3.81
329.21	4	347.78	4	365.05	4.33	368.8	4.35	370.66	4.36
370.94	4.37	375.43	4.38	377.09	4.39	378.25	4.42	378.5	4.43
382.8	4.53	384.99	4.6	385.88	4.63	394.18	5	402.2	5
404.36	4.86	456.47	4	459.69	4	460.76	3.69	460.91	3.67
461.94	3.59	462.66	3.5	462.78	3.49	462.91	3.46	464.31	3.33
466.95	3	477.33	3	477.65	3.04	478.06	3.05	478.12	3.05
478.29	3.06	478.42	3.06	478.87	3.09	490.79	3.72	491.05	3.73
491.38	3.74	492.81	3.78	498.2	4	512.59	4	513.04	4.01
575.11	4.03	575.3	4.03	576.76	4	720.13	4	726.35	3.6
726.42	3.6	727.13	3.63	733.2	4	748	4	748.18	4
749.13	3.73	749.45	3.67	750.4	3.41	751.05	3.26	751.84	3
753.79	2.59	756.76	1.03	765.98	-1.78	773.5	-1.19	774.84	-.38
778.05	2.36	779.07	2.62	779.74	3	780.16	3.27	781.51	4
782.44	4.62	783.1	5	783.72	5.53	784.21	6	784.79	6.54
785.19	6.88	785.34	7	785.37	7	785.57	7	785.77	7
786.06	7	786.68	7	791.23	7				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val

```
     -74     .11     748    .035  785.19    .065

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           748  785.19           115.65  112.38  112.29             .1       .3

CROSS SECTION


RIVER: East Riser Ditch
REACH: Middle             RS: 6837

INPUT
Description:
Station Elevation Data    num=     148
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
       0    8.34    1.34    8.34    2.95    8.28    4.03    8.25    4.57    8.25
    6.11     8.2   10.59    8.04   11.87       8   28.04    7.26   33.54       7
   34.64    6.92   38.09    6.68   40.79     6.5   43.29    6.32   46.55    6.11
   47.98       6   48.42       6   51.56    5.92   52.98    5.88   53.73    5.87
   56.87    5.79   74.32    5.32    76.1    5.28   80.11     5.2   81.55    5.16
   86.32    5.06   86.48    5.05    89.4       5  101.42       5  105.43    4.82
  106.14    4.81  118.63    4.65  121.79    4.59  137.74    4.31  140.87    4.25
  152.85       4  171.38       4  173.26    4.06  174.29     4.1  181.93    4.29
  183.86    4.36  184.43    4.37  189.55    4.61  193.46    4.82  195.78    4.94
  196.83       5  232.68       5  233.28    4.98  234.23    4.97  236.72    4.93
  242.59    4.81  244.26    4.78  247.29     4.7  248.16     4.7  250.79    4.63
  281.82    4.53  282.79    4.56  286.86    4.65  289.02    4.69  299.84       5
  311.55       5  326.74    5.88  328.38    5.95  329.35    5.96  331.16    5.91
  332.18    5.86  336.12    5.62  341.64    5.27  345.83       5  346.36    4.87
  348.08    4.34  349.41       4  354.63       4  355.44    4.09  355.61    4.09
  361.62       5  416.38       5  418.04    4.92  421.76    4.78  422.52    4.72
  426.08    4.49  428.86    4.29  431.96    4.18  432.42    4.15  434.04    4.09
  435.83       4  724.85       4  725.91    3.85  726.96    3.86  732.01    3.89
  740.82    3.79  750.16    3.45  751.24    3.42  755.61    3.26  757.06     3.2
  758.22    3.16  763.55       3  788.06       3  793.25    3.25  801.34    3.68
  806.75    3.88  807.39    3.91  810.09       4  812.02       4  814.37    4.05
   815.9    4.04  816.29    4.09  817.54    4.22  820.11    4.58  820.97    4.69
  822.28    4.88  823.21       5  825.72    5.59  826.76       6  830.92       6
   831.5    5.96  837.01    5.55  842.21    5.16  843.54     5.1  845.25    5.17
  847.69    5.26  853.69       5  854.24       5  858.47    4.63  861.05    4.42
  865.21       4  865.64       4  865.99    3.93  870.81    3.02  870.94       3
  872.58    2.57  873.39    2.42  875.43    2.33  877.55    1.18  881.78     -.4
  890.79   -1.66  894.25   -2.38     897     .36  897.33       3  898.72    3.67
  899.51       4  899.64       4  901.54    4.38   902.4    4.52   905.1       5
   906.8       6  915.08       6  917.24    5.95

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0     .11  865.99    .035   902.4    .065

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        865.99   902.4            111.2  123.83  125.25             .1       .3

LATERAL STRUCTURE


RIVER: East Riser Ditch
REACH: Middle             RS: 6823

INPUT
Description:
Lateral structure position     = Right overbank
Distance from Upstream XS =
Deck/Roadway Width        =      20
Weir Coefficient          =     2.6
Weir Flow Reference       = Water Surface
 Weir Embankment Coordinates    num =      500
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
```

0	6	14.97	6	16.48	5.39	17.48	5.39	21.9	5.4
22.02	5.39	25.77	5	77.05	5	77.87	5	78.22	5
78.47	5	78.84	5	79.65	5	81.45	5	81.59	5
82.15	5	83.72	5	83.85	5	86.1	5	86.76	5
92.48	5	93.73	5	94.87	5	94.93	5	96.66	5
96.72	5	98.8	5	99.17	5	99.56	5	99.62	5
101.13	5	103.44	5	117.66	5	119.54	5	120.15	5
127.61	5	128.06	5	129.2	5	129.22	5	129.55	5
130.35	5	130.59	5	136.83	5	137.1	5	138.96	5
144.05	5	144.06	5	146.5	5	153.05	5	153.06	5
153.7	5	155.04	5	156.31	5	157.18	5	159.09	5
159.65	5	160.12	5	160.61	5	162.15	5	162.45	5
162.72	5	171.85	5	173.19	5	173.74	5	175.43	5
176.86	5	177.13	5	177.26	5	178.3	5	179.91	5
181.65	5	203.55	5.7	204.25	5.74	208.24	6	208.35	6
208.85	6	209.22	6	210.74	6	211.91	6	213.51	5.88
213.63	5.87	215.05	6	216.28	6	216.42	6	216.5	6
217.5	6	217.97	6	219.46	6	219.55	6	219.98	6
220.79	6	221.76	6	221.8	6	222.74	5.92	222.76	5.92
224.03	5.88	224.32	5.88	224.42	5.88	224.93	5.87	226.21	5.79
226.24	5.79	226.26	5.79	226.28	5.79	226.51	5.76	226.97	5.78
227.16	5.78	234.64	5.35	235.72	5.35	236.37	5.36	237	5.35
237.88	5.36	238.43	5.35	239.53	5.33	242.82	5.3	243.71	5.3
244.8	5.27	245.31	5.25	250.79	5.21	266.2	5.18	268.43	5.14
268.88	5.13	270.91	5.12	273.04	5.1	284.49	5	289.83	5
289.94	5	290.2	5	291.86	5	292.26	5	292.56	5
303.73	5	311.13	5	312.28	5	313.07	5	319.05	5
326.98	5	330.37	5	330.65	5	331.11	5	332.23	5
332.29	5	332.88	5	340.03	5	340.97	5	341.17	5
341.96	5	343.54	5	344.2	5	344.41	5	344.81	5
344.93	5	345.41	5	345.71	5	346.12	5	347.49	5
347.99	5	348.92	5	349.93	5	353.42	5	353.73	5
354.31	5	355.92	5	356.13	5	357.27	5	357.99	5
358.21	5	358.48	5	359.5	5	359.96	5	360.3	5
361.69	5	362.06	5	362.8	5	363.25	5	364.55	5
365.31	5	366.16	5	366.59	5	367.56	5	368.03	5
370.14	5	370.36	5	371.44	5	373.63	5	374.22	5
375.16	5	386.04	5.83	386.42	5.84	387.05	5.85	387.69	5.86
388.46	5.88	389.99	5.88	392.13	6	392.35	6	393.92	6
394.05	6	397.05	5.86	418.37	5	418.65	5	419.43	5
420.23	5	420.82	5	421.63	5	422.97	5	423.44	5
424.26	5	427.79	5	431.3	5	432.57	5	432.85	5
433.92	5	434.3	5	435.22	5	435.77	5	438.17	5
438.33	5	439.48	5	444.43	5	445.36	5	445.48	5
446.62	5	450.11	5	450.58	5	450.95	5	452	5
452.96	5	456.02	5	456.61	5	456.77	5	456.84	5
457.11	5	457.73	5	459.44	5	459.57	5	459.75	5
461.35	5	461.88	5	462.64	5	463.42	5	464.21	5
465.59	5	468.42	5	469.97	5	471.24	5	474.88	5
475.24	5	476.71	5	478.01	5	478.35	5	481.79	5
483.67	5	484.16	5	484.52	5	485.14	5	486.39	5
487.51	5	488.33	5	488.66	5	489.54	5	490.54	5
493.56	5	493.91	5	495.03	5	495.25	5	498.11	5
498.42	5	498.86	5	499.32	5	500.14	5	500.54	5
501.15	5	501.48	5	502.42	5	502.5	5	502.77	5
503.35	5	503.69	5	508.17	5	508.84	5	508.99	5
509.71	4.99	509.73	4.99	509.74	4.99	510.78	4.98	515.41	4.95
516.36	4.96	516.4	4.96	516.49	4.96	516.52	4.96	517.06	4.95
517.98	4.95	523.4	4.95	523.96	4.95	524.64	4.95	524.76	4.95
525.44	4.95	525.59	4.95	528.56	4.95	534.83	4.95	536.6	5
537.25	5	537.59	5	537.76	5	537.79	5	537.84	5
537.85	5	540.94	5	541.06	5	542.13	5	542.24	5
543.07	5	545.43	5	546.86	5	547.1	5	548.4	5
549.09	5	549.71	5	550.67	5	550.75	5	552.55	5
553.57	5	556.94	5	557.35	5	559.19	5	560.08	5
561.04	5	561.39	5	561.94	5	562.66	5	563.02	5
563.49	5	564.07	5	565.21	5	565.96	5	567.76	5
568.09	5	568.45	5	568.75	5	569.23	5	569.82	5
570.49	5	570.59	5	571.33	5	571.73	5	572.13	5
572.78	5	573.98	5	574.61	5	575.56	5	575.67	5
577.18	5	577.64	5	579.2	5	581.52	5	583.11	5

583.56	5	583.9	5	585.01	5	585.27	5	585.61	5
587.04	5	587.53	5	588.2	5	589.12	5	590.08	5
591.97	5	593.93	5	594.12	5	594.68	5	595.82	5
596.95	5	597.46	5	598.18	5	598.66	5	599.24	5
600.83	5	601.17	5	603.02	5	603.15	5	603.89	5
604.69	5	604.78	5	604.95	5	606.04	5	606.63	5
606.92	5	607.89	5	608.23	5	608.81	5	609.45	5
610.87	5	611.7	5	612.55	5	613.48	5	614.6	5
614.86	5	617.08	5	617.8	5	618.06	5	618.6	5
619.24	5	620.2	5	620.66	5	621.37	5	621.98	5
622.3	5	623.07	5	623.78	5	623.97	5	624.72	5
626.04	5	626.6	5	628.35	5	630.4	5	631.34	5
632.14	5	632.33	5	632.56	5	633.88	5	634.06	5
636.87	5	637.36	5	638.93	5	639.51	5	641.02	5
643.68	5	645.62	5	645.82	5	646.13	5	648.97	5
649.44	5	649.55	5	649.7	5	650.23	5	650.38	5
650.63	5	650.8	5	652.84	5	652.89	5	653.12	5
658.53	5	658.77	5	659.9	5	660.52	5	662.04	5
662.16	5	663.53	5	664.16	5	664.35	5	678.01	5
678.2	5	678.31	5	680.03	5	680.77	5	682.03	5
682.75	5	685.1	5	686.75	5	686.85	5	687.06	5
687.33	5	689.49	5	689.66	5	690.14	5	690.65	5
692.07	5	692.33	5	692.65	5	693.89	5	694.18	5
695.35	5	697.14	5	709.33	5.82	709.55	5.82	709.92	5.82
710.17	5.82	710.83	5.82	713.79	5.8	716.02	5.81	720.97	5.8
721.75	5.81	722.3	5.8	723.01	5.79	723.06	5.79	723.22	5.78
730.42	5.75	731.12	5.75	731.93	5.76	732.35	5.76	733.41	5.75
733.6	5.75	740.31	5.73	741.47	5.74	743.68	5.72	744.16	5.71
744.92	5.7	745.73	5.68	746.4	5.67	746.86	5.67	755.07	5.89

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #100 Yr Lat Struct

E.G. US. (ft)	5.63	Weir Sta US (ft)	14.97
W.S. US. (ft)	5.58	Weir Sta DS (ft)	709.33
E.G. DS (ft)	5.43	Min El Weir Flow (ft)	4.95
W.S. DS (ft)	5.42	Wr Top Wdth (ft)	626.69
Q US (cfs)	790.99	Weir Max Depth (ft)	0.57
Q Leaving Total (cfs)	490.54	Weir Avg Depth (ft)	0.44
Q DS (cfs)	302.51	Weir Flow Area (sq ft)	277.39
Perc Q Leaving	61.76	Weir Coef (ft^1/2)	2.600
Q Weir (cfs)	490.54	Weir Submerg	0.00
Q Gates (cfs)		Q Gate Group (cfs)	
Q Culv (cfs)	0.00	Gate Open Ht (ft)	
Q Lat RC (cfs)		Gate #Open	
		Gate Area (sq ft)	
Q Breach (cfs)		Gate Submerg	
Breach Avg Velocity (ft/s)		Gate Invert (ft)	
Breach Flow Area (sq ft)		Gate Weir Coef	

Warning: Divided flow computed for this cross-section.

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 6713

INPUT
Description:
Station Elevation Data num= 146

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	8	8.32	8	15.69	7.34	19.74	7	21.02	6.82
24.62	6.36	26.91	6.08	28.96	5.85	29.58	5.79	31.66	5.56
33.22	5.41	34.12	5.34	36.13	5.21	36.54	5.17	39.07	5
87.23	5	99.33	4.18	99.86	4.19	108.04	5	110.12	5
121.43	4.41	128.58	4	150.58	4	157.05	4.24	166.38	4.46

166.62	4.47	169.54	4.53	223.81	4.08	224.11	4.07	227.78	4.04
228.34	4.03	229.89	4.03	230.15	4.04	240.87	4.16	298.77	4.83
299.25	4.84	300.8	4.84	306.35	5	307.24	5	311.75	4.83
339.9	4	362.38	4	376.59	4.67	377.53	4.68	384.6	4.96
385.75	5	387.88	5	388.03	4.99	392.77	4.82	409.72	4.52
425.5	4.39	426.92	4.52	427.5	4.51	434.87	4.56	436.96	4.71
440.48	5	475.09	5	477.02	4.93	485.54	4.69	509.04	4
566.23	4	568.25	4.07	570.45	4.11	572.17	4.13	576.39	4.22
601.55	5	606.91	5	611.69	4.93	621.22	4.59	623.54	4.48
624.52	4.44	626.47	4.38	632.21	4.12	634.74	4	762.53	4
792.94	3.55	793.93	3.62	794.09	3.61	795.63	3.67	797.67	3.74
800.59	3.86	803.09	4	822.53	4	823.34	3.95	827.34	3.67
828.3	3.59	831.96	3.21	833.48	3.07	834.35	3	834.59	2.96
838.24	2.42	839.09	2.3	840.8	2	841.43	1.72	842.2	1.44
843.36	1	845.51	1	846.84	1.3	851.38	1.77	852.2	1.66
853.64	1.5	856.72	1.34	857.71	1.23	859.22	1	869.46	1
871.41	1.67	872.41	2	874.07	2.67	874.85	3	877.15	3.52
877.63	3.61	878.99	3.91	879.53	4	879.87	4	880.96	4.15
882.99	4.21	885.1	4.19	885.92	4.2	889.47	4.33	890.14	4.44
891.44	4.58	891.94	4.62	893.73	4.89	895.39	5	895.87	5
898.1	4.62	898.38	4.58	899.93	4.29	901.45	4	902.25	4
904.47	3.6	906.69	3.27	908.34	3	913.49	1.71	915.52	-.07
921.95	-1.87	923.68	-.7	928.58	.63	931.32	2	932.28	2.18
934.8	3	935.64	3.67	937.14	4.83	937.39	5	938.78	5
953.77	5								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.11	899.93	.035	938.78	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
899.93	938.78	94.88	94.46	92.3	.1	.3

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 6619

INPUT
Description:
Station Elevation Data num= 147

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	8.55	13.02	8	13.31	8	14.19	7.83	16.2	7.45
17.5	7.21	17.89	7.14	18.75	7	20.87	6.76	21.86	6.63
22.65	6.53	24.11	6.34	25	6.24	26.74	6	29.31	5.78
37.69	5	114.85	5	138.11	4.18	142.14	4	142.41	4
143.03	4.05	151.61	5	301.33	5	308.8	4.8	309.92	4.78
321.31	4.51	327.35	4.37	338.39	4.1	339.09	4.08	342.76	4
386.43	4	388.84	4.15	389.45	4.19	395.6	4.54	396.1	4.56
403.94	4.59	405.54	4.6	405.68	4.59	406.14	4.59	408.24	4.53
409.37	4.47	411.18	4.35	411.33	4.33	414.17	4.07	414.92	4
422.09	4	423.09	4.19	423.61	4.2	423.8	4.23	425.76	4.46
426.63	4.57	429.9	5	533.96	5	540.87	4.75	542.71	4.7
543.51	4.67	544.18	4.65	559.42	4	728.58	4	774.69	3.24
776.28	3.22	780.61	3.17	784.43	3.13	787.12	3.1	794.32	3.17
795.29	3.13	797.21	3	806.66	3	811.62	2.16	812.54	2
834.46	2	836.71	2.19	837.21	2.25	837.48	2.27	838.22	2.35
839.57	2.5	840.55	2.62	842.28	2.84	843.88	3	846.32	3.24
848.42	3.46	850.1	3.64	852.87	3.93	853.11	3.96	853.51	4
853.87	4.02	855.42	4.09	858.02	4.21	859.78	4.29	860.26	4.31
864.28	4.53	865.39	4.57	867.19	4.61	867.53	4.63	869.55	4.71
869.98	4.72	871.91	4.73	872.72	4.76	872.91	4.77	875.03	4.76
875.26	4.75	877.52	4.84	893.42	4.89	893.68	4.89	896.17	4.92
899.16	5	918.83	5	923.4	5.4	924.43	5.39	925.7	5.42
926.54	5.41	927.18	5.39	927.96	5.37	931.54	5	931.62	5
931.94	4.96	933.87	4.77	934.35	4.69	936.33	4.47	937.53	4
947.22	4	956.92	4	959.47	3.55	962.29	3.1	962.64	3
963.46	2.74	966.01	1.26	973.8	-1.49	977.43	-1.76	982.65	-1.15

984.12	.61	986.05	3	987.6	3	990.45	3.69	991.65	3.98
992.06	4.1	993.52	4.51	993.76	4.57	994.62	4.81	995.56	5
995.74	5	999.24	5.42	1003.05	5.81	1003.08	5.82	1003.65	5.85
1004.08	5.89	1008.96	5.75						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.11	956.92	.035	995.56	.06

Bank Sta: Left	Right	Lengths: Left Channel		Right	Coeff Contr.	Expan.
956.92	995.56	185.45	187.85	187.68	.1	.3

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 6431

INPUT
Description:
Station Elevation Data num= 145

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	7.19	1.21	7	22.34	7	34.07	6.47	37.21	6.32
39.11	6.24	39.86	6.2	41.02	6.16	41.78	6.12	42.49	6.11
44.51	6.03	45.09	6.03	78.4	6	105.21	6	106.81	6.07
108.68	6.18	110.58	6.32	125.76	6.39	126.3	6.38	129.9	6.2
131.65	6.14	134	6.07	135.04	6	200.82	6	232.28	5.3
234.54	5	240.84	5	242.38	5.06	243.68	5.15	243.87	5.14
244.91	5.23	245.62	5.22	246.86	5.24	257.05	6	268.34	6
276.26	5.41	283.97	5.4	287.08	5.48	294.83	5.73	296.57	5.72
299.94	5.68	319.98	5.56	320.16	5.56	328.17	5.44	353.55	5
617.42	5	618.99	5.1	629.31	5.45	632.66	5.4	635.92	5.28
639.26	5.22	645.86	5	672.37	5	679.42	4.44	679.59	4.44
685.89	5	694.34	4.61	695.27	4.62	711.7	4.46	714.78	4.38
722.64	4.16	724.91	4.08	727.43	4	727.88	4	738.5	3.39
738.76	3.38	746.79	3.5	747.93	3.61	748.85	3.68	751.87	3.87
756.1	4.12	759.02	4.28	763.02	4.66	766.4	5	774.68	5
776.12	5.2	779.08	5	869.71	5	877.24	4.75	888.01	4.43
901.33	4	959.68	4	963.36	3.97	966.88	3.95	989.71	3.63
996.73	3.52	998.27	3.49	1004.7	3.41	1025.92	3.14	1027.05	3.13
1030.04	3	1031.02	3	1032.36	2.93	1041.17	2.49	1043.06	2.4
1049.88	2	1051.17	2	1052.09	2.11	1052.5	2.18	1054.35	2.33
1057.81	2.76	1059.61	3	1066.47	3.83	1067.93	4	1277.31	4
1284.95	4.22	1287.23	4.24	1288.06	4.29	1292.52	4.62	1293.3	4.64
1296.78	5	1296.84	5	1297.82	5.35	1299.86	6	1300.07	6.09
1302.54	7.02	1306.02	7.32	1306.5	7.25	1307.92	7	1309.08	6.82
1310.62	6.41	1311.58	6.19	1312.19	6	1316.44	5	1316.67	5
1317.63	4.79	1319.26	4.45	1322.06	4	1327.27	4	1346.5	4
1346.86	3.94	1349.73	3	1352.97	2.29	1354.12	1.02	1359.2	-1
1366.74	-2.2	1369.57	-1.68	1376.68	1.37	1379.6	5	1380.88	5
1383.32	5.28	1387.28	5.74	1388.47	5.85	1389.55	6	1395.59	6

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.105	1346.5	.035	1383.32	.06

Bank Sta: Left	Right	Lengths: Left Channel		Right	Coeff Contr.	Expan.
1346.5	1383.32	197.17	211.97	212.4	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	325	6.5	F

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 6219

INPUT
Description:
Station Elevation Data num= 148

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	7	7.17	7	34.4	6.61	64.95	6.59	74.28	6.67
107	6	118.87	6	119.89	6.05	126.86	6.26	131.68	6.37
149.72	6	179.07	6	221.3	5.19	225.89	5.11	230.34	5.02
231.7	5	233.72	5	269.75	5.51	279.33	5.75	287.74	6
365.93	6	368.85	5.7	369.42	5.61	370.66	5.56	371.13	5.47
372.19	5.36	374.93	5.03	378.77	4.2	379.59	4.13	379.97	4.06
381.38	4.09	388.47	4.32	390.15	4.39	403.48	5	419.19	5
454.74	5.54	470.44	5.8	471.94	5.8	473.84	6	481.37	5.84
483.28	5.82	528.48	6	531.57	6	547.21	5.96	549.32	5.96
549.67	6	567.29	6	601.1	5.3	601.88	5.31	604.26	5
606.89	5	611.11	5.24	611.85	5.26	629.49	5.15	633.92	5
635.63	5	639.86	4.79	659.12	4	699.8	4	711.06	4.7
712.27	4.78	716.07	5	770.69	5	780.14	4.72	789.4	4.44
804.57	4	804.81	4	814.63	3.01	815.65	3	817.09	3.17
825.13	3.99	826.4	4	829.6	4.11	834.7	4.35	838.82	4.55
842.01	4.72	844.39	4.79	846.46	4.88	852.61	5	856.04	5
859.52	4.91	880.88	4.9	881.24	4.89	884.3	4.9	887.15	4.88
888.07	4.86	888.86	4.9	921.82	4.78	923.74	4.81	926.03	4.83
935.43	4.89	937.78	4.89	943.31	4.75	948.23	4.54	957.51	4.16
961.28	4	968.56	3.45	972.53	3.14	973.81	3.05	974.97	3
975.93	3	986.74	2.06	988.19	2.02	992.13	2.4	993.64	2.72
993.96	2.75	995.23	3	997.61	3.11	1000.72	3.3	1010.99	4
1013.26	4	1027	4.59	1035.85	5	1072.12	5	1073.01	4.98
1114.27	4.91	1121.88	5	1148.87	5	1152.86	4.81	1155.33	4.71
1161.94	4.5	1167.44	4.28	1174.77	4	1278.31	4	1289.79	3.52
1291.31	3.68	1291.99	3.73	1292.35	3.69	1293.25	3.7	1293.58	3.63
1293.92	3.67	1295.75	3.39	1300.3	4	1415.57	4	1416.39	3.98
1417.46	3.95	1440.36	3	1447.25	-.08	1458.96	-.76	1469.52	-3.24
1471.12	-1.76	1473.01	-.6	1474.1	4	1479.13	4	1483.13	4.34
1488.43	4.8	1490.54	5	1494.2	5				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.105	1416.39	.035	1474.1	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1416.39	1474.1	192.21	200.14	198.86	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	630	6.5	F

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 6019

INPUT
Description:
Station Elevation Data num= 150

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	7	8.16	6.71	24.9	6.23	53.77	6.08	57.79	6
123.8	6	152.81	5.13	155.33	5.03	168.65	5.45	174.4	5.67
182.11	6	184.9	6	186.52	5.84	197.6	5	255.41	5
269.5	5.21	274.65	5.24	293.5	5.26	302.87	5.26	328.41	6
347.45	6	348.66	5.92	366.82	5.49	368.73	5.53	371.66	5.68
374.42	5.72	379.17	5.99	385.9	5.75	388.26	5.56	393.57	4.9
401.88	4.41	405.11	4.43	408.89	5	435.02	5	437.91	5.04
441.04	5.34	445.03	5.88	446.46	5.77	447.96	5.82	450.91	5.56
452.7	5.58	463.34	5.34	468.47	5.35	474.92	5.31	483.76	6
485.8	5.98	492.85	5.59	495.33	5.62	502.02	6	523.44	6
526.6	5.59	527.72	5.59	529.62	5.42	534.79	5.34	543.46	5.25
546.24	5.42	549.16	5.66	551.85	5.74	553.68	6	601.46	6
609.76	5.72	615.24	5.7	633.92	5.19	653.14	5.12	660.3	5.11

663.56	5	695.54	5	702.89	4	704.19	3.61	706.89	3
709.31	3	713.23	2.67	714.13	3	715.75	3.78	721.54	3.98
726.3	4.48	728.79	4.68	730.18	4.65	732.65	4.86	736.4	4.84
738.38	5	742.34	5	744.66	4.3	751.76	4	754.23	3.82
761.22	3.48	766.15	3	768.51	2.12	769.98	2.15	772.37	2.44
774.38	3.36	776.07	4	785.81	5	787.31	5	790.62	5.15
814.79	6	826.15	6	842.67	5.42	850.25	5.2	861.33	5
869.7	4.92	876.98	4.82	889.69	4.61	915.38	4	967.43	4
981.33	3.67	1013.36	3.34	1020.3	3.82	1023.63	4	1053.45	4
1071.72	4.29	1081.53	4.47	1089.93	4.59	1111.75	5	1119.59	5
1138.84	4.11	1141.54	4	1172.65	4	1205.89	3.45	1213.8	3.34
1237.95	3.41	1241.54	3	1242.59	3	1257.99	3.63	1258.64	3.69
1260.59	3.5	1261.1	3.56	1263.14	3.38	1265.55	3	1267.86	3
1274.13	3.18	1300.45	3.41	1314.87	3.63	1322.42	3.73	1339.99	4
1354.35	4	1357.36	4	1378.44	4.06	1379.82	3.96	1382.58	3
1385.71	-.08	1393.48	-1.46	1399.27	-1.99	1408.74	-1.9	1410.27	.16
1411.4	3.98	1412.78	5	1415.94	6	1420.81	6	1433.5	6

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.105	1378.44	.035	1415.94	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

1378.44	1415.94	172.41	200.47	202.68	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	690	6.5	F

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 5818

INPUT
Description:
Station Elevation Data num= 148

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	7	1.7	7	8.83	6.73	14.2	6.54	26.37	6
96.8	6	101.9	6.27	102.8	6.28	106.76	6.41	107.46	6.45
111.5	6.56	113.34	6.55	119.19	6.51	129.59	6.3	130.8	6.29
131.83	6.3	137.54	6.33	153.02	6	207.43	6	238.84	6.84
244.78	7	255.69	7	291.69	6.12	293.9	6.01	294.41	6
302.7	6	310.6	6.68	311.01	6.66	311.63	6.58	312.22	6.52
314.42	6.51	315.26	6.27	315.47	6.31	315.77	6.31	316.01	6.27
316.84	6.51	317.26	6.57	323.94	6	329.76	6	330.02	5.99
335.38	5.84	344.61	5.57	353.91	5.32	357.18	5.25	357.39	5.25
368.81	5	371.48	5	372.92	3.99	374.29	3	381.58	3
384.27	3.59	385.89	4	398.54	4	413.15	4.46	415.24	4.52
416.62	4.52	417.9	4.51	419.95	4.48	420.66	4.49	423.33	4.46
424.02	4.46	431.11	4	436.28	4	448.37	4.62	448.71	4.63
457.55	4.77	459.62	4.8	463.25	4.88	464.38	4.9	468.57	4.9
474.22	4.92	476.31	4.88	477.77	4.86	492.6	4.68	495.1	4.64
501.01	4.46	503.04	4.38	506.23	4.26	507.53	4.22	508.72	4.17
513.8	4	515.12	4	518.21	3.94	520.97	3.88	521.7	3.87
524.52	3.81	525.57	3.78	526.97	3.75	557.61	3	591.96	3
605.85	3.25	647.66	3.89	648.77	3.9	654.18	3.92	655.76	3.92
669.35	4	780.83	4	783.22	3.72	783.35	3.72	799.47	4
963.79	4	971.15	3	973.43	3	974.14	3.05	987.22	4
1033.95	4	1035.79	3.78	1036.86	3.61	1040.29	3	1057.59	3
1062.49	3.15	1076.28	3.58	1086.84	3.93	1089.27	4	1094.38	4
1107.38	4	1109.62	3.64	1110.2	3.56	1111.81	3.17	1112.55	3
1113.77	2.52	1115.49	2.22	1115.9	2.09	1117.5	-.14	1122.12	-2.16
1126.62	-3.31	1133.74	-2.17	1139.3	.25	1141.01	3.21	1141.55	3.39
1142.36	3.63	1143.55	4.12	1144.68	4.76	1145.26	5	1146.24	5.24
1146.98	5.28	1147.92	5.38	1148.49	5.36	1149.62	6	1150.26	6
1162.4	6	1171.14	5.62	1178.7	5	1180.1	5	1181.95	5.23
1182	5.23	1187.49	5.99	1188.25	6.18				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.105	1107.38	.035	1150.26	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

1107.38	1150.26		168.46	176.9	174.99	.1	.3

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 5641

INPUT
Description:
Station Elevation Data num= 149

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	7.82	1.52	7.78	28.49	7.1	32.17	7	34.23	7
40.25	6.3	42.42	6.06	42.97	6	46.1	6	82.68	5.33
97.18	5.12	98.12	5	104.68	5	105.6	5.01	106.15	5.03
106.6	5.04	114.63	5.28	115.33	5.31	126.39	5.6	127.25	5.64
133.7	6	208.22	6	214.64	6.31	215.28	6.33	215.85	6.34
217.08	6.37	217.58	6.38	219	6.42	231.08	7	249.01	7
249.81	6.84	250.02	6.82	251.15	6.57	251.24	6.58	253.14	6.2
253.49	6.17	258.07	6.21	258.97	6.26	260.67	6.35	261.57	6.39
263.4	6.49	266	6.63	271.22	7	291.11	7	294.24	6.96
294.6	6.95	297.12	6.94	297.42	6.93	298.43	6.92	322.57	6
343.3	6	343.32	5.97	344.17	5	344.57	4.55	345.69	3.27
345.92	3	352.91	3	356.63	3.99	356.65	4	358.61	4.73
359.24	5	369.88	5	375.97	5.16	377.43	5.12	378.59	5.1
381.06	5.04	381.67	5	383.47	5	384.64	4.97	387.35	4.85
387.68	4.83	388.26	4.81	393.58	4.53	395.78	4.41	396.66	4.37
398.99	4.24	403.8	4	418.48	4	447.82	3.08	448	3.08
451.71	3	660.36	3	661.36	3.04	700.24	4	705.53	4
709.53	3.47	730.8	3.55	731.3	3.56	736	3.67	736.31	3.67
738.09	3.71	740.13	3.75	740.37	3.75	747.9	3.83	750.78	3.84
769.41	3.94	772.5	4	913.13	4	934.82	4.55	956.97	4.55
957.34	4.54	978.24	4	1014.05	4	1014.94	3.87	1017.17	3.46
1018.04	3.32	1018.47	3.28	1018.76	3.28	1019.23	3.25	1019.98	3.23
1020.17	3.23	1020.74	3.26	1021.8	3.27	1022.5	3.31	1023.04	3.33
1027.58	3.58	1027.85	3.6	1028.49	3.58	1033.15	4	1040.91	3.36
1042.08	3.39	1043	3.38	1043.57	3.39	1044.1	3.39	1044.54	3.38
1045.25	3.41	1086.26	3.22	1087.03	3.21	1088.46	3.18	1092.18	3.11
1093.37	3.1	1099.49	3	1208.59	3	1220.03	-.27	1224.09	-1.84
1227.59	-2.39	1231.45	-2.05	1240.01	.52	1242.73	4.84	1243.11	5
1244.19	5	1244.98	5.03	1248.35	5.17	1249.76	5.22	1250.13	5.24
1253.56	5.38	1256.39	5.47	1263.68	5.73	1270.45	5.99		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.105	1208.59	.035	1244.98	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

1208.59	1244.98		189.86	190.15	189.91	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	345	6.5	F

LATERAL STRUCTURE

RIVER: East Riser Ditch
REACH: Middle RS: 5502

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS =

Deck/Roadway Width = 20
Weir Coefficient = 2.6
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 155

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	5.2	9.46	5	9.98	5	17.76	5	22.82	5
23.03	5	23.23	5	24.79	5	26.15	5	27.32	5
29.85	5	30.27	5	31.84	5	32.21	5	32.86	5
36.75	5	37.49	5	38	5	38.82	5	38.91	5
39.77	5	40.5	5	41.89	5	42.33	5	43.12	5
44.08	5	44.46	5	45.05	5	47.52	5	47.92	5
49.08	5	49.84	5	50.02	5	50.83	5	51.97	5
52.54	5	52.74	5	56.24	5	57.2	5	57.79	5
58.51	5	59.09	5	60.81	5	61.13	5	62.03	5
63.93	5	66.15	5	66.93	5	67.13	5	67.5	5
68.66	5	68.98	5	71.58	5	71.69	5	72.19	5
72.46	5	72.72	5	73.32	5	73.4	5	73.7	5
73.77	5	73.82	5	73.93	5	83.23	5	108.57	5
116.38	5	116.48	5	116.73	5	117.18	5	117.67	5
117.81	5	118.64	5	119.19	5	119.41	5	119.48	5
120.51	5	120.87	5	123.01	5	123.45	5	124.55	5
129.98	5	130.1	5	130.23	5	132.09	5	132.95	5
133.05	5	133.62	5	134.96	5	135.06	5	135.38	5
135.41	5	137.82	5	138.65	5	140.02	5	140.06	5
143.79	5	144.47	5	148.69	5	149.09	5	149.81	5
150.67	5	150.9	5	152.7	5	152.89	5	153.02	5
153.11	5	158.75	5	158.99	5	159.37	5	159.89	5
160.22	5	164.06	5	165.35	5	165.59	5	191.37	5
205.57	5	211.38	5	213.01	5	215.35	5	215.87	4.98
224.01	4.98	225.98	5	227.94	5	228.36	5	244.22	5
245.34	5	245.53	5	246.06	5	246.97	5	254.3	5
261.47	5	261.5	5	261.55	5	261.77	5	261.82	5
261.85	5	265.42	5	272.27	5	272.88	5	273.44	5
273.87	5	274.3	5	277.48	5	290.16	5	296.68	5
297.86	5	300.27	5	300.59	5	305.34	5	305.57	5
307.59	5	318.58	5	322.46	5	323.86	5	332.29	5.2

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #100 Yr Lat Struct

E.G. US. (ft)	5.40	Weir Sta US (ft)	0.00
W.S. US. (ft)	5.40	Weir Sta DS (ft)	332.29
E.G. DS (ft)	5.40	Min El Weir Flow (ft)	4.98
W.S. DS (ft)	5.40	Wr Top Wdth (ft)	332.29
Q US (cfs)	302.51	Weir Max Depth (ft)	0.42
Q Leaving Total (cfs)	216.46	Weir Avg Depth (ft)	0.40
Q DS (cfs)	161.36	Weir Flow Area (sq ft)	131.90
Perc Q Leaving	71.49	Weir Coef (ft^1/2)	2.600
Q Weir (cfs)	216.46	Weir Submerg	0.00
Q Gates (cfs)		Q Gate Group (cfs)	
Q Culv (cfs)	0.00	Gate Open Ht (ft)	
Q Lat RC (cfs)		Gate #Open	
		Gate Area (sq ft)	
Q Breach (cfs)		Gate Submerg	
Breach Avg Velocity (ft/s)		Gate Invert (ft)	
Breach Flow Area (sq ft)		Gate Weir Coef	

Warning: Divided flow computed for this cross-section.

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 5451

INPUT
Description:

Station Elevation Data num= 129

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	7	12.53	7	13.42	6.92	19.84	6.47	25.41	6.22
28.74	6.08	30.35	6.1	31.37	6.05	32.72	6.02	32.74	6.03
33.17	6.03	34.55	6.01	34.64	6	38.42	6	49.91	5.53
53.42	5.52	53.94	5.52	93.66	5	193.1	5	194.78	5.09
195.33	5.11	195.48	5.12	197.63	5.23	197.67	5.23	202.59	5.5
213.5	5.89	215.81	5.97	216.28	6	223.36	6	225.01	5.85
225.64	5.79	225.82	5.77	228.2	5.58	228.57	5.55	233.04	5
259.84	5	260.64	4.65	262.69	4	263.73	3.51	264	3.38
264.15	3.32	264.54	3.19	264.84	3.1	265.46	3.01	267.94	3.08
268.28	3	272.56	3	277.47	3.6	279.95	4	280.98	4
286.35	4.35	287.33	4.4	288.83	4.47	290.56	4.56	295.1	4.81
298.32	4.9	299.38	4.91	299.42	4.92	300.03	4.9	300.97	4.97
301.98	4.98	310.64	4.97	346.36	4.98	346.49	4.99	347.43	4.98
349.08	4.99	350.52	4.99	354.35	5	363.46	5	366.86	4.99
370.92	4.95	372.57	4.94	372.9	4.93	376.1	4.94	376.51	4.93
430.59	4	452.57	4	456.39	3.96	456.54	3.96	463.03	3.95
464.1	3.93	464.39	3.92	464.48	3.92	465.16	3.91	465.37	3.91
465.86	3.9	466.14	3.9	469.58	3.82	469.83	3.82	469.97	3.81
473.58	3.77	475.89	3.72	477.84	3.68	478.38	3.68	479.79	3.64
483	3.57	491.43	3.49	492.72	3.47	516.31	3	773.99	3
792.56	3.61	794.5	3.63	796.54	3.66	819.3	4	1058.5	4
1095.45	3.04	1096.8	3	1218.59	3	1223.82	3.33	1234.24	3.98
1234.6	4	1252.76	4	1253.62	3.92	1254.5	3.85	1261.18	3.29
1272.5	2.68	1275.27	2	1282.33	.16	1286.4	-1.49	1291.21	-1.55
1295.35	-1.33	1301.56	1.04	1303.37	3.55	1303.77	3.66	1304.93	4
1306.7	4.39	1307.45	4.51	1309.88	5	1317.78	5		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.105	1261.18	.035	1303.77	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1261.18	1303.77	144.09	205.59	205.73	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	260	6.5	F

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 5245

INPUT
Description:
Station Elevation Data num= 147

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	7.3	7.07	7	51.07	7	71.62	6.23	75.93	6
96.63	6	113.5	5.37	119.42	5.21	123.58	5	128.81	5
144.62	5.27	184.98	6	188.04	5.75	190.23	6	191.88	6
203.25	5	214.78	5	218.05	5.81	219.29	5.82	226.78	5
241.33	5	245.18	5.24	255.26	5	269.92	5.07	274.61	5
286.53	5	287.98	4.96	297.53	4.89	301.94	4.8	314.78	4.42
318.63	4.36	339.47	4.69	347.89	4.77	350.1	4.73	355.21	4.86
358.2	4.8	360.56	4.61	363.58	4.58	369.91	4.42	372.29	4.3
383.86	4	416.41	4	438.62	3.57	445.79	3.49	448.84	3.52
458.76	3.46	468.74	3.47	487.72	3.3	501.77	3	523.24	3
528.53	4	535.43	3	552.89	3	561.98	4	568.42	4
570.1	3.95	583.28	3.78	587.74	3.83	591.91	3.73	600.82	3.83
609.33	3.79	655.32	3.38	673.18	3.4	676.29	3.42	705.29	3.7
711.88	3.72	727.14	3.72	730.99	3.7	747.94	3.52	771.31	3.2
794.91	3	1035.79	3	1052.73	3.21	1059.39	3.33	1079.38	3.65
1105.86	3.93	1112	3.92	1132.67	4	1164.28	4	1178.24	3.45
1189.38	3.25	1198.83	3	1225.96	3	1243.47	3.28	1244.53	3.32
1253.35	4	1263.65	3.35	1273.42	3	1274.9	3	1282.12	3.72
1292.99	3.77	1302.7	4	1307.03	4	1339	3.02	1343.04	3.13

```
 1356.65       4 1363.18       4 1366.57    3.85 1370.36     3.9 1374.47     3.7
    1389    3.32 1404.13       4 1407.76       4 1428.07    3.36  1435.7    3.24
 1444.83       3 1452.26       3 1455.55       4 1462.26       3 1472.89       3
 1476.92    3.28 1485.53       4 1492.06       4 1495.95     3.4  1498.4     3.1
 1500.52    3.11 1517.44    3.37 1526.32    3.09 1527.39       3 1568.42       3
 1595.56       4 1605.75    4.58 1610.15    4.78 1616.18    5.27 1620.25    5.52
  1622.5    5.57 1625.33    5.23 1628.35       5 1646.38       5 1648.12    5.26
 1661.53       6 1678.91       6 1681.13    5.76 1691.89       5 1694.82    4.86
 1697.01    4.33 1700.76    3.88 1706.75     .93 1712.01   -1.08 1719.52   -2.94
 1725.46   -1.79  1731.5     .96 1733.34       4 1737.45    4.65 1741.29    4.52
 1746.65    4.83 1749.47    4.82

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0    .105 1697.01    .035 1733.34    .055

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
       1697.01 1733.34            125.6  238.14  277.91             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
       0     195     6.5       F

CROSS SECTION


RIVER: East Riser Ditch
REACH: Middle             RS: 5007

INPUT
Description:
Station Elevation Data    num=     140
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
       0    8.67     .42    8.56    1.85    8.38    3.65       8    6.64    7.91
    9.25     7.8   29.01       7   38.76       6   65.06       6   68.22    5.75
   69.46    5.72   73.07    5.55   76.67    5.25   80.25    5.12   82.22    5.12
   91.68       5  153.54       5  165.01    4.34  169.19    4.15  171.75    4.07
  173.45    4.06  177.82    4.17   197.1       5  217.55       5  231.67    4.57
  236.71    4.45  247.25     4.3  248.05    4.28  259.77       5  365.11       5
  374.55     4.8  378.23    4.76  390.28    4.91  393.11    4.96  397.26    4.84
  399.22    4.76  401.22    4.56  404.18    4.36  405.19    4.32  407.59    4.38
  408.79    4.33  415.79    4.42  438.22     4.5  440.22    4.55  448.36    4.53
  452.59    4.58  458.83    4.59   472.4    4.22  476.51       4   501.9       4
  505.77    3.34  508.13       3  513.24       3  526.12    3.53   544.9       4
  555.98       4  577.87    3.38  582.69    3.29  593.72       3   831.7       3
  847.41    2.44   849.1    2.37  852.78     2.3  856.13    2.46  873.21       3
 1008.75       3 1049.46    3.77 1050.87    3.78    1063       4 1137.48       4
 1140.88    3.36 1143.36       3 1146.37       3 1147.69    3.33  1151.8       4
 1302.31       4 1323.39    4.83 1325.55    4.91 1331.59       5 1387.73    4.28
 1388.24     4.3 1394.06       4 1397.19       4 1400.47    3.85 1405.02    3.73
 1409.76    3.64 1423.45    3.62 1432.77    3.45 1445.49    3.36 1446.58    3.34
 1457.05       3 1482.37       3  1497.9    3.73 1504.45     3.8 1511.84    3.93
 1515.15       4 1531.09       4 1536.09    4.56 1538.28    4.52 1540.11    4.54
 1541.08    4.46 1546.29       5 1577.18       5 1578.55    5.33 1581.86    5.69
 1583.92       6 1584.97    6.56 1585.78    6.78 1586.76    6.47 1587.63       6
 1588.37       6 1594.66     5.3 1595.47    5.24 1596.96       5 1610.79       5
 1614.54    5.31 1618.37    5.53 1620.18    5.53 1626.37       6 1629.25    5.31
 1630.65    5.33 1649.94       6  1664.3       6  1665.7       6 1668.72    4.91
 1674.16    4.23 1681.28    -.07 1686.61   -1.28 1699.88   -3.01 1708.77   -2.04
 1716.48     .49 1722.55    3.58 1725.08    4.44 1726.07    4.62 1727.23       5
 1727.72       5 1727.94       5 1729.59    5.51  1730.7       6 1738.82       6

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0    .105 1668.72    .035 1727.72    .055

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
       1668.72 1727.72            164.23  163.72  163.88             .1       .3
```

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 4844

INPUT
Description:
Station Elevation Data num= 144

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	7.18	10.57	7	23.38	7	26.23	6.4	27.89	6
28.1	5.93	29.3	5.68	30.02	5.6	35.16	6	92.11	6
98.83	5.71	104.19	5.5	120.13	5.19	121.5	5.26	126.39	6
128.64	6	142.98	5.36	144.73	5.31	151.23	5.15	156.17	5
176.48	5	188.74	4.72	192.4	4.69	210.16	4.56	260.56	5
264.87	5	275.68	5.29	295.97	6	317.3	6	324.85	5.63
338.99	5.49	345.88	5.49	346.49	5.48	358.29	5.45	379.11	5.23
381.64	5.19	395.34	5	400.54	5	401.01	4.85	403.23	4.44
404.63	4.14	405.48	4	409.51	4	412.79	4.78	413.59	5
413.91	5	415.19	5.38	416.17	5.56	423.86	5	533.09	5
615.84	4	647.8	4	651.99	3.92	659.64	3.8	666	3.65
668.07	3.59	698.76	3.16	715.91	3	811.42	3	842.29	3.87
843.03	3.92	845	4	846.84	4	878.47	3.79	883.9	3.8
884.23	3.79	894.62	3.73	894.92	3.74	905.7	3.66	930.47	4
936.66	4	940.73	3.81	942.75	3.7	950.28	3.56	978.26	3
997.34	3	999.09	3.15	1008.68	4	1149.43	4	1157.62	4.36
1158.64	4.37	1160.95	4.45	1161.88	4.44	1176.84	5	1195.21	5
1223.21	4.37	1225.29	4.33	1229.44	4.28	1245.41	4	1262.96	4
1263.69	4.05	1267.87	4.28	1273.09	4.2	1281.87	4.34	1282.74	4.34
1318.65	4.8	1324.52	4.89	1327.87	5	1330.48	4.92	1332	4.89
1346.66	4.42	1357.56	4	1401.09	4	1419.33	3.51	1431.1	3.16
1438.93	3.07	1441.89	3	1484.16	3	1490.93	3.32	1495.21	4
1499.1	4	1501.11	4.04	1503.79	4.29	1508.3	4.54	1511.25	4.59
1512.38	4.62	1514.78	4.75	1515.71	4.75	1521.36	4.96	1521.62	4.98
1524.11	5.04	1529.5	5.06	1530.44	5.04	1531.63	5	1537.62	4.77
1543.06	4	1543.13	3.94	1545.08	2.8	1546.1	.78	1551.31	-2.17
1564.03	-3.13	1570.44	-1.05	1579.82	1.07	1580.03	2.31	1584.61	2.89
1585.34	2.92	1585.62	3	1587.82	3.74	1588.4	4	1588.87	4.29
1590.03	5	1591.26	5.9	1591.46	6.6	1611.82	6.7		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.105	1537.62	.035	1590.03	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1537.62	1590.03	301.46	287.49	287.31	.1	.3

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 4556

INPUT
Description:
Station Elevation Data num= 145

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	8.62	.99	8.54	2.36	8.41	5.19	8.18	7.22	8
8.35	7.93	12.93	7.63	15.61	7.45	19.69	7.23	23.78	7
26.16	7	33.96	6.75	36.04	6.73	65.85	6	68.78	6
71.88	5.92	104.77	5	118.1	5	136.04	4.69	156.71	4.36
159.62	4.32	179.6	4	436.33	4	438.19	3.96	461.95	3.41
469.31	3.28	470.79	3.25	472.47	3.24	489.55	3	496.5	3
502.42	3.11	504.2	3.13	532.45	3.5	536.57	3.55	549.07	3.71
550.87	3.75	557.12	3.85	558.74	3.86	565.25	3.95	566.92	3.93
568.34	3.96	572.8	3.92	581.96	3.74	582.85	3.72	586.22	3.6
611.91	3	613.22	3	622.35	3.41	627.63	3.62	628.73	3.62
632.75	3.57	633.36	3.55	639.24	3.68	639.7	3.67	641.61	3.75

647.73	3.37	648.33	3.36	649.11	3.29	652.56	3.13	652.77	3.1
656.5	3	658.12	3.03	658.45	3	669.47	3.73	670.2	3.72
685.13	4	696.19	4	704.67	4.73	705.05	4.74	720.74	4.83
723.32	4.89	725.1	4.92	727.05	4.91	729.39	5	740.94	4.09
742.16	4	747.06	4	752.73	4.25	753.27	4.26	770.48	4.71
772.88	4.71	773.37	4.7	781.4	4.61	785.09	4.62	786.93	4.62
796.96	5	839.98	5	853.57	5.65	859.34	5.8	860.78	5.85
864.61	5.95	866.15	6	879.25	6	881.13	5.89	882.87	5.8
896.38	5	917.83	5	917.94	5.05	918.86	5.29	919.43	5.65
920.11	6	921.67	6	924.1	6.54	924.8	6.64	926.79	7
927.9	7	929.59	7.19	930.25	7.23	931.22	7.36	936.94	7.9
937.28	7.95	938.03	8	938.93	8	940.65	8.63	941.27	8.84
941.82	8.94	943.01	8.9	949.7	8	950.69	8	954.34	7.68
961.71	7	962.16	7	964.56	6.64	965.96	6.34	967.28	6
969.35	5	972.39	4.18	973.58	.85	982.83	-3.43	991.45	-3.53
998.98	-1.8	1009.64	.88	1013.95	2.79	1014.24	2.79	1016.89	3
1017.37	3	1017.88	3.3	1018.86	4	1019.54	4.4	1021.09	5
1023.17	5.6	1023.94	5.85	1024.39	6.7	1027.7	7	1039.66	7

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.105	962.16	.035	1023.94	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
962.16	1023.94	518.12	331.38	299.29	.1	.3

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 4225

INPUT
Description:
Station Elevation Data num= 146

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	9.79	13.6	9.09	15.14	9	16.35	9	27.47	8.67
33.11	8.51	36.8	8.41	37.45	8.4	41.13	8.31	41.28	8.31
45.34	8.26	46.57	8.25	61.42	8	66.56	8	70.11	7.94
72.92	7.9	76.97	7.81	86.98	7.57	87.68	7.56	114.11	7
121.36	7	123.12	6.95	137.58	6.59	138.98	6.56	188.1	6.24
211.23	6	218.69	6	224.5	5.74	233.7	5.43	235.65	5.38
244.45	5	249.03	5	254.06	5.92	254.56	6	257.96	6
267.05	6.92	267.18	6.92	267.96	7	268.92	7.19	271.84	7.73
272.48	7.8	272.92	7.81	273.27	7.8	273.87	7.81	274.07	7.79
274.53	7.8	275.61	7.79	275.9	7.76	277.95	7.69	278.65	7.64
284.36	7	285.31	7	288.94	7.15	290.99	7.14	299.15	7.01
299.9	7	301.33	7	302.99	7.06	313.67	7.02	313.85	7
348.15	7	348.36	6.97	351.39	6.63	351.5	6.64	366.06	6
374.79	6	402.98	5.27	404.3	5.23	414.53	5.06	417.07	5.04
418.38	5.04	422.04	5.14	422.76	5.17	428.34	5.19	428.8	5.2
439.94	5.52	441.21	5.55	454.08	5.72	455.42	5.74	464.84	5.98
465.43	6	477.09	6	534.93	5.12	541.11	5.03	541.25	5.02
543.19	5	553.94	4.51	556.17	4.42	559.08	4.29	561.18	4.19
563.81	4.08	565.51	4	699.39	4	700.47	4.05	704.49	4.28
705.21	4.28	720.15	4.57	730.64	4	732.63	4	743.86	4.75
744.35	4.8	744.67	4.8	745.48	4.87	746.74	5	747.35	5
749.42	5.32	752.04	5.69	754.08	6	754.25	6	755.33	6.37
756.25	6.76	756.59	6.86	757.96	6.94	758.07	6.96	759.75	6.91
760.12	6.91	760.46	6.93	763.61	6.82	765.42	6.73	765.84	6.7
770.65	6.46	771.01	6.43	775.42	6.15	775.49	6.15	779.54	6
782.72	6	783.39	5.86	784.82	5.55	787.44	5	790.8	4
791.44	3.85	795.95	3	798.11	1.12	811.14	-2.13	820.94	-2.3
830.96	-1.35	839.88	.25	840.94	3	841.57	3.31	842.9	4
843.19	4.18	845.47	5.54	846.25	6	847.68	7	848.36	7.07
859.64	7.62								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val

```
*********************************************
       0    .105  784.82    .035  847.68    .055

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        784.82  847.68           434.42  325.29  316.79             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
       0     506       8       F

CROSS SECTION


RIVER: East Riser Ditch
REACH: Middle             RS: 3899

INPUT
Description:
Station Elevation Data    num=     119
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*******************************************************************************
       0    7.29    2.72    7.12    3.25    7.08    4.54       7    4.62       7
    5.77    6.96     8.5    6.87    9.19    6.85   10.89    6.79   11.67    6.76
   11.84    6.75   11.94    6.75   13.49    6.68   15.39     6.6   15.96    6.57
   18.89    6.44   20.91    6.34   25.26    6.16   26.51    6.11   26.59    6.11
   28.88       6   29.34       6   30.94    5.87    31.1    5.85   31.91    5.78
   35.53    5.44   39.18    5.19   39.75    5.15   40.33    5.12   42.45       5
  173.13       5  176.37    4.94  178.01    4.93  183.01    4.91  187.22    4.89
  189.28    4.89  193.26    4.87     194    4.88  194.06    4.88  195.35    4.87
  197.18    4.85  201.42    4.81  201.63     4.8  225.94       5   462.3       5
  463.49       5  465.09       5  465.15       5  465.19       5  466.61       5
  467.43       5  495.72       5  498.52       5  498.73       5  502.44       5
  502.69       5  502.91       5  505.53       5  507.22       5  508.24       5
  513.55       5  515.02       5  528.63       5  528.83       5  528.94       5
  531.15       5  531.21       5  531.24       5   531.5       5  531.51       5
   531.8       5  537.17     5.5  539.91    5.75  540.58     5.8  542.79       6
   546.6    6.23  550.44    6.46  551.96    6.55  554.75    6.72  557.72     6.9
  559.32       7  559.36       7  559.37       7  559.58       7  564.16       7
  564.31       7  572.23       7  578.17       7  582.98       7   583.1       7
  583.57       7  584.27    6.82  584.45    6.77  585.93    6.36   586.3    6.28
  587.35       6  588.73    5.03  588.79       5  590.92    4.38  591.36    4.26
  591.99       4  595.54    3.69  597.16    1.26  610.19   -2.13  619.77    -2.3
  629.49   -1.35  638.61     .25  639.08    4.03  640.83       5  642.12    5.85
  642.36       6  642.96     6.4  643.38    6.68  643.52    6.76  644.16    7.07
  651.83    7.62   653.3       7  656.82       7  663.29       7

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0    .105  584.45    .035  644.16    .055

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        584.45  644.16           282.22  253.55  249.81             .1       .3

CROSS SECTION


RIVER: East Riser Ditch
REACH: Middle             RS: 3646

INPUT
Description:
Station Elevation Data    num=     116
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*******************************************************************************
       0       7   26.78       7  158.93    6.12  170.82       6  265.12       6
   295.8    5.88   299.8    5.88  300.02    5.89  308.19    5.88  323.47       6
  403.01       6  406.85    5.93  407.44    5.91  407.98    5.91  409.57    5.84
  410.79    5.79  411.12    5.77  411.96    5.73  413.64    5.67  413.95    5.66
  415.04    5.61  418.42    5.48  419.29    5.44  420.48     5.4  430.06       5
  432.84       5  442.94    4.84   445.7     4.8  453.97    4.67  467.96    4.44
  468.19    4.44   496.5       4   530.6       4  534.97    4.05  546.89    4.18
```

563.18	4.35	613.39	4.82	613.63	4.81	613.76	4.82	614.41	4.82
624.41	4.97	625.56	5	628.19	5	631.79	5.08	642.91	5.22
648.06	5.31	659.69	5.52	684.11	5.89	684.39	5.89	684.52	5.89
685.02	5.89	685.46	5.89	685.52	5.89	685.54	5.89	685.57	5.89
687.99	5.96	688.7	5.98	688.72	5.98	688.74	5.98	688.85	5.98
689.43	5.99	689.45	5.99	689.51	5.99	690.36	5.99	690.38	5.99
692.46	6	696.93	6	697.4	6	700.05	6	700.51	6
701.06	6	704.32	6	704.96	6	704.97	6	704.98	6
706.19	6.02	711.21	6.08	715.26	6.12	715.56	6.12	717.83	6.22
718.45	6.25	719.02	6.27	720.78	6.33	725.99	6.52	736.46	7
737.01	7	737.12	7	737.64	7	738.57	7	739.32	7
743.9	6.5	750.56	.55	775.17	-2.03	786.2	.25	797.84	4.7
798.2	5	799.25	5.85	799.44	6	800.37	6.73	800.71	7
801.12	7.13	801.48	7.23	802.79	7.6	803.75	8	803.8	8
804.2	8	806.59	8.29	806.81	8.31	806.95	8.32	808.57	8.28
822.05	8	822.3	8	825.67	8	825.96	8	826.15	8
826.38	8								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.105	743.9	.035	801.48	.055

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

Left	Right	Left	Channel	Right	Coeff Contr.	Expan.
743.9	801.48	172.35	200.7	200.49	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	670	6.5	F

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 3445

INPUT
Description:
Station Elevation Data num= 121

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	7	96.36	7	129.28	6.22	131.13	6.16	131.28	6.16
133.11	6.11	135.06	6.07	135.18	6.07	137.73	6.02	137.78	6.02
138.59	6	265.98	6	297.16	5.54	305.14	5.46	306.05	5.45
307.9	5.44	309.65	5.43	315.38	5.39	334.62	5.24	348.64	5.24
375.21	5	424	5	427.29	5.32	427.66	5.32	427.92	5.33
431.08	5.24	475.19	5	538.94	5	540.32	5.05	548.4	5.35
550.66	5.43	553.66	5.54	555.11	5.59	568.44	6	625.76	6
625.78	6	625.96	6	626.55	6	627.18	6	629.93	6
630.35	6	632.85	6	632.96	6	633.12	6	633.38	6
633.62	6	641.08	6	669.17	6	670.37	6	670.51	6
672.31	6	672.66	6	673.11	6	673.13	6	674.25	6
674.3	6	676.11	6	676.23	6	681.01	6	681.74	6
685.84	6	693.48	6	693.51	6	693.96	6	694.11	6
695.97	6	705.44	6.51	717.83	7	717.91	7	717.92	7
718.43	7.06	720.21	7.23	720.7	7.25	720.84	7.26	722.01	7.36
722.96	7.43	723.84	7.47	724.53	7.52	724.97	7.55	725.8	7.6
726.17	7.62	726.46	7.64	733.82	7.26	734.43	7.17	734.71	7.16
735.61	7	736.75	6.74	737.42	6.62	737.99	6.49	738.31	6.43
738.95	6.33	740.45	6.09	740.62	6.07	740.73	6.05	741.02	6
741.05	6	741.91	5.71	743	.34	766	-1.93	785.23	.46
789.53	2.33	789.79	3.08	790.01	3.18	790.27	3.31	790.96	4
791.49	4.53	791.96	5	792.62	5.54	793.18	6	793.79	6.47
794.26	6.73	794.8	7	796.9	7.45	797.65	7.64	798.4	8
799.47	8.43	800.11	8.66	800.92	9	802.12	9	803.77	9
822.49	9								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.105	738.95	.035	798.4	.055

```
Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        738.95   798.4            101.7  203.59   227.1             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
       0     570     6.5       F
```

LATERAL STRUCTURE

RIVER: East Riser Ditch
REACH: Middle RS: 3298

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS =
Deck/Roadway Width = 20
Weir Coefficient = 2.6
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 35

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6.58	6.04	6	6.8	6	6.96	6	7.11	6
7.34	6	7.6	6	9.86	5.88	31.06	5	31.69	5
31.91	5	115.67	5.78	117.51	5.8	118.44	5.81	124.65	5.85
131.01	5.89	133.54	5.92	134.79	5.93	134.84	5.93	134.86	5.93
134.94	5.93	135.08	5.93	135.55	5.93	136.64	5.94	137.17	5.95
148.58	6	149.08	6	149.63	6	150.98	6	154.65	6
155.43	6	155.78	6	156.73	6	156.86	6	158.56	6

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #100 Yr Lat Struct

E.G. US. (ft)	5.37	Weir Sta US (ft)	9.86
W.S. US. (ft)	5.37	Weir Sta DS (ft)	115.67
E.G. DS (ft)	5.37	Min El Weir Flow (ft)	5.00
W.S. DS (ft)	5.36	Wr Top Wdth (ft)	48.73
Q US (cfs)	161.36	Weir Max Depth (ft)	0.37
Q Leaving Total (cfs)	11.48	Weir Avg Depth (ft)	0.19
Q DS (cfs)	187.69	Weir Flow Area (sq ft)	9.06
Perc Q Leaving	6.98	Weir Coef (ft^1/2)	2.600
Q Weir (cfs)	11.48	Weir Submerg	0.00
Q Gates (cfs)		Q Gate Group (cfs)	
Q Culv (cfs)	0.00	Gate Open Ht (ft)	
Q Lat RC (cfs)		Gate #Open	
		Gate Area (sq ft)	
Q Breach (cfs)		Gate Submerg	
Breach Avg Velocity (ft/s)		Gate Invert (ft)	
Breach Flow Area (sq ft)		Gate Weir Coef	

Warning: Divided flow computed for this cross-section.

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 3242

INPUT
Description:
Station Elevation Data num= 120

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	7	41.25	7	62.31	6.32	69.63	6	213.76	6
230.51	5.89	272.98	5.94	283.37	5.96	285.32	5.95	285.35	5.95
286.83	5.96	288.76	5.97	292.42	5.97	293.48	5.98	294.9	6
399.29	6	404.01	5.89	404.38	5.89	405.29	5.9	405.32	5.9
412.85	5.74	413.14	5.74	501.96	5.73	502.86	5.73	505.95	5.75

526.08	6	603.79	6	609.17	6.19	613.05	6.33	624.02	6.7
631.49	6.94	632.99	6.99	633.28	7	644.91	7	644.98	7
648.75	7	657.28	6.34	657.61	6.25	657.62	6.25	657.64	6.25
657.65	6.25	658.15	6.28	658.17	6.27	662.34	6.35	664.52	6.58
665.39	6.65	668.62	7	668.86	7	670.23	7.23	670.97	7.35
672.36	7.6	674.74	8	674.9	8	675.06	8	675.86	8
675.91	8	675.96	8	675.99	8	676.06	8	678.58	7.91
678.79	7.92	678.96	7.91	679.07	7.91	679.26	7.9	679.49	7.89
685.13	7	685.2	7	685.54	7	686.33	7	686.78	7
687.01	7	687.39	7	687.4	7	687.44	7	687.97	7
689.38	6.9	689.9	6.88	690.28	6.87	708.87	6	713.3	1.21
732.1	-1.69	748.7	.72	749.95	3.96	750.07	3.96	750.55	4
750.67	4	751.25	4.22	752.24	4.5	753.23	4.71	756.69	5
757.05	5	761.27	5	762.73	5	762.79	5	764.47	5
766.96	5	767.25	5	769	5	770.17	5	772.11	5
772.14	5	772.29	5	772.96	5	773.68	5	774.09	5
774.48	5	775.3	5	775.61	5	776.41	5	777	5
777.25	5	777.32	5	777.48	5	778.43	5	790.37	5.12
809.5	5.32	835.68	5.56	836.27	5.56	837.49	5.57	850.33	5.66

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.105	708.87	.035	756.69	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
708.87	756.69	119.4	201.24	218.17	.1	.3

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 3040

INPUT
Description:
Station Elevation Data num= 137

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	7	6.59	7	66.77	6.5	67.3	6.49	75.73	6.42
76.63	6.42	77.21	6.41	108.17	6.24	117.03	6.16	119.66	6.15
125.99	6.12	128.6	6.12	152.57	6	490.22	6	492.17	6
492.41	6	492.54	6	492.91	6	497.57	6	498.5	6
498.83	6	499	6	499.35	6	505.65	6	506.36	6
529.24	6	552.46	6	562.31	6	562.38	6	562.57	6
563.1	6	563.42	6	564.62	6	564.69	6	564.83	6
576.4	6.25	591.55	6.48	592.04	6.49	594.53	6.51	596.16	6.53
599.82	6.58	600.59	6.6	602.3	6.61	618.51	7	618.74	7
618.99	7	621.37	7	621.64	7	622.9	7	653.26	7
653.35	7	655.3	7	656	7	656.01	7	656.32	7
657.4	7	657.75	7	658.06	7	669.98	7	670.16	7
671.49	7	671.65	7	672.8	7	673.52	7	673.95	7
674.84	7	675.19	7	680.94	6.15	682.71	6	683.5	5.82
683.92	5.64	684.18	5.53	685.46	5	685.98	4.75	686.67	4.47
687.62	4	688.22	3.72	689.72	3	690.24	.59	708.3	-1.29
730.4	.44	731.94	3.87	732.66	4	733.04	4.06	733.97	4.19
734.47	4.25	735.88	4.53	742.83	5	744.11	5	744.88	5
745.68	5	746.24	5	758.23	5	760.94	5	761.15	5
762.04	5	762.28	5	763.94	5	768.97	5	769.78	5
770.95	5	771.77	5	779.86	5	779.9	5	780.02	5
780.76	5	790.72	5.07	791.27	5.08	801.35	5.17	804.98	5.19
892.79	6	894.31	6	894.87	6	895.16	6	895.28	6
895.43	6	899.44	6	899.63	6	901.28	6	907.1	6
908.16	6	950.43	6.66	951.02	6.67	962.25	7	963.7	7
964.11	7	964.58	7	965.82	7	965.88	7	965.95	7
966.02	7	967.19	7	967.67	7	967.81	7	968.55	7
969.14	7	971.66	7						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val

```
       0    .105  682.71    .035  735.88    .055

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        682.71  735.88           199.11  194.14  195.05             .1       .3

CROSS SECTION


RIVER: East Riser Ditch
REACH: Middle             RS: 2846

INPUT
Description:
Station Elevation Data    num=     128
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
       0    7.12     2.9       7   29.24       7   65.51     6.4   66.43     6.4
   66.48    6.39  102.06       6  413.97       6  415.15       6  416.19       6
  421.89       6  422.41       6  422.75       6  423.72       6  425.15       6
   426.3       6  427.43       6  427.81       6  429.79       6  438.16    6.28
   438.3    6.28  440.57    6.29  443.18     6.3  443.23     6.3  443.28     6.3
  443.39     6.3  445.62    6.35  448.55    6.44  449.13    6.45  449.48    6.46
   449.7    6.47  450.87     6.5   451.8    6.53  470.11       7  470.32       7
  470.59       7  482.03    6.35   482.1    6.35  482.53    6.31   483.3    6.23
  484.57    6.11  485.37    6.02  485.55       6  485.97       6  488.64       6
  488.78       6  488.88       6  489.89    5.78  490.27    5.57   490.3    5.57
  491.28       5  493.03    4.27  493.57       4  493.62       4   498.8     .61
  516.05   -1.29  534.48     .62  537.83    1.82  541.39    4.85  549.06       5
  549.21       5  549.37       5  549.44       5  549.47       5  549.56       5
  550.27       5  553.07       5  555.13       5  555.74       5  557.37       5
  561.48       5  562.06       5     565       5  565.66       5   570.4       5
  570.56       5  570.71       5  572.94       5  577.43       5  578.59       5
  578.94       5  579.35       5  579.72       5   579.8       5  581.04       5
  583.26       5  584.32       5  584.99       5  586.09       5  586.24       5
   586.3       5  586.31       5  586.33       5  587.77       5     589       5
  635.49    5.46  691.83       6  692.84       6  695.42       6  695.94       6
  696.28       6  696.32       6  696.66       6  709.95    6.34  711.54    6.38
  712.51     6.4  715.48    6.48  721.12    6.63  722.72    6.67  736.41       7
  736.52       7  736.67       7   736.9       7  737.01       7  737.27       7
  737.42       7   737.6       7  737.63       7  750.92       7  752.99       7
  753.34       7  760.04       7  764.01       7   764.1       7  764.15       7
  764.19       7   764.2       7  774.26       7

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0    .105  489.89    .035  541.39     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        489.89  541.39           185.17  191.64  190.23             .1       .3

CROSS SECTION


RIVER: East Riser Ditch
REACH: Middle             RS: 2655

INPUT
Description:
Station Elevation Data    num=     129
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
       0       7   64.08       7   83.42    6.83      84    6.83  108.41    6.77
  109.25    6.77  125.87     6.8  126.21     6.8  126.77    6.79  173.07       6
  264.92       6  265.09       6  265.38       6  265.48       6  265.93       6
  266.33       6  272.35       6  272.97       6  273.57       6  274.77       6
   280.1       6  280.19       6  283.43       6  284.75       6  290.15       6
  295.13       6  295.17       6  295.21       6  295.44       6  295.61       6
  304.68       6     309       6  311.78       6  312.44       6  357.49       6
  357.55       6  360.09       6   360.1       6  360.46       6  360.63       6
  361.17       6  361.38       6  363.54     6.1  366.16    6.22  366.28    6.23
```

366.37	6.23	367.15	6.26	367.53	6.28	373.7	6.66	375.5	6.7
376.66	6.77	376.94	6.79	378.43	6.88	380.09	6.87	380.82	6.86
394.38	7	394.72	7	395.23	7	410.12	7	411.42	7
412.2	7	414.39	7	415.59	7	416.93	7	418.12	7
418.16	7	418.45	7	418.58	7	419.37	7	420.48	7
423.5	7	424.75	7	425.16	7	427.14	7	427.4	7
427.98	7	428.26	7	428.58	7	430.09	6.61	430.96	6.28
431.7	6.01	431.71	6	432.22	5.76	434.2	5	435.12	4.75
435.16	4.73	435.18	4.72	436.3	4.4	438.74	.8	452.31	-.18
463.51	-.1	474.08	.72	479.08	2.97	482.17	3.4	484.68	4
485.37	4.16	485.56	4.2	486.31	4.37	487.29	4.59	488.57	4.9
488.97	5	488.98	5	490.88	5	497.98	5	535.89	5
536.48	5	605.76	5.77	632.58	6	632.84	6	635.49	6
635.71	6	635.92	6	636.12	6	636.61	6	637.15	6
637.32	6	637.58	6	661.87	6.77	662.4	6.79	667.66	6.96
669.08	7	669.11	7	669.8	7	670.79	7	676.47	7
677.58	7	677.61	7	682.27	7	689.63	7		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.105	430.09	.035	486.31	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
430.09	486.31	196.22	190.35	189.68	.1	.3

LATERAL STRUCTURE

RIVER: East Riser Ditch
REACH: Middle RS: 2570

INPUT
Description:
Lateral structure position = Left overbank
Distance from Upstream XS =
Deck/Roadway Width = 30
Weir Coefficient = 2.8
Weir Flow Reference = Water Surface

Weir Embankment Coordinates num = 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6.85	66	6.83	164.5	6.663	255.5	6.76	300.5	6
437.5	5.5	522.5	5.5	592.5	5.5	627.5	6	698.5	7

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #100 Yr Lat Struct

E.G. US. (ft)	5.34	Weir Sta US (ft)	
W.S. US. (ft)	5.33	Weir Sta DS (ft)	
E.G. DS (ft)	5.30	Min El Weir Flow (ft)	5.50
W.S. DS (ft)	5.23	Wr Top Wdth (ft)	
Q US (cfs)	187.69	Weir Max Depth (ft)	
Q Leaving Total (cfs)	0.00	Weir Avg Depth (ft)	
Q DS (cfs)	225.29	Weir Flow Area (sq ft)	
Perc Q Leaving	0.00	Weir Coef (ft^1/2)	2.600
Q Weir (cfs)	0.00	Weir Submerg	
Q Gates (cfs)		Q Gate Group (cfs)	
Q Culv (cfs)	0.00	Gate Open Ht (ft)	
Q Lat RC (cfs)		Gate #Open	
		Gate Area (sq ft)	
Q Breach (cfs)		Gate Submerg	
Breach Avg Velocity (ft/s)		Gate Invert (ft)	
Breach Flow Area (sq ft)		Gate Weir Coef	

Warning: Divided flow computed for this cross-section.

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 2464

INPUT
Description:
Station Elevation Data num= 115

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	7	124.89	7	125.91	6.99	125.96	6.99	128.17	6.95
128.63	6.94	130.27	6.9	132.99	6.82	134.14	6.79	136.11	6.72
153.56	6.38	171.89	6	185.14	6	190.46	5.47	190.75	5.45
191.33	5.43	191.87	5.4	192.14	5.41	206.15	5.4	206.59	5.41
207.24	5.43	213.68	6	304.69	6	323.16	5.74	340.39	6
380.23	6	385.47	6.14	386.94	6.17	395.73	6	423.97	6
424.33	6	424.83	6	424.99	6	425.52	6	427.44	5.22
428.38	5	429.24	4.73	430.19	4.39	430.94	4.13	434.54	.95
449.39	-.56	451.6	-.61	471.4	.35	479.35	3	481.5	3.54
481.96	3.63	482.33	3.7	484.08	4	484.21	4	484.29	4
484.4	4	484.46	4	484.49	4	486.46	4.37	487.41	4.32
489.39	4.48	489.84	4.51	490.42	4.49	510.42	5	510.99	5
522.26	5	522.97	5	524.34	5	525.34	5	550.49	5
550.51	5	550.52	5	550.54	5	550.61	5	551.57	5
551.61	5	574.8	5.31	588.91	5.49	629.63	6	630.95	6
630.98	6	631.16	6	631.26	6	634.73	6.09	637.14	6.15
637.47	6.15	638.5	6.18	647.58	6.41	648.47	6.44	649.1	6.45
674.4	7	675.03	7	675.3	7	677.99	7	681.32	7
681.76	7	682.29	7	682.44	7	684.75	7	685.12	7
685.14	7	685.16	7	685.38	7	685.42	7	685.46	7
735.44	7	735.61	7	736.37	7	736.76	7	737.13	7
737.28	7	738.2	7	738.33	7	738.39	7	740.23	7
740.56	7	740.81	7	741.83	7	744.47	7	745.32	7

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.105	427.44	.035	484.08	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
427.44	484.08	214.19	202.18	201.33	.1	.3

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 2262

INPUT
Description:
Station Elevation Data num= 102

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	7.19	2	7	2.38	7	2.79	6.98	18.12	6.54
21.84	6.44	22.45	6.43	23.06	6.42	24.17	6.39	25.43	6.36
25.85	6.35	30.32	6	413.23	6	413.3	6	413.32	6
413.49	6	413.61	6	414.23	6	414.3	6	414.43	6
414.44	6	414.75	6	417.02	6	417.31	6	418.98	6
422.55	6	425.82	6	426.49	6	431.77	6	433.46	6
434.72	6	435.06	6	435.12	6	435.34	6	439.44	6
451.78	6	461.56	6	465.35	6	465.48	6	465.93	6
466.55	6	467.95	6	468.28	6	468.52	6	473.4	6
474.35	6	474.76	6	474.86	6	476.09	5.89	477.2	5.79
479.32	5.46	480	5.33	481.04	5.16	481.4	5.12	482.02	5
482.52	4.87	484.79	.42	490.14	.26	504.47	-.97	521.8	.82
531.43	4	531.55	4	531.59	4	532.11	4	548.76	4.24
557.82	4.37	560.23	4.4	563.36	4.44	569.94	4.53	570.06	4.53
603.61	5	604.43	5	605.04	5	605.1	5	605.43	5
605.56	5	606.11	5	606.4	5	606.41	5	606.43	5
616.91	5.13	622.75	5.2	625.33	5.23	632.42	5.33	642.03	5.45
649.16	5.55	680.2	5.95	683.89	6	683.92	6	684.01	6

```
  691.76    6.24  715.34       7  715.39       7  716.08       7   716.1       7
  716.31       7  717.05       7  732.07       7  733.67       7  738.96       7
  741.43       7  742.18       7

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*******************************************
       0    .105  476.09    .035  531.43     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        476.09  531.43           241.66  247.79  243.45             .1       .3

CROSS SECTION


RIVER: East Riser Ditch
REACH: Middle             RS: 2014

INPUT
Description:
Station Elevation Data    num=     123
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
       0       6  231.62       6  231.99    6.02  232.02    6.02  232.36    6.05
  244.29     6.4  246.21     6.4   257.3    6.21  257.56    6.21  260.09    6.17
  260.36    6.16  272.73    6.85     274       7  301.72       7  302.86       7
  303.82       7  304.84       7  306.72       7  306.81       7   307.2       7
  307.21       7  307.22       7  310.25    7.16  313.06    7.29  314.22    7.35
  315.81    7.43  317.77     7.5  319.08    7.58  328.85       8  328.88       8
  328.94       8  329.14       8  330.87       8  330.98       8  331.33       8
   331.6       8  333.08       8  334.69       8  335.83       8  336.75       8
  338.47       8  338.86       8  339.67       8  340.27       8  344.82       8
  344.92       8  344.96       8   345.1       8  345.62       8  346.43       8
   346.5       8   346.6       8  346.75    7.99  348.74    7.91  351.03    7.78
  353.06    7.62  354.13    7.53  360.23       7  362.54    6.16  362.77    6.08
  363.02       6  363.14    5.96  364.02    5.65  365.94       5  366.13    4.91
  366.44    4.81  367.15    4.56  367.44    4.46  368.86       4   369.4    3.81
  375.84     .22  382.74    -.99  396.29   -1.38  403.64     .02  409.14     .41
  412.79       4  413.32    4.24  413.79    4.43  417.08       5  417.69       5
  418.58       5  419.59       5  420.17       5  420.67       5  422.28    5.14
  435.21       5  435.66       5  437.29       5  437.66       5  438.74       5
  439.47       5   444.7       5  447.76       5  459.27       5  459.35       5
  459.44       5  459.47       5  460.43       5  465.29       5  470.99       5
   471.2       5  471.46       5  472.74       5  477.45       5   543.3    5.69
  543.43    5.69  567.99       6  568.85       6  568.92       6  569.09       6
   569.2       6  569.21       6  575.84    6.25  588.42    6.74  588.69    6.75
  588.84    6.75  595.14       7   595.2       7  595.26       7  599.87       7
  599.88       7  608.71       7  625.04       7

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*******************************************
       0    .105  363.14    .035  417.08     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        363.14  417.08           221.23  150.67  128.44             .1       .3

CROSS SECTION


RIVER: East Riser Ditch
REACH: Middle             RS: 1864

INPUT
Description:
Station Elevation Data    num=      78
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
       0       5    2.61       5     3.3       5    3.54       5    3.71       5
    3.82       5    3.89       5    3.98       5    4.38       5    4.42       5
    4.46       5    4.74       5    4.86       5    5.23       5    5.28       5
```

5.73	5	6.11	5	6.44	5	6.79	5	19.94	5
19.97	5	21.39	5	21.41	5	22.62	5	22.75	5
25.42	5	28.35	5	37.44	5	39.67	5	43.36	5
43.43	5	43.62	5	43.98	5	44.41	5	44.51	5
47.09	5.03	47.6	5.04	48.97	5.05	91.69	5.21	95.8	5.24
96.53	5.25	99.42	5.23	99.55	5.23	100.06	5.24	100.59	5.24
100.95	5.24	101.63	5.25	130.73	6.04	140.43	-2.4	156.43	-2.4
162.53	5.45	170.51	5	171.68	5	172.39	5	172.99	5
173.45	5	187.23	5.08	196.93	5.15	200.85	5.17	245.32	5.46
317.16	5.92	329.16	6	330.11	6	330.37	6	330.59	6
340.39	6.38	342.18	6.44	342.78	6.46	352.32	6.79	355.02	6.89
357.83	7	358.09	7	358.17	7	358.22	7	358.35	7
358.64	7	359.24	7	377.77	7				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	130.73	.02	162.53	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
130.73	162.53	1873.19	1863.54 1803.49	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	142.43	6.5	F
154.43	377.77	6.5	F

SUMMARY OF MANNING'S N VALUES

River:East Riser Ditch

Reach	River Sta.	n1	n2	n3
Middle	9188	.08	.035	.065
Middle	9049	Lat Struct		
Middle	9001	.08	.035	.065
Middle	8694	.08	.035	.065
Middle	8436	.08	.035	.065
Middle	8194	.08	.035	.065
Middle	8003	.08	.035	.065
Middle	7739	.105	.035	.05
Middle	7538	.105	.035	.05
Middle	7445	Lat Struct		
Middle	7318	.11	.035	.06
Middle	7113	.11	.035	.065
Middle	7042	.11	.035	.065
Middle	6949	.11	.035	.065
Middle	6837	.11	.035	.065
Middle	6823	Lat Struct		
Middle	6713	.11	.035	.06
Middle	6619	.11	.035	.06
Middle	6431	.105	.035	.06
Middle	6219	.105	.035	.06
Middle	6019	.105	.035	.06
Middle	5818	.105	.035	.06
Middle	5641	.105	.035	.06
Middle	5502	Lat Struct		
Middle	5451	.105	.035	.055
Middle	5245	.105	.035	.055
Middle	5007	.105	.035	.055
Middle	4844	.105	.035	.055
Middle	4556	.105	.035	.055
Middle	4225	.105	.035	.055
Middle	3899	.105	.035	.055
Middle	3646	.105	.035	.055
Middle	3445	.105	.035	.055
Middle	3298	Lat Struct		
Middle	3242	.105	.035	.055
Middle	3040	.105	.035	.055
Middle	2846	.105	.035	.06

*Middle	*	2655	* .105*	.035*	.06*
*Middle	*	2570	*Lat Struct*	*	*
*Middle	*	2464	* .105*	.035*	.06*
*Middle	*	2262	* .105*	.035*	.06*
*Middle	*	2014	* .105*	.035*	.06*
*Middle	*	1864	* .04*	.02*	.04*

SUMMARY OF REACH LENGTHS

River: East Riser Ditch

* Reach	*	River Sta.	* Left *	Channel *	Right *
*Middle	*	9188	* 188.07*	187.35*	187.01*
*Middle	*	9049	*Lat Struct*	*	*
*Middle	*	9001	* 309.59*	307.19*	307.22*
*Middle	*	8694	* 263.03*	257.77*	257.21*
*Middle	*	8436	* 236.17*	241.64*	242.83*
*Middle	*	8194	* 198.33*	191.32*	190.19*
*Middle	*	8003	* 265.16*	264.17*	263.66*
*Middle	*	7739	* 195.55*	200.78*	201.98*
*Middle	*	7538	* 215.06*	219.69*	217.71*
*Middle	*	7445	*Lat Struct*	*	*
*Middle	*	7318	* 195.98*	205.4*	206.71*
*Middle	*	7113	* 65.29*	71.33*	73.51*
*Middle	*	7042	* 94.37*	92.36*	91.56*
*Middle	*	6949	* 115.65*	112.38*	112.29*
*Middle	*	6837	* 111.2*	123.83*	125.25*
*Middle	*	6823	*Lat Struct*	*	*
*Middle	*	6713	* 94.88*	94.46*	92.3*
*Middle	*	6619	* 185.45*	187.85*	187.68*
*Middle	*	6431	* 197.17*	211.97*	212.4*
*Middle	*	6219	* 192.21*	200.14*	198.86*
*Middle	*	6019	* 172.41*	200.47*	202.68*
*Middle	*	5818	* 168.46*	176.9*	174.99*
*Middle	*	5641	* 189.86*	190.15*	189.91*
*Middle	*	5502	*Lat Struct*	*	*
*Middle	*	5451	* 144.09*	205.59*	205.73*
*Middle	*	5245	* 125.6*	238.14*	277.91*
*Middle	*	5007	* 164.23*	163.72*	163.88*
*Middle	*	4844	* 301.46*	287.49*	287.31*
*Middle	*	4556	* 518.12*	331.38*	299.29*
*Middle	*	4225	* 434.42*	325.29*	316.79*
*Middle	*	3899	* 282.22*	253.55*	249.81*
*Middle	*	3646	* 172.35*	200.7*	200.49*
*Middle	*	3445	* 101.7*	203.59*	227.1*
*Middle	*	3298	*Lat Struct*	*	*
*Middle	*	3242	* 119.4*	201.24*	218.17*
*Middle	*	3040	* 199.11*	194.14*	195.05*
*Middle	*	2846	* 185.17*	191.64*	190.23*
*Middle	*	2655	* 196.22*	190.35*	189.68*
*Middle	*	2570	*Lat Struct*	*	*
*Middle	*	2464	* 214.19*	202.18*	201.33*
*Middle	*	2262	* 241.66*	247.79*	243.45*
*Middle	*	2014	* 221.23*	150.67*	128.44*
*Middle	*	1864	* 1873.19*	1863.54*	1803.49*

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: East Riser Ditch

* Reach	*	River Sta.	* Contr. *	Expan. *	
*Middle	*	9188	* .1*	.3*	
*Middle	*	9049	*Lat Struct*	*	

```
*Middle          *    9001    *       .1*       .3*
*Middle          *    8694    *       .1*       .3*
*Middle          *    8436    *       .1*       .3*
*Middle          *    8194    *       .1*       .3*
*Middle          *    8003    *       .1*       .3*
*Middle          *    7739    *       .1*       .3*
*Middle          *    7538    *       .1*       .3*
*Middle          *    7445    *Lat Struct*        *
*Middle          *    7318    *       .1*       .3*
*Middle          *    7113    *       .1*       .3*
*Middle          *    7042    *       .1*       .3*
*Middle          *    6949    *       .1*       .3*
*Middle          *    6837    *       .1*       .3*
*Middle          *    6823    *Lat Struct*        *
*Middle          *    6713    *       .1*       .3*
*Middle          *    6619    *       .1*       .3*
*Middle          *    6431    *       .1*       .3*
*Middle          *    6219    *       .1*       .3*
*Middle          *    6019    *       .1*       .3*
*Middle          *    5818    *       .1*       .3*
*Middle          *    5641    *       .1*       .3*
*Middle          *    5502    *Lat Struct*        *
*Middle          *    5451    *       .1*       .3*
*Middle          *    5245    *       .1*       .3*
*Middle          *    5007    *       .1*       .3*
*Middle          *    4844    *       .1*       .3*
*Middle          *    4556    *       .1*       .3*
*Middle          *    4225    *       .1*       .3*
*Middle          *    3899    *       .1*       .3*
*Middle          *    3646    *       .1*       .3*
*Middle          *    3445    *       .1*       .3*
*Middle          *    3298    *Lat Struct*        *
*Middle          *    3242    *       .1*       .3*
*Middle          *    3040    *       .1*       .3*
*Middle          *    2846    *       .1*       .3*
*Middle          *    2655    *       .1*       .3*
*Middle          *    2570    *Lat Struct*        *
*Middle          *    2464    *       .1*       .3*
*Middle          *    2262    *       .1*       .3*
*Middle          *    2014    *       .1*       .3*
*Middle          *    1864    *       .1*       .3*
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APPENDIX C

HYDRAULIC ANALYSIS – EXISTING CONDITIONS: HEC-RAS OUTPUT

HEC-RAS Plan: Ex4QDyn92313spi River: East Riser Ditch Reach: Middle

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Middle	9188	2 Yr	370.80	-0.77	6.21		6.31	0.001625	3.03	323.12	528.80	0.32
Middle	9188	10 Yr	568.10	-0.77	6.64		6.71	0.001260	2.94	561.38	572.70	0.29
Middle	9188	25 Yr	710.00	-0.77	6.84		6.91	0.001242	3.04	678.17	581.65	0.29
Middle	9188	100 Yr	968.60	-0.77	7.13		7.20	0.001285	3.26	847.62	588.47	0.30
Middle	9049		Lat Struct									
Middle	9001	2 Yr	370.77	-0.86	5.82		5.98	0.001843	3.52	203.87	233.25	0.36
Middle	9001	10 Yr	554.88	-0.86	6.20		6.39	0.002203	4.16	324.36	412.25	0.40
Middle	9001	25 Yr	676.88	-0.86	6.41		6.60	0.002192	4.31	416.56	470.20	0.40
Middle	9001	100 Yr	891.54	-0.86	6.73		6.90	0.002022	4.39	573.41	508.03	0.39
Middle	8694	2 Yr	295.41	-1.00	5.68	1.71	5.72	0.000336	1.66	275.07	408.81	0.16
Middle	8694	10 Yr	405.17	-1.00	6.02	2.22	6.07	0.000411	1.95	393.62	666.16	0.18
Middle	8694	25 Yr	476.32	-1.00	6.22	2.49	6.27	0.000417	2.04	495.18	710.30	0.18
Middle	8694	100 Yr	601.37	-1.00	6.53	2.92	6.58	0.000402	2.11	661.42	732.71	0.18
Middle	8436	2 Yr	295.41	-1.12	5.61		5.64	0.000276	1.46	325.25	226.19	0.15
Middle	8436	10 Yr	405.17	-1.12	5.93		5.97	0.000335	1.71	397.57	228.15	0.16
Middle	8436	25 Yr	476.32	-1.12	6.12		6.16	0.000362	1.84	446.24	270.58	0.17
Middle	8436	100 Yr	601.37	-1.12	6.43		6.48	0.000396	2.03	530.28	275.80	0.18
Middle	8194	2 Yr	295.41	-1.24	5.45		5.54	0.000683	2.37	168.30	156.14	0.23
Middle	8194	10 Yr	405.17	-1.24	5.72		5.83	0.000927	2.90	217.64	200.46	0.27
Middle	8194	25 Yr	476.32	-1.24	5.88		6.02	0.001033	3.15	251.47	207.98	0.28
Middle	8194	100 Yr	601.37	-1.24	6.17		6.32	0.001124	3.45	341.16	413.39	0.30
Middle	8003	2 Yr	295.41	-1.33	5.47		5.48	0.000078	0.99	342.38	235.50	0.08
Middle	8003	10 Yr	405.17	-1.33	5.73		5.76	0.000118	1.26	409.65	270.96	0.10
Middle	8003	25 Yr	476.32	-1.33	5.90		5.93	0.000141	1.41	456.12	293.40	0.11
Middle	8003	100 Yr	601.37	-1.33	6.18		6.21	0.000178	1.64	571.32	493.43	0.13
Middle	7739	2 Yr	361.31	-1.45	5.39	1.42	5.44	0.000366	1.93	345.77	505.65	0.17
Middle	7739	10 Yr	516.87	-1.45	5.60	2.04	5.69	0.000587	2.53	394.16	533.88	0.22
Middle	7739	25 Yr	620.82	-1.45	5.74	2.43	5.84	0.000733	2.88	424.78	551.88	0.24
Middle	7739	100 Yr	805.67	-1.45	5.96	3.04	6.10	0.000978	3.44	477.98	582.92	0.28
Middle	7538	2 Yr	361.31	-1.00	5.35	1.19	5.38	0.000195	1.54	612.14	572.32	0.13
Middle	7538	10 Yr	516.87	-1.00	5.55	1.78	5.59	0.000316	2.01	693.18	580.13	0.16
Middle	7538	25 Yr	620.82	-1.00	5.67	2.13	5.72	0.000398	2.28	742.66	585.76	0.18
Middle	7538	100 Yr	805.67	-1.00	5.86	2.70	5.94	0.000539	2.69	826.38	600.65	0.21
Middle	7445		Lat Struct									
Middle	7318	2 Yr	361.31	-1.20	5.32		5.33	0.000177	1.22	922.38	609.91	0.11
Middle	7318	10 Yr	516.87	-1.20	5.50		5.52	0.000275	1.57	1031.58	623.91	0.14
Middle	7318	25 Yr	620.82	-1.20	5.61		5.63	0.000341	1.79	1099.69	654.65	0.16
Middle	7318	100 Yr	805.66	-1.20	5.78		5.82	0.000465	2.15	1216.98	682.92	0.19
Middle	7113	2 Yr	361.31	-1.75	5.30		5.31	0.000085	1.02	1194.59	674.87	0.08
Middle	7113	10 Yr	516.46	-1.75	5.46		5.48	0.000142	1.34	1305.75	681.92	0.11
Middle	7113	25 Yr	617.68	-1.75	5.56		5.58	0.000180	1.52	1372.29	686.96	0.12
Middle	7113	100 Yr	790.99	-1.75	5.72		5.75	0.000245	1.81	1483.56	695.65	0.14
Middle	7042	2 Yr	361.31	-1.50	5.30		5.30	0.000170	0.99	1176.62	705.43	0.11
Middle	7042	10 Yr	516.46	-1.50	5.46		5.46	0.000262	1.27	1290.37	709.40	0.13
Middle	7042	25 Yr	617.68	-1.50	5.55		5.56	0.000321	1.44	1358.02	711.74	0.15
Middle	7042	100 Yr	790.99	-1.50	5.71		5.72	0.000413	1.69	1470.59	715.63	0.17
Middle	6949	2 Yr	361.31	-1.78	5.28		5.29	0.000116	1.16	1148.44	748.03	0.10
Middle	6949	10 Yr	516.46	-1.78	5.43		5.44	0.000190	1.51	1260.25	750.47	0.13
Middle	6949	25 Yr	617.68	-1.78	5.51		5.53	0.000240	1.72	1326.09	751.90	0.14
Middle	6949	100 Yr	790.99	-1.78	5.66		5.69	0.000322	2.03	1435.77	754.27	0.16
Middle	6837	2 Yr	361.31	-2.38	5.25		5.27	0.000190	1.42	880.40	784.57	0.12
Middle	6837	10 Yr	516.46	-2.38	5.38		5.41	0.000312	1.86	985.23	797.61	0.16
Middle	6837	25 Yr	617.68	-2.38	5.46		5.50	0.000395	2.12	1046.34	804.43	0.18
Middle	6837	100 Yr	790.99	-2.38	5.59		5.64	0.000532	2.51	1149.26	815.80	0.21
Middle	6823		Lat Struct									
Middle	6713	2 Yr	335.12	-1.87	5.23		5.25	0.000177	1.25	1026.80	917.99	0.12
Middle	6713	10 Yr	466.35	-1.87	5.36		5.38	0.000268	1.58	1140.79	919.87	0.15
Middle	6713	25 Yr	550.77	-1.87	5.43		5.45	0.000326	1.76	1206.05	920.73	0.16
Middle	6713	100 Yr	695.17	-1.87	5.55		5.58	0.000418	2.04	1315.48	921.97	0.18

HEC-RAS Plan: Ex4QDyn92313spi River: East Riser Ditch Reach: Middle (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Middle	6619	2 Yr	314.91	-1.76	5.21		5.23	0.000174	1.30	913.06	953.87	0.12
Middle	6619	10 Yr	427.01	-1.76	5.33		5.35	0.000254	1.61	1023.10	958.49	0.14
Middle	6619	25 Yr	497.98	-1.76	5.39		5.42	0.000305	1.78	1085.87	962.17	0.16
Middle	6619	100 Yr	618.98	-1.76	5.50		5.54	0.000384	2.03	1192.46	967.77	0.18
Middle	6431	2 Yr	291.95	-2.20	5.19	0.84	5.20	0.000111	1.13	920.11	1014.17	0.09
Middle	6431	10 Yr	379.02	-2.20	5.29	1.23	5.31	0.000159	1.36	1026.22	1033.80	0.11
Middle	6431	25 Yr	431.52	-2.20	5.35	1.43	5.37	0.000186	1.48	1087.19	1044.82	0.12
Middle	6431	100 Yr	519.24	-2.20	5.45	1.74	5.48	0.000245	1.72	1187.58	1075.43	0.14
Middle	6219	2 Yr	252.20	-3.24	5.18	0.19	5.18	0.000060	0.79	906.23	957.06	0.07
Middle	6219	10 Yr	301.98	-3.24	5.28	0.38	5.29	0.000073	0.89	994.06	993.27	0.08
Middle	6219	25 Yr	328.52	-3.24	5.34	0.48	5.35	0.000079	0.93	1044.32	1007.47	0.08
Middle	6219	100 Yr	372.39	-3.24	5.43	0.63	5.44	0.000087	0.99	1127.03	1031.04	0.08
Middle	6019	2 Yr	234.48	-1.99	5.17	-0.04	5.17	0.000049	0.82	929.45	838.42	0.06
Middle	6019	10 Yr	266.36	-1.99	5.27	0.08	5.27	0.000056	0.88	996.22	903.29	0.07
Middle	6019	25 Yr	280.28	-1.99	5.32	0.14	5.33	0.000058	0.90	1035.03	925.67	0.07
Middle	6019	100 Yr	302.51	-1.99	5.42	0.22	5.43	0.000060	0.92	1099.49	970.08	0.07
Middle	5818	2 Yr	234.48	-3.31	5.16		5.16	0.000040	0.72	1133.80	788.95	0.06
Middle	5818	10 Yr	266.36	-3.31	5.26		5.26	0.000045	0.77	1212.55	796.41	0.06
Middle	5818	25 Yr	280.28	-3.31	5.32		5.32	0.000046	0.78	1258.57	800.96	0.06
Middle	5818	100 Yr	302.51	-3.31	5.41		5.42	0.000048	0.79	1335.05	807.65	0.06
Middle	5641	2 Yr	234.48	-2.39	5.15	0.28	5.16	0.000024	0.57	1553.50	919.25	0.05
Middle	5641	10 Yr	266.36	-2.39	5.25	0.44	5.26	0.000027	0.62	1642.85	932.32	0.05
Middle	5641	25 Yr	280.28	-2.39	5.31	0.51	5.31	0.000028	0.63	1694.89	939.37	0.05
Middle	5641	100 Yr	302.51	-2.39	5.41	0.61	5.41	0.000029	0.64	1781.00	951.02	0.05
Middle	5502		Lat Struct									
Middle	5451	2 Yr	227.63	-1.55	5.15	0.76	5.15	0.000023	0.51	1697.55	1199.91	0.04
Middle	5451	10 Yr	251.29	-1.55	5.25	0.88	5.25	0.000024	0.53	1801.84	1210.19	0.04
Middle	5451	25 Yr	259.57	-1.55	5.31	0.92	5.31	0.000023	0.53	1862.67	1216.09	0.04
Middle	5451	100 Yr	270.85	-1.55	5.40	0.97	5.40	0.000022	0.52	1963.16	1225.85	0.04
Middle	5245	2 Yr	195.94	-2.94	5.15	-0.31	5.15	0.000009	0.36	2394.26	1495.44	0.03
Middle	5245	10 Yr	184.06	-2.94	5.25	-0.38	5.25	0.000007	0.32	2541.23	1516.04	0.02
Middle	5245	25 Yr	168.63	-2.94	5.31	-0.48	5.31	0.000005	0.28	2627.53	1525.94	0.02
Middle	5245	100 Yr	134.35	-2.94	5.40	-0.71	5.40	0.000003	0.21	2770.69	1542.20	0.02
Middle	5007	2 Yr	196.52	-3.01	5.15		5.15	0.000009	0.36	2180.49	1575.17	0.03
Middle	5007	10 Yr	189.71	-3.01	5.25		5.25	0.000007	0.32	2337.35	1580.79	0.03
Middle	5007	25 Yr	181.04	-3.01	5.30		5.31	0.000006	0.30	2429.24	1583.59	0.02
Middle	5007	100 Yr	161.36	-3.01	5.40		5.40	0.000004	0.25	2581.55	1592.39	0.02
Middle	4844	2 Yr	196.52	-3.13	5.14		5.15	0.000016	0.46	1582.63	1316.65	0.04
Middle	4844	10 Yr	189.71	-3.13	5.24		5.25	0.000012	0.41	1715.24	1337.28	0.03
Middle	4844	25 Yr	181.04	-3.13	5.30		5.30	0.000010	0.38	1793.87	1351.93	0.03
Middle	4844	100 Yr	161.36	-3.13	5.40		5.40	0.000007	0.32	1925.43	1374.17	0.02
Middle	4556	2 Yr	196.52	-3.53	5.14		5.14	0.000017	0.51	1110.30	819.79	0.04
Middle	4556	10 Yr	189.71	-3.53	5.24		5.24	0.000014	0.47	1193.56	828.17	0.04
Middle	4556	25 Yr	181.04	-3.53	5.30		5.30	0.000012	0.43	1242.75	833.06	0.03
Middle	4556	100 Yr	161.36	-3.53	5.40		5.40	0.000009	0.37	1324.55	840.94	0.03
Middle	4225	2 Yr	196.52	-2.30	5.13	-0.65	5.13	0.000028	0.63	493.04	291.06	0.05
Middle	4225	10 Yr	189.71	-2.30	5.23	-0.68	5.23	0.000024	0.59	521.27	316.46	0.05
Middle	4225	25 Yr	181.04	-2.30	5.29	-0.72	5.29	0.000021	0.55	538.30	327.14	0.04
Middle	4225	100 Yr	161.36	-2.30	5.39	-0.80	5.39	0.000015	0.48	567.10	345.39	0.04
Middle	3899	2 Yr	196.52	-2.30	5.12		5.12	0.000035	0.71	336.71	545.01	0.05
Middle	3899	10 Yr	189.71	-2.30	5.22		5.23	0.000030	0.67	393.60	548.10	0.05
Middle	3899	25 Yr	181.04	-2.30	5.28		5.29	0.000026	0.62	427.53	549.85	0.05
Middle	3899	100 Yr	161.36	-2.30	5.38		5.39	0.000019	0.54	483.98	552.74	0.04
Middle	3646	2 Yr	196.52	-2.03	5.10	0.12	5.11	0.000045	0.78	252.19	258.90	0.06
Middle	3646	10 Yr	189.71	-2.03	5.21	0.09	5.22	0.000039	0.74	257.78	270.05	0.06
Middle	3646	25 Yr	181.04	-2.03	5.27	0.06	5.28	0.000035	0.69	261.13	275.56	0.06
Middle	3646	100 Yr	161.36	-2.03	5.38	-0.04	5.38	0.000026	0.60	266.72	284.18	0.05
Middle	3445	2 Yr	196.52	-1.93	5.10	0.03	5.10	0.000036	0.73	268.95	194.39	0.06
Middle	3445	10 Yr	189.71	-1.93	5.20	0.01	5.21	0.000032	0.69	274.28	229.81	0.05

HEC-RAS Plan: Ex4QDyn92313spi River: East Riser Ditch Reach: Middle (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Middle	3445	25 Yr	181.04	-1.93	5.27	-0.03	5.27	0.000028	0.65	277.49	261.68	0.05
Middle	3445	100 Yr	161.36	-1.93	5.37	-0.12	5.38	0.000021	0.57	282.83	281.75	0.04
Middle	3298		Lat Struct									
Middle	3242	2 Yr	196.21	-1.69	5.08		5.09	0.000079	0.95	208.04	76.56	0.08
Middle	3242	10 Yr	187.36	-1.69	5.19		5.20	0.000066	0.89	216.96	87.24	0.07
Middle	3242	25 Yr	176.22	-1.69	5.25		5.26	0.000056	0.82	222.94	93.62	0.07
Middle	3242	100 Yr	150.13	-1.69	5.36		5.37	0.000037	0.68	233.85	104.85	0.06
Middle	3040	2 Yr	201.81	-1.29	5.07		5.08	0.000061	0.86	238.29	104.96	0.07
Middle	3040	10 Yr	201.76	-1.29	5.18		5.19	0.000056	0.84	250.43	117.48	0.07
Middle	3040	25 Yr	198.22	-1.29	5.24		5.25	0.000052	0.81	258.59	125.87	0.07
Middle	3040	100 Yr	187.69	-1.29	5.35		5.36	0.000043	0.75	273.26	138.19	0.06
Middle	2846	2 Yr	201.81	-1.29	5.05		5.07	0.000063	0.89	230.15	103.27	0.07
Middle	2846	10 Yr	201.76	-1.29	5.16		5.18	0.000058	0.87	242.19	114.63	0.07
Middle	2846	25 Yr	198.22	-1.29	5.23		5.24	0.000053	0.84	250.19	121.60	0.07
Middle	2846	100 Yr	187.69	-1.29	5.35		5.35	0.000044	0.77	264.59	133.21	0.06
Middle	2655	2 Yr	201.81	-0.18	5.04		5.05	0.000093	0.98	207.88	105.66	0.09
Middle	2655	10 Yr	201.76	-0.18	5.15		5.16	0.000084	0.95	220.31	116.03	0.08
Middle	2655	25 Yr	198.22	-0.18	5.22		5.23	0.000077	0.92	228.55	122.43	0.08
Middle	2655	100 Yr	187.69	-0.18	5.33		5.34	0.000063	0.84	243.33	133.14	0.07
Middle	2570		Lat Struct									
Middle	2464	2 Yr	201.81	-0.61	5.02		5.04	0.000067	0.88	240.92	125.11	0.08
Middle	2464	10 Yr	201.76	-0.61	5.14		5.15	0.000062	0.85	255.59	134.06	0.07
Middle	2464	25 Yr	198.22	-0.61	5.21		5.22	0.000056	0.82	265.19	139.61	0.07
Middle	2464	100 Yr	187.69	-0.61	5.32		5.33	0.000046	0.75	282.17	148.78	0.06
Middle	2262	2 Yr	201.81	-0.97	5.01		5.02	0.000066	0.89	257.43	125.26	0.07
Middle	2262	10 Yr	201.76	-0.97	5.12		5.14	0.000061	0.87	272.33	135.09	0.07
Middle	2262	25 Yr	198.22	-0.97	5.20		5.21	0.000056	0.83	282.18	141.56	0.07
Middle	2262	100 Yr	187.69	-0.97	5.32		5.32	0.000046	0.76	299.76	151.30	0.06
Middle	2014	2 Yr	201.81	-1.38	4.99		5.01	0.000070	0.91	221.88	51.08	0.08
Middle	2014	10 Yr	201.76	-1.38	5.11		5.12	0.000064	0.88	233.92	118.80	0.07
Middle	2014	25 Yr	198.22	-1.38	5.18		5.19	0.000059	0.85	242.98	129.26	0.07
Middle	2014	100 Yr	187.69	-1.38	5.30		5.31	0.000048	0.78	259.55	141.31	0.06
Middle	1864	2 Yr	207.41	-2.40	4.90	-0.30	4.99	0.000072	2.37	87.60	30.06	0.15
Middle	1864	10 Yr	216.06	-2.40	5.01	-0.24	5.10	0.000074	2.43	88.92	80.48	0.16
Middle	1864	25 Yr	220.22	-2.40	5.08	-0.21	5.17	0.000075	2.45	89.76	105.53	0.16
Middle	1864	100 Yr	225.29	-2.40	5.20	-0.18	5.29	0.000074	2.47	91.20	158.15	0.16

APPENDIX D

HYDRAULIC ANALYSIS – PROPOSED CONDITIONS: HEC-RAS INPUT

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X      X   X     X  X    X
X     X  X        X           X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X           X  X     X    X        X
X     X  X        X    X      X   X    X    X        X
X     X  XXXXXX    XXXX       X    X   X    X   XXXXX
```

****

PROJECT DATA
Project Title: Teter East Riser Ditch Working 9.23.13
Project File : ERD92313.prj
Run Date and Time: 9/20/2013 4:42:17 PM

Project in English units

****

PLAN DATA

Plan Title: PrPlan 47PrDy9.23.13at7CN
Plan File : k:\TETERBORO\URS H&H\Teterboro\HEC RAS Final 92313\ERD92313.p49

Geometry Title: Pr4Qdyn9.23.13 br45 dredg ExtRt46 spill
Geometry File : k:\TETERBORO\URS H&H\Teterboro\HEC RAS Final 92313\ERD92313.g28

Flow Title : Prop Dyn 4Q9.19.13extenRt46
Flow File : k:\TETERBORO\URS H&H\Teterboro\HEC RAS Final 92313\ERD92313.f26

Plan Description:
Project Site Prop. Condition Br HW44,L45 with dredg at bridge and island,Dyn,
model extended to Rt46 9.19.13 , island at 7 and improved CN and % imperv and
spill

Plan Summary Information:
Number of: Cross Sections = 37 Multiple Openings = 0
Culverts = 0 Inline Structures = 0
Bridges = 1 Lateral Structures = 6

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

****

FLOW DATA

Flow Title: Prop Dyn 4Q9.19.13extenRt46
Flow File : k:\TETERBORO\URS H&H\Teterboro\HEC RAS Final 92313\ERD92313.f26

Flow Data (cfs)

River	Reach	RS	2 Yr	10 Yr	25 Yr	100 Yr
East Riser Ditch	Middle	9188	370.8	568.1	710	968.6
East Riser Ditch	Middle	7739	436.7	679.8	854.5	1172.9
East Riser Ditch	Middle	5007	449	710.1	900.3	1250.2
East Riser Ditch	Middle	3040	454.6	724.4	922.3	1287.8
East Riser Ditch	Middle	1864	460.2	738.7	944.3	1325.4

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
East Riser Ditch	Middle	2 Yr		Known WS = 4.9
East Riser Ditch	Middle	10 Yr		Known WS = 5.01
East Riser Ditch	Middle	25 Yr		Known WS = 5.08
East Riser Ditch	Middle	100 Yr		Known WS = 5.2

GEOMETRY DATA

Geometry Title: Pr4Qdyn9.23.13 br45 dredg ExtRt46 spill
Geometry File : k:\TETERBORO\URS H&H\Teterboro\HEC RAS Final 92313\ERD92313.g28

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 9188

INPUT
Description:
Station Elevation Data num= 149

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	8.73	11.51	9	23.07	9	30.15	8.6	32.37	8.59
33.14	8.59	33.95	8.58	45.28	8.47	45.41	8.47	68.77	8
92.88	8	95.67	8.36	95.83	8.36	101.1	9	102.54	9
102.65	8.98	104.37	8.92	118.54	8	120.71	8.46	121.57	8.25
121.63	8.25	124.19	8	129.13	8	134.83	7.61	135.75	7.67
136.38	7.64	137.25	7.53	137.9	7.4	139.54	7	140.98	7
152.18	6.34	152.81	6.32	154.78	6.11	154.96	6.1	155.61	6.13
155.65	6.14	156.12	6.01	156.36	6	250.85	6	263.9	5.72
264.57	5.72	266.22	5.71	266.6	5.71	290.46	5.63	293.49	5.64
295.9	5.63	310.67	5.67	311.28	5.68	317.75	5.72	325.48	5.78
326.26	5.78	327.12	5.79	332.67	5.81	338.68	5.84	340.32	5.85
341.53	5.85	342.23	5.86	343.44	5.86	361.29	5.99	362.04	6
362.42	6	365.75	6.05	368.56	6.09	369.76	6.11	376.49	6.21
379.37	6.24	381.81	6.27	382.22	6.28	384.25	6.32	385.15	6.34
388.45	6.42	389.02	6.41	417.25	6	443.41	6	446.69	5.93
466.35	5.56	467.66	5.55	475.91	5.42	478.34	5.41	483.36	5.38

505.85	5.27	508.87	5.27	510.17	5.28	511.68	5.28	514.47	5.3
518.41	5.31	521.18	5.33	521.99	5.34	523.18	5.35	527.64	5.38
528.48	5.39	536.22	5.46	550.5	5.59	551.14	5.6	552.51	5.61
555.79	5.64	557.09	5.65	559.7	5.68	560.92	5.69	561.17	5.7
562.14	5.71	563.2	5.73	563.52	5.73	577.45	5.81	592.83	6
607.49	6	611.18	6.03	621.18	6	712.82	6	732.21	5.62
766.97	5	770.38	5	770.84	5	776.93	4.13	777.63	3.99
777.7	3.96	778.7	.1	781.1	-.77	782.95	.1	784.57	2.5
785.6	3.57	787.21	4	787.97	4.06	790.27	4.19	790.95	4.23
791.33	4.24	793.23	4.36	798.5	4.78	800.14	5	800.57	5
815.89	5.32	822.57	5.47	847.87	6	858.25	6	881.7	6.86
883.08	7	883.17	7	883.63	7.21	885.42	8	887.43	9
888.2	9.35	889.18	9.81	890.3	10.36	891.51	11	893.6	12
894.23	12.24	894.71	12.43	896.01	13	902.47	13		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.08	770.38	.035	800.14	.065

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
770.38	800.14	188.07	187.35	187.01	.1	.3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
550	706	9

LATERAL STRUCTURE

RIVER: East Riser Ditch
REACH: Middle RS: 9049

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS =
Deck/Roadway Width = 20
Weir Coefficient = 2.6
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6.76	5.99	6.63	18.85	6	44.34	6	45.78	5.99
48.7	5.97	73.33	5	97.78	5	108.37	5.47	109.11	5.53
113.13	5.82	115.69	6	120.2	6.48	125	7		

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #100 Yr Lat Struct

E.G. US. (ft)	6.98	Weir Sta US (ft)	0.00
W.S. US. (ft)	6.84	Weir Sta DS (ft)	125.00
E.G. DS (ft)	6.82	Min El Weir Flow (ft)	5.00
W.S. DS (ft)	6.68	Wr Top Wdth (ft)	122.02
Q US (cfs)	968.60	Weir Max Depth (ft)	1.71
Q Leaving Total (cfs)	365.47	Weir Avg Depth (ft)	1.04
Q DS (cfs)	602.83	Weir Flow Area (sq ft)	126.58
Perc Q Leaving	37.76	Weir Coef (ft^1/2)	2.600
Q Weir (cfs)	365.47	Weir Submerg	0.00
Q Gates (cfs)		Q Gate Group (cfs)	
Q Culv (cfs)	0.00	Gate Open Ht (ft)	
Q Lat RC (cfs)		Gate #Open	
		Gate Area (sq ft)	
Q Breach (cfs)		Gate Submerg	
Breach Avg Velocity (ft/s)		Gate Invert (ft)	
Breach Flow Area (sq ft)		Gate Weir Coef	

Warning: Divided flow computed for this cross-section.

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 9001

INPUT
Description:
Station Elevation Data num= 148

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	8.56	.41	8.56	1.94	8.52	8.66	8	19.27	8
22.25	7.87	23.5	7.83	27.06	7.67	36.51	7.37	47.62	7
216.84	7	236.68	6.35	239.2	6.33	242.17	6.28	242.91	6.26
257.36	6.29	260.88	6.32	261.34	6.32	263.06	6.34	293.52	6
362.02	6	364.13	5.99	365.02	5.97	366	5.96	374.55	5.82
374.71	5.81	382.92	5.75	384.82	5.68	387.02	5.67	390.43	5.64
391.87	5.62	395.37	5.6	400.37	5.54	402.08	5.48	402.89	5.46
409.36	5.37	415.82	5.16	417.27	5.14	421.87	5.01	422.92	5
509.26	5	510.1	5.09	513	5.33	515.88	5.55	515.94	5.55
521.44	6	528.48	5.31	529.61	5.33	537.59	6	561.53	6
562.89	6.41	562.94	6.4	563.7	6.54	564.13	6.66	564.74	6.76
564.78	6.75	570.08	6	601.96	6	642.96	6.86	645.65	6.9
647.05	6.93	648.96	6.96	651.27	7	753.38	7	758.04	6.89
758.86	6.89	760.36	6.88	762.86	6.81	763.75	6.79	764.21	6.79
765.89	6.75	769.5	6.63	770.58	6.6	770.96	6.58	778.64	7
807.49	7	808.6	6.84	810.04	7	820.13	7	825.06	6.5
825.7	6.48	826.7	6.46	827.8	6.46	828.32	6.47	829.37	6.47
830.76	6.46	831.52	6.47	833.5	6.43	833.68	6.42	835.3	6.38
843.8	6.46	844.35	6.47	844.52	6.49	846.22	6.53	846.88	6.56
848.92	6.62	849.57	6.63	850.11	6.65	850.33	6.64	850.86	6.66
853.02	6.62	853.49	6.64	854.35	6.62	855.86	6.69	873.24	6.45
874.1	6.46	898.36	7	919.44	7	920.69	7.02	934.99	7.03
936.65	7	962	7	963.58	6.97	963.96	6.95	964.71	6.94
966.68	6.88	974.17	6.68	978.13	6.53	978.53	6.52	980.97	6.42
982.58	6.35	984.21	6.3	990.26	6	992.29	6	993.5	5.84
993.93	5.77	995.17	5.55	998.24	5	999.06	4.85	1001.13	4.48
1001.8	4.35	1003.34	4.12	1004.09	4	1006.49	.1	1009.11	-.86
1011.84	.8	1014.87	2	1019.02	3.78	1019.1	3.76	1020.18	4
1022.61	4.31	1023.38	4.4	1024.71	4.64	1026.65	5	1026.99	5
1031.75	5.1	1064.36	5.56	1069.54	5.62				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.08	998.24	.035	1026.65	.065

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
998.24	1026.65	309.59	307.19	307.22	.1	.3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
700	930	8.8

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 8694

INPUT
Description:
Station Elevation Data num= 150

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	9.71	.69	9.72	4.5	9.37	7.06	9.04	7.42	9
10.54	9	21.94	8.73	27.68	8.65	29.16	8.62	30.73	8.6
32.88	8.56	39.8	8.45	40.22	8.44	61.13	8	135.24	8
150	7.71	152.72	7.56	152.91	7.56	154.8	7.46	155.22	7.45
156.77	7.37	158.86	7.25	160.46	7.17	163.56	7	200.21	7

217.49	6.72	218.64	6.74	219.81	6.74	221.58	6.77	222.16	6.77
224.72	6.82	225.12	6.82	226.39	6.85	228.55	6.89	229.2	6.91
230.5	6.93	233.4	7	259.18	7	259.93	6.99	261.94	6.95
262.32	6.95	263.81	6.91	267.25	6.85	268.81	6.83	274.84	6.72
276.12	6.7	279.93	6.63	282.41	6.58	288.58	6.54	292.57	6.4
292.97	6.38	297.33	6.27	298.82	6.22	300.14	6.19	300.73	6.16
302.41	6.13	305.93	6.09	310.97	6.04	313.17	6	365.39	6
403.24	5.14	404.33	5.1	404.71	5.11	405.84	5.08	407.72	5.04
411	5	440.47	5	476.33	5.81	477.67	5.84	488.2	6
498.22	6	527.82	5.3	554.87	5.39	555.71	5.39	578.74	5.36
580.79	5.35	594.64	5.42	596.78	5.42	625.41	6	627.91	6
658.07	5.44	661.54	5.38	662.51	5.37	683.16	5	699.13	5
701.07	5.12	701.48	5.14	736.62	6	795.18	6	801.62	6.05
802.63	6.05	803.53	6.04	804.93	6.06	817.64	6.05	820.89	6.02
821.09	6.03	823.01	6	825.13	5.92	826.81	6	857.3	6
864.56	5.05	864.81	5.06	870.51	5	905.13	5	910.6	5.22
910.7	5.23	916.15	5.34	943.81	5.08	945.85	5	948.33	4.85
953.59	4.52	955.11	4.43	958.25	4.22	960.07	4.12	961.68	4
961.76	4	969.5	3.09	970.07	2.3	980.25	-.9	988.4	-1
990.72	.5	991.74	3	992.01	3.12	993.35	4	994.45	4.7
994.94	5	996.96	5	997.72	5.11	998.09	5.22	999.07	5.31
999.41	5.34	999.69	5.59	1000.13	5.8	1000.8	6	1002.23	6
1030.11	6.85	1030.57	6.86	1033.2	6.95	1034.52	7	1035.88	7
1038.05	7.2	1038.21	7.19	1038.8	7.26	1064.91	7.52	1071.55	7.41
1072.2	7.39	1092.28	7	1095.85	7	1100.2	6.95	1135.07	6.51

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.08	948.33	.035	997.72	.065

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
948.33	997.72	263.03	257.77	257.21	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	490	9	F

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 8436

INPUT
Description:
Station Elevation Data num= 146

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	8.53	4.05	8.45	6.98	8.36	11.1	8.24	15.69	8.09
15.99	8.09	18.55	8	19.34	7.97	22.04	7.85	22.66	7.84
23.22	7.8	53.58	7	91.06	7	106.79	7.61	108.09	7.61
109.1	7.62	112.25	7.62	112.69	7.63	113.62	7.63	175.16	7.56
176.31	7.56	177.07	7.55	178.16	7.55	179.33	7.54	181.41	7.54
207.23	7	319.6	7	321.34	6.94	321.46	6.93	323.79	6.85
324.85	6.82	330.01	6.64	330.88	6.62	331.64	6.59	332.37	6.57
335.66	6.46	336.81	6.43	338.92	6.36	339.67	6.34	342.7	6.25
343.08	6.23	344.42	6.2	347.53	6.1	347.7	6.1	349.09	6.06
349.28	6.05	351.12	6	352.62	5.97	353.95	5.95	357.5	5.89
357.74	5.88	358.6	5.87	360.46	5.84	361.49	5.82	364.34	5.78
364.67	5.77	366.17	5.75	367.01	5.73	367.43	5.73	368.93	5.71
370.82	5.68	371.24	5.67	374.21	5.63	375.51	5.61	375.9	5.61
377.01	5.59	379.75	5.56	380.79	5.54	381.38	5.54	383.7	5.51
384.24	5.51	385.97	5.48	386.8	5.48	388.45	5.46	389.34	5.46
390.39	5.44	390.97	5.44	392.49	5.42	393.52	5.42	393.86	5.41
394.85	5.41	395.84	5.39	397.06	5.38	398.51	5.38	399.93	5.36
402.27	5.34	403.08	5.34	404.26	5.33	405.2	5.31	406.37	5.3
407.69	5.3	408.73	5.28	410.4	5.27	411.65	5.25	413.17	5.24
414.37	5.22	414.79	5.22	416.01	5.2	416.4	5.2	417.81	5.18
420.28	5.13	420.51	5.13	423.28	5.08	424.47	5.05	425.06	5.04
426.48	5	427.12	5	450.12	4.72	472.22	4.46	482.05	4.34
493.35	4.2	497.88	4.15	508.56	4	510.71	4	510.98	4.01

538.38	5	540.74	5	544.82	5.06	545.89	5.06	566.44	5
631.13	5	634.04	4.84	639.55	4.54	649.35	4	652.22	3
657.98	-1.12	668.81	-1	678.04	3.89	678.59	3.94	679.39	4
681.34	4.29	682.18	4.42	683.72	4.54	684.77	4.79	685.42	5
685.58	5	689.4	5.65	690.22	5.78	691.56	6	731.41	6
732.01	6.03	736.56	6.3	737.85	6.38	749.19	6.99	749.45	7
824.25	7								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.08	634.04	.035	689.4	.065

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
634.04	689.4	236.17	241.64	242.83	.1	.3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
0	463	9

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 8194

INPUT
Description:
Station Elevation Data num= 144

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	7	20.99	7	29.63	6.65	36.82	6.38	41.68	6.17
43.44	6.1	45.45	6	75.01	6	77.87	6.11	79.56	6.18
91.18	6.53	104.42	7	146.58	7	191.02	6.09	191.1	6.09
198.3	6	236.04	6	292.09	6.35	294.33	6.35	373.85	6.41
374.62	6.4	378.13	6.4	378.65	6.39	379.36	6.39	380.6	6.38
380.76	6.38	381.59	6.39	381.71	6.39	382.98	6.38	383.77	6.38
384.28	6.37	387.01	6.37	388.03	6.36	392.14	6.36	393.11	6.35
398.22	6.35	398.83	6.34	409.57	6.34	457.2	6.74	458.2	6.75
458.48	6.76	459.15	6.76	461.41	6.79	461.49	6.79	462.28	6.8
463.17	6.8	477.87	7	701.61	7	701.86	7.03	702.14	7
702.45	7	705.27	6.86	706.15	6.82	706.2	6.82	710.93	6.6
712.09	6.57	714.16	6.41	715.33	6.33	718.38	6.09	719.03	6.03
719.12	6.03	719.44	6	719.49	6	723.29	5.9	726.89	5.82
728.78	5.76	729.81	5.74	737.28	5.56	737.83	5.55	747.46	5.49
747.97	5.48	749.04	5.48	749.45	5.49	750.16	5.49	751.25	5.5
751.78	5.5	752.29	5.51	752.31	5.51	753.94	5.54	754.58	5.55
758.34	5.47	760.39	5.51	760.85	5.5	763.35	5.45	763.86	5.46
766.37	5.51	766.79	5.51	769.69	5.47	770.25	5.48	771.13	5.46
771.17	5.46	772.01	5.48	776.54	5.43	796.81	5	892.87	5
894.23	5	895.44	4.72	895.6	4.68	897.87	4	899.3	3.74
899.69	3.66	900.77	3.4	902.33	3	905.52	.5	913.93	-.5
915.43	-1.24	917.71	.1	919.17	1	919.52	2.28	920.82	2.61
921.18	2.69	921.88	3	923.6	3	923.82	3.09	923.9	3.13
924.42	3.37	925.54	3.88	925.72	4	926.34	4.25	928.14	5
928.81	5.15	931.18	5.69	932.74	6	1016.43	6	1020.9	6.44
1023.77	6.83	1024.35	6.9	1025.07	7	1025.49	7	1027.71	7.18
1027.76	7.18	1028.01	7.19	1030.3	7.34	1032.43	7.47	1032.58	7.47
1033.26	7.51	1034.67	7.61	1038.45	7.8	1040.06	7.9	1040.08	7.9
1041.09	7.95	1044	8	1073.76	8	1074.21	7.99		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.08	894.23	.035	928.81	.065

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
894.23	928.81	198.33	191.32	190.19	.1	.3

Blocked Obstructions num= 1

Sta L	Sta R	Elev

```
     270     716       9

CROSS SECTION


RIVER: East Riser Ditch
REACH: Middle             RS: 8003

INPUT
Description:
Station Elevation Data    num=     147
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
       0    5.24   21.39    5.12   23.28    5.14   26.63    5.12   47.74       6
  126.77       6  128.14    6.02  144.99    6.28  149.02    6.32   155.8    6.37
  163.71    6.41  164.52    6.42  167.33    6.43  174.59    6.43  183.33    6.46
  188.97    6.47  190.93    6.45  192.16    6.46  195.59    6.42  252.43       7
  289.74       7   293.9    6.86  299.21    6.67  300.67    6.64  322.56       6
  328.15    5.79  328.48    5.77  331.22    5.67  336.37    5.46  350.41       5
  366.44       5  371.65    5.11  376.38    5.15  378.76    5.16  380.86    5.19
  382.22    5.22  382.82    5.22  384.21    5.25  388.96       5  396.96       5
  423.38    5.88  424.69    5.89  425.25       6  432.38       6  452.62    5.15
  454.62    5.15  502.82    5.35  507.92    5.35  508.83    5.36  513.61    5.36
  514.86    5.37  518.09    5.37  587.66    5.41   594.6    5.41  595.49     5.4
  607.53     5.4  607.99    5.41  649.96    5.41  680.71    5.32  685.13    5.32
  691.67    5.33  695.32    5.33  702.99    5.37  707.04    5.39  708.54    5.41
  712.89    5.43  713.66    5.44  716.23    5.44  716.31    5.45  727.48    5.42
   728.7    5.42  730.57    5.44  732.11    5.44  734.18    5.46  735.85    5.46
  739.07    5.48  756.29    5.46  758.65    5.47  759.14    5.48  762.19    5.48
   775.6    5.39  776.63     5.4  782.14    5.32  786.44    5.35  788.96    5.35
  789.49    5.36  793.15    5.37  793.55    5.38  796.67    5.39  806.98    5.41
  808.54    5.41  810.88    5.43  815.36    5.44  817.41    5.44  818.12    5.45
  824.88    5.42  827.63    5.44  828.47    5.43  830.16    5.45  833.21    5.46
  835.77    5.48  851.52       5  858.59       5  860.47    5.05   869.4    5.19
  876.45    5.34  883.69    5.51   884.8    5.53  886.62    5.59  906.18       6
  928.29       6   930.4     5.1  930.78       5  934.22       4  934.82    4.03
  935.69    4.15   937.1     4.2  937.33    4.24  938.13    4.29   939.1    3.94
  939.48    3.73  940.22     3.5  941.66    2.65  942.24    2.27  943.02       2
  947.01       1  947.11      -1  968.24   -1.33  984.77       1  986.73       2
  989.51     2.8  990.23       3  992.72       4  994.51       5  995.23    5.48
  996.02       6 1060.12       6 1068.83    6.33 1071.25    6.46 1072.88    6.54
 1076.46    6.74 1078.12    6.82  1081.2       7 1081.37       7 1084.19    7.31
 1090.16       8 1232.86       8

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0     .08   930.4    .035  995.23    .065

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         930.4  995.23           265.16  264.17  263.66             .1       .3
Blocked Obstructions     num=       1
   Sta L   Sta R    Elev
***********************
     427     820       9

CROSS SECTION


RIVER: East Riser Ditch
REACH: Middle             RS: 7739

INPUT
Description:
Station Elevation Data    num=     150
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
       0       7   23.58       7    46.5    6.49   46.72    6.49   47.09    6.48
   50.04    6.42   57.72     6.2   57.82     6.2   58.91    6.17   60.62    6.11
    64.1       6   64.39       6   68.27    5.86   73.02     5.7    76.5    5.58
   90.78       5   91.52       5  128.76    4.22  133.55    4.12  138.04    4.03
```

139.45	4	148.56	4	166.27	4.27	166.48	4.27	169.64	4.23
172.79	4.17	175.85	4.1	181.23	4	183.82	4	184.16	3.97
186.22	3.8	191.11	4	244.99	4	245.95	4.02	247.02	4.04
248.2	4.07	248.86	4.08	249.95	4.11	255.54	4.15	255.73	4.15
256.04	4.13	258.4	4.19	260.22	4.21	277.8	5	286.61	5
287.23	4.96	287.42	4.96	329.39	4.73	330.98	4.76	332.84	4.79
342.06	5	343.76	5	388.68	5.75	393.48	5.83	400.23	5.93
400.48	5.93	403.07	5.99	403.47	6	475.32	6	476.78	5.35
477.39	5	479.24	4.59	480.03	4.43	480.7	4.33	481.1	4.34
481.28	4.34	482.03	4.32	482.17	4.33	482.49	4.39	482.52	4.39
483.32	4.67	490.64	4	588.54	4	591.73	4.12	591.98	4.12
593.4	4.19	593.79	4.2	595.1	4.26	595.74	4.25	600.51	4.58
624.93	5	631.31	5	633.59	5.26	637.14	5.66	641.51	6
657.55	6.01	661.22	5.37	664.36	5.11	665.48	5	666.36	5
667.57	4.83	668.65	4.69	669.93	4.51	670.07	4.47	670.36	4.46
670.47	4.45	671.36	4	672.37	3.58	674.08	2.89	674.55	2.8
677.14	2.01	677.89	2	678.45	.9	683.27	-.81	694.29	-1.45
697.31	-.7	698.34	.9	699.52	3	701.13	3.66	701.86	4
702.65	4.09	705.1	4.35	705.22	4.37	707.21	4.58	708.25	4.69
709.62	4.84	710.94	5	711.71	5.03	712.03	5.04	721.73	5.35
722.59	5.38	724.18	5.43	740.82	6.01	804.4	6	817.65	6.87
819.69	7	821.19	7.63	821.7	7.78	822.57	8	824.18	8
825.37	8.16	827.51	8.03	828.61	7.94	828.86	7.93	831.06	7.78
832.24	7.67	833.35	7.58	835.19	7.37	836.1	7.28	838.31	7
839.19	7	841.14	6.75	845.08	6	853.31	6	860.5	6.58
866.08	7	866.38	7	866.52	7.01	877.78	8	1048.06	8

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.105	667.57	.035	707.21	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
667.57	707.21	195.55	200.78	201.98	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	475	8	F

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 7538

INPUT
Description:
Station Elevation Data num= 154

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-120	8.1	-58	7	-38	6.85	-12.9	7.5	0	6.66
4.35	6.45	6.38	6.33	8.82	6.23	10.92	6.16	14.1	6.03
15.58	6	100.61	6	103.03	6.24	106.25	6.62	110.45	7
113.46	7	116.7	6.9	131.75	6	140.06	6	146.24	5.87
149.12	5.8	155.27	6	171.14	6	182.68	5.89	185.94	5.87
188.15	5.83	199.42	5.49	201.57	5.42	208.65	5	216.91	5
223.4	4.85	239.3	4.49	247.88	4.29	251.34	4.22	256.22	4.16
258.52	4.08	260.35	4.08	261.21	4.11	264.14	4.15	266.86	4.25
270.39	4.36	278.26	4.44	283.93	4.33	285.82	4.3	290.05	4.2
291.52	4.15	295.02	4	399.57	4	402.55	3.65	409.11	3
448.2	3	455.86	3.39	456.1	3.39	467.13	3	473.7	3.51
476.04	3.57	491.99	4	496.76	4	498	3.87	499.24	4
511.54	4	511.91	3.91	514.67	3	519.02	3	520.68	3.28
522.09	3.2	543.58	4	554.19	4	571.98	4.79	575.71	5
661.11	5	667.95	4.23	669.02	4.27	671.67	4.19	672.71	4.21
675.96	4.44	685.77	5	686.26	5	688.23	5.09	691.19	5.09
693.9	5.03	694.66	5	710.92	5	722.38	4.78	724.16	5
730.07	6	730.97	6	732.96	5.92	735.53	5.94	736.3	5.84
739.84	5.2	741.07	5	749.11	4.2	751.02	4	751.46	4
752.73	3.26	753.53	3	754.56	2.56	756.07	1.57	758.19	-.9
776.54	-1	778.17	-.6	778.71	1.09	780.63	2	783.15	3
785.31	4	787.18	5	788.05	5.5	789.5	5.97	789.61	6

```
  826.97       6  829.41    6.06  834.59    6.13  835.96     6.2  836.92     6.3
  838.15    6.34  840.79    6.59  844.81       7   848.1     7.6  849.19    7.78
  850.27       8  873.63       8     879    8.31  879.35    8.31   904.9       8
  907.02       8  910.48    7.67  913.14    7.43  918.25       7  920.51    6.87
  924.01     6.7  930.84       7  931.83       7  941.84    6.46  943.42    6.51
   943.9     6.5  945.82    6.56  948.89    6.71  952.13    6.58  952.42    6.52
  954.21    6.51  954.72    6.48  956.26    6.32  957.16    6.34  960.95       7
  990.54       7   997.9    7.33 1000.13    7.44 1001.87    7.51 1003.63    7.55
 1008.63    7.86 1010.44    7.96 1012.22       8 1025.36       8

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
    -120    .105  751.02    .035   789.5     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        751.02   789.5           215.06  219.69  217.71             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
    -120     360       8       F

LATERAL STRUCTURE


RIVER: East Riser Ditch
REACH: Middle             RS: 7445

INPUT
Description:
Lateral structure position     = Right overbank
Distance from Upstream XS =
Deck/Roadway Width        =      20
Weir Coefficient          =     2.6
Weir Flow Reference       = Water Surface
 Weir Embankment Coordinates    num =      141
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*****************************************************************************
       0    6.18   11.22       6    11.6       6   12.72       6   14.47       6
    14.7       6   33.77       6   34.38       6   36.05       6   36.67       6
    37.1       6   37.84       6   39.25       6   45.79       6   45.94       6
    46.6       6   49.23       6   50.47       6    51.1       6   53.44       6
   54.77       6   55.66       6   59.11       6   60.67       6   62.33       6
   63.07       6   63.83       6   67.15       6   68.72       6   69.21       6
   69.95       6   70.05       6   70.51       6   70.75       6    77.3       6
   77.92       6   78.94       6   79.06       6   79.18       6   82.84       6
   83.69       6    84.4       6   86.16       6   90.35       6    90.8       6
   94.09       6   96.39       6   97.81       6   98.75       6   99.73       6
  101.28       6  101.77       6  102.43       6  102.97       6  103.31       6
  103.43       6  103.53       6  105.37    5.94  105.49    5.94  107.84       6
  109.37       6  162.12    5.58  162.25    5.58  162.41    5.58  162.53    5.58
  165.09     5.5  165.42    5.49   165.6    5.49  165.84    5.49  166.19    5.48
   167.3    5.46  173.57    5.46  174.01    5.45  174.48    5.44   174.8    5.44
  176.23    5.44  176.39    5.43  176.45    5.43  182.67    5.45  183.83    5.48
  183.84    5.48  183.93    5.48  185.11    5.49  185.13    5.49  186.11     5.5
  186.22     5.5  197.69       6  198.11       6   198.5       6  198.95       6
  200.45       6  200.58       6  202.48       6  203.24       6   203.6       6
  204.33       6  204.44       6  204.47       6  204.61       6  211.79       6
  212.32       6  214.44       6  218.14       6   220.3       6  220.58       6
   222.8       6  225.54       6  225.56       6  225.84       6   232.7       6
  234.34       6  235.42       6  235.61       6  236.78       6  236.86       6
  237.69       6  238.96    5.93  239.95    5.87  241.96    5.77  242.91    5.73
  243.57    5.74  243.99    5.72  244.15    5.72  244.17    5.72  245.89    5.76
  263.87    5.61  264.67    5.63  265.39    5.65  266.17    5.68  267.43    5.72
   268.2    5.74  268.57    5.75  273.52    5.93  273.62    5.93  274.06    5.94
  275.86       6  275.88       6  276.28       6  276.58       6  277.48       6
  280.29       6

Weir crest shape                          = Broad Crested


LATERAL STRUCTURE OUTPUT  Profile #100 Yr  Lat Struct
```

E.G. US. (ft)	5.87	Weir Sta US (ft)	137.71		
W.S. US. (ft)	5.81	Weir Sta DS (ft)	267.43		
E.G. DS (ft)	5.74	Min El Weir Flow (ft)	5.43		
W.S. DS (ft)	5.71	Wr Top Wdth (ft)	68.75		
Q US (cfs)	807.13	Weir Max Depth (ft)	0.31		
Q Leaving Total (cfs)	12.01	Weir Avg Depth (ft)	0.15		
Q DS (cfs)	795.33	Weir Flow Area (sq ft)	10.07		
Perc Q Leaving	1.46	Weir Coef (ft^1/2)	2.600		
Q Weir (cfs)	12.01	Weir Submerg	0.00		
Q Gates (cfs)		Q Gate Group (cfs)			
Q Culv (cfs)	0.00	Gate Open Ht (ft)			
Q Lat RC (cfs)		Gate #Open			
		Gate Area (sq ft)			
Q Breach (cfs)		Gate Submerg			
Breach Avg Velocity (ft/s)		Gate Invert (ft)			
Breach Flow Area (sq ft)		Gate Weir Coef			

Warning: Divided flow computed for this cross-section.

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 7318

INPUT
Description:
Station Elevation Data num= 151

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-140	6.8	-83	6.4	-21.3	7	0	7.55	.11	7.55
.68	7.53	1.7	7.47	2.73	7.4	3.4	7.35	5.66	7.16
6.7	7.06	7.19	7	8.3	6.95	9.53	6.9	30.15	6
173.39	6	190.22	5.89	195.49	5.84	195.75	5.84	196.57	5.83
196.83	5.82	218.57	5.76	219.57	5.76	228.68	5.58	230.11	5.57
231.1	5.55	231.26	5.55	232.9	5.53	242.76	5.54	244.44	5.47
246.46	5.53	246.79	5.51	247.16	5.52	249.71	5.64	250.04	5.67
250.23	5.65	250.86	5.61	251.1	5.62	251.66	5.6	251.91	5.6
253.07	5.55	254.58	5.57	255.32	5.53	256.2	5.51	257.37	5.47
259.17	5.4	260.75	5.29	261.09	5.26	262.69	5.21	264.45	5.1
264.62	5.1	266.34	5	266.72	4.99	267.3	4.99	267.46	4.98
268.78	4.95	268.89	4.95	270.61	4.91	272.64	4.86	273.41	4.84
277.77	4.71	277.91	4.7	297.79	4	319.27	4	354.42	3.05
358.93	3	377.77	3	378.59	3.13	379.38	3.08	380.31	3.07
380.43	3.08	381.33	3.12	382.04	3.21	383.03	3.1	447.05	4
458.89	4	460.98	3.53	462.34	3.22	462.42	3.2	463.7	3
486.52	3	487.55	3.03	487.69	3.03	488.67	3.05	490.52	3.09
490.84	3.1	497.37	3.23	515.87	3.95	517.01	4	725.52	4
728.11	4.13	728.55	4.14	731.83	4.31	732.44	4.31	744.34	4.81
758.95	5	764.26	5	786.25	4.28	787.18	4.3	788.18	4.33
806.39	4.9	808.33	5	808.75	5	813.67	5.34	814.1	5.36
814.71	5.42	817.31	5.55	821.43	5.71	821.53	5.71	824.19	5.96
824.54	6	829.66	6	832.17	5.9	837.83	5.52	845.62	5
846.67	5	848.24	4.74	851.09	4.27	851.45	4.23	853.46	4
853.88	3.89	854.81	3.76	855.28	3.7	855.69	3.64	857.14	3.41
857.55	3.35	859.02	3.27	859.07	3.26	861.25	3.11	861.96	3.03
862.04	3.01	862.74	2.95	864.86	.8	865.24	-.86	865.93	-1.2
881.96	-.79	882.23	1.05	885.21	3	886.27	3.59	886.7	3.7
887.18	4	888.88	4.47	889.69	4.67	890.08	4.76	891.29	5
892.39	5	892.55	5	893.17	5.06	909.02	6	911.78	6
916.66	5.87								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-140	.11	848.24	.035	892.39	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
848.24	892.39	195.98	205.4	206.71	.1	.3

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 7113

INPUT
Description:
Station Elevation Data num= 145

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	7.04	1.42	7	6.19	7	9.43	6.84	9.72	6.82
10.51	6.75	11.02	6.71	13.96	6.45	14.43	6.41	18.86	6
26.17	6	51.23	5.43	51.45	5.42	65.62	5	77.57	5
78.17	4.98	78.18	4.98	79.74	4.93	80.14	4.92	82.44	4.84
110.73	4	112.55	4	112.7	3.99	112.71	3.99	115.68	3.87
132.1	3.2	134.03	3.12	135.73	3.05	135.91	3.04	136.07	3.04
136.17	3.03	136.33	3.03	137.73	3	140.78	3	161.61	3.61
161.9	3.62	162.69	3.62	188.3	3.05	189.11	3	251.25	3
255.16	3.01	255.76	3.01	256.35	3.02	257.02	3.03	257.11	3.03
261.69	3.09	270.38	3.3	275.03	3.4	277.04	3.45	278.36	3.49
279.93	3.52	281.75	3.58	296.66	4	297.7	4	325.5	3.11
325.59	3.11	335.39	3.3	339.54	3.48	340.9	3.54	344.55	3.68
352.48	4	456.44	4	466.73	3.82	472.42	3.75	474.05	3.73
475.58	3.72	502.62	3.46	506.02	3.43	510.89	3.38	513.59	3.36
515.32	3.34	550.88	3	564.98	3	574.32	3.33	575.47	3.35
576.43	3.37	580.48	3.48	581.59	3.51	582.99	3.53	587.29	3.64
587.6	3.64	592.36	4	660.05	4	660.95	4.23	661.97	4.47
662.05	4.49	662.12	4.51	662.85	4.68	663.36	4.79	664.19	5
665.57	5.64	666.86	6	671.12	6	671.81	5.78	672.86	5.56
673.97	5.24	674.63	5.07	674.89	5	675.34	4.91	676.13	4.81
681.86	4.06	682.48	4.09	682.6	4.11	682.99	4.15	685.09	4.41
687.07	4.65	689.83	5	697.46	5	698.45	4.68	699.11	4.49
699.63	4.33	700.69	4	702.81	3.02	702.82	3.01	702.85	3
702.86	3	702.88	2.99	705.77	2.41	706.2	2.35	706.88	2.26
707	2.25	707.25	2.24	708.99	2.19	709.07	2.17	709.37	1.82
711.94	-.7	714.25	-1.75	727.34	-1.33	734.25	1.16	734.75	3.17
736.88	4	737.65	4.39	738.6	5	740.09	5.68	740.97	6
741.45	6	741.51	6	741.64	6.01	751.95	6.41	765.47	7
779.55	7	780.24	7	784.26	7	784.35	7	791.8	6.56

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.11	699.63	.035	741.45	.065

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
699.63	741.45	65.29	71.33	73.51	.1	.3

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 7042

INPUT
Description:
Station Elevation Data num= 142

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	7.42	5.1	7.02	5.32	7	7.56	7	13.03	6.68
14.75	6.61	26.46	6	33.34	6	48.49	5.25	53.2	5.03
53.85	5	64.18	4.35	66.57	4.2	69.03	4.06	70.01	4
72.27	4	92.9	3.66	94.63	3.64	116.53	3	166.43	3
183.58	3.42	204.78	3.91	205.23	3.91	205.82	3.93	208.09	4
216.69	4	241.95	3.86	242.4	3.86	248.94	3.89	270.82	3.91
275.04	4	277.77	4	300.45	3.15	301.46	3.13	302.77	3.09
303.1	3.09	303.19	3.08	305.88	3.01	306.16	3	405.08	3
416.29	3.08	416.69	3.07	417.34	3.09	417.38	3.1	417.87	3.09
420.18	3.08	420.36	3.07	420.97	3.08	421.83	3.1	422.29	3.12

422.48	3.12	422.62	3.13	423.35	3.14	440.75	4	498.22	4
498.66	3.98	498.83	3.98	500.62	3.97	501.51	3.95	502.77	3.94
503.01	3.93	523.86	3	524.1	3	529.34	3.27	529.87	3.27
530.21	3.29	531.48	3.26	531.88	3.26	533.63	3.23	534.44	3.27
535.05	3.27	535.59	3.28	539.26	3.52	541.5	3.71	544.46	4
558.89	4	560.13	3.82	560.35	3.81	560.87	3.75	562.34	3.6
568.91	3	569.52	3	569.94	3.1	570.27	3.11	570.64	3.13
570.8	3.13	570.94	3.14	573.1	3.28	573.92	3.41	574.13	3.42
575.5	3.7	575.62	3.72	576.72	4	609.85	4	613.65	3.94
615.56	3.96	617.62	3.98	619.09	4	653.65	4	657.68	4.09
661.35	4.18	662.21	4.2	687.52	5	712.7	5	714	4.85
721.8	4	721.95	4	722.57	3.87	723.71	3.63	726.72	3
728	.9	729.67	-.51	732.31	-1.5	735.3	-1.4	738.7	1.06
739.58	3	740.7	3.18	745.76	4	747.4	4.27	751.69	5
755.95	5.96	756.15	6	756.82	6	758.6	6.29	759.85	6.45
761.11	6.59	761.23	6.59	761.78	6.65	762.18	6.69	762.46	6.7
763.93	6.72	766.54	6.87	767.67	6.86	768.89	6.84	769.02	6.83
770.2	6.81	775.07	6	789.29	6	790.54	6.05	791.49	6.02
792.2	6	800.49	6						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.11	712.7	.035	751.69	.065

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
712.7	751.69	94.37	92.36	91.56	.3	.5

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 6949

INPUT
Description: Bridge 45 ft US
Station Elevation Data num= 108

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-74	7	-55	7.3	-20.5	6.9	-8.7	7.15	0	6.91
2.65	6.86	3.46	6.86	3.49	6.85	4.31	6.83	4.47	6.82
6.61	6.73	13.22	6.52	13.29	6.52	14.77	6.44	15.19	6.42
17.45	6.28	18.17	6.23	18.45	6.22	20.11	6.1	21.6	6
22.69	6	24.58	5.92	25.87	5.89	26.46	5.86	26.68	5.85
38.68	5.06	39.53	5	42.57	5	52.95	4.21	56	4
56.17	4	67.71	3.66	68.66	3.63	69.04	3.62	89.3	3
154.52	3	155.46	3.02	157.49	3.07	158.86	3.11	162.05	3.19
162.47	3.19	163	3.21	165.8	3.26	166.33	3.27	191.82	3.84
198.23	4	254.91	4	256.73	3.93	263.59	3.9	263.63	3.9
263.96	3.89	264.04	3.89	264.39	3.88	267.74	3.82	274.57	3.75
275.09	3.73	275.26	3.72	276.23	3.69	279.1	3.62	279.15	3.62
282.28	3.54	289.2	3.54	292.84	3.59	294.01	3.62	294.06	3.62
294.95	3.66	295.29	3.68	317.87	3.72	321.28	3.8	321.92	3.81
329.21	4	347.78	4	365.05	4.33	368.8	4.35	370.66	4.36
370.94	4.37	375.43	4.38	377.09	4.39	378.25	4.42	378.5	4.43
382.8	4.53	384.99	4.6	385.88	4.63	394.18	5	402.2	5
404.36	4.86	420	4.5	437.26	4.31	446	4	455	7
685	7	725	7	740	4	740.1	-.78	753	-.78
755	-1.78	765.98	-1.78	775	-1.78	777	-.78	784.9	-.78
785.19	6.88	785.34	7	785.37	7	785.57	7	785.77	7
786.06	7	786.68	7	791.23	7				

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
-74	.11	420	.045	740	.035	785.19	.065

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
740	785.19	115.65	112.38	112.29	.3	.5

BRIDGE

RIVER: East Riser Ditch
REACH: Middle RS: 6861

INPUT
Description:
Distance from Upstream XS = 60
Deck/Roadway Width = 44
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 6

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
685	7		740	7		740	7	6
785	7	6	785	7		791.23	7	

Upstream Bridge Cross Section Data
Station Elevation Data num= 108

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-74	7	-55	7.3	-20.5	6.9	-8.7	7.15	0	6.91
2.65	6.86	3.46	6.86	3.49	6.85	4.31	6.83	4.47	6.82
6.61	6.73	13.22	6.52	13.29	6.52	14.77	6.44	15.19	6.42
17.45	6.28	18.17	6.23	18.45	6.22	20.11	6.1	21.6	6
22.69	6	24.58	5.92	25.87	5.89	26.46	5.86	26.68	5.85
38.68	5.06	39.53	5	42.57	5	52.95	4.21	56	4
56.17	4	67.71	3.66	68.66	3.63	69.04	3.62	89.3	3
154.52	3	155.46	3.02	157.49	3.07	158.86	3.11	162.05	3.19
162.47	3.19	163	3.21	165.8	3.26	166.33	3.27	191.82	3.84
198.23	4	254.91	4	256.73	3.93	263.59	3.9	263.63	3.9
263.96	3.89	264.04	3.89	264.39	3.88	267.74	3.82	274.57	3.75
275.09	3.73	275.26	3.72	276.23	3.69	279.1	3.62	279.15	3.62
282.28	3.54	289.2	3.54	292.84	3.59	294.01	3.62	294.06	3.62
294.95	3.66	295.29	3.68	317.87	3.72	321.28	3.8	321.92	3.81
329.21	4	347.78	4	365.05	4.33	368.8	4.35	370.66	4.36
370.94	4.37	375.43	4.38	377.09	4.39	378.25	4.42	378.5	4.43
382.8	4.53	384.99	4.6	385.88	4.63	394.18	5	402.2	5
404.36	4.86	420	4.5	437.26	4.31	446	4	455	7
685	7	725	7	740	4	740.1	-.78	753	-.78
755	-1.78	765.98	-1.78	775	-1.78	777	-.78	784.9	-.78
785.19	6.88	785.34	7	785.37	7	785.57	7	785.77	7
786.06	7	786.68	7	791.23	7				

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
-74	.11	420	.045	740	.035	785.19	.065

Bank Sta: Left Right Coeff Contr. Expan.
740 785.19 .3 .5

Downstream Deck/Roadway Coordinates
num= 6

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
806	7		860	7		860	7	6
905	7	6	905	7		917.24	5.95	

Downstream Bridge Cross Section Data
Station Elevation Data num= 103

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	8.34	1.34	8.34	2.95	8.28	4.03	8.25	4.57	8.25
6.11	8.2	10.59	8.04	11.87	8	28.04	7.26	33.54	7
34.64	6.92	38.09	6.68	40.79	6.5	43.29	6.32	46.55	6.11
47.98	6	48.42	6	51.56	5.92	52.98	5.88	53.73	5.87
56.87	5.79	74.32	5.32	76.1	5.28	80.11	5.2	81.55	5.16
86.32	5.06	86.48	5.05	89.4	5	101.42	5	105.43	4.82
106.14	4.81	118.63	4.65	121.79	4.59	137.74	4.31	140.87	4.25
152.85	4	171.38	4	173.26	4.06	174.29	4.1	181.93	4.29

```
  183.86    4.36  184.43    4.37  189.55    4.61  193.46    4.82  195.78    4.94
  196.83       5  232.68       5  233.28    4.98  234.23    4.97  236.72    4.93
  242.59    4.81  244.26    4.78  247.29     4.7  248.16     4.7  250.79    4.63
  281.82    4.53  282.79    4.56  286.86    4.65  289.02    4.69  299.84       5
  311.55       5  326.74    5.88  328.38    5.95  329.35    5.96  331.16    5.91
  332.18    5.86  336.12    5.62  341.64    5.27  345.83       5  346.36    4.87
  348.08    4.34  349.41       4  354.63       4  355.44    4.09  355.61    4.09
  361.62       5  416.38       5  418.04    4.92  421.76    4.78  422.52    4.72
  426.08    4.49  428.86    4.29  431.96    4.18  432.42    4.15  434.04    4.09
  435.83       4     490       4     516       4     525       7     845       7
     860       4   860.1   -1.38     873   -1.38     875   -2.38  894.25   -2.38
     895   -2.38     897   -1.38   904.9   -1.38     905       5   905.1       5
   906.8       6  915.08       6  917.24    5.95

Manning's n Values        num=       4
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
************************************************************
       0     .11     490    .045     860    .035     905    .065

Bank Sta: Left   Right    Coeff Contr.   Expan.
           860     905             .3       .5

Upstream Embankment side slope              =       0 horiz. to 1.0 vertical
Downstream Embankment side slope            =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
       Energy Only

Additional Bridge Parameters
       Add Friction component to Momentum
       Do not add Weight component to Momentum
       Class B flow critical depth computations use critical depth
           inside the bridge at the upstream end
       Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION


RIVER: East Riser Ditch
REACH: Middle             RS: 6837

INPUT
Description: Bridge 45 ft  DS
Station Elevation Data    num=     103
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
       0    8.34    1.34    8.34    2.95    8.28    4.03    8.25    4.57    8.25
    6.11     8.2   10.59    8.04   11.87       8   28.04    7.26   33.54       7
   34.64    6.92   38.09    6.68   40.79     6.5   43.29    6.32   46.55    6.11
   47.98       6   48.42       6   51.56    5.92   52.98    5.88   53.73    5.87
   56.87    5.79   74.32    5.32    76.1    5.28   80.11     5.2   81.55    5.16
   86.32    5.06   86.48    5.05    89.4       5  101.42       5  105.43    4.82
  106.14    4.81  118.63    4.65  121.79    4.59  137.74    4.31  140.87    4.25
  152.85       4  171.38       4  173.26    4.06  174.29     4.1  181.93    4.29
  183.86    4.36  184.43    4.37  189.55    4.61  193.46    4.82  195.78    4.94
  196.83       5  232.68       5  233.28    4.98  234.23    4.97  236.72    4.93
  242.59    4.81  244.26    4.78  247.29     4.7  248.16     4.7  250.79    4.63
  281.82    4.53  282.79    4.56  286.86    4.65  289.02    4.69  299.84       5
  311.55       5  326.74    5.88  328.38    5.95  329.35    5.96  331.16    5.91
  332.18    5.86  336.12    5.62  341.64    5.27  345.83       5  346.36    4.87
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348.08	4.34	349.41	4	354.63	4	355.44	4.09	355.61	4.09
361.62	5	416.38	5	418.04	4.92	421.76	4.78	422.52	4.72
426.08	4.49	428.86	4.29	431.96	4.18	432.42	4.15	434.04	4.09
435.83	4	490	4	516	4	525	7	845	7
860	4	860.1	-1.38	873	-1.38	875	-2.38	894.25	-2.38
895	-2.38	897	-1.38	904.9	-1.38	905	5	905.1	5
906.8	6	915.08	6	917.24	5.95				

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.11	490	.045	860	.035	905	.065

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

Left	Right	Left	Channel	Right	Coeff Contr.	Expan.
860	905	111.2	123.83	125.25	.3	.5

LATERAL STRUCTURE

RIVER: East Riser Ditch
REACH: Middle RS: 6823

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS =
Deck/Roadway Width = 20
Weir Coefficient = 2.6
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 500

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6	14.97	6	16.48	5.39	17.48	5.39	21.9	5.4
22.02	5.39	25.77	5	77.05	5	77.87	5	78.22	5
78.47	5	78.84	5	79.65	5	81.45	5	81.59	5
82.15	5	83.72	5	83.85	5	86.1	5	86.76	5
92.48	5	93.73	5	94.87	5	94.93	5	96.66	5
96.72	5	98.8	5	99.17	5	99.56	5	99.62	5
101.13	5	103.44	5	117.66	5	119.54	5	120.15	5
127.61	5	128.06	5	129.2	5	129.22	5	129.55	5
130.35	5	130.59	5	136.83	5	137.1	5	138.96	5
144.05	5	144.06	5	146.5	5	153.05	5	153.06	5
153.7	5	155.04	5	156.31	5	157.18	5	159.09	5
159.65	5	160.12	5	160.61	5	162.15	5	162.45	5
162.72	5	171.85	5	173.19	5	173.74	5	175.43	5
176.86	5	177.13	5	177.26	5	178.3	5	179.91	5
181.65	5	203.55	5.7	204.25	5.74	208.24	6	208.35	6
208.85	6	209.22	6	210.74	6	211.91	6	213.51	5.88
213.63	5.87	215.05	6	216.28	6	216.42	6	216.5	6
217.5	6	217.97	6	219.46	6	219.55	6	219.98	6
220.79	6	221.76	6	221.8	6	222.74	5.92	222.76	5.92
224.03	5.88	224.32	5.88	224.42	5.88	224.93	5.87	226.21	5.79
226.24	5.79	226.26	5.79	226.28	5.79	226.51	5.76	226.97	5.78
227.16	5.78	234.64	5.35	235.72	5.35	236.37	5.36	237	5.35
237.88	5.36	238.43	5.35	239.53	5.33	242.82	5.3	243.71	5.3
244.8	5.27	245.31	5.25	250.79	5.21	266.2	5.18	268.43	5.14
268.88	5.13	270.91	5.12	273.04	5.1	284.49	5	289.83	5
289.94	5	290.2	5	291.86	5	292.26	5	292.56	5
303.73	5	311.13	5	312.28	5	313.07	5	319.05	5
326.98	5	330.37	5	330.65	5	331.11	5	332.23	5
332.29	5	332.88	5	340.03	5	340.97	5	341.17	5
341.96	5	343.54	5	344.2	5	344.41	5	344.81	5
344.93	5	345.41	5	345.71	5	346.12	5	347.49	5
347.99	5	348.92	5	349.93	5	353.42	5	353.73	5
354.31	5	355.92	5	356.13	5	357.27	5	357.99	5
358.21	5	358.48	5	359.5	5	359.96	5	360.3	5
361.69	5	362.06	5	362.8	5	363.25	5	364.55	5
365.31	5	366.16	5	366.59	5	367.56	5	368.03	5
370.14	5	370.36	5	371.44	5	373.63	5	374.22	5
375.16	5	386.04	5.83	386.42	5.84	387.05	5.85	387.69	5.86
388.46	5.88	389.99	5.88	392.13	6	392.35	6	393.92	6

394.05	6	397.05	5.86	418.37	5	418.65	5	419.43	5
420.23	5	420.82	5	421.63	5	422.97	5	423.44	5
424.26	5	427.79	5	431.3	5	432.57	5	432.85	5
433.92	5	434.3	5	435.22	5	435.77	5	438.17	5
438.33	5	439.48	5	444.43	5	445.36	5	445.48	5
446.62	5	450.11	5	450.58	5	450.95	5	452	5
452.96	5	456.02	5	456.61	5	456.77	5	456.84	5
457.11	5	457.73	5	459.44	5	459.57	5	459.75	5
461.35	5	461.88	5	462.64	5	463.42	5	464.21	5
465.59	5	468.42	5	469.97	5	471.24	5	474.88	5
475.24	5	476.71	5	478.01	5	478.35	5	481.79	5
483.67	5	484.16	5	484.52	5	485.14	5	486.39	5
487.51	5	488.33	5	488.66	5	489.54	5	490.54	5
493.56	5	493.91	5	495.03	5	495.25	5	498.11	5
498.42	5	498.86	5	499.32	5	500.14	5	500.54	5
501.15	5	501.48	5	502.42	5	502.5	5	502.77	5
503.35	5	503.69	5	508.17	5	508.84	5	508.99	5
509.71	4.99	509.73	4.99	509.74	4.99	510.78	4.98	515.41	4.95
516.36	4.96	516.4	4.96	516.49	4.96	516.52	4.96	517.06	4.95
517.98	4.95	523.4	4.95	523.96	4.95	524.64	4.95	524.76	4.95
525.44	4.95	525.59	4.95	528.56	4.95	534.83	4.95	536.6	5
537.25	5	537.59	5	537.76	5	537.79	5	537.84	5
537.85	5	540.94	5	541.06	5	542.13	5	542.24	5
543.07	5	545.43	5	546.86	5	547.1	5	548.4	5
549.09	5	549.71	5	550.67	5	550.75	5	552.55	5
553.57	5	556.94	5	557.35	5	559.19	5	560.08	5
561.04	5	561.39	5	561.94	5	562.66	5	563.02	5
563.49	5	564.07	5	565.21	5	565.96	5	567.76	5
568.09	5	568.45	5	568.75	5	569.23	5	569.82	5
570.49	5	570.59	5	571.33	5	571.73	5	572.13	5
572.78	5	573.98	5	574.61	5	575.56	5	575.67	5
577.18	5	577.64	5	579.2	5	581.52	5	583.11	5
583.56	5	583.9	5	585.01	5	585.27	5	585.61	5
587.04	5	587.53	5	588.2	5	589.12	5	590.08	5
591.97	5	593.93	5	594.12	5	594.68	5	595.82	5
596.95	5	597.46	5	598.18	5	598.66	5	599.24	5
600.83	5	601.17	5	603.02	5	603.15	5	603.89	5
604.69	5	604.78	5	604.95	5	606.04	5	606.63	5
606.92	5	607.89	5	608.23	5	608.81	5	609.45	5
610.87	5	611.7	5	612.55	5	613.48	5	614.6	5
614.86	5	617.08	5	617.8	5	618.06	5	618.6	5
619.24	5	620.2	5	620.66	5	621.37	5	621.98	5
622.3	5	623.07	5	623.78	5	623.97	5	624.72	5
626.04	5	626.6	5	628.35	5	630.4	5	631.34	5
632.14	5	632.33	5	632.56	5	633.88	5	634.06	5
636.87	5	637.36	5	638.93	5	639.51	5	641.02	5
643.68	5	645.62	5	645.82	5	646.13	5	648.97	5
649.44	5	649.55	5	649.7	5	650.23	5	650.38	5
650.63	5	650.8	5	652.84	5	652.89	5	653.12	5
658.53	5	658.77	5	659.9	5	660.52	5	662.04	5
662.16	5	663.53	5	664.16	5	664.35	5	678.01	5
678.2	5	678.31	5	680.03	5	680.77	5	682.03	5
682.75	5	685.1	5	686.75	5	686.85	5	687.06	5
687.33	5	689.49	5	689.66	5	690.14	5	690.65	5
692.07	5	692.33	5	692.65	5	693.89	5	694.18	5
695.35	5	697.14	5	709.33	5.82	709.55	5.82	709.92	5.82
710.17	5.82	710.83	5.82	713.79	5.8	716.02	5.81	720.97	5.8
721.75	5.81	722.3	5.8	723.01	5.79	723.06	5.79	723.22	5.78
730.42	5.75	731.12	5.75	731.93	5.76	732.35	5.76	733.41	5.75
733.6	5.75	740.31	5.73	741.47	5.74	743.68	5.72	744.16	5.71
744.92	5.7	745.73	5.68	746.4	5.67	746.86	5.67	755.07	5.89

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #100 Yr Lat Struct

E.G. US. (ft)	5.63	Weir Sta US (ft)	14.97
W.S. US. (ft)	5.57	Weir Sta DS (ft)	709.33
E.G. DS (ft)	5.43	Min El Weir Flow (ft)	4.95
W.S. DS (ft)	5.42	Wr Top Wdth (ft)	626.24

* Q US (cfs)	* 795.33	* Weir Max Depth (ft)	* 0.57 *
* Q Leaving Total (cfs)	* 491.91	* Weir Avg Depth (ft)	* 0.44 *
* Q DS (cfs)	* 304.61	* Weir Flow Area (sq ft)	* 277.70 *
* Perc Q Leaving	* 61.70	* Weir Coef (ft^1/2)	* 2.600 *
* Q Weir (cfs)	* 491.91	* Weir Submerg	* 0.00 *
* Q Gates (cfs)	*	* Q Gate Group (cfs)	* *
* Q Culv (cfs)	* 0.00	* Gate Open Ht (ft)	* *
* Q Lat RC (cfs)	*	* Gate #Open	* *
*	*	* Gate Area (sq ft)	* *
* Q Breach (cfs)	*	* Gate Submerg	* *
* Breach Avg Velocity (ft/s)	*	* Gate Invert (ft)	* *
* Breach Flow Area (sq ft)	*	* Gate Weir Coef	* *

Warning: Divided flow computed for this cross-section.

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 6713

INPUT
Description: Channel Improvements
Station Elevation Data num= 83

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	8	8.32	8	15.69	7.34	19.74	7	21.02	6.82
24.62	6.36	26.91	6.08	28.96	5.85	29.58	5.79	31.66	5.56
33.22	5.41	34.12	5.34	36.13	5.21	36.54	5.17	39.07	5
87.23	5	99.33	4.18	99.86	4.19	108.04	5	110.12	5
121.43	4.41	128.58	4	150.58	4	157.05	4.24	166.38	4.46
166.62	4.47	169.54	4.53	223.81	4.08	224.11	4.07	227.78	4.04
228.34	4.03	229.89	4.03	230.15	4.04	240.87	4.16	298.77	4.83
299.25	4.84	300.8	4.84	306.35	5	307.24	5	311.75	4.83
339.9	4	362.38	4	376.59	4.67	377.53	4.68	384.6	4.96
385.75	5	387.88	5	388.03	4.99	392.77	4.82	409.72	4.52
425.5	4.39	426.92	4.52	427.5	4.51	434.87	4.56	436.96	4.71
440.48	5	457	5	475.09	5	506.5	4.1	508.86	4
518.63	4	532.5	4	541.5	7	786.5	7	841.5	7
850	4	858	4	878	4	886	1.33	893	-.87
903.95	-.87	906.95	-1.87	921.95	-1.87	923.68	-.7	928.58	.63
931.32	2	932.28	2.18	934.8	3	935.64	3.67	937.14	4.83
937.39	5	938.78	5	953.77	5				

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.11	506.5	.045	878	.035	938.78	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
878	938.78	94.88	94.46	92.3	.1	.3

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 6619

INPUT
Description: Channel Improvements
Station Elevation Data num= 93

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	8.55	13.02	8	13.31	8	14.19	7.83	16.2	7.45
17.5	7.21	17.89	7.14	18.75	7	20.87	6.76	21.86	6.63
22.65	6.53	24.11	6.34	25	6.24	26.74	6	29.31	5.78
37.69	5	114.85	5	138.11	4.18	142.14	4	142.41	4
143.03	4.05	151.61	5	301.33	5	308.8	4.8	309.92	4.78
321.31	4.51	327.35	4.37	338.39	4.1	339.09	4.08	342.76	4
386.43	4	388.84	4.15	389.45	4.19	395.6	4.54	396.1	4.56

```
  403.94    4.59  405.54     4.6  405.68    4.59  406.14    4.59  408.24    4.53
  409.37    4.47  411.18    4.35  411.33    4.33  414.17    4.07  414.92       4
  422.09       4  423.09    4.19  423.61     4.2   423.8    4.23  425.76    4.46
  426.63    4.57   429.9       5     526       5  533.95       5     536     4.8
     541     4.6  553.22    4.27     562       4     571       7     903       7
     909       5  914.33       5  927.96    5.37  931.54       5  931.62       5
  931.94    4.96  933.87    4.77  934.35    4.69  936.33    4.47  937.53       4
  945.22       4  966.01    1.26   971.8    -.87   973.8   -1.49  977.43   -1.76
  982.65   -1.15  984.12     .61  986.05       3   987.6       3  990.45    3.69
  991.65    3.98  992.06     4.1  993.52    4.51  993.76    4.57  994.62    4.81
  995.56       5  995.74       5  999.24    5.42 1003.05    5.81 1003.08    5.82
 1003.65    5.85 1004.08    5.89 1008.96    5.75

Manning's n Values        num=       4
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
**************************************************************
       0     .11     536    .045  945.22    .035  995.56     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        945.22  995.56           185.45  187.85  187.68             .1       .3

CROSS SECTION


RIVER: East Riser Ditch
REACH: Middle             RS: 6431

INPUT
Description:
Station Elevation Data    num=     146
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
       0    7.19    1.21       7   22.34       7   34.07    6.47   37.21    6.32
   39.11    6.24   39.86     6.2   41.02    6.16   41.78    6.12   42.49    6.11
   44.51    6.03   45.09    6.03    78.4       6  105.21       6  106.81    6.07
  108.68    6.18  110.58    6.32  125.76    6.39   126.3    6.38   129.9     6.2
  131.65    6.14     134    6.07  135.04       6  200.82       6  232.28     5.3
  234.54       5  240.84       5  242.38    5.06  243.68    5.15  243.87    5.14
  244.91    5.23  245.62    5.22  246.86    5.24  257.05       6  268.34       6
  276.26    5.41  283.97     5.4  287.08    5.48  294.83    5.73  296.57    5.72
  299.94    5.68  319.98    5.56  320.16    5.56  328.17    5.44  353.55       5
  617.42       5  618.99     5.1  629.31    5.45  632.66     5.4  635.92    5.28
  639.26    5.22  645.86       5  672.37       5  679.42    4.44  679.59    4.44
  685.89       5  694.34    4.61  695.27    4.62   711.7    4.46  714.78    4.38
  722.64    4.16  724.91    4.08  727.43       4  727.88       4   738.5    3.39
  738.76    3.38  746.79     3.5  747.93    3.61  748.85    3.68  751.87    3.87
   756.1    4.12  759.02    4.28  763.02    4.66   766.4       5  774.68       5
  776.12     5.2  779.08       5  869.71       5  877.24    4.75  888.01    4.43
  901.28       4     950       4  959.76       4  966.88    3.95  989.71    3.63
  996.73    3.52  998.27    3.49  1004.7    3.41 1025.92    3.14 1027.05    3.13
 1030.04       3 1031.02       3 1032.36    2.93 1041.17    2.49 1043.06     2.4
 1049.88       2 1051.17       2 1052.09    2.11  1052.5    2.18 1054.35    2.33
 1057.81    2.76 1059.61       3 1066.47    3.83 1067.93       4    1179       4
 1277.31       4 1284.95    4.22 1287.23    4.24 1288.06    4.29 1292.52    4.62
  1293.3    4.64 1296.78       5 1296.84       5 1297.82    5.35 1299.86       6
 1300.07    6.09 1302.54    7.02 1306.02    7.32  1306.5    7.25 1307.92       7
 1309.08    6.82 1310.62    6.41 1311.58    6.19 1312.19       6 1316.44       5
 1316.67       5 1317.63    4.79 1319.26    4.45 1322.06       4 1327.27       4
  1346.5       4 1346.86    3.94 1349.73       3 1352.97    2.29 1354.12    1.02
  1359.2      -1 1366.74    -2.2 1369.57   -1.68 1376.68    1.37  1379.6       5
 1380.88       5 1383.32    5.28 1387.28    5.74 1388.47    5.85 1389.55       6
 1395.59       6

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
**********************************************
       0    .105  1346.5    .035 1383.32     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        1346.5 1383.32           197.17  211.97   212.4             .1       .3
Ineffective Flow     num=       1
```

Sta L	Sta R	Elev	Permanent
0	325	6.5	F

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 6219

INPUT
Description:
Station Elevation Data num= 148

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	7	7.17	7	34.4	6.61	64.95	6.59	74.28	6.67
107	6	118.87	6	119.89	6.05	126.86	6.26	131.68	6.37
149.72	6	179.07	6	221.3	5.19	225.89	5.11	230.34	5.02
231.7	5	233.72	5	269.75	5.51	279.33	5.75	287.74	6
365.93	6	368.85	5.7	369.42	5.61	370.66	5.56	371.13	5.47
372.19	5.36	374.93	5.03	378.77	4.2	379.59	4.13	379.97	4.06
381.38	4.09	388.47	4.32	390.15	4.39	403.48	5	419.19	5
454.74	5.54	470.44	5.8	471.94	5.8	473.84	6	481.37	5.84
483.28	5.82	528.48	6	531.57	6	547.21	5.96	549.32	5.96
549.67	6	567.29	6	601.1	5.3	601.88	5.31	604.26	5
606.89	5	611.11	5.24	611.85	5.26	629.49	5.15	633.92	5
635.63	5	639.86	4.79	659.12	4	699.8	4	711.06	4.7
712.27	4.78	716.07	5	770.69	5	780.14	4.72	789.4	4.44
804.57	4	804.81	4	814.63	3.01	815.65	3	817.09	3.17
825.13	3.99	826.4	4	829.6	4.11	834.7	4.35	838.82	4.55
842.01	4.72	844.39	4.79	846.46	4.88	852.61	5	856.04	5
859.52	4.91	880.88	4.9	881.24	4.89	884.3	4.9	887.15	4.88
888.07	4.86	888.86	4.9	921.82	4.78	923.74	4.81	926.03	4.83
935.43	4.89	937.78	4.89	943.31	4.75	948.23	4.54	957.51	4.16
961.28	4	968.56	3.45	972.53	3.14	973.81	3.05	974.97	3
975.93	3	986.74	2.06	988.19	2.02	992.13	2.4	993.64	2.72
993.96	2.75	995.23	3	997.61	3.11	1000.72	3.3	1010.99	4
1013.26	4	1027	4.59	1035.85	5	1072.12	5	1073.01	4.98
1114.27	4.91	1121.88	5	1148.87	5	1152.86	4.81	1155.33	4.71
1161.94	4.5	1167.44	4.28	1174.77	4	1278.31	4	1289.79	3.52
1291.31	3.68	1291.99	3.73	1292.35	3.69	1293.25	3.7	1293.58	3.63
1293.92	3.67	1295.75	3.39	1300.3	4	1415.57	4	1416.39	3.98
1417.46	3.95	1440.36	3	1447.25	-.08	1458.96	-.76	1469.52	-3.24
1471.12	-1.76	1473.01	-.6	1474.1	4	1479.13	4	1483.13	4.34
1488.43	4.8	1490.54	5	1494.2	5				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.105	1416.39	.035	1474.1	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1416.39	1474.1	192.21	200.14	198.86	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	630	6.5	F

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 6019

INPUT
Description:
Station Elevation Data num= 150

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	7	8.16	6.71	24.9	6.23	53.77	6.08	57.79	6
123.8	6	152.81	5.13	155.33	5.03	168.65	5.45	174.4	5.67
182.11	6	184.9	6	186.52	5.84	197.6	5	255.41	5
269.5	5.21	274.65	5.24	293.5	5.26	302.87	5.26	328.41	6

347.45	6	348.66	5.92	366.82	5.49	368.73	5.53	371.66	5.68
374.42	5.72	379.17	5.99	385.9	5.75	388.26	5.56	393.57	4.9
401.88	4.41	405.11	4.43	408.89	5	435.02	5	437.91	5.04
441.04	5.34	445.03	5.88	446.46	5.77	447.96	5.82	450.91	5.56
452.7	5.58	463.34	5.34	468.47	5.35	474.92	5.31	483.76	6
485.8	5.98	492.85	5.59	495.33	5.62	502.02	6	523.44	6
526.6	5.59	527.72	5.59	529.62	5.42	534.79	5.34	543.46	5.25
546.24	5.42	549.16	5.66	551.85	5.74	553.68	6	601.46	6
609.76	5.72	615.24	5.7	633.92	5.19	653.14	5.12	660.3	5.11
663.56	5	695.54	5	702.89	4	704.19	3.61	706.89	3
709.31	3	713.23	2.67	714.13	3	715.75	3.78	721.54	3.98
726.3	4.48	728.79	4.68	730.18	4.65	732.65	4.86	736.4	4.84
738.38	5	742.34	5	744.66	4.3	751.76	4	754.23	3.82
761.22	3.48	766.15	3	768.51	2.12	769.98	2.15	772.37	2.44
774.38	3.36	776.07	4	785.81	5	787.31	5	790.62	5.15
814.79	6	826.15	6	842.67	5.42	850.25	5.2	861.33	5
869.7	4.92	876.98	4.82	889.69	4.61	915.38	4	967.43	4
981.33	3.67	1013.36	3.34	1020.3	3.82	1023.63	4	1053.45	4
1071.72	4.29	1081.53	4.47	1089.93	4.59	1111.75	5	1119.59	5
1138.84	4.11	1141.54	4	1172.65	4	1205.89	3.45	1213.8	3.34
1237.95	3.41	1241.54	3	1242.59	3	1257.99	3.63	1258.64	3.69
1260.59	3.5	1261.1	3.56	1263.14	3.38	1265.55	3	1267.86	3
1274.13	3.18	1300.45	3.41	1314.87	3.63	1322.42	3.73	1339.99	4
1354.35	4	1357.36	4	1378.44	4.06	1379.82	3.96	1382.58	3
1385.71	-.08	1393.48	-1.46	1399.27	-1.99	1408.74	-1.9	1410.27	.16
1411.4	3.98	1412.78	5	1415.94	6	1420.81	6	1433.5	6

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.105	1378.44	.035	1415.94	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1378.44	1415.94	172.41	200.47	202.68	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	690	6.5	F

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 5818

INPUT
Description:
Station Elevation Data num= 148

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	7	1.7	7	8.83	6.73	14.2	6.54	26.37	6
96.8	6	101.9	6.27	102.8	6.28	106.76	6.41	107.46	6.45
111.5	6.56	113.34	6.55	119.19	6.51	129.59	6.3	130.8	6.29
131.83	6.3	137.54	6.33	153.02	6	207.43	6	238.84	6.84
244.78	7	255.69	7	291.69	6.12	293.9	6.01	294.41	6
302.7	6	310.6	6.68	311.01	6.66	311.63	6.58	312.22	6.52
314.42	6.51	315.26	6.27	315.47	6.31	315.77	6.31	316.01	6.27
316.84	6.51	317.26	6.57	323.94	6	329.76	6	330.02	5.99
335.38	5.84	344.61	5.57	353.91	5.32	357.18	5.25	357.39	5.25
368.81	5	371.48	5	372.92	3.99	374.29	3	381.58	3
384.27	3.59	385.89	4	398.54	4	413.15	4.46	415.24	4.52
416.62	4.52	417.9	4.51	419.95	4.48	420.66	4.49	423.33	4.46
424.02	4.46	431.11	4	436.28	4	448.37	4.62	448.71	4.63
457.55	4.77	459.62	4.8	463.25	4.88	464.38	4.9	468.57	4.9
474.22	4.92	476.31	4.88	477.77	4.86	492.6	4.68	495.1	4.64
501.01	4.46	503.04	4.38	506.23	4.26	507.53	4.22	508.72	4.17
513.8	4	515.12	4	518.21	3.94	520.97	3.88	521.7	3.87
524.52	3.81	525.57	3.78	526.97	3.75	557.61	3	591.96	3
605.85	3.25	647.66	3.89	648.77	3.9	654.18	3.92	655.76	3.92
669.35	4	780.83	4	783.22	3.72	783.35	3.72	799.47	4
963.79	4	971.15	3	973.43	3	974.14	3.05	987.22	4
1033.95	4	1035.79	3.78	1036.86	3.61	1040.29	3	1057.59	3

```
 1062.49    3.15 1076.28    3.58 1086.84    3.93 1089.27       4 1094.38       4
 1107.38       4 1109.62    3.64  1110.2    3.56 1111.81    3.17 1112.55       3
 1113.77    2.52 1115.49    2.22  1115.9    2.09  1117.5    -.14 1122.12   -2.16
 1126.62   -3.31 1133.74   -2.17  1139.3     .25 1141.01    3.21 1141.55    3.39
 1142.36    3.63 1143.55    4.12 1144.68    4.76 1145.26       5 1146.24    5.24
 1146.98    5.28 1147.92    5.38 1148.49    5.36 1149.62       6 1150.26       6
  1162.4       6 1171.14    5.62  1178.7       5  1180.1       5 1181.95    5.23
    1182    5.23 1187.49    5.99 1188.25    6.18

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0    .105 1107.38    .035 1150.26     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
       1107.38 1150.26           168.46   176.9  174.99             .1       .3

CROSS SECTION


RIVER: East Riser Ditch
REACH: Middle             RS: 5641

INPUT
Description:
Station Elevation Data    num=     149
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
       0    7.82    1.52    7.78   28.49     7.1   32.17       7   34.23       7
   40.25     6.3   42.42    6.06   42.97       6    46.1       6   82.68    5.33
   97.18    5.12   98.12       5  104.68       5   105.6    5.01  106.15    5.03
   106.6    5.04  114.63    5.28  115.33    5.31  126.39     5.6  127.25    5.64
   133.7       6  208.22       6  214.64    6.31  215.28    6.33  215.85    6.34
  217.08    6.37  217.58    6.38     219    6.42  231.08       7  249.01       7
  249.81    6.84  250.02    6.82  251.15    6.57  251.24    6.58  253.14     6.2
  253.49    6.17  258.07    6.21  258.97    6.26  260.67    6.35  261.57    6.39
   263.4    6.49     266    6.63  271.22       7  291.11       7  294.24    6.96
   294.6    6.95  297.12    6.94  297.42    6.93  298.43    6.92  322.57       6
   343.3       6  343.32    5.97  344.17       5  344.57    4.55  345.69    3.27
  345.92       3  352.91       3  356.63    3.99  356.65       4  358.61    4.73
  359.24       5  369.88       5  375.97    5.16  377.43    5.12  378.59     5.1
  381.06    5.04  381.67       5  383.47       5  384.64    4.97  387.35    4.85
  387.68    4.83  388.26    4.81  393.58    4.53  395.78    4.41  396.66    4.37
  398.99    4.24   403.8       4  418.48       4  447.82    3.08     448    3.08
  451.71       3  660.36       3  661.36    3.04  700.24       4  705.53       4
  709.53    3.47   730.8    3.55   731.3    3.56     736    3.67  736.31    3.67
  738.09    3.71  740.13    3.75  740.37    3.75   747.9    3.83  750.78    3.84
  769.41    3.94   772.5       4  913.13       4  934.82    4.55  956.97    4.55
  957.34    4.54  978.24       4 1014.05       4 1014.94    3.87 1017.17    3.46
 1018.04    3.32 1018.47    3.28 1018.76    3.28 1019.23    3.25 1019.98    3.23
 1020.17    3.23 1020.74    3.26  1021.8    3.27  1022.5    3.31 1023.04    3.33
 1027.58    3.58 1027.85     3.6 1028.49    3.58 1033.15       4 1040.91    3.36
 1042.08    3.39    1043    3.38 1043.57    3.39  1044.1    3.39 1044.54    3.38
 1045.25    3.41 1086.26    3.22 1087.03    3.21 1088.46    3.18 1092.18    3.11
 1093.37     3.1 1099.49       3 1208.59       3 1220.03    -.27 1224.09   -1.84
 1227.59   -2.39 1231.45   -2.05 1240.01     .52 1242.73    4.84 1243.11       5
 1244.19       5 1244.98    5.03 1248.35    5.17 1249.76    5.22 1250.13    5.24
 1253.56    5.38 1256.39    5.47 1263.68    5.73 1270.45    5.99

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0    .105 1208.59    .035 1244.98     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
       1208.59 1244.98           189.86  190.15  189.91             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
       0     345     6.5          F

LATERAL STRUCTURE
```

RIVER: East Riser Ditch
REACH: Middle RS: 5502

INPUT
Description:
Lateral structure position = Right overbank
Distance from Upstream XS =
Deck/Roadway Width = 20
Weir Coefficient = 2.6
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 155

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	5.2	9.46	5	9.98	5	17.76	5	22.82	5
23.03	5	23.23	5	24.79	5	26.15	5	27.32	5
29.85	5	30.27	5	31.84	5	32.21	5	32.86	5
36.75	5	37.49	5	38	5	38.82	5	38.91	5
39.77	5	40.5	5	41.89	5	42.33	5	43.12	5
44.08	5	44.46	5	45.05	5	47.52	5	47.92	5
49.08	5	49.84	5	50.02	5	50.83	5	51.97	5
52.54	5	52.74	5	56.24	5	57.2	5	57.79	5
58.51	5	59.09	5	60.81	5	61.13	5	62.03	5
63.93	5	66.15	5	66.93	5	67.13	5	67.5	5
68.66	5	68.98	5	71.58	5	71.69	5	72.19	5
72.46	5	72.72	5	73.32	5	73.4	5	73.7	5
73.77	5	73.82	5	73.93	5	83.23	5	108.57	5
116.38	5	116.48	5	116.73	5	117.18	5	117.67	5
117.81	5	118.64	5	119.19	5	119.41	5	119.48	5
120.51	5	120.87	5	123.01	5	123.45	5	124.55	5
129.98	5	130.1	5	130.23	5	132.09	5	132.95	5
133.05	5	133.62	5	134.96	5	135.06	5	135.38	5
135.41	5	137.82	5	138.65	5	140.02	5	140.06	5
143.79	5	144.47	5	148.69	5	149.09	5	149.81	5
150.67	5	150.9	5	152.7	5	152.89	5	153.02	5
153.11	5	158.75	5	158.99	5	159.37	5	159.89	5
160.22	5	164.06	5	165.35	5	165.59	5	191.37	5
205.57	5	211.38	5	213.01	5	215.35	5	215.87	4.98
224.01	4.98	225.98	5	227.94	5	228.36	5	244.22	5
245.34	5	245.53	5	246.06	5	246.97	5	254.3	5
261.47	5	261.5	5	261.55	5	261.77	5	261.82	5
261.85	5	265.42	5	272.27	5	272.88	5	273.44	5
273.87	5	274.3	5	277.48	5	290.16	5	296.68	5
297.86	5	300.27	5	300.59	5	305.34	5	305.57	5
307.59	5	318.58	5	322.46	5	323.86	5	332.29	5.2

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #100 Yr Lat Struct

E.G. US. (ft)	5.41	Weir Sta US (ft)	0.00
W.S. US. (ft)	5.40	Weir Sta DS (ft)	332.29
E.G. DS (ft)	5.40	Min El Weir Flow (ft)	4.98
W.S. DS (ft)	5.40	Wr Top Wdth (ft)	332.29
Q US (cfs)	304.61	Weir Max Depth (ft)	0.42
Q Leaving Total (cfs)	217.53	Weir Avg Depth (ft)	0.40
Q DS (cfs)	162.40	Weir Flow Area (sq ft)	132.33
Perc Q Leaving	72.06	Weir Coef (ft^1/2)	2.600
Q Weir (cfs)	217.53	Weir Submerg	0.00
Q Gates (cfs)		Q Gate Group (cfs)	
Q Culv (cfs)	0.00	Gate Open Ht (ft)	
Q Lat RC (cfs)		Gate #Open	
		Gate Area (sq ft)	
Q Breach (cfs)		Gate Submerg	
Breach Avg Velocity (ft/s)		Gate Invert (ft)	
Breach Flow Area (sq ft)		Gate Weir Coef	

Warning: Divided flow computed for this cross-section.

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 5451

INPUT
Description:
Station Elevation Data num= 129

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	7	12.53	7	13.42	6.92	19.84	6.47	25.41	6.22
28.74	6.08	30.35	6.1	31.37	6.05	32.72	6.02	32.74	6.03
33.17	6.03	34.55	6.01	34.64	6	38.42	6	49.91	5.53
53.42	5.52	53.94	5.52	93.66	5	193.1	5	194.78	5.09
195.33	5.11	195.48	5.12	197.63	5.23	197.67	5.23	202.59	5.5
213.5	5.89	215.81	5.97	216.28	6	223.36	6	225.01	5.85
225.64	5.79	225.82	5.77	228.2	5.58	228.57	5.55	233.04	5
259.84	5	260.64	4.65	262.69	4	263.73	3.51	264	3.38
264.15	3.32	264.54	3.19	264.84	3.1	265.46	3.01	267.94	3.08
268.28	3	272.56	3	277.47	3.6	279.95	4	280.98	4
286.35	4.35	287.33	4.4	288.83	4.47	290.56	4.56	295.1	4.81
298.32	4.9	299.38	4.91	299.42	4.92	300.03	4.9	300.97	4.97
301.98	4.98	310.64	4.97	346.36	4.98	346.49	4.99	347.43	4.98
349.08	4.99	350.52	4.99	354.35	5	363.46	5	366.86	4.99
370.92	4.95	372.57	4.94	372.9	4.93	376.1	4.94	376.51	4.93
430.59	4	452.57	4	456.39	3.96	456.54	3.96	463.03	3.95
464.1	3.93	464.39	3.92	464.48	3.92	465.16	3.91	465.37	3.91
465.86	3.9	466.14	3.9	469.58	3.82	469.83	3.82	469.97	3.81
473.58	3.77	475.89	3.72	477.84	3.68	478.38	3.68	479.79	3.64
483	3.57	491.43	3.49	492.72	3.47	516.31	3	773.99	3
792.56	3.61	794.5	3.63	796.54	3.66	819.3	4	1058.5	4
1095.45	3.04	1096.8	3	1218.59	3	1223.82	3.33	1234.24	3.98
1234.6	4	1252.76	4	1253.62	3.92	1254.5	3.85	1261.18	3.29
1272.5	2.68	1275.27	2	1282.33	.16	1286.4	-1.49	1291.21	-1.55
1295.35	-1.33	1301.56	1.04	1303.37	3.55	1303.77	3.66	1304.93	4
1306.7	4.39	1307.45	4.51	1309.88	5	1317.78	5		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.105	1261.18	.035	1303.77	.055

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
1261.18 1303.77 144.09 205.59 205.73 .1 .3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	260	6.5	F

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 5245

INPUT
Description:
Station Elevation Data num= 147

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	7.3	7.07	7	51.07	7	71.62	6.23	75.93	6
96.63	6	113.5	5.37	119.42	5.21	123.58	5	128.81	5
144.62	5.27	184.98	6	188.04	5.75	190.23	6	191.88	6
203.25	5	214.78	5	218.05	5.81	219.29	5.82	226.78	5
241.33	5	245.18	5.24	255.26	5	269.92	5.07	274.61	5
286.53	5	287.98	4.96	297.53	4.89	301.94	4.8	314.78	4.42
318.63	4.36	339.47	4.69	347.89	4.77	350.1	4.73	355.21	4.86
358.2	4.8	360.56	4.61	363.58	4.58	369.91	4.42	372.29	4.3
383.86	4	416.41	4	438.62	3.57	445.79	3.49	448.84	3.52
458.76	3.46	468.74	3.47	487.72	3.3	501.77	3	523.24	3

```
  528.53       4  535.43       3  552.89       3  561.98       4  568.42       4
   570.1    3.95  583.28    3.78  587.74    3.83  591.91    3.73  600.82    3.83
  609.33    3.79  655.32    3.38  673.18     3.4  676.29    3.42  705.29     3.7
  711.88    3.72  727.14    3.72  730.99     3.7  747.94    3.52  771.31     3.2
  794.91       3 1035.79       3 1052.73    3.21 1059.39    3.33 1079.38    3.65
 1105.86    3.93    1112    3.92 1132.67       4 1164.28       4 1178.24    3.45
 1189.38    3.25 1198.83       3 1225.96       3 1243.47    3.28 1244.53    3.32
 1253.35       4 1263.65    3.35 1273.42       3  1274.9       3 1282.12    3.72
 1292.99    3.77  1302.7       4 1307.03       4    1339    3.02 1343.04    3.13
 1356.65       4 1363.18       4 1366.57    3.85 1370.36     3.9 1374.47     3.7
    1389    3.32 1404.13       4 1407.76       4 1428.07    3.36  1435.7    3.24
 1444.83       3 1452.26       3 1455.55       4 1462.26       3 1472.89       3
 1476.92    3.28 1485.53       4 1492.06       4 1495.95     3.4  1498.4     3.1
 1500.52    3.11 1517.44    3.37 1526.32    3.09 1527.39       3 1568.42       3
 1595.56       4 1605.75    4.58 1610.15    4.78 1616.18    5.27 1620.25    5.52
  1622.5    5.57 1625.33    5.23 1628.35       5 1646.38       5 1648.12    5.26
 1661.53       6 1678.91       6 1681.13    5.76 1691.89       5 1694.82    4.86
 1697.01    4.33 1700.76    3.88 1706.75     .93 1712.01   -1.08 1719.52   -2.94
 1725.46   -1.79  1731.5     .96 1733.34       4 1737.45    4.65 1741.29    4.52
 1746.65    4.83 1749.47    4.82

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0    .105 1697.01    .035 1733.34    .055

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
       1697.01 1733.34            125.6  238.14  277.91             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
       0     195     6.5       F

CROSS SECTION


RIVER: East Riser Ditch
REACH: Middle             RS: 5007

INPUT
Description:
Station Elevation Data    num=     140
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
       0    8.67     .42    8.56    1.85    8.38    3.65       8    6.64    7.91
    9.25     7.8   29.01       7   38.76       6   65.06       6   68.22    5.75
   69.46    5.72   73.07    5.55   76.67    5.25   80.25    5.12   82.22    5.12
   91.68       5  153.54       5  165.01    4.34  169.19    4.15  171.75    4.07
  173.45    4.06  177.82    4.17   197.1       5  217.55       5  231.67    4.57
  236.71    4.45  247.25     4.3  248.05    4.28  259.77       5  365.11       5
  374.55     4.8  378.23    4.76  390.28    4.91  393.11    4.96  397.26    4.84
  399.22    4.76  401.22    4.56  404.18    4.36  405.19    4.32  407.59    4.38
  408.79    4.33  415.79    4.42  438.22     4.5  440.22    4.55  448.36    4.53
  452.59    4.58  458.83    4.59   472.4    4.22  476.51       4   501.9       4
  505.77    3.34  508.13       3  513.24       3  526.12    3.53   544.9       4
  555.98       4  577.87    3.38  582.69    3.29  593.72       3   831.7       3
  847.41    2.44   849.1    2.37  852.78     2.3  856.13    2.46  873.21       3
 1008.75       3 1049.46    3.77 1050.87    3.78    1063       4 1137.48       4
 1140.88    3.36 1143.36       3 1146.37       3 1147.69    3.33  1151.8       4
 1302.31       4 1323.39    4.83 1325.55    4.91 1331.59       5 1387.73    4.28
 1388.24     4.3 1394.06       4 1397.19       4 1400.47    3.85 1405.02    3.73
 1409.76    3.64 1423.45    3.62 1432.77    3.45 1445.49    3.36 1446.58    3.34
 1457.05       3 1482.37       3  1497.9    3.73 1504.45     3.8 1511.84    3.93
 1515.15       4 1531.09       4 1536.09    4.56 1538.28    4.52 1540.11    4.54
 1541.08    4.46 1546.29       5 1577.18       5 1578.55    5.33 1581.86    5.69
 1583.92       6 1584.97    6.56 1585.78    6.78 1586.76    6.47 1587.63       6
 1588.37       6 1594.66     5.3 1595.47    5.24 1596.96       5 1610.79       5
 1614.54    5.31 1618.37    5.53 1620.18    5.53 1626.37       6 1629.25    5.31
 1630.65    5.33 1649.94       6  1664.3       6  1665.7       6 1668.72    4.91
 1674.16    4.23 1681.28    -.07 1686.61   -1.28 1699.88   -3.01 1708.77   -2.04
 1716.48     .49 1722.55    3.58 1725.08    4.44 1726.07    4.62 1727.23       5
 1727.72       5 1727.94       5 1729.59    5.51  1730.7       6 1738.82       6
```

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.105	1668.72	.035	1727.72	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1668.72	1727.72	164.23	163.72	163.88	.1 .3

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 4844

INPUT
Description:
Station Elevation Data num= 144

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	7.18	10.57	7	23.38	7	26.23	6.4	27.89	6
28.1	5.93	29.3	5.68	30.02	5.6	35.16	6	92.11	6
98.83	5.71	104.19	5.5	120.13	5.19	121.5	5.26	126.39	6
128.64	6	142.98	5.36	144.73	5.31	151.23	5.15	156.17	5
176.48	5	188.74	4.72	192.4	4.69	210.16	4.56	260.56	5
264.87	5	275.68	5.29	295.97	6	317.3	6	324.85	5.63
338.99	5.49	345.88	5.49	346.49	5.48	358.29	5.45	379.11	5.23
381.64	5.19	395.34	5	400.54	5	401.01	4.85	403.23	4.44
404.63	4.14	405.48	4	409.51	4	412.79	4.78	413.59	5
413.91	5	415.19	5.38	416.17	5.56	423.86	5	533.09	5
615.84	4	647.8	4	651.99	3.92	659.64	3.8	666	3.65
668.07	3.59	698.76	3.16	715.91	3	811.42	3	842.29	3.87
843.03	3.92	845	4	846.84	4	878.47	3.79	883.9	3.8
884.23	3.79	894.62	3.73	894.92	3.74	905.7	3.66	930.47	4
936.66	4	940.73	3.81	942.75	3.7	950.28	3.56	978.26	3
997.34	3	999.09	3.15	1008.68	4	1149.43	4	1157.62	4.36
1158.64	4.37	1160.95	4.45	1161.88	4.44	1176.84	5	1195.21	5
1223.21	4.37	1225.29	4.33	1229.44	4.28	1245.41	4	1262.96	4
1263.69	4.05	1267.87	4.28	1273.09	4.2	1281.87	4.34	1282.74	4.34
1318.65	4.8	1324.52	4.89	1327.87	5	1330.48	4.92	1332	4.89
1346.66	4.42	1357.56	4	1401.09	4	1419.33	3.51	1431.1	3.16
1438.93	3.07	1441.89	3	1484.16	3	1490.93	3.32	1495.21	4
1499.1	4	1501.11	4.04	1503.79	4.29	1508.3	4.54	1511.25	4.59
1512.38	4.62	1514.78	4.75	1515.71	4.75	1521.36	4.96	1521.62	4.98
1524.11	5.04	1529.5	5.06	1530.44	5.04	1531.63	5	1537.62	4.77
1543.06	4	1543.13	3.94	1545.08	2.8	1546.1	.78	1551.31	-2.17
1564.03	-3.13	1570.44	-1.05	1579.82	1.07	1580.03	2.31	1584.61	2.89
1585.34	2.92	1585.62	3	1587.82	3.74	1588.4	4	1588.87	4.29
1590.03	5	1591.26	5.9	1591.46	6.6	1611.82	6.7		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.105	1537.62	.035	1590.03	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
1537.62	1590.03	301.46	287.49	287.31	.1 .3

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 4556

INPUT
Description:
Station Elevation Data num= 145

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	8.62	.99	8.54	2.36	8.41	5.19	8.18	7.22	8
8.35	7.93	12.93	7.63	15.61	7.45	19.69	7.23	23.78	7

26.16	7	33.96	6.75	36.04	6.73	65.85	6	68.78	6
71.88	5.92	104.77	5	118.1	5	136.04	4.69	156.71	4.36
159.62	4.32	179.6	4	436.33	4	438.19	3.96	461.95	3.41
469.31	3.28	470.79	3.25	472.47	3.24	489.55	3	496.5	3
502.42	3.11	504.2	3.13	532.45	3.5	536.57	3.55	549.07	3.71
550.87	3.75	557.12	3.85	558.74	3.86	565.25	3.95	566.92	3.93
568.34	3.96	572.8	3.92	581.96	3.74	582.85	3.72	586.22	3.6
611.91	3	613.22	3	622.35	3.41	627.63	3.62	628.73	3.62
632.75	3.57	633.36	3.55	639.24	3.68	639.7	3.67	641.61	3.75
647.73	3.37	648.33	3.36	649.11	3.29	652.56	3.13	652.77	3.1
656.5	3	658.12	3.03	658.45	3	669.47	3.73	670.2	3.72
685.13	4	696.19	4	704.67	4.73	705.05	4.74	720.74	4.83
723.32	4.89	725.1	4.92	727.05	4.91	729.39	5	740.94	4.09
742.16	4	747.06	4	752.73	4.25	753.27	4.26	770.48	4.71
772.88	4.71	773.37	4.7	781.4	4.61	785.09	4.62	786.93	4.62
796.96	5	839.98	5	853.57	5.65	859.34	5.8	860.78	5.85
864.61	5.95	866.15	6	879.25	6	881.13	5.89	882.87	5.8
896.38	5	917.83	5	917.94	5.05	918.86	5.29	919.43	5.65
920.11	6	921.67	6	924.1	6.54	924.8	6.64	926.79	7
927.9	7	929.59	7.19	930.25	7.23	931.22	7.36	936.94	7.9
937.28	7.95	938.03	8	938.93	8	940.65	8.63	941.27	8.84
941.82	8.94	943.01	8.9	949.7	8	950.69	8	954.34	7.68
961.71	7	962.16	7	964.56	6.64	965.96	6.34	967.28	6
969.35	5	972.39	4.18	973.58	.85	982.83	-3.43	991.45	-3.53
998.98	-1.8	1009.64	.88	1013.95	2.79	1014.24	2.79	1016.89	3
1017.37	3	1017.88	3.3	1018.86	4	1019.54	4.4	1021.09	5
1023.17	5.6	1023.94	5.85	1024.39	6.7	1027.7	7	1039.66	7

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.105	962.16	.035	1023.94	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
962.16	1023.94	518.12	331.38	299.29	.1	.3

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 4225

INPUT
Description:
Station Elevation Data num= 146

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	9.79	13.6	9.09	15.14	9	16.35	9	27.47	8.67
33.11	8.51	36.8	8.41	37.45	8.4	41.13	8.31	41.28	8.31
45.34	8.26	46.57	8.25	61.42	8	66.56	8	70.11	7.94
72.92	7.9	76.97	7.81	86.98	7.57	87.68	7.56	114.11	7
121.36	7	123.12	6.95	137.58	6.59	138.98	6.56	188.1	6.24
211.23	6	218.69	6	224.5	5.74	233.7	5.43	235.65	5.38
244.45	5	249.03	5	254.06	5.92	254.56	6	257.96	6
267.05	6.92	267.18	6.92	267.96	7	268.92	7.19	271.84	7.73
272.48	7.8	272.92	7.81	273.27	7.8	273.87	7.81	274.07	7.79
274.53	7.8	275.61	7.79	275.9	7.76	277.95	7.69	278.65	7.64
284.36	7	285.31	7	288.94	7.15	290.99	7.14	299.15	7.01
299.9	7	301.33	7	302.99	7.06	313.67	7.02	313.85	7
348.15	7	348.36	6.97	351.39	6.63	351.5	6.64	366.06	6
374.79	6	402.98	5.27	404.3	5.23	414.53	5.06	417.07	5.04
418.38	5.04	422.04	5.14	422.76	5.17	428.34	5.19	428.8	5.2
439.94	5.52	441.21	5.55	454.08	5.72	455.42	5.74	464.84	5.98
465.43	6	477.09	6	534.93	5.12	541.11	5.03	541.25	5.02
543.19	5	553.94	4.51	556.17	4.42	559.08	4.29	561.18	4.19
563.81	4.08	565.51	4	699.39	4	700.47	4.05	704.49	4.28
705.21	4.28	720.15	4.57	730.64	4	732.63	4	743.86	4.75
744.35	4.8	744.67	4.8	745.48	4.87	746.74	5	747.35	5
749.42	5.32	752.04	5.69	754.08	6	754.25	6	755.33	6.37
756.25	6.76	756.59	6.86	757.96	6.94	758.07	6.96	759.75	6.91
760.12	6.91	760.46	6.93	763.61	6.82	765.42	6.73	765.84	6.7

```
  770.65    6.46  771.01    6.43  775.42    6.15  775.49    6.15  779.54       6
  782.72       6  783.39    5.86  784.82    5.55  787.44       5   790.8       4
  791.44    3.85  795.95       3  798.11    1.12  811.14   -2.13  820.94    -2.3
  830.96   -1.35  839.88     .25  840.94       3  841.57    3.31   842.9       4
  843.19    4.18  845.47    5.54  846.25       6  847.68       7  848.36    7.07
  859.64    7.62

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0    .105  784.82    .035  847.68    .055

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        784.82  847.68           434.42  325.29  316.79             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
       0     506       8       F

CROSS SECTION


RIVER: East Riser Ditch
REACH: Middle             RS: 3899

INPUT
Description:
Station Elevation Data    num=     119
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
       0    7.29    2.72    7.12    3.25    7.08    4.54       7    4.62       7
    5.77    6.96     8.5    6.87    9.19    6.85   10.89    6.79   11.67    6.76
   11.84    6.75   11.94    6.75   13.49    6.68   15.39     6.6   15.96    6.57
   18.89    6.44   20.91    6.34   25.26    6.16   26.51    6.11   26.59    6.11
   28.88       6   29.34       6   30.94    5.87    31.1    5.85   31.91    5.78
   35.53    5.44   39.18    5.19   39.75    5.15   40.33    5.12   42.45       5
  173.13       5  176.37    4.94  178.01    4.93  183.01    4.91  187.22    4.89
  189.28    4.89  193.26    4.87     194    4.88  194.06    4.88  195.35    4.87
  197.18    4.85  201.42    4.81  201.63     4.8  225.94       5   462.3       5
  463.49       5  465.09       5  465.15       5  465.19       5  466.61       5
  467.43       5  495.72       5  498.52       5  498.73       5  502.44       5
  502.69       5  502.91       5  505.53       5  507.22       5  508.24       5
  513.55       5  515.02       5  528.63       5  528.83       5  528.94       5
  531.15       5  531.21       5  531.24       5   531.5       5  531.51       5
   531.8       5  537.17     5.5  539.91    5.75  540.58     5.8  542.79       6
   546.6    6.23  550.44    6.46  551.96    6.55  554.75    6.72  557.72     6.9
  559.32       7  559.36       7  559.37       7  559.58       7  564.16       7
  564.31       7  572.23       7  578.17       7  582.98       7   583.1       7
  583.57       7  584.27    6.82  584.45    6.77  585.93    6.36   586.3    6.28
  587.35       6  588.73    5.03  588.79       5  590.92    4.38  591.36    4.26
  591.99       4  595.54    3.69  597.16    1.26  610.19   -2.13  619.77    -2.3
  629.49   -1.35  638.61     .25  639.08    4.03  640.83       5  642.12    5.85
  642.36       6  642.96     6.4  643.38    6.68  643.52    6.76  644.16    7.07
  651.83    7.62   653.3       7  656.82       7  663.29       7

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0    .105  584.45    .035  644.16    .055

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        584.45  644.16           282.22  253.55  249.81             .1       .3

CROSS SECTION


RIVER: East Riser Ditch
REACH: Middle             RS: 3646

INPUT
Description:
Station Elevation Data    num=     116
```

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	7	26.78	7	158.93	6.12	170.82	6	265.12	6
295.8	5.88	299.8	5.88	300.02	5.89	308.19	5.88	323.47	6
403.01	6	406.85	5.93	407.44	5.91	407.98	5.91	409.57	5.84
410.79	5.79	411.12	5.77	411.96	5.73	413.64	5.67	413.95	5.66
415.04	5.61	418.42	5.48	419.29	5.44	420.48	5.4	430.06	5
432.84	5	442.94	4.84	445.7	4.8	453.97	4.67	467.96	4.44
468.19	4.44	496.5	4	530.6	4	534.97	4.05	546.89	4.18
563.18	4.35	613.39	4.82	613.63	4.81	613.76	4.82	614.41	4.82
624.41	4.97	625.56	5	628.19	5	631.79	5.08	642.91	5.22
648.06	5.31	659.69	5.52	684.11	5.89	684.39	5.89	684.52	5.89
685.02	5.89	685.46	5.89	685.52	5.89	685.54	5.89	685.57	5.89
687.99	5.96	688.7	5.98	688.72	5.98	688.74	5.98	688.85	5.98
689.43	5.99	689.45	5.99	689.51	5.99	690.36	5.99	690.38	5.99
692.46	6	696.93	6	697.4	6	700.05	6	700.51	6
701.06	6	704.32	6	704.96	6	704.97	6	704.98	6
706.19	6.02	711.21	6.08	715.26	6.12	715.56	6.12	717.83	6.22
718.45	6.25	719.02	6.27	720.78	6.33	725.99	6.52	736.46	7
737.01	7	737.12	7	737.64	7	738.57	7	739.32	7
743.9	6.5	750.56	.55	775.17	-2.03	786.2	.25	797.84	4.7
798.2	5	799.25	5.85	799.44	6	800.37	6.73	800.71	7
801.12	7.13	801.48	7.23	802.79	7.6	803.75	8	803.8	8
804.2	8	806.59	8.29	806.81	8.31	806.95	8.32	808.57	8.28
822.05	8	822.3	8	825.67	8	825.96	8	826.15	8
826.38	8								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.105	743.9	.035	801.48	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
743.9	801.48	172.35	200.7	200.49	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	670	6.5	F

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 3445

INPUT
Description:
Station Elevation Data num= 121

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	7	96.36	7	129.28	6.22	131.13	6.16	131.28	6.16
133.11	6.11	135.06	6.07	135.18	6.07	137.73	6.02	137.78	6.02
138.59	6	265.98	6	297.16	5.54	305.14	5.46	306.05	5.45
307.9	5.44	309.65	5.43	315.38	5.39	334.62	5.24	348.64	5.24
375.21	5	424	5	427.29	5.32	427.66	5.32	427.92	5.33
431.08	5.24	475.19	5	538.94	5	540.32	5.05	548.4	5.35
550.66	5.43	553.66	5.54	555.11	5.59	568.44	6	625.76	6
625.78	6	625.96	6	626.55	6	627.18	6	629.93	6
630.35	6	632.85	6	632.96	6	633.12	6	633.38	6
633.62	6	641.08	6	669.17	6	670.37	6	670.51	6
672.31	6	672.66	6	673.11	6	673.13	6	674.25	6
674.3	6	676.11	6	676.23	6	681.01	6	681.74	6
685.84	6	693.48	6	693.51	6	693.96	6	694.11	6
695.97	6	705.44	6.51	717.83	7	717.91	7	717.92	7
718.43	7.06	720.21	7.23	720.7	7.25	720.84	7.26	722.01	7.36
722.96	7.43	723.84	7.47	724.53	7.52	724.97	7.55	725.8	7.6
726.17	7.62	726.46	7.64	733.82	7.26	734.43	7.17	734.71	7.16
735.61	7	736.75	6.74	737.42	6.62	737.99	6.49	738.31	6.43
738.95	6.33	740.45	6.09	740.62	6.07	740.73	6.05	741.02	6
741.05	6	741.91	5.71	743	.34	766	-1.93	785.23	.46
789.53	2.33	789.79	3.08	790.01	3.18	790.27	3.31	790.96	4
791.49	4.53	791.96	5	792.62	5.54	793.18	6	793.79	6.47

```
  794.26    6.73   794.8       7   796.9    7.45  797.65    7.64   798.4       8
  799.47    8.43  800.11    8.66  800.92       9  802.12       9  803.77       9
  822.49       9

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*******************************************
       0    .105  738.95    .035   798.4    .055

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        738.95   798.4            101.7  203.59   227.1             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
       0     570     6.5       F

LATERAL STRUCTURE


RIVER: East Riser Ditch
REACH: Middle             RS: 3298

INPUT
Description:
Lateral structure position     = Right overbank
Distance from Upstream XS =
Deck/Roadway Width        =      20
Weir Coefficient          =     2.6
Weir Flow Reference       = Water Surface
 Weir Embankment Coordinates    num =       35
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
       0    6.58    6.04       6     6.8       6    6.96       6    7.11       6
    7.34       6     7.6       6    9.86    5.88   31.06       5   31.69       5
   31.91       5  115.67    5.78  117.51     5.8  118.44    5.81  124.65    5.85
  131.01    5.89  133.54    5.92  134.79    5.93  134.84    5.93  134.86    5.93
  134.94    5.93  135.08    5.93  135.55    5.93  136.64    5.94  137.17    5.95
  148.58       6  149.08       6  149.63       6  150.98       6  154.65       6
  155.43       6  155.78       6  156.73       6  156.86       6  158.56       6

Weir crest shape                          = Broad Crested


LATERAL STRUCTURE OUTPUT  Profile #100 Yr  Lat Struct
*********************************************************************************
* E.G. US. (ft)             *    5.37  * Weir Sta US (ft)           *    9.86  *
* W.S. US. (ft)             *    5.37  * Weir Sta DS (ft)           *  115.67  *
* E.G. DS (ft)              *    5.37  * Min El Weir Flow (ft)      *    5.00  *
* W.S. DS (ft)              *    5.36  * Wr Top Wdth (ft)           *   48.85  *
* Q US (cfs)                *  162.40  * Weir Max Depth (ft)        *    0.37  *
* Q Leaving Total (cfs)     *   11.55  * Weir Avg Depth (ft)        *    0.19  *
* Q DS (cfs)                *  188.30  * Weir Flow Area (sq ft)     *    9.10  *
* Perc Q Leaving            *    7.20  * Weir Coef (ft^1/2)         *   2.600  *
* Q Weir (cfs)              *   11.55  * Weir Submerg               *    0.00  *
* Q Gates (cfs)             *          * Q Gate Group (cfs)         *          *
* Q Culv (cfs)              *    0.00  * Gate Open Ht (ft)          *          *
* Q Lat RC (cfs)            *          * Gate #Open                 *          *
*                           *          * Gate Area (sq ft)          *          *
* Q Breach (cfs)            *          * Gate Submerg               *          *
* Breach Avg Velocity (ft/s) *         * Gate Invert (ft)           *          *
* Breach Flow Area (sq ft)  *          * Gate Weir Coef             *          *
*********************************************************************************

Warning: Divided flow computed for this cross-section.

CROSS SECTION


RIVER: East Riser Ditch
REACH: Middle             RS: 3242

INPUT
```

Description:
Station Elevation Data num= 120

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	7	41.25	7	62.31	6.32	69.63	6	213.76	6
230.51	5.89	272.98	5.94	283.37	5.96	285.32	5.95	285.35	5.95
286.83	5.96	288.76	5.97	292.42	5.97	293.48	5.98	294.9	6
399.29	6	404.01	5.89	404.38	5.89	405.29	5.9	405.32	5.9
412.85	5.74	413.14	5.74	501.96	5.73	502.86	5.73	505.95	5.75
526.08	6	603.79	6	609.17	6.19	613.05	6.33	624.02	6.7
631.49	6.94	632.99	6.99	633.28	7	644.91	7	644.98	7
648.75	7	657.28	6.34	657.61	6.25	657.62	6.25	657.64	6.25
657.65	6.25	658.15	6.28	658.17	6.27	662.34	6.35	664.52	6.58
665.39	6.65	668.62	7	668.86	7	670.23	7.23	670.97	7.35
672.36	7.6	674.74	8	674.9	8	675.06	8	675.86	8
675.91	8	675.96	8	675.99	8	676.06	8	678.58	7.91
678.79	7.92	678.96	7.91	679.07	7.91	679.26	7.9	679.49	7.89
685.13	7	685.2	7	685.54	7	686.33	7	686.78	7
687.01	7	687.39	7	687.4	7	687.44	7	687.97	7
689.38	6.9	689.9	6.88	690.28	6.87	708.87	6	713.3	1.21
732.1	-1.69	748.7	.72	749.95	3.96	750.07	3.96	750.55	4
750.67	4	751.25	4.22	752.24	4.5	753.23	4.71	756.69	5
757.05	5	761.27	5	762.73	5	762.79	5	764.47	5
766.96	5	767.25	5	769	5	770.17	5	772.11	5
772.14	5	772.29	5	772.96	5	773.68	5	774.09	5
774.48	5	775.3	5	775.61	5	776.41	5	777	5
777.25	5	777.32	5	777.48	5	778.43	5	790.37	5.12
809.5	5.32	835.68	5.56	836.27	5.56	837.49	5.57	850.33	5.66

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.105	708.87	.035	756.69	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
708.87	756.69	119.4	201.24	218.17	.1	.3

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 3040

INPUT
Description:
Station Elevation Data num= 137

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	7	6.59	7	66.77	6.5	67.3	6.49	75.73	6.42
76.63	6.42	77.21	6.41	108.17	6.24	117.03	6.16	119.66	6.15
125.99	6.12	128.6	6.12	152.57	6	490.22	6	492.17	6
492.41	6	492.54	6	492.91	6	497.57	6	498.5	6
498.83	6	499	6	499.35	6	505.65	6	506.36	6
529.24	6	552.46	6	562.31	6	562.38	6	562.57	6
563.1	6	563.42	6	564.62	6	564.69	6	564.83	6
576.4	6.25	591.55	6.48	592.04	6.49	594.53	6.51	596.16	6.53
599.82	6.58	600.59	6.6	602.3	6.61	618.51	7	618.74	7
618.99	7	621.37	7	621.64	7	622.9	7	653.26	7
653.35	7	655.3	7	656	7	656.01	7	656.32	7
657.4	7	657.75	7	658.06	7	669.98	7	670.16	7
671.49	7	671.65	7	672.8	7	673.52	7	673.95	7
674.84	7	675.19	7	680.94	6.15	682.71	6	683.5	5.82
683.92	5.64	684.18	5.53	685.46	5	685.98	4.75	686.67	4.47
687.62	4	688.22	3.72	689.72	3	690.24	.59	708.3	-1.29
730.4	.44	731.94	3.87	732.66	4	733.04	4.06	733.97	4.19
734.47	4.25	735.88	4.53	742.83	5	744.11	5	744.88	5
745.68	5	746.24	5	758.23	5	760.94	5	761.15	5
762.04	5	762.28	5	763.94	5	768.97	5	769.78	5
770.95	5	771.77	5	779.86	5	779.9	5	780.02	5
780.76	5	790.72	5.07	791.27	5.08	801.35	5.17	804.98	5.19
892.79	6	894.31	6	894.87	6	895.16	6	895.28	6

895.43	6	899.44	6	899.63	6	901.28	6	907.1	6
908.16	6	950.43	6.66	951.02	6.67	962.25	7	963.7	7
964.11	7	964.58	7	965.82	7	965.88	7	965.95	7
966.02	7	967.19	7	967.67	7	967.81	7	968.55	7
969.14	7	971.66	7						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.105	682.71	.035	735.88	.055

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
682.71	735.88	199.11	194.14	195.05	.1	.3

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 2846

INPUT
Description:
Station Elevation Data num= 128

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	7.12	2.9	7	29.24	7	65.51	6.4	66.43	6.4
66.48	6.39	102.06	6	413.97	6	415.15	6	416.19	6
421.89	6	422.41	6	422.75	6	423.72	6	425.15	6
426.3	6	427.43	6	427.81	6	429.79	6	438.16	6.28
438.3	6.28	440.57	6.29	443.18	6.3	443.23	6.3	443.28	6.3
443.39	6.3	445.62	6.35	448.55	6.44	449.13	6.45	449.48	6.46
449.7	6.47	450.87	6.5	451.8	6.53	470.11	7	470.32	7
470.59	7	482.03	6.35	482.1	6.35	482.53	6.31	483.3	6.23
484.57	6.11	485.37	6.02	485.55	6	485.97	6	488.64	6
488.78	6	488.88	6	489.89	5.78	490.27	5.57	490.3	5.57
491.28	5	493.03	4.27	493.57	4	493.62	4	498.8	.61
516.05	-1.29	534.48	.62	537.83	1.82	541.39	4.85	549.06	5
549.21	5	549.37	5	549.44	5	549.47	5	549.56	5
550.27	5	553.07	5	555.13	5	555.74	5	557.37	5
561.48	5	562.06	5	565	5	565.66	5	570.4	5
570.56	5	570.71	5	572.94	5	577.43	5	578.59	5
578.94	5	579.35	5	579.72	5	579.8	5	581.04	5
583.26	5	584.32	5	584.99	5	586.09	5	586.24	5
586.3	5	586.31	5	586.33	5	587.77	5	589	5
635.49	5.46	691.83	6	692.84	6	695.42	6	695.94	6
696.28	6	696.32	6	696.66	6	709.95	6.34	711.54	6.38
712.51	6.4	715.48	6.48	721.12	6.63	722.72	6.67	736.41	7
736.52	7	736.67	7	736.9	7	737.01	7	737.27	7
737.42	7	737.6	7	737.63	7	750.92	7	752.99	7
753.34	7	760.04	7	764.01	7	764.1	7	764.15	7
764.19	7	764.2	7	774.26	7				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.105	489.89	.035	541.39	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
489.89	541.39	185.17	191.64	190.23	.1	.3

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 2655

INPUT
Description:
Station Elevation Data num= 129

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

0	7	64.08	7	83.42	6.83	84	6.83	108.41	6.77
109.25	6.77	125.87	6.8	126.21	6.8	126.77	6.79	173.07	6
264.92	6	265.09	6	265.38	6	265.48	6	265.93	6
266.33	6	272.35	6	272.97	6	273.57	6	274.77	6
280.1	6	280.19	6	283.43	6	284.75	6	290.15	6
295.13	6	295.17	6	295.21	6	295.44	6	295.61	6
304.68	6	309	6	311.78	6	312.44	6	357.49	6
357.55	6	360.09	6	360.1	6	360.46	6	360.63	6
361.17	6	361.38	6	363.54	6.1	366.16	6.22	366.28	6.23
366.37	6.23	367.15	6.26	367.53	6.28	373.7	6.66	375.5	6.7
376.66	6.77	376.94	6.79	378.43	6.88	380.09	6.87	380.82	6.86
394.38	7	394.72	7	395.23	7	410.12	7	411.42	7
412.2	7	414.39	7	415.59	7	416.93	7	418.12	7
418.16	7	418.45	7	418.58	7	419.37	7	420.48	7
423.5	7	424.75	7	425.16	7	427.14	7	427.4	7
427.98	7	428.26	7	428.58	7	430.09	6.61	430.96	6.28
431.7	6.01	431.71	6	432.22	5.76	434.2	5	435.12	4.75
435.16	4.73	435.18	4.72	436.3	4.4	438.74	.8	452.31	-.18
463.51	-.1	474.08	.72	479.08	2.97	482.17	3.4	484.68	4
485.37	4.16	485.56	4.2	486.31	4.37	487.29	4.59	488.57	4.9
488.97	5	488.98	5	490.88	5	497.98	5	535.89	5
536.48	5	605.76	5.77	632.58	6	632.84	6	635.49	6
635.71	6	635.92	6	636.12	6	636.61	6	637.15	6
637.32	6	637.58	6	661.87	6.77	662.4	6.79	667.66	6.96
669.08	7	669.11	7	669.8	7	670.79	7	676.47	7
677.58	7	677.61	7	682.27	7	689.63	7		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.105	430.09	.035	486.31	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
430.09	486.31	196.22	190.35	189.68	.1	.3

LATERAL STRUCTURE

RIVER: East Riser Ditch
REACH: Middle RS: 2570

INPUT
Description:
Lateral structure position = Left overbank
Distance from Upstream XS =
Deck/Roadway Width = 30
Weir Coefficient = 2.8
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6.85	66	6.83	164.5	6.663	255.5	6.76	300.5	6
437.5	5.5	522.5	5.5	592.5	5.5	627.5	6	698.5	7

Weir crest shape = Broad Crested

LATERAL STRUCTURE OUTPUT Profile #100 Yr Lat Struct

E.G. US. (ft)	5.34	Weir Sta US (ft)	
W.S. US. (ft)	5.33	Weir Sta DS (ft)	
E.G. DS (ft)	5.30	Min El Weir Flow (ft)	5.50
W.S. DS (ft)	5.23	Wr Top Wdth (ft)	
Q US (cfs)	188.30	Weir Max Depth (ft)	
Q Leaving Total (cfs)	0.00	Weir Avg Depth (ft)	
Q DS (cfs)	225.90	Weir Flow Area (sq ft)	
Perc Q Leaving	0.00	Weir Coef (ft^1/2)	2.600
Q Weir (cfs)	0.00	Weir Submerg	
Q Gates (cfs)		Q Gate Group (cfs)	
Q Culv (cfs)	0.00	Gate Open Ht (ft)	
Q Lat RC (cfs)		Gate #Open	

```
*                            *          * Gate Area (sq ft)          *          *
* Q Breach (cfs)              *          * Gate Submerg               *          *
* Breach Avg Velocity (ft/s) *          * Gate Invert (ft)           *          *
* Breach Flow Area (sq ft)   *          * Gate Weir Coef             *          *
*******************************************************************************

Warning: Divided flow computed for this cross-section.

CROSS SECTION


RIVER: East Riser Ditch
REACH: Middle             RS: 2464

INPUT
Description:
Station Elevation Data    num=     115
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*******************************************************************************
       0       7  124.89       7  125.91    6.99  125.96    6.99  128.17    6.95
  128.63    6.94  130.27     6.9  132.99    6.82  134.14    6.79  136.11    6.72
  153.56    6.38  171.89       6  185.14       6  190.46    5.47  190.75    5.45
  191.33    5.43  191.87     5.4  192.14    5.41  206.15     5.4  206.59    5.41
  207.24    5.43  213.68       6  304.69       6  323.16    5.74  340.39       6
  380.23       6  385.47    6.14  386.94    6.17  395.73       6  423.97       6
  424.33       6  424.83       6  424.99       6  425.52       6  427.44    5.22
  428.38       5  429.24    4.73  430.19    4.39  430.94    4.13  434.54     .95
  449.39    -.56   451.6    -.61   471.4     .35  479.35       3   481.5    3.54
  481.96    3.63  482.33     3.7  484.08       4  484.21       4  484.29       4
   484.4       4  484.46       4  484.49       4  486.46    4.37  487.41    4.32
  489.39    4.48  489.84    4.51  490.42    4.49  510.42       5  510.99       5
  522.26       5  522.97       5  524.34       5  525.34       5  550.49       5
  550.51       5  550.52       5  550.54       5  550.61       5  551.57       5
  551.61       5   574.8    5.31  588.91    5.49  629.63       6  630.95       6
  630.98       6  631.16       6  631.26       6  634.73    6.09  637.14    6.15
  637.47    6.15   638.5    6.18  647.58    6.41  648.47    6.44   649.1    6.45
   674.4       7  675.03       7   675.3       7  677.99       7  681.32       7
  681.76       7  682.29       7  682.44       7  684.75       7  685.12       7
  685.14       7  685.16       7  685.38       7  685.42       7  685.46       7
  735.44       7  735.61       7  736.37       7  736.76       7  737.13       7
  737.28       7   738.2       7  738.33       7  738.39       7  740.23       7
  740.56       7  740.81       7  741.83       7  744.47       7  745.32       7

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0    .105  427.44    .035  484.08     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        427.44  484.08           214.19  202.18  201.33             .1       .3

CROSS SECTION


RIVER: East Riser Ditch
REACH: Middle             RS: 2262

INPUT
Description:
Station Elevation Data    num=     102
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*******************************************************************************
       0    7.19       2       7    2.38       7    2.79    6.98   18.12    6.54
   21.84    6.44   22.45    6.43   23.06    6.42   24.17    6.39   25.43    6.36
   25.85    6.35   30.32       6  413.23       6   413.3       6  413.32       6
  413.49       6  413.61       6  414.23       6   414.3       6  414.43       6
  414.44       6  414.75       6  417.02       6  417.31       6  418.98       6
  422.55       6  425.82       6  426.49       6  431.77       6  433.46       6
  434.72       6  435.06       6  435.12       6  435.34       6  439.44       6
  451.78       6  461.56       6  465.35       6  465.48       6  465.93       6
  466.55       6  467.95       6  468.28       6  468.52       6   473.4       6
```

474.35	6	474.76	6	474.86	6	476.09	5.89	477.2	5.79
479.32	5.46	480	5.33	481.04	5.16	481.4	5.12	482.02	5
482.52	4.87	484.79	.42	490.14	.26	504.47	-.97	521.8	.82
531.43	4	531.55	4	531.59	4	532.11	4	548.76	4.24
557.82	4.37	560.23	4.4	563.36	4.44	569.94	4.53	570.06	4.53
603.61	5	604.43	5	605.04	5	605.1	5	605.43	5
605.56	5	606.11	5	606.4	5	606.41	5	606.43	5
616.91	5.13	622.75	5.2	625.33	5.23	632.42	5.33	642.03	5.45
649.16	5.55	680.2	5.95	683.89	6	683.92	6	684.01	6
691.76	6.24	715.34	7	715.39	7	716.08	7	716.1	7
716.31	7	717.05	7	732.07	7	733.67	7	738.96	7
741.43	7	742.18	7						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.105	476.09	.035	531.43	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
476.09	531.43	241.66	247.79	243.45	.1	.3

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 2014

INPUT
Description:
Station Elevation Data num= 123

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6	231.62	6	231.99	6.02	232.02	6.02	232.36	6.05
244.29	6.4	246.21	6.4	257.3	6.21	257.56	6.21	260.09	6.17
260.36	6.16	272.73	6.85	274	7	301.72	7	302.86	7
303.82	7	304.84	7	306.72	7	306.81	7	307.2	7
307.21	7	307.22	7	310.25	7.16	313.06	7.29	314.22	7.35
315.81	7.43	317.77	7.5	319.08	7.58	328.85	8	328.88	8
328.94	8	329.14	8	330.87	8	330.98	8	331.33	8
331.6	8	333.08	8	334.69	8	335.83	8	336.75	8
338.47	8	338.86	8	339.67	8	340.27	8	344.82	8
344.92	8	344.96	8	345.1	8	345.62	8	346.43	8
346.5	8	346.6	8	346.75	7.99	348.74	7.91	351.03	7.78
353.06	7.62	354.13	7.53	360.23	7	362.54	6.16	362.77	6.08
363.02	6	363.14	5.96	364.02	5.65	365.94	5	366.13	4.91
366.44	4.81	367.15	4.56	367.44	4.46	368.86	4	369.4	3.81
375.84	.22	382.74	-.99	396.29	-1.38	403.64	.02	409.14	.41
412.79	4	413.32	4.24	413.79	4.43	417.08	5	417.69	5
418.58	5	419.59	5	420.17	5	420.67	5	422.28	5.14
435.21	5	435.66	5	437.29	5	437.66	5	438.74	5
439.47	5	444.7	5	447.76	5	459.27	5	459.35	5
459.44	5	459.47	5	460.43	5	465.29	5	470.99	5
471.2	5	471.46	5	472.74	5	477.45	5	543.3	5.69
543.43	5.69	567.99	6	568.85	6	568.92	6	569.09	6
569.2	6	569.21	6	575.84	6.25	588.42	6.74	588.69	6.75
588.84	6.75	595.14	7	595.2	7	595.26	7	599.87	7
599.88	7	608.71	7	625.04	7				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.105	363.14	.035	417.08	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
363.14	417.08	221.23	150.67	128.44	.1	.3

CROSS SECTION

RIVER: East Riser Ditch
REACH: Middle RS: 1864

INPUT
Description:
Station Elevation Data num= 78

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	5	2.61	5	3.3	5	3.54	5	3.71	5
3.82	5	3.89	5	3.98	5	4.38	5	4.42	5
4.46	5	4.74	5	4.86	5	5.23	5	5.28	5
5.73	5	6.11	5	6.44	5	6.79	5	19.94	5
19.97	5	21.39	5	21.41	5	22.62	5	22.75	5
25.42	5	28.35	5	37.44	5	39.67	5	43.36	5
43.43	5	43.62	5	43.98	5	44.41	5	44.51	5
47.09	5.03	47.6	5.04	48.97	5.05	91.69	5.21	95.8	5.24
96.53	5.25	99.42	5.23	99.55	5.23	100.06	5.24	100.59	5.24
100.95	5.24	101.63	5.25	130.73	6.04	140.43	-2.4	156.43	-2.4
162.53	5.45	170.51	5	171.68	5	172.39	5	172.99	5
173.45	5	187.23	5.08	196.93	5.15	200.85	5.17	245.32	5.46
317.16	5.92	329.16	6	330.11	6	330.37	6	330.59	6
340.39	6.38	342.18	6.44	342.78	6.46	352.32	6.79	355.02	6.89
357.83	7	358.09	7	358.17	7	358.22	7	358.35	7
358.64	7	359.24	7	377.77	7				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	130.73	.02	162.53	.04

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
130.73 162.53 1873.19 1863.54 1803.49 .1 .3
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	142.43	6.5	F
154.43	377.77	6.5	F

SUMMARY OF MANNING'S N VALUES

River:East Riser Ditch

Reach	River Sta.	n1	n2	n3	n4
Middle	9188	.08	.035	.065	
Middle	9049	Lat Struct			
Middle	9001	.08	.035	.065	
Middle	8694	.08	.035	.065	
Middle	8436	.08	.035	.065	
Middle	8194	.08	.035	.065	
Middle	8003	.08	.035	.065	
Middle	7739	.105	.035	.05	
Middle	7538	.105	.035	.05	
Middle	7445	Lat Struct			
Middle	7318	.11	.035	.06	
Middle	7113	.11	.035	.065	
Middle	7042	.11	.035	.065	
Middle	6949	.11	.045	.035	.065
Middle	6861	Bridge			
Middle	6837	.11	.045	.035	.065
Middle	6823	Lat Struct			
Middle	6713	.11	.045	.035	.06
Middle	6619	.11	.045	.035	.06
Middle	6431	.105	.035	.06	
Middle	6219	.105	.035	.06	
Middle	6019	.105	.035	.06	
Middle	5818	.105	.035	.06	
Middle	5641	.105	.035	.06	
Middle	5502	Lat Struct			
Middle	5451	.105	.035	.055	
Middle	5245	.105	.035	.055	
Middle	5007	.105	.035	.055	

*Middle	*	4844	* .105*	.035*	.055*
*Middle	*	4556	* .105*	.035*	.055*
*Middle	*	4225	* .105*	.035*	.055*
*Middle	*	3899	* .105*	.035*	.055*
*Middle	*	3646	* .105*	.035*	.055*
*Middle	*	3445	* .105*	.035*	.055*
*Middle	*	3298	*Lat Struct*	*	*
*Middle	*	3242	* .105*	.035*	.055*
*Middle	*	3040	* .105*	.035*	.055*
*Middle	*	2846	* .105*	.035*	.06*
*Middle	*	2655	* .105*	.035*	.06*
*Middle	*	2570	*Lat Struct*	*	*
*Middle	*	2464	* .105*	.035*	.06*
*Middle	*	2262	* .105*	.035*	.06*
*Middle	*	2014	* .105*	.035*	.06*
*Middle	*	1864	* .04*	.02*	.04*

SUMMARY OF REACH LENGTHS

River: East Riser Ditch

Reach	River Sta.	Left	Channel	Right
*Middle	* 9188	* 188.07*	187.35*	187.01*
*Middle	* 9049	*Lat Struct*	*	*
*Middle	* 9001	* 309.59*	307.19*	307.22*
*Middle	* 8694	* 263.03*	257.77*	257.21*
*Middle	* 8436	* 236.17*	241.64*	242.83*
*Middle	* 8194	* 198.33*	191.32*	190.19*
*Middle	* 8003	* 265.16*	264.17*	263.66*
*Middle	* 7739	* 195.55*	200.78*	201.98*
*Middle	* 7538	* 215.06*	219.69*	217.71*
*Middle	* 7445	*Lat Struct*	*	*
*Middle	* 7318	* 195.98*	205.4*	206.71*
*Middle	* 7113	* 65.29*	71.33*	73.51*
*Middle	* 7042	* 94.37*	92.36*	91.56*
*Middle	* 6949	* 115.65*	112.38*	112.29*
*Middle	* 6861	*Bridge *	*	*
*Middle	* 6837	* 111.2*	123.83*	125.25*
*Middle	* 6823	*Lat Struct*	*	*
*Middle	* 6713	* 94.88*	94.46*	92.3*
*Middle	* 6619	* 185.45*	187.85*	187.68*
*Middle	* 6431	* 197.17*	211.97*	212.4*
*Middle	* 6219	* 192.21*	200.14*	198.86*
*Middle	* 6019	* 172.41*	200.47*	202.68*
*Middle	* 5818	* 168.46*	176.9*	174.99*
*Middle	* 5641	* 189.86*	190.15*	189.91*
*Middle	* 5502	*Lat Struct*	*	*
*Middle	* 5451	* 144.09*	205.59*	205.73*
*Middle	* 5245	* 125.6*	238.14*	277.91*
*Middle	* 5007	* 164.23*	163.72*	163.88*
*Middle	* 4844	* 301.46*	287.49*	287.31*
*Middle	* 4556	* 518.12*	331.38*	299.29*
*Middle	* 4225	* 434.42*	325.29*	316.79*
*Middle	* 3899	* 282.22*	253.55*	249.81*
*Middle	* 3646	* 172.35*	200.7*	200.49*
*Middle	* 3445	* 101.7*	203.59*	227.1*
*Middle	* 3298	*Lat Struct*	*	*
*Middle	* 3242	* 119.4*	201.24*	218.17*
*Middle	* 3040	* 199.11*	194.14*	195.05*
*Middle	* 2846	* 185.17*	191.64*	190.23*
*Middle	* 2655	* 196.22*	190.35*	189.68*
*Middle	* 2570	*Lat Struct*	*	*
*Middle	* 2464	* 214.19*	202.18*	201.33*
*Middle	* 2262	* 241.66*	247.79*	243.45*
*Middle	* 2014	* 221.23*	150.67*	128.44*
*Middle	* 1864	* 1873.19*	1863.54*	1803.49*

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: East Riser Ditch

Reach	River Sta.	Contr.	Expan.
Middle	9188	.1	.3
Middle	9049	Lat Struct	
Middle	9001	.1	.3
Middle	8694	.1	.3
Middle	8436	.1	.3
Middle	8194	.1	.3
Middle	8003	.1	.3
Middle	7739	.1	.3
Middle	7538	.1	.3
Middle	7445	Lat Struct	
Middle	7318	.1	.3
Middle	7113	.1	.3
Middle	7042	.3	.5
Middle	6949	.3	.5
Middle	6861	Bridge	
Middle	6837	.3	.5
Middle	6823	Lat Struct	
Middle	6713	.1	.3
Middle	6619	.1	.3
Middle	6431	.1	.3
Middle	6219	.1	.3
Middle	6019	.1	.3
Middle	5818	.1	.3
Middle	5641	.1	.3
Middle	5502	Lat Struct	
Middle	5451	.1	.3
Middle	5245	.1	.3
Middle	5007	.1	.3
Middle	4844	.1	.3
Middle	4556	.1	.3
Middle	4225	.1	.3
Middle	3899	.1	.3
Middle	3646	.1	.3
Middle	3445	.1	.3
Middle	3298	Lat Struct	
Middle	3242	.1	.3
Middle	3040	.1	.3
Middle	2846	.1	.3
Middle	2655	.1	.3
Middle	2570	Lat Struct	
Middle	2464	.1	.3
Middle	2262	.1	.3
Middle	2014	.1	.3
Middle	1864	.1	.3

APPENDIX E

HYDRAULIC ANALYSIS – PROPOSED CONDITIONS: HEC-RAS OUTPUT

HEC-RAS Plan: Pr91913at7CNa River: East Riser Ditch Reach: Middle

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Middle	9188	2 Yr	370.80	-0.77	6.21		6.31	0.001637	3.04	321.66	528.24	0.32
Middle	9188	10 Yr	568.10	-0.77	6.64		6.71	0.001264	2.94	560.77	572.66	0.29
Middle	9188	25 Yr	710.00	-0.77	6.84		6.91	0.001244	3.04	677.76	581.62	0.29
Middle	9188	100 Yr	968.60	-0.77	7.13		7.20	0.001287	3.26	846.95	588.46	0.30
Middle	9049		Lat Struct									
Middle	9001	2 Yr	370.78	-0.86	5.82		5.98	0.001871	3.54	202.00	232.59	0.36
Middle	9001	10 Yr	555.31	-0.86	6.19		6.39	0.002239	4.19	321.44	411.06	0.40
Middle	9001	25 Yr	677.41	-0.86	6.40		6.59	0.002221	4.34	414.00	469.54	0.40
Middle	9001	100 Yr	892.26	-0.86	6.72		6.89	0.002043	4.41	571.01	507.42	0.39
Middle	8694	2 Yr	296.75	-1.00	5.67	1.72	5.71	0.000345	1.68	271.48	405.58	0.16
Middle	8694	10 Yr	406.77	-1.00	6.01	2.23	6.06	0.000422	1.98	387.97	662.91	0.18
Middle	8694	25 Yr	478.30	-1.00	6.21	2.49	6.26	0.000427	2.06	490.03	709.54	0.18
Middle	8694	100 Yr	602.83	-1.00	6.52	2.93	6.58	0.000409	2.12	657.26	731.61	0.18
Middle	8436	2 Yr	296.75	-1.12	5.60		5.63	0.000284	1.48	322.24	226.11	0.15
Middle	8436	10 Yr	406.77	-1.12	5.92		5.96	0.000344	1.73	394.43	228.06	0.16
Middle	8436	25 Yr	478.30	-1.12	6.11		6.15	0.000371	1.86	442.98	270.38	0.17
Middle	8436	100 Yr	602.83	-1.12	6.42		6.47	0.000402	2.05	527.69	275.62	0.18
Middle	8194	2 Yr	296.75	-1.24	5.44		5.52	0.000704	2.40	165.53	154.06	0.23
Middle	8194	10 Yr	406.77	-1.24	5.69		5.82	0.000960	2.94	213.47	199.49	0.27
Middle	8194	25 Yr	478.30	-1.24	5.86		6.00	0.001068	3.20	247.40	207.00	0.29
Middle	8194	100 Yr	602.83	-1.24	6.15		6.31	0.001157	3.49	334.30	408.70	0.30
Middle	8003	2 Yr	296.75	-1.33	5.45		5.47	0.000080	1.00	338.34	228.85	0.08
Middle	8003	10 Yr	406.77	-1.33	5.71		5.74	0.000121	1.27	404.28	268.32	0.10
Middle	8003	25 Yr	478.30	-1.33	5.88		5.91	0.000145	1.43	450.69	290.13	0.11
Middle	8003	100 Yr	602.83	-1.33	6.16		6.20	0.000181	1.66	563.61	491.47	0.13
Middle	7739	2 Yr	362.65	-1.45	5.37	1.42	5.42	0.000377	1.95	341.48	503.07	0.17
Middle	7739	10 Yr	518.47	-1.45	5.58	2.05	5.66	0.000606	2.56	388.74	530.70	0.22
Middle	7739	25 Yr	622.80	-1.45	5.71	2.43	5.82	0.000757	2.92	419.29	548.64	0.25
Middle	7739	100 Yr	807.13	-1.45	5.94	3.04	6.08	0.001003	3.47	472.89	580.44	0.29
Middle	7538	2 Yr	362.65	-1.00	5.33	1.20	5.36	0.000202	1.57	603.42	571.69	0.13
Middle	7538	10 Yr	518.47	-1.00	5.52	1.78	5.57	0.000328	2.04	682.25	578.88	0.16
Middle	7538	25 Yr	622.80	-1.00	5.64	2.14	5.70	0.000413	2.31	731.59	584.51	0.18
Middle	7538	100 Yr	807.13	-1.00	5.84	2.71	5.92	0.000555	2.73	816.24	597.20	0.22
Middle	7445		Lat Struct									
Middle	7318	2 Yr	362.65	-1.20	5.30		5.31	0.000185	1.24	908.79	608.56	0.12
Middle	7318	10 Yr	518.47	-1.20	5.47		5.49	0.000289	1.61	1013.89	619.97	0.15
Middle	7318	25 Yr	622.80	-1.20	5.58		5.60	0.000358	1.82	1080.66	649.59	0.16
Middle	7318	100 Yr	807.13	-1.20	5.76		5.79	0.000479	2.17	1199.10	672.76	0.19
Middle	7113	2 Yr	362.65	-1.75	5.28		5.29	0.000088	1.04	1178.98	673.91	0.08
Middle	7113	10 Yr	518.39	-1.75	5.43		5.45	0.000148	1.36	1285.26	680.36	0.11
Middle	7113	25 Yr	620.67	-1.75	5.53		5.55	0.000189	1.56	1350.78	685.33	0.12
Middle	7113	100 Yr	795.33	-1.75	5.69		5.72	0.000256	1.84	1463.34	694.04	0.15
Middle	7042	2 Yr	362.65	-1.50	5.27		5.28	0.000178	1.00	1160.13	704.86	0.11
Middle	7042	10 Yr	518.39	-1.50	5.43		5.43	0.000278	1.30	1268.72	708.64	0.14
Middle	7042	25 Yr	620.67	-1.50	5.52		5.53	0.000341	1.48	1335.30	710.95	0.15
Middle	7042	100 Yr	795.33	-1.50	5.68		5.69	0.000436	1.73	1449.25	714.89	0.18
Middle	6949	2 Yr	362.65	-1.78	5.26	-0.01	5.27	0.000057	0.97	876.63	465.46	0.07
Middle	6949	10 Yr	518.39	-1.78	5.40	0.33	5.42	0.000103	1.32	941.94	468.71	0.09
Middle	6949	25 Yr	620.67	-1.78	5.48	0.53	5.51	0.000137	1.53	981.16	470.65	0.10
Middle	6949	100 Yr	795.33	-1.78	5.62	0.86	5.66	0.000200	1.87	1047.86	473.93	0.13
Middle	6861		Bridge									
Middle	6837	2 Yr	362.65	-2.38	5.24		5.26	0.000060	1.04	604.81	467.25	0.07
Middle	6837	10 Yr	518.39	-2.38	5.37		5.40	0.000112	1.43	665.93	478.33	0.09
Middle	6837	25 Yr	620.67	-2.38	5.45		5.49	0.000151	1.68	702.18	484.34	0.11
Middle	6837	100 Yr	795.33	-2.38	5.57		5.63	0.000225	2.07	763.49	494.35	0.13
Middle	6823		Lat Struct									
Middle	6713	2 Yr	336.23	-1.87	5.24		5.25	0.000058	0.93	718.04	607.80	0.07
Middle	6713	10 Yr	467.96	-1.87	5.36		5.38	0.000098	1.23	794.96	610.43	0.09

HEC-RAS Plan: Pr91913at7CNa River: East Riser Ditch Reach: Middle (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Middle	6713	25 Yr	552.71	-1.87	5.44		5.46	0.000126	1.41	839.83	611.73	0.11
Middle	6713	100 Yr	697.95	-1.87	5.56		5.60	0.000176	1.69	914.73	613.71	0.13
Middle	6619	2 Yr	315.84	-1.76	5.21		5.24	0.000241	1.50	436.13	611.74	0.14
Middle	6619	10 Yr	428.56	-1.76	5.32		5.37	0.000370	1.89	504.65	619.71	0.17
Middle	6619	25 Yr	499.47	-1.76	5.38		5.44	0.000457	2.13	544.07	623.65	0.19
Middle	6619	100 Yr	621.33	-1.76	5.49		5.56	0.000592	2.47	611.33	626.45	0.22
Middle	6431	2 Yr	292.93	-2.20	5.19	0.86	5.20	0.000111	1.13	921.50	1014.41	0.09
Middle	6431	10 Yr	381.39	-2.20	5.30	1.24	5.31	0.000161	1.36	1027.10	1033.93	0.11
Middle	6431	25 Yr	433.72	-2.20	5.36	1.44	5.38	0.000187	1.48	1088.92	1045.14	0.12
Middle	6431	100 Yr	523.54	-2.20	5.45	1.75	5.48	0.000248	1.73	1189.55	1075.79	0.14
Middle	6219	2 Yr	252.68	-3.24	5.18	0.20	5.18	0.000060	0.79	907.41	957.59	0.07
Middle	6219	10 Yr	304.25	-3.24	5.28	0.39	5.29	0.000074	0.89	994.61	993.40	0.08
Middle	6219	25 Yr	329.55	-3.24	5.34	0.48	5.35	0.000079	0.93	1045.71	1007.87	0.08
Middle	6219	100 Yr	375.07	-3.24	5.43	0.64	5.44	0.000088	1.00	1128.46	1031.45	0.08
Middle	6019	2 Yr	234.69	-1.99	5.17	-0.04	5.17	0.000049	0.82	930.36	839.14	0.06
Middle	6019	10 Yr	268.59	-1.99	5.27	0.10	5.27	0.000057	0.89	996.51	903.45	0.07
Middle	6019	25 Yr	280.73	-1.99	5.33	0.14	5.33	0.000058	0.90	1036.11	926.51	0.07
Middle	6019	100 Yr	304.61	-1.99	5.42	0.24	5.43	0.000061	0.92	1100.50	970.61	0.07
Middle	5818	2 Yr	234.69	-3.31	5.16		5.16	0.000040	0.72	1134.88	789.04	0.06
Middle	5818	10 Yr	268.59	-3.31	5.26		5.26	0.000046	0.77	1212.80	796.43	0.06
Middle	5818	25 Yr	280.73	-3.31	5.32		5.32	0.000046	0.78	1259.84	801.08	0.06
Middle	5818	100 Yr	304.61	-3.31	5.41		5.42	0.000049	0.79	1336.18	807.73	0.06
Middle	5641	2 Yr	234.69	-2.39	5.16	0.28	5.16	0.000024	0.57	1554.73	919.53	0.05
Middle	5641	10 Yr	268.59	-2.39	5.25	0.45	5.26	0.000028	0.62	1643.07	932.36	0.05
Middle	5641	25 Yr	280.73	-2.39	5.31	0.52	5.32	0.000028	0.63	1696.33	939.58	0.05
Middle	5641	100 Yr	304.61	-2.39	5.41	0.62	5.41	0.000029	0.65	1782.22	951.19	0.05
Middle	5502		Lat Struct									
Middle	5451	2 Yr	227.72	-1.55	5.15	0.76	5.15	0.000023	0.51	1699.00	1200.05	0.04
Middle	5451	10 Yr	252.99	-1.55	5.25	0.89	5.25	0.000024	0.54	1802.04	1210.21	0.05
Middle	5451	25 Yr	259.79	-1.55	5.31	0.93	5.31	0.000023	0.53	1864.35	1216.26	0.04
Middle	5451	100 Yr	272.52	-1.55	5.40	0.99	5.40	0.000022	0.53	1964.54	1225.99	0.04
Middle	5245	2 Yr	195.54	-2.94	5.15	-0.31	5.15	0.000009	0.36	2396.30	1495.73	0.03
Middle	5245	10 Yr	183.47	-2.94	5.25	-0.38	5.25	0.000007	0.32	2541.52	1516.08	0.02
Middle	5245	25 Yr	167.94	-2.94	5.31	-0.48	5.31	0.000005	0.28	2629.92	1526.21	0.02
Middle	5245	100 Yr	133.89	-2.94	5.40	-0.71	5.40	0.000003	0.21	2772.65	1542.42	0.02
Middle	5007	2 Yr	197.13	-3.01	5.15		5.15	0.000009	0.36	2182.65	1575.25	0.03
Middle	5007	10 Yr	189.92	-3.01	5.25		5.25	0.000007	0.32	2337.65	1580.80	0.03
Middle	5007	25 Yr	181.83	-3.01	5.31		5.31	0.000006	0.30	2431.76	1583.66	0.02
Middle	5007	100 Yr	162.40	-3.01	5.40		5.40	0.000004	0.25	2583.62	1592.50	0.02
Middle	4844	2 Yr	197.13	-3.13	5.15		5.15	0.000016	0.46	1584.42	1316.87	0.04
Middle	4844	10 Yr	189.92	-3.13	5.24		5.25	0.000012	0.41	1715.50	1337.33	0.03
Middle	4844	25 Yr	181.83	-3.13	5.30		5.31	0.000010	0.38	1796.01	1352.31	0.03
Middle	4844	100 Yr	162.40	-3.13	5.40		5.40	0.000007	0.32	1927.20	1374.46	0.02
Middle	4556	2 Yr	197.13	-3.53	5.14		5.14	0.000017	0.51	1111.39	819.90	0.04
Middle	4556	10 Yr	189.92	-3.53	5.24		5.24	0.000014	0.47	1193.71	828.19	0.04
Middle	4556	25 Yr	181.83	-3.53	5.30		5.30	0.000012	0.44	1244.04	833.19	0.03
Middle	4556	100 Yr	162.40	-3.53	5.40		5.40	0.000009	0.37	1325.60	841.05	0.03
Middle	4225	2 Yr	197.13	-2.30	5.13	-0.64	5.13	0.000028	0.63	493.39	291.32	0.05
Middle	4225	10 Yr	189.92	-2.30	5.23	-0.68	5.24	0.000024	0.59	521.32	316.49	0.05
Middle	4225	25 Yr	181.83	-2.30	5.29	-0.72	5.30	0.000021	0.55	538.73	327.41	0.04
Middle	4225	100 Yr	162.40	-2.30	5.39	-0.80	5.39	0.000016	0.48	567.44	345.62	0.04
Middle	3899	2 Yr	197.13	-2.30	5.12		5.12	0.000035	0.71	337.36	545.05	0.05
Middle	3899	10 Yr	189.92	-2.30	5.22		5.23	0.000030	0.67	393.68	548.10	0.05
Middle	3899	25 Yr	181.83	-2.30	5.28		5.29	0.000027	0.62	428.31	549.89	0.05
Middle	3899	100 Yr	162.40	-2.30	5.38		5.39	0.000019	0.54	484.58	552.77	0.04
Middle	3646	2 Yr	197.13	-2.03	5.10	0.12	5.11	0.000045	0.78	252.26	259.02	0.06
Middle	3646	10 Yr	189.92	-2.03	5.21	0.09	5.22	0.000040	0.74	257.79	270.06	0.06
Middle	3646	25 Yr	181.83	-2.03	5.27	0.05	5.28	0.000035	0.70	261.20	275.67	0.06
Middle	3646	100 Yr	162.40	-2.03	5.38	-0.03	5.38	0.000026	0.61	266.77	284.26	0.05

HEC-RAS Plan: Pr91913at7CNa River: East Riser Ditch Reach: Middle (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Middle	3445	2 Yr	197.13	-1.93	5.10	0.04	5.11	0.000037	0.73	269.01	194.76	0.06
Middle	3445	10 Yr	189.92	-1.93	5.20	0.01	5.21	0.000032	0.69	274.29	229.84	0.05
Middle	3445	25 Yr	181.83	-1.93	5.27	-0.03	5.27	0.000028	0.66	277.55	261.94	0.05
Middle	3445	100 Yr	162.40	-1.93	5.37	-0.12	5.38	0.000021	0.57	282.87	281.90	0.04
Middle	3298		Lat Struct									
Middle	3242	2 Yr	196.82	-1.69	5.08		5.09	0.000079	0.95	208.11	76.66	0.08
Middle	3242	10 Yr	187.51	-1.69	5.19		5.20	0.000067	0.89	216.97	87.24	0.07
Middle	3242	25 Yr	176.98	-1.69	5.26		5.27	0.000056	0.82	223.05	93.73	0.07
Middle	3242	100 Yr	150.72	-1.69	5.36		5.37	0.000038	0.68	233.94	104.95	0.06
Middle	3040	2 Yr	202.42	-1.29	5.07		5.08	0.000061	0.87	238.38	105.10	0.07
Middle	3040	10 Yr	201.81	-1.29	5.18		5.19	0.000056	0.84	250.44	117.49	0.07
Middle	3040	25 Yr	198.98	-1.29	5.24		5.25	0.000052	0.82	258.73	126.00	0.07
Middle	3040	100 Yr	188.30	-1.29	5.36		5.36	0.000043	0.75	273.37	138.28	0.06
Middle	2846	2 Yr	202.42	-1.29	5.05		5.07	0.000063	0.89	230.24	103.36	0.07
Middle	2846	10 Yr	201.81	-1.29	5.16		5.18	0.000058	0.87	242.20	114.64	0.07
Middle	2846	25 Yr	198.98	-1.29	5.23		5.24	0.000054	0.84	250.32	121.71	0.07
Middle	2846	100 Yr	188.30	-1.29	5.35		5.36	0.000044	0.77	264.69	133.29	0.06
Middle	2655	2 Yr	202.42	-0.18	5.04		5.05	0.000093	0.99	207.97	105.73	0.09
Middle	2655	10 Yr	201.81	-0.18	5.15		5.16	0.000084	0.95	220.32	116.04	0.08
Middle	2655	25 Yr	198.98	-0.18	5.22		5.23	0.000077	0.92	228.67	122.52	0.08
Middle	2655	100 Yr	188.30	-0.18	5.33		5.35	0.000063	0.84	243.43	133.21	0.07
Middle	2570		Lat Struct									
Middle	2464	2 Yr	202.42	-0.61	5.02		5.04	0.000068	0.88	241.01	125.16	0.08
Middle	2464	10 Yr	201.81	-0.61	5.14		5.15	0.000062	0.85	255.60	134.07	0.07
Middle	2464	25 Yr	198.98	-0.61	5.21		5.22	0.000057	0.82	265.32	139.68	0.07
Middle	2464	100 Yr	188.30	-0.61	5.33		5.33	0.000046	0.75	282.27	148.84	0.06
Middle	2262	2 Yr	202.42	-0.97	5.01		5.02	0.000067	0.90	257.51	125.31	0.07
Middle	2262	10 Yr	201.81	-0.97	5.12		5.14	0.000061	0.87	272.33	135.10	0.07
Middle	2262	25 Yr	198.98	-0.97	5.20		5.21	0.000056	0.84	282.30	141.63	0.07
Middle	2262	100 Yr	188.30	-0.97	5.32		5.32	0.000046	0.76	299.85	151.35	0.06
Middle	2014	2 Yr	202.42	-1.38	4.99		5.01	0.000070	0.91	221.91	51.08	0.08
Middle	2014	10 Yr	201.81	-1.38	5.11		5.12	0.000064	0.88	233.92	118.81	0.07
Middle	2014	25 Yr	198.98	-1.38	5.18		5.19	0.000059	0.86	243.07	129.33	0.07
Middle	2014	100 Yr	188.30	-1.38	5.30		5.31	0.000049	0.79	259.63	141.37	0.06
Middle	1864	2 Yr	208.02	-2.40	4.90	-0.30	4.99	0.000072	2.37	87.60	30.06	0.15
Middle	1864	10 Yr	216.11	-2.40	5.01	-0.24	5.10	0.000074	2.43	88.92	80.48	0.16
Middle	1864	25 Yr	220.98	-2.40	5.08	-0.21	5.17	0.000075	2.46	89.76	105.53	0.16
Middle	1864	100 Yr	225.90	-2.40	5.20	-0.18	5.30	0.000074	2.48	91.20	158.15	0.16

APPENDIX F

COMPARISON OF PRE- AND POST-CONSTRUCTION FLOOD ELEVATIONS AND DISCHARGES

East Riser Ditch
Comparison of WSEL and Discharge Data
Pre- and Post-Construction HEC-RAS Data

PRE-CONSTRUCTION				POST-CONSTRUCTION					COMPARISON	
River Sta	Profile	WSEL (ft)	Q Total (cfs)	River Sta	Profile	WSEL (ft)	Q Total (cfs)		WSEL DIFFERENCE (feet)	Q Total DIFFERENCE (cfs)
9188	2 Yr	6.21	370.8	9188	2 Yr	6.21	370.8	9188 2 Yr	0.0	0.0
9188	10 Yr	6.64	568.1	9188	10 Yr	6.64	568.1	9188 10 Yr	0.0	0.0
9188	25 Yr	6.84	710	9188	25 Yr	6.84	710	9188 25 Yr	0.0	0.0
9188	100 Yr	7.13	968.6	9188	100 Yr	7.13	968.6	9188 100 Yr	0.0	0.0
9049		Lat Struct		9049		Lat Struct		9049		
9001	2 Yr	5.82	370.77	9001	2 Yr	5.82	370.78	9001 2 Yr	0.0	0.0
9001	10 Yr	6.2	554.88	9001	10 Yr	6.19	555.31	9001 10 Yr	0.0	0.4
9001	25 Yr	6.41	676.88	9001	25 Yr	6.4	677.41	9001 25 Yr	0.0	0.5
9001	100 Yr	6.73	891.54	9001	100 Yr	6.72	892.26	9001 100 Yr	0.0	0.7
8694	2 Yr	5.68	295.41	8694	2 Yr	5.67	296.75	8694 2 Yr	0.0	1.3
8694	10 Yr	6.02	405.17	8694	10 Yr	6.01	406.77	8694 10 Yr	0.0	1.6
8694	25 Yr	6.22	476.32	8694	25 Yr	6.21	478.3	8694 25 Yr	0.0	2.0
8694	100 Yr	6.53	601.37	8694	100 Yr	6.52	602.83	8694 100 Yr	0.0	1.5
8436	2 Yr	5.61	295.41	8436	2 Yr	5.6	296.75	8436 2 Yr	0.0	1.3
8436	10 Yr	5.93	405.17	8436	10 Yr	5.92	406.77	8436 10 Yr	0.0	1.6
8436	25 Yr	6.12	476.32	8436	25 Yr	6.11	478.3	8436 25 Yr	0.0	2.0
8436	100 Yr	6.43	601.37	8436	100 Yr	6.42	602.83	8436 100 Yr	0.0	1.5
8194	2 Yr	5.45	295.41	8194	2 Yr	5.44	296.75	8194 2 Yr	0.0	1.3
8194	10 Yr	5.72	405.17	8194	10 Yr	5.69	406.77	8194 10 Yr	0.0	1.6
8194	25 Yr	5.88	476.32	8194	25 Yr	5.86	478.3	8194 25 Yr	0.0	2.0
8194	100 Yr	6.17	601.37	8194	100 Yr	6.15	602.83	8194 100 Yr	0.0	1.5
8003	2 Yr	5.47	295.41	8003	2 Yr	5.45	296.75	8003 2 Yr	0.0	1.3
8003	10 Yr	5.73	405.17	8003	10 Yr	5.71	406.77	8003 10 Yr	0.0	1.6
8003	25 Yr	5.9	476.32	8003	25 Yr	5.88	478.3	8003 25 Yr	0.0	2.0
8003	100 Yr	6.18	601.37	8003	100 Yr	6.16	602.83	8003 100 Yr	0.0	1.5
7739	2 Yr	5.39	361.31	7739	2 Yr	5.37	362.65	7739 2 Yr	0.0	1.3
7739	10 Yr	5.6	516.87	7739	10 Yr	5.58	518.47	7739 10 Yr	0.0	1.6
7739	25 Yr	5.74	620.82	7739	25 Yr	5.71	622.8	7739 25 Yr	0.0	2.0
7739	100 Yr	5.96	805.67	7739	100 Yr	5.94	807.13	7739 100 Yr	0.0	1.5
7538	2 Yr	5.35	361.31	7538	2 Yr	5.33	362.65	7538 2 Yr	0.0	1.3
7538	10 Yr	5.55	516.87	7538	10 Yr	5.52	518.47	7538 10 Yr	0.0	1.6
7538	25 Yr	5.67	620.82	7538	25 Yr	5.64	622.8	7538 25 Yr	0.0	2.0
7538	100 Yr	5.86	805.67	7538	100 Yr	5.84	807.13	7538 100 Yr	0.0	1.5
7445		Lat Struct		7445		Lat Struct		7445		
7318	2 Yr	5.32	361.31	7318	2 Yr	5.3	362.65	7318 2 Yr	0.0	1.3
7318	10 Yr	5.5	516.87	7318	10 Yr	5.47	518.47	7318 10 Yr	0.0	1.6
7318	25 Yr	5.61	620.82	7318	25 Yr	5.58	622.8	7318 25 Yr	0.0	2.0
7318	100 Yr	5.78	805.66	7318	100 Yr	5.76	807.13	7318 100 Yr	0.0	1.5

PRE-CONSTRUCTION				POST-CONSTRUCTION					COMPARISON	
River Sta	Profile	WSEL (ft)	Q Total (cfs)	River Sta	Profile	WSEL (ft)	Q Total (cfs)		WSEL DIFFERENCE (feet)	Q Total DIFFERENCE (cfs)
7113	2 Yr	5.3	361.31	7113	2 Yr	5.28	362.65	7113 2 Yr	0.0	1.3
7113	10 Yr	5.46	516.46	7113	10 Yr	5.43	518.39	7113 10 Yr	0.0	1.9
7113	25 Yr	5.56	617.68	7113	25 Yr	5.53	620.67	7113 25 Yr	0.0	3.0
7113	100 Yr	5.72	790.99	7113	100 Yr	5.69	795.33	7113 100 Yr	0.0	4.3
7042	2 Yr	5.3	361.31	7042	2 Yr	5.27	362.65	7042 2 Yr	0.0	1.3
7042	10 Yr	5.46	516.46	7042	10 Yr	5.43	518.39	7042 10 Yr	0.0	1.9
7042	25 Yr	5.55	617.68	7042	25 Yr	5.52	620.67	7042 25 Yr	0.0	3.0
7042	100 Yr	5.71	790.99	7042	100 Yr	5.68	795.33	7042 100 Yr	0.0	4.3
6949	2 Yr	5.28	361.31	6949	2 Yr	5.26	362.65	6949 2 Yr	0.0	1.3
6949	10 Yr	5.43	516.46	6949	10 Yr	5.4	518.39	6949 10 Yr	0.0	1.9
6949	25 Yr	5.51	617.68	6949	25 Yr	5.48	620.67	6949 25 Yr	0.0	3.0
6949	100 Yr	5.66	790.99	6949	100 Yr	5.62	795.33	6949 100 Yr	0.0	4.3
				6861		Bridge		6861		
6837	2 Yr	5.25	361.31	6837	2 Yr	5.24	362.65	6837 2 Yr	0.0	1.3
6837	10 Yr	5.38	516.46	6837	10 Yr	5.37	518.39	6837 10 Yr	0.0	1.9
6837	25 Yr	5.46	617.68	6837	25 Yr	5.45	620.67	6837 25 Yr	0.0	3.0
6837	100 Yr	5.59	790.99	6837	100 Yr	5.57	795.33	6837 100 Yr	0.0	4.3
6823		Lat Struct		6823		Lat Struct		6823		
6713	2 Yr	5.23	335.12	6713	2 Yr	5.24	336.23	6713 2 Yr	0.0	1.1
6713	10 Yr	5.36	466.35	6713	10 Yr	5.36	467.96	6713 10 Yr	0.0	1.6
6713	25 Yr	5.43	550.77	6713	25 Yr	5.44	552.71	6713 25 Yr	0.0	1.9
6713	100 Yr	5.55	695.17	6713	100 Yr	5.56	697.95	6713 100 Yr	0.0	2.8
6619	2 Yr	5.21	314.91	6619	2 Yr	5.21	315.84	6619 2 Yr	0.0	0.9
6619	10 Yr	5.33	427.01	6619	10 Yr	5.32	428.56	6619 10 Yr	0.0	1.6
6619	25 Yr	5.39	497.98	6619	25 Yr	5.38	499.47	6619 25 Yr	0.0	1.5
6619	100 Yr	5.5	618.98	6619	100 Yr	5.49	621.33	6619 100 Yr	0.0	2.4
6431	2 Yr	5.19	291.95	6431	2 Yr	5.19	292.93	6431 2 Yr	0.0	1.0
6431	10 Yr	5.29	379.02	6431	10 Yr	5.3	381.39	6431 10 Yr	0.0	2.4
6431	25 Yr	5.35	431.52	6431	25 Yr	5.36	433.72	6431 25 Yr	0.0	2.2
6431	100 Yr	5.45	519.24	6431	100 Yr	5.45	523.54	6431 100 Yr	0.0	4.3
6219	2 Yr	5.18	252.2	6219	2 Yr	5.18	252.68	6219 2 Yr	0.0	0.5
6219	10 Yr	5.28	301.98	6219	10 Yr	5.28	304.25	6219 10 Yr	0.0	2.3
6219	25 Yr	5.34	328.52	6219	25 Yr	5.34	329.55	6219 25 Yr	0.0	1.0
6219	100 Yr	5.43	372.39	6219	100 Yr	5.43	375.07	6219 100 Yr	0.0	2.7
6019	2 Yr	5.17	234.48	6019	2 Yr	5.17	234.69	6019 2 Yr	0.0	0.2
6019	10 Yr	5.27	266.36	6019	10 Yr	5.27	268.59	6019 10 Yr	0.0	2.2
6019	25 Yr	5.32	280.28	6019	25 Yr	5.33	280.73	6019 25 Yr	0.0	0.5
6019	100 Yr	5.42	302.51	6019	100 Yr	5.42	304.61	6019 100 Yr	0.0	2.1
5818	2 Yr	5.16	234.48	5818	2 Yr	5.16	234.69	5818 2 Yr	0.0	0.2
5818	10 Yr	5.26	266.36	5818	10 Yr	5.26	268.59	5818 10 Yr	0.0	2.2
5818	25 Yr	5.32	280.28	5818	25 Yr	5.32	280.73	5818 25 Yr	0.0	0.5
5818	100 Yr	5.41	302.51	5818	100 Yr	5.41	304.61	5818 100 Yr	0.0	2.1

PRE-CONSTRUCTION				POST-CONSTRUCTION					COMPARISON	
River Sta	Profile	WSEL (ft)	Q Total (cfs)	River Sta	Profile	WSEL (ft)	Q Total (cfs)		WSEL DIFFERENCE (feet)	Q Total DIFFERENCE (cfs)
5641	2 Yr	5.15	234.48	5641	2 Yr	5.16	234.69	5641 2 Yr	0.0	0.2
5641	10 Yr	5.25	266.36	5641	10 Yr	5.25	268.59	5641 10 Yr	0.0	2.2
5641	25 Yr	5.31	280.28	5641	25 Yr	5.31	280.73	5641 25 Yr	0.0	0.5
5641	100 Yr	5.41	302.51	5641	100 Yr	5.41	304.61	5641 100 Yr	0.0	2.1
5502		Lat Struct		5502		Lat Struct		5502		
5451	2 Yr	5.15	227.63	5451	2 Yr	5.15	227.72	5451 2 Yr	0.0	0.1
5451	10 Yr	5.25	251.29	5451	10 Yr	5.25	252.99	5451 10 Yr	0.0	1.7
5451	25 Yr	5.31	259.57	5451	25 Yr	5.31	259.79	5451 25 Yr	0.0	0.2
5451	100 Yr	5.4	270.85	5451	100 Yr	5.4	272.52	5451 100 Yr	0.0	1.7
5245	2 Yr	5.15	195.94	5245	2 Yr	5.15	195.54	5245 2 Yr	0.0	-0.4
5245	10 Yr	5.25	184.06	5245	10 Yr	5.25	183.47	5245 10 Yr	0.0	-0.6
5245	25 Yr	5.31	168.63	5245	25 Yr	5.31	167.94	5245 25 Yr	0.0	-0.7
5245	100 Yr	5.4	134.35	5245	100 Yr	5.4	133.89	5245 100 Yr	0.0	-0.5
5007	2 Yr	5.15	196.52	5007	2 Yr	5.15	197.13	5007 2 Yr	0.0	0.6
5007	10 Yr	5.25	189.71	5007	10 Yr	5.25	189.92	5007 10 Yr	0.0	0.2
5007	25 Yr	5.3	181.04	5007	25 Yr	5.31	181.83	5007 25 Yr	0.0	0.8
5007	100 Yr	5.4	161.36	5007	100 Yr	5.4	162.4	5007 100 Yr	0.0	1.0
4844	2 Yr	5.14	196.52	4844	2 Yr	5.15	197.13	4844 2 Yr	0.0	0.6
4844	10 Yr	5.24	189.71	4844	10 Yr	5.24	189.92	4844 10 Yr	0.0	0.2
4844	25 Yr	5.3	181.04	4844	25 Yr	5.3	181.83	4844 25 Yr	0.0	0.8
4844	100 Yr	5.4	161.36	4844	100 Yr	5.4	162.4	4844 100 Yr	0.0	1.0
4556	2 Yr	5.14	196.52	4556	2 Yr	5.14	197.13	4556 2 Yr	0.0	0.6
4556	10 Yr	5.24	189.71	4556	10 Yr	5.24	189.92	4556 10 Yr	0.0	0.2
4556	25 Yr	5.3	181.04	4556	25 Yr	5.3	181.83	4556 25 Yr	0.0	0.8
4556	100 Yr	5.4	161.36	4556	100 Yr	5.4	162.4	4556 100 Yr	0.0	1.0
4225	2 Yr	5.13	196.52	4225	2 Yr	5.13	197.13	4225 2 Yr	0.0	0.6
4225	10 Yr	5.23	189.71	4225	10 Yr	5.23	189.92	4225 10 Yr	0.0	0.2
4225	25 Yr	5.29	181.04	4225	25 Yr	5.29	181.83	4225 25 Yr	0.0	0.8
4225	100 Yr	5.39	161.36	4225	100 Yr	5.39	162.4	4225 100 Yr	0.0	1.0
3899	2 Yr	5.12	196.52	3899	2 Yr	5.12	197.13	3899 2 Yr	0.0	0.6
3899	10 Yr	5.22	189.71	3899	10 Yr	5.22	189.92	3899 10 Yr	0.0	0.2
3899	25 Yr	5.28	181.04	3899	25 Yr	5.28	181.83	3899 25 Yr	0.0	0.8
3899	100 Yr	5.38	161.36	3899	100 Yr	5.38	162.4	3899 100 Yr	0.0	1.0
3646	2 Yr	5.1	196.52	3646	2 Yr	5.1	197.13	3646 2 Yr	0.0	0.6
3646	10 Yr	5.21	189.71	3646	10 Yr	5.21	189.92	3646 10 Yr	0.0	0.2
3646	25 Yr	5.27	181.04	3646	25 Yr	5.27	181.83	3646 25 Yr	0.0	0.8
3646	100 Yr	5.38	161.36	3646	100 Yr	5.38	162.4	3646 100 Yr	0.0	1.0
3445	2 Yr	5.1	196.52	3445	2 Yr	5.1	197.13	3445 2 Yr	0.0	0.6
3445	10 Yr	5.2	189.71	3445	10 Yr	5.2	189.92	3445 10 Yr	0.0	0.2
3445	25 Yr	5.27	181.04	3445	25 Yr	5.27	181.83	3445 25 Yr	0.0	0.8
3445	100 Yr	5.37	161.36	3445	100 Yr	5.37	162.4	3445 100 Yr	0.0	1.0
3298		Lat Struct		3298		Lat Struct		3298		

PRE-CONSTRUCTION				POST-CONSTRUCTION					COMPARISON	
River Sta	Profile	WSEL (ft)	Q Total (cfs)	River Sta	Profile	WSEL (ft)	Q Total (cfs)		WSEL DIFFERENCE (feet)	Q Total DIFFERENCE (cfs)
3242	2 Yr	5.08	196.21	3242	2 Yr	5.08	196.82	3242 2 Yr	0.0	0.6
3242	10 Yr	5.19	187.36	3242	10 Yr	5.19	187.51	3242 10 Yr	0.0	0.1
3242	25 Yr	5.25	176.22	3242	25 Yr	5.26	176.98	3242 25 Yr	0.0	0.8
3242	100 Yr	5.36	150.13	3242	100 Yr	5.36	150.72	3242 100 Yr	0.0	0.6
3040	2 Yr	5.07	201.81	3040	2 Yr	5.07	202.42	3040 2 Yr	0.0	0.6
3040	10 Yr	5.18	201.76	3040	10 Yr	5.18	201.81	3040 10 Yr	0.0	0.1
3040	25 Yr	5.24	198.22	3040	25 Yr	5.24	198.98	3040 25 Yr	0.0	0.8
3040	100 Yr	5.35	187.69	3040	100 Yr	5.36	188.3	3040 100 Yr	0.0	0.6
2846	2 Yr	5.05	201.81	2846	2 Yr	5.05	202.42	2846 2 Yr	0.0	0.6
2846	10 Yr	5.16	201.76	2846	10 Yr	5.16	201.81	2846 10 Yr	0.0	0.1
2846	25 Yr	5.23	198.22	2846	25 Yr	5.23	198.98	2846 25 Yr	0.0	0.8
2846	100 Yr	5.35	187.69	2846	100 Yr	5.35	188.3	2846 100 Yr	0.0	0.6
2655	2 Yr	5.04	201.81	2655	2 Yr	5.04	202.42	2655 2 Yr	0.0	0.6
2655	10 Yr	5.15	201.76	2655	10 Yr	5.15	201.81	2655 10 Yr	0.0	0.1
2655	25 Yr	5.22	198.22	2655	25 Yr	5.22	198.98	2655 25 Yr	0.0	0.8
2655	100 Yr	5.33	187.69	2655	100 Yr	5.33	188.3	2655 100 Yr	0.0	0.6
2570		Lat Struct		2570		Lat Struct		2570		
2464	2 Yr	5.02	201.81	2464	2 Yr	5.02	202.42	2464 2 Yr	0.0	0.6
2464	10 Yr	5.14	201.76	2464	10 Yr	5.14	201.81	2464 10 Yr	0.0	0.1
2464	25 Yr	5.21	198.22	2464	25 Yr	5.21	198.98	2464 25 Yr	0.0	0.8
2464	100 Yr	5.32	187.69	2464	100 Yr	5.33	188.3	2464 100 Yr	0.0	0.6
2262	2 Yr	5.01	201.81	2262	2 Yr	5.01	202.42	2262 2 Yr	0.0	0.6
2262	10 Yr	5.12	201.76	2262	10 Yr	5.12	201.81	2262 10 Yr	0.0	0.1
2262	25 Yr	5.2	198.22	2262	25 Yr	5.2	198.98	2262 25 Yr	0.0	0.8
2262	100 Yr	5.32	187.69	2262	100 Yr	5.32	188.3	2262 100 Yr	0.0	0.6
2014	2 Yr	4.99	201.81	2014	2 Yr	4.99	202.42	2014 2 Yr	0.0	0.6
2014	10 Yr	5.11	201.76	2014	10 Yr	5.11	201.81	2014 10 Yr	0.0	0.1
2014	25 Yr	5.18	198.22	2014	25 Yr	5.18	198.98	2014 25 Yr	0.0	0.8
2014	100 Yr	5.3	187.69	2014	100 Yr	5.3	188.3	2014 100 Yr	0.0	0.6
1864	2 Yr	4.9	207.41	1864	2 Yr	4.9	208.02	1864 2 Yr	0.0	0.6
1864	10 Yr	5.01	216.06	1864	10 Yr	5.01	216.11	1864 10 Yr	0.0	0.1
1864	25 Yr	5.08	220.22	1864	25 Yr	5.08	220.98	1864 25 Yr	0.0	0.8
1864	100 Yr	5.2	225.29	1864	100 Yr	5.2	225.9	1864 100 Yr	0.0	0.6

APPENDIX G

ORIGINAL HYDROLOGIC AND HYDRAULIC ANALYSES
JACOBS CIVIL CONSULTANTS. INC.

– Existing HEC-HMS Model and Supportive Computations

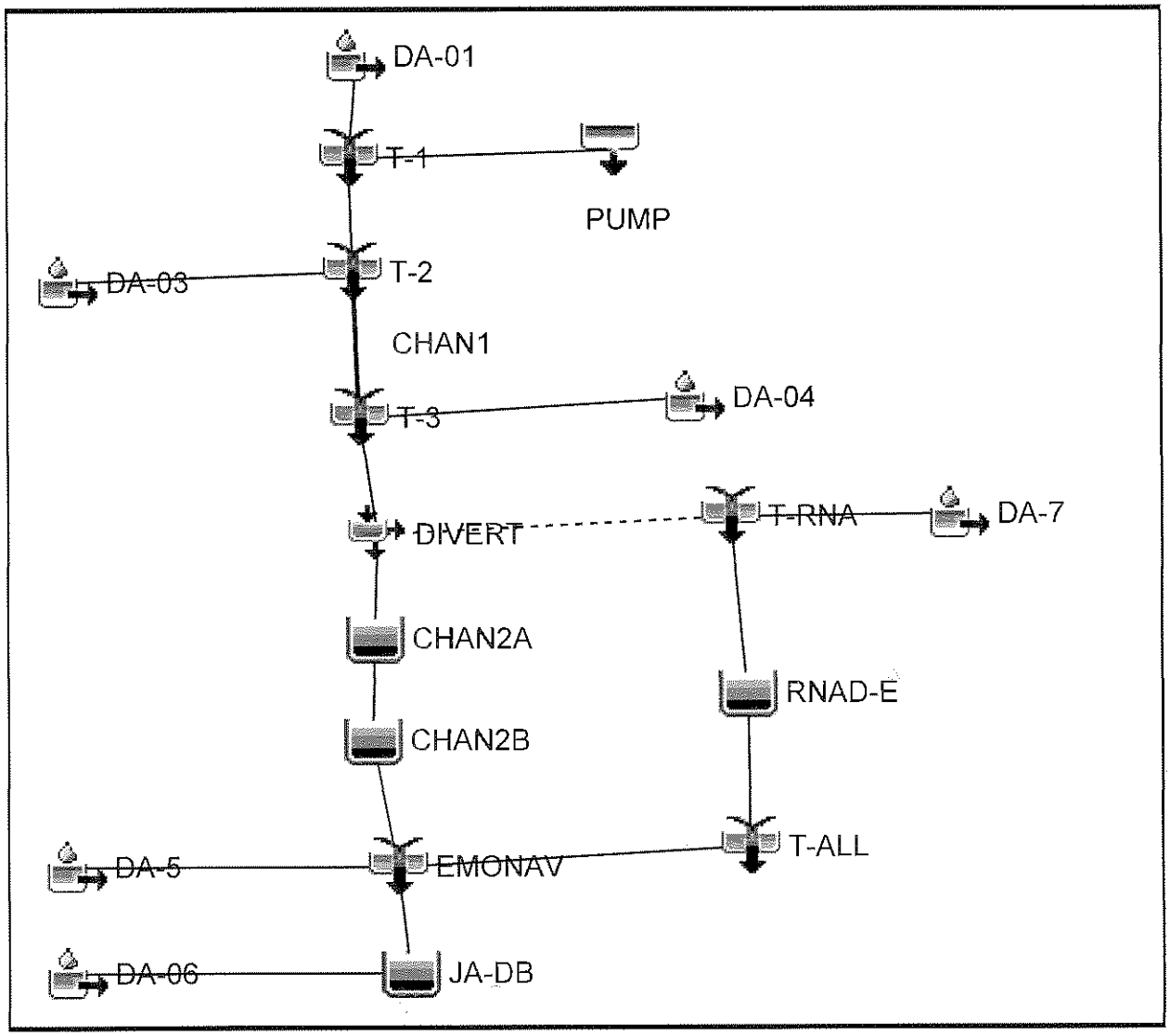
99 Sheets

HEC-HMS

Project : Existing Conditions

Basin Model : Existing Model 12-17-08

Dec 23 10:03:06 EST 2008



```
Basin: Existing Model 12-17-08
     Description: Channel 2 storage split, RNAD-E outlet control, and Rev Exp and Cont Coeff;
     Last Modified Date: 17 December 2008
     Last Modified Time: 15:51:49
     Version: 3.2
     Unit System: English
     Missing Flow To Zero: No
     Enable Flow Ratio: No
     Allow Blending: No
     Compute Local Flow At Junctions: No

     Sediment Grade Scale: NONE
     Enable Sediment Routing: No
     Fall Velocity Method: UNSPECIFIED
End:

Subbasin: DA-01
     Description: HUYLER STREET REGION NORTH OF AIRPORT  (AREA ADJUSTED FOR DRAINAGE TO PUMP STA
     Canvas X: 91.55789473684212
     Canvas Y: 692.4315789473685
     Area: 0.686
     Downstream: T-1

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 63
     Curve Number: 61

     Transform: SCS
     Lag: 60.0

     Baseflow: None

     Erosion: None
End:

Source: PUMP
     Description: DRAINAGE AREA 2 = 123 ACRES
     Canvas X: 312.4842105263158
     Canvas Y: 640.3263157894737
     Label X: -29.0
     Label Y: 19.0
     Downstream: T-1

     Flow Gage: PUMP
End:

Junction: T-1
     Description: COMBINE RUNOFF
     Canvas X: 87.38947368421054
     Canvas Y: 621.5684210526317
     Downstream: T-2
End:

Subbasin: DA-03
     Description: DRAINAGE WEST OF FRED WHEREN DRIVE  Area = 60 ACRES COMPUTE RUNOFF
     Canvas X: -32.44757281553399
     Canvas Y: 528.780582524272
     Area: 0.0938
     Downstream: T-2

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 64
     Curve Number: 60

     Transform: SCS
     Lag: 20.400

     Baseflow: None

     Erosion: None
End:
```

```
Junction: T-2
     Description: COMBINE RUNOFF
     Canvas X: 87.80870229007638
     Canvas Y: 518.3395419847329
     Downstream: CHAN1
End:

Reach: CHAN1
     Description: CHANNEL ROUTING FROM  T-2 TO EXISTING TWIN 60" RCPS USED ENERGY SLOPE FROM INITIAL
HEC-RAS RUNS
     Canvas X: 88.89694656488552
     Canvas Y: 437.80946564885505
     From Canvas X: 87.80870229007638
     From Canvas Y: 518.3395419847329
     Downstream: T-3

     Route: Modified Puls
     Number of Reaches: 7
     Initial Outflow Equals Inflow: Yes
     Storage Outflow Table Name: CHAN1 (See Attached Tables for Data)
     Elevation Discharge Table Name: CHAN1
     Channel Loss: None

     Route Sediment: No
End:

Subbasin: DA-04
     Description: DRAINAGE AREA TO EXISTING 60 INCH RCPS  Area = 140 acres COMPUTE RUNOFF
     Canvas X: 173.62621359223306
     Canvas Y: 428.81941747572824
     Area: 0.2188
     Downstream: T-3

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 14
     Curve Number: 56

     Transform: SCS
     Lag: 73.8

     Baseflow: None

     Erosion: None
End:

Junction: T-3
     Description: COMBINE RUNOFF
     Canvas X: 88.89694656488552
     Canvas Y: 437.80946564885505
     Downstream: DIVERT
End:

Diversion: DIVERT
     Description: EK ADDED DIVERSION FOR FLOW OVER RED NECK AVE AT RUNWAY 1 THAT DOES NOT RETURN
     Canvas X: 88.89694656488552
     Canvas Y: 372.5148091603054
     Downstream: CHAN2A
     Divert To: T-RNA

     Diverter: Inflow-Diversion Table
     Inflow Diversion Table Name: DIVREV4 (See Attached Tables for Data)
     End Diverter:
End:

Subbasin: DA-06
     Description: DRAINAGE FROM REGION NEAR JET AVIATION, Area = 70 acres COMPUTE RUNOFF
     Canvas X: -162.01262135922332
     Canvas Y: 297.3320388349515
     Area: 0.1094
     Downstream: JA-DB

     Canopy: None

     Surface: None
```

```
     LossRate: SCS
     Percent Impervious Area: 55
     Curve Number: 60

     Transform: SCS
     Lag: 34.8

     Baseflow: None

     Erosion: None
End:

Reservoir: JA-DB
     Description: ANALYZE 2 DETENTION BASINS AS 1 COMBINED DETENTION BASIN ROUTE RUNOFF FROM DRAINAGE
AREA 6 ROUTE RUNOFF - RESERVOIR ROUTING,  DATA FROM DEWBERRY STAGE I STUDY REPORT (See Attached)
     Canvas X: -161.24368932038837
     Canvas Y: 221.2077669902913
     Downstream: EMONAV

     Route: Modified Puls
     Routing Curve: Elevation-Area-Outflow
     Initial Elevation: 96.3
     Elevation-Area Table: JA-DB(Basin 2)
     Elevation-Outflow Table: JA-DB(Basin 2)
     Primary Table: Elevation-Outflow
End:

Subbasin: DA-5
     Description: REGION SOUTH OF RUNWAY 1-19 Area = 11 acres COMPUTE RUNOFF
     Canvas X: -22.451456310679646
     Canvas Y: 320.40000000000003
     Area: 0.0171
     Downstream: EMONAV

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 17
     Curve Number: 61

     Transform: SCS
     Lag: 18.0

     Baseflow: None

     Erosion: None
End:

Junction: EMONAV
     Description: ARCH CULVERT ALONG EAST RISER DITCH AT MOONACHIE AVE TOTAL ALL COMBINE RUNOFF
     Canvas X: 88.27475728155338
     Canvas Y: 219.6699029126214
     Downstream: T-ALL
End:

Subbasin: DA-7
     Description: DRAINAGE AREA TO RED NECK AVENUE DITCH,  Area = 53 acres COMPUTE RUNOFF, DATA FROM CHA
     Canvas X: 259.7466019417476
     Canvas Y: 424.2058252427185
     Area: 0.0828
     Downstream: T-RNA

     Canopy: None

     Surface: None

     LossRate: SCS
     Percent Impervious Area: 0.0
     Curve Number: 84

     Transform: SCS
     Lag: 72.0

     Baseflow: None

     Erosion: None
```

```
End:

Junction: T-RNA
     Description: TOTAL FLOW TO RED NECK AVENUE DITCH
     Canvas X: 260.5155339805825
     Canvas Y: 360.3844660194175
     Downstream: RNAD-E
End:

Reservoir: RNAD-E
     Description: ROUTE RUNOFF - LEVEL POOL ROUTING
     Canvas X: 257.82427184466025
     Canvas Y: 131.242718446602
     Downstream: T-ALL

     Route: Modified Puls
     Routing Curve: Elevation-Area-Outflow
     Initial Elevation: 0.79
     Elevation-Area Table: RNAD-E(Basin 2)
     Elevation-Outflow Table: RNAD-E (REV Basin2)
     Primary Table: Elevation-Outflow
End:

Junction: T-ALL
     Description: TOTAL ALL  - EAST RISER DITCH AND RED NECK AVENUE
     Canvas X: 91.73495145631068
     Canvas Y: 130.47378640776708
End:

Reservoir: CHAN2A
     Description: Channel between access road and 1-19 runway
     Canvas X: 119.13199999999995
     Canvas Y: 323.1720000000001
     Downstream: CHAN2B

     Route: Modified Puls
     Routing Curve: Storage-Elevation-Outflow
     Initial Outflow Equals Inflow: Yes
     Storage-Outflow Table: Chan2aREV1
     Elevation-Storage Table: CHAN 2a REV1
     Primary Table: Storage-Outflow
End:

Reservoir: CHAN2B
     Description: Channel between access road and moonachie ave
     Canvas X: 110.81600000000003
     Canvas Y: 278.0280000000001
     Downstream: EMONAV

     Route: Modified Puls
     Routing Curve: Storage-Elevation-Outflow
     Initial Outflow Equals Inflow: Yes
     Storage-Outflow Table: Chan2bREV1
     Elevation-Storage Table: Chan2b REV1
     Primary Table: Storage-Outflow
End:

Basin Schematic Properties:
     Last View N: 5000.0
     Last View S: -5000.0
     Last View W: -5000.0
     Last View E: 5000.0
     Maximum View N: 716.4000000000001
     Maximum View S: 3.6000000000000014
     Maximum View W: 35.0
     Maximum View E: 170.0
     Extent Method: Elements
     Buffer: 0
     Draw Icons: Yes
     Draw Icon Labels: Yes
     Draw Gridlines: No
     Draw Flow Direction: No
     Fix Element Locations: No
End:
```

(See Attached Tables for Data)

(See Attached Tables for Data).

2_year.met

```
Meteorology: 2-year
     Description: 2-year Rainfall
     Last Modified Date: 17 December 2008
     Last Modified Time: 15:28:40
     Version: 3.2
     Unit System: English
     Precipitation Method: SCS Storm
     Snowmelt Method: None
     Use Basin Model: Original ModelREV2
     Use Basin Model: OriginalModNewDIV
     Use Basin Model: OriginalModChan2
     Use Basin Model: Existing Model12-15-08
     Use Basin Model: Existing Model 12-17-08
End:

Precip Method Parameters: SCS Storm
     Storm Depth: 3.3
     Storm Type: Type III
End:

Subbasin: DA-5
End:

Subbasin: DA-01
End:

Subbasin: DA-03
End:

Subbasin: DA-04
End:

Subbasin: DA-06
End:

Subbasin: DA-7
End:
```

```
Meteorology: 10-year
     Description: 10-Year Rainfall
     Last Modified Date: 17 December 2008
     Last Modified Time: 15:28:28
     Version: 3.2
     Unit System: English
     Precipitation Method: SCS Storm
     Snowmelt Method: None
     Use Basin Model: Original ModelREV2
     Use Basin Model: OriginalModNewDIV
     Use Basin Model: OriginalModChan2
     Use Basin Model: Existing Model12-15-08
     Use Basin Model: Existing Model 12-17-08
End:

Precip Method Parameters: SCS Storm
     Storm Depth: 5.1
     Storm Type: Type III
End:

Subbasin: DA-5
End:

Subbasin: DA-01
End:

Subbasin: DA-03
End:

Subbasin: DA-04
End:

Subbasin: DA-06
End:

Subbasin: DA-7
End:
```

100_year.met

```
Meteorology: 100-year
     Description: 100-year Rainfall
     Last Modified Date: 17 December 2008
     Last Modified Time: 15:28:22
     Version: 3.2
     Unit System: English
     Precipitation Method: SCS Storm
     Snowmelt Method: None
     Use Basin Model: Original Model
     Use Basin Model: Original Model
     Use Basin Model: Original ModelREV1
     Use Basin Model: Original ModelREV2
     Use Basin Model: Original ModelREV3
     Use Basin Model: OriginalModNewDIV
     Use Basin Model: OriginalModChan2
     Use Basin Model: Existing Model12-15-08
     Use Basin Model: Existing Model 12-17-08
End:

Precip Method Parameters: SCS Storm
     Storm Depth: 8.4
     Storm Type: Type III
End:

Subbasin: DA-01
End:

Subbasin: DA-03
End:

Subbasin: DA-04
End:

Subbasin: DA-06
End:

Subbasin: DA-5
End:

Subbasin: DA-7
End:
```

EDWARDS AND KELCEY
CONSULTING ENGINEERS

PROJECT TEB - EA's Runway 1-19 FILE NO.
SUBJECT East Basin Hydrology SHEET NO. 1 OF 3
COMPUTED BY CHECKED BY DATE

Channel Routing on the Airport (Chan 1)
(From T-2 to Twin 60" RCPs (T-3)
(DS of MT 46)

Computation Step Estimate =

Reach Length / Avg. Velocity / Time Interval

Time Interval = 6 Minutes

Reach Length = 6000 L.F.

Avg Channel Vel. = ±1.5 FPS (from Initial Hec-1 Runs)

Comp. Step Estimate = 6000'/1.5 FPS/(6 min × 60 sec/min)
= 11.1, say 11

Based on flood wave Traveling 50% Faster than the Channel velocity.
(USACOE, 1960 → from PWRTEC-1 Manual, Page 7-19)

11/1.5 = = 7.3, say 7

7.32

$$O_{avg} = I_{avg} - \frac{\Delta S}{\Delta t}$$

Where:

O_{avg} = Mean outflow from storage during Δt

I_{avg} = Mean inflow into storage during Δt

ΔS = Change in storage during Δt

Δt = Routing time interval

Requirements for routing include:

- Inflow hydrograph, defined in Δt time intervals
- Starting storage in the reservoir or routing reach
- Storage-outflow relationship

Equation 7.32 can be approximated by:

7.33

$$\frac{O_1 + O_2}{2} = \frac{I_1 + I_2}{2} - \frac{S_2 - S_1}{\Delta t}$$

where the subscripts 1 and 2 denote the beginning and end, respectively, for a routing period, Δt. The assumption implicit in Equation 7.33 is that discharge varies linearly with time during a routing period Δt. This asumption is consistent with gradually varying flood applications.

Writing Equation 7.33 with all the unknown terms (subscript 2) defined as a function of the known terms, at time step 1, yields:

7.34

$$\left(\frac{S_2}{\Delta t} + \frac{O_2}{2}\right) = \left(\frac{S_1}{\Delta t} + \frac{O_1}{2}\right) - O_1 + \frac{I_1 + I_2}{2}$$

The storage-outflow combination ($S/\Delta t + O/2$) in Equation 7.34 is called **storage indication** and has the units of discharge [HEC, 1990a]. This equation is the basis of the Modified Puls method and enables rapid direct calculation of end-of-period outflow.

Modified Puls routing in HEC-1 can be applied with either:

1. **Normal Depth**: a storage-outflow relationship computed by an analysis of the routing reach assuming normal depth flow conditions.
2. **Storage-Discharge**: a given storage versus outflow relationship.

Each of these options are described in detail in the following sections.

Normal Depth Storage Routing

The **Normal Depth** routing option allows the user to define a typical channel cross-section for the routing reach, using the same 8-Point cross-section data as the Muskingum-Cunge application. The corresponding reach length, average energy grade line slope, and Manning roughness coefficients are also required. Therefore the normal depth approach does not consider backwater effects.

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The Manning formula is used to compute the normal depth of flow in the cross-section for a specified flow rate. The corresponding cross-sectional area is multipled by the reach length to compute the incremental storage volume in the reach. Storage and outflow values are computed for 20 evenly-spaced stages beginning at the lowest point on the cross section to a specified maximum stage. The cross section is extended vertically at each end to the maximum stage. [HEC, 1990a]

The Normal Depth routing option is very useful when a detailed hydraulic model of a particular stream is not available. The data required for the Normal Depth routing option may be obtained from topographic maps, field survey data, field observations, and other available data.

Storage and outflow should not be calculated from normal depth when the storage limits and conveyance limits are significantly different. Also, if the cross section is "representative" for a reach that is not uniform, the stages will not be applicable to any specific location. Generally, the stages produced by the method are of limited value because downstream effects are not taken into account. [HEC, 1990a]

The sequence of records illustrated in Figure 7.15 is used to implement the Normal Depth routing option.

```
KK: Stream Reach or Hydrograph Computation Identifier
KM: Message (Optional)
RS: Modified Puls Stream Flow Routing Data
RC: Manning N Values for Channel Routing Reach
RX: Horizontal Coordinates of Channel Cross-Section
RY: Vertical Coordinates of Channel Cross-Section
RL: Channel Loss Rate Data - Weighted Inflow Method or Channel Area Method (Optional)
```

FIGURE 7.15 Normal Depth Stream Flow Routing Data

The same example used earlier to illustrate the use of the Muskingum-Cunge routing method may also be used to illustrate the Normal Depth storage routing method.

Figure 7.16 presents the HEC-1 output for the Kempton Creek watershed, with the lower portion of the channel modeled using the Normal Depth storage routing method. As indicated, the input data set is almost identical to the Muskingum-Cunge example, except that an RS record is used in place of the RD record to invoke Normal Depth storage routing. Two additional input data values are required on this record: the number of computation steps required for the routing and the starting condition for the routing computation.

For this example, 8 routing steps are used, based upon an estimated flow velocity of 3 feet per second in the 29,040 foot long channel segment. This yields an average travel time of 29040/(3 * 60) = 161 minutes. Since flood waves travel approximately 50% faster than the channel flow velocity [Corps of Engineers, 1960], the travel time for a flood wave through the channel segment would be about 161/1.5 = 107 minutes. Since this example file uses a 15-minute computation interval, the number of intervals would be 107/15 = 7.17 intervals, which rounds up to 8.

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Project: PA NY/NJ -TEB Runway I-19 Improvements
Subject: HEC-HMS Channel 1 Storage
Sheet:
Date: 12/22/2008

Objective: Calculate the Elevation, Storage, Discharge curve for Channel 1 Routing for the HEC-HMS Model. Channel 1 is channel upstream of I-19 Runway Culvert.

Elev. (ft)	EAST RISER DITCH Flow (cfs)
-1.3	0
-1.11	0.03
-0.92	0.2
-0.73	0.6
-0.54	1.28
-0.35	2.32
-0.16	3.78
0.03	5.7
0.22	8.14
0.41	11.16
0.6	15.15
0.79	20.06
0.98	25.51
1.17	31.49
1.36	37.98
1.55	44.97
1.74	52.45
1.93	60.41
2.12	68.83
2.31	77.72
2.5	87.07
2.69	96.87
2.88	107.13
3.07	117.83
3.26	128.97
3.45	140.56
3.64	152.58
3.83	165.05
4.02	177.96
4.21	191.34
4.4	205.96
4.59	221.76
4.78	239.42
4.97	258.25
5.16	278.16
5.35	299.28
5.4	305.06
5.41	305.17
5.54	319.2
5.73	343.48
5.92	370.64
6.11	396.14
6.3	449.89
6.49	512.59
6.68	586.22
6.87	670.32
7.06	764.66
7.25	869.12
7.44	983.69
7.63	1108.4
7.82	1243.31
8	1380.62

Obtained from Pondpack Model of Channel Routing for ERD

Elev. (ft)	EAST RISER DITCH Flow Area (sq.ft)	Storage (ft^3)
-1.3	0	0
-1.11	0.4074	2444.4
-0.92	1.6294	9776.4
-0.73	3.6661	21996.6
-0.54	6.5176	39105.6
-0.35	10.1837	61102.2
-0.16	14.6646	87987.6
0.03	19.9601	119760.6
0.22	26.0704	156422.4
0.41	32.9947	197968.2
0.6	40.5044	243026.4
0.79	48.2745	289647
0.98	56.1662	336997.2
1.17	64.1798	385078.8
1.36	72.3152	433891.2
1.55	80.5723	483433.8
1.74	88.9513	533707.8
1.93	97.4519	584711.4
2.12	106.0745	636447
2.31	114.8188	688912.8
2.5	123.6848	742108.8
2.69	132.6728	796036.8
2.88	141.7824	850694.4
3.07	151.0138	906082.8
3.26	160.3671	962202.6
3.45	169.8421	1019052.6
3.64	179.4388	1076632.8
3.83	189.1574	1134944.4
4.02	198.9979	1193987.4
4.21	208.9615	1253769
4.4	219.6626	1317975.6
4.59	233.1098	1398658.8
4.78	249.8858	1499314.8
4.97	268.139	1608834
5.16	287.9865	1727919
5.35	309.6465	1857879
5.4	315.6485	1893891
5.41	316.9441	1901664.6
5.54	336.4433	2018659.8
5.73	371.2567	2227540.2
5.92	412.7432	2476459.2
6.11	470.2977	2821786.2
6.3	679.9631	4079778.6
6.49	859.0478	5154286.8
6.68	1046.7744	6280646.4
6.87	1243.1423	7458853.8
7.06	1448.1517	8688910.2
7.25	1661.8027	9970816.2
7.44	1884.095	11304570
7.63	2115.0288	12690172.8
7.82	2354.6035	14127621
8	2589.541	15537246

Area time total channel length of Coopers.

Elev. (ft)	Storage (ac ft)
-1.30	0.00
-1.11	0.06
-0.92	0.22
-0.73	0.50
-0.54	0.90
-0.35	1.40
-0.16	2.02
0.03	2.75
0.22	3.59
0.41	4.54
0.60	5.58
0.79	6.65
0.98	7.74
1.17	8.84
1.36	9.96
1.55	11.10
1.74	12.25
1.93	13.42
2.12	14.61
2.31	15.82
2.50	17.04
2.69	18.27
2.88	19.53
3.07	20.80
3.26	22.09
3.45	23.39
3.64	24.72
3.83	26.05
4.02	27.41
4.21	28.78
4.40	30.26
4.59	32.11
4.78	34.42
4.97	36.93
5.16	39.67
5.35	42.65
5.40	43.48
5.41	43.66
5.54	46.34
5.73	51.14
5.92	56.85
6.11	64.78
6.30	93.66
6.49	118.33
6.68	144.18
6.87	171.23
7.06	199.47
7.25	228.90
7.44	259.52
7.63	291.33
7.82	324.33
8.00	356.69

Elevation shifted up by 10 feet because HEC-Hms does not take negative elevation values.

Elev. (ft)	Elev (ft)*	flow
-1.30	8.70	0.00
-1.11	8.89	0.03
-0.92	9.08	0.20
-0.73	9.27	0.60
-0.54	9.46	1.28
-0.35	9.65	2.32
-0.16	9.84	3.78
0.03	10.03	5.70
0.22	10.22	8.14
0.41	10.41	11.16
0.60	10.60	15.15
0.79	10.79	20.06
0.98	10.98	25.51
1.17	11.17	31.49
1.36	11.36	37.98
1.55	11.55	44.97
1.74	11.74	52.45
1.93	11.93	60.41
2.12	12.12	68.83
2.31	12.31	77.72
2.50	12.50	87.07
2.69	12.69	96.87
2.88	12.88	107.13
3.07	13.07	117.83
3.26	13.26	128.97
3.45	13.45	140.56
3.64	13.64	152.58
3.83	13.83	165.05
4.02	14.02	177.96
4.21	14.21	191.34
4.40	14.40	205.96
4.59	14.59	221.76
4.78	14.78	239.42
4.97	14.97	258.25
5.16	15.16	278.16
5.35	15.35	299.28
5.40	15.40	305.06
5.41	15.41	305.17
5.54	15.54	319.20
5.73	15.73	343.48
5.92	15.92	370.64
6.11	16.11	396.14
6.30	16.30	449.89
6.49	16.49	512.59
6.68	16.68	586.22
6.87	16.87	670.32
7.06	17.06	764.66
7.25	17.25	869.12
7.44	17.44	983.69
7.63	17.63	1108.40
7.82	17.82	1243.31
8.00	18.00	1380.62

Storage (ac ft)	flow
0.00	0.00
0.06	0.03
0.22	0.20
0.50	0.60
0.90	1.28
1.40	2.32
2.02	3.78
2.75	5.70
3.59	8.14
4.54	11.16
5.58	15.15
6.65	20.06
7.74	25.51
8.84	31.49
9.96	37.98
11.10	44.97
12.25	52.45
13.42	60.41
14.61	68.83
15.82	77.72
17.04	87.07
18.27	96.87
19.53	107.13
20.80	117.83
22.09	128.97
23.39	140.56
24.72	152.58
26.05	165.05
27.41	177.96
28.78	191.34
30.26	205.96
32.11	221.76
34.42	239.42
36.93	258.25
39.67	278.16
42.65	299.28
43.48	305.06
43.66	305.17
46.34	319.20
51.14	343.48
56.85	370.64
64.78	396.14
93.66	449.89
118.33	512.59
144.18	586.22
171.23	670.32
199.47	764.66
228.90	869.12
259.52	983.69
291.33	1108.40
324.33	1243.31
356.69	1380.62

Channel Elevation, Storage, Discharge entered in HEC-Hms Model.

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==========
JOB TITLE
==========

Project Date: 8/13/2008
Project Engineer: Jacobs User
Project Title: Teterboro EMAS Runway 1-19 Safety Area Improvement
Project Comments:

USED FOR MODIFIED PULS CHANNEL ROUTING IN HEC-HMS MODEL.

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********** CHANNEL ANALYSES **********

EAST RISER DITCH Chn-Irreg. 1.01
Channel Equations 1.09

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COMPOSITE CHANNEL SECTION

Slope = .000160 ft/ft
Elev.Constant= .00 ft

GROUND ELEVATION POINTS

Lowest Elev. = -1.30 ft

X Distance (ft)	Y Elev (ft)	Y+Constant (ft)
-200.00	8.00	8.00
.00	7.00	7.00
200.00	6.00	6.00
493.00	6.00	6.00
772.00	6.10	6.10
790.73	6.20	6.20
846.58	4.50	4.50
854.00	.60	.60
872.19	-1.30	-1.30
894.28	.40	.40
899.87	4.20	4.20
906.35	4.40	4.40
928.15	4.60	4.60
931.32	5.00	5.00
938.31	5.40	5.40
945.06	5.40	5.40
972.00	5.50	5.50
1048.00	6.00	6.00
1111.00	7.60	7.60
1126.75	8.00	8.00

← Typical X-Section Upstream of I-19 Runway Culvert.

THE INFORMATION BELOW WAS USED TO COMPUTE
FLOW RATE SEPARATELY FOR EACH SEGMENT.

CROSS SECTION SUBDIVIDED INTO DIFFERENT SEGMENTS

Segment	X Left (ft)	X Right (ft)	Ground n	Descr.
1	-200.00	846.58	0.08000	Left Overbank
2	846.58	899.87	0.05000	Main Channel
3	899.87	1126.75	0.06000	Right Overbank

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Solution to Mannings Open Channel Flow Equation
(Computed values are based on normal depth.)

IRREGULAR CROSS SECTION

Slope = .000160 ft/ft

FLOW RATE COMPUTED SEPARATELY FOR EACH SEGMENT.

COMPOSITE CROSS SECTION

Seg. No.	Elev. (ft)	Max. Depth (ft)	Seg. n	Flow (cfs)	Avg.Vel (ft/sec)	Area (sq.ft)	Top W (ft)	Wet.P (ft)	Hd (ft)	Froude No.
	-1.30	Q=0.0; Water surface at or below lowest cross section point.								
2	-1.11	.19	.0500	.03	.08	.4074	4.29	4.31	.10	0.04
	TOTAL FLOW			.03		.4074	4.29	4.31		
2	-.92	.38	.0500	.20	.12	1.6294	8.58	8.61	.19	0.05
	TOTAL FLOW			.20		1.6294	8.58	8.61		
2	-.73	.57	.0500	.60	.16	3.6661	12.86	12.92	.29	0.05
	TOTAL FLOW			.60		3.6661	12.86	12.92		
2	-.54	.76	.0500	1.28	.20	6.5176	17.15	17.22	.38	0.06
	TOTAL FLOW			1.28		6.5176	17.15	17.22		
2	-.35	.95	.0500	2.32	.23	10.1837	21.44	21.53	.48	0.06
	TOTAL FLOW			2.32		10.1837	21.44	21.53		
2	-.16	1.14	.0500	3.78	.26	14.6646	25.73	25.83	.57	0.06
	TOTAL FLOW			3.78		14.6646	25.73	25.83		
2	.03	1.33	.0500	5.70	.29	19.9601	30.02	30.14	.67	0.06
	TOTAL FLOW			5.70		19.9601	30.02	30.14		
2	.22	1.52	.0500	8.14	.31	26.0704	34.30	34.44	.76	0.06
	TOTAL FLOW			8.14		26.0704	34.30	34.44		
2	.41	1.71	.0500	11.16	.34	32.9947	38.48	38.63	.86	0.06
	TOTAL FLOW			11.16		32.9947	38.48	38.63		
2	.60	1.90	.0500	15.15	.37	40.5045	40.57	40.80	1.00	0.07
	TOTAL FLOW			15.15		40.5045	40.57	40.80		
2	.79	2.09	.0500	20.06	.42	48.2745	41.22	41.55	1.17	0.07
	TOTAL FLOW			20.06		48.2745	41.22	41.55		

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Solution to Mannings Open Channel Flow Equation
(Computed values are based on normal depth.)

IRREGULAR CROSS SECTION

Slope = .000160 ft/ft

FLOW RATE COMPUTED SEPARATELY FOR EACH SEGMENT.

COMPOSITE CROSS SECTION

Seg. No.	Elev. (ft)	Max. Depth (ft)	Seg. n	Flow (cfs)	Avg.Vel (ft/sec)	Area (sq.ft)	Top W (ft)	Wet.P (ft)	Hd (ft)	Froude No.
2	.98	2.28	.0500	25.51	.45	56.1662	41.86	42.29	1.34	0.07
	TOTAL FLOW			25.51		56.1662	41.86	42.29		
2	1.17	2.47	.0500	31.49	.49	64.1798	42.50	43.04	1.51	0.07
	TOTAL FLOW			31.49		64.1798	42.50	43.04		
2	1.36	2.66	.0500	37.98	.53	72.3152	43.14	43.79	1.68	0.07
	TOTAL FLOW			37.98		72.3152	43.14	43.79		
2	1.55	2.85	.0500	44.97	.56	80.5723	43.78	44.53	1.84	0.07
	TOTAL FLOW			44.97		80.5723	43.78	44.53		
2	1.74	3.04	.0500	52.45	.59	88.9513	44.42	45.28	2.00	0.07
	TOTAL FLOW			52.45		88.9513	44.42	45.28		
2	1.93	3.23	.0500	60.41	.62	97.4519	45.06	46.02	2.16	0.07
	TOTAL FLOW			60.41		97.4519	45.06	46.02		
2	2.12	3.42	.0500	68.83	.65	106.0745	45.70	46.77	2.32	0.08
	TOTAL FLOW			68.83		106.0745	45.70	46.77		
2	2.31	3.61	.0500	77.72	.68	114.8188	46.34	47.52	2.48	0.08
	TOTAL FLOW			77.72		114.8188	46.34	47.52		
2	2.50	3.80	.0500	87.07	.70	123.6848	46.98	48.26	2.63	0.08
	TOTAL FLOW			87.07		123.6848	46.98	48.26		
2	2.69	3.99	.0500	96.87	.73	132.6728	47.63	49.01	2.79	0.08
	TOTAL FLOW			96.87		132.6728	47.63	49.01		
2	2.88	4.18	.0500	107.13	.76	141.7824	48.27	49.76	2.94	0.08
	TOTAL FLOW			107.13		141.7824	48.27	49.76		

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Solution to Mannings Open Channel Flow Equation
(Computed values are based on normal depth.)

IRREGULAR CROSS SECTION

Slope = .000160 ft/ft

FLOW RATE COMPUTED SEPARATELY FOR EACH SEGMENT.

COMPOSITE CROSS SECTION

Seg. No.	Elev. (ft)	Max. Depth (ft)	Seg. n	Flow (cfs)	Avg.Vel (ft/sec)	Area (sq.ft)	Top W (ft)	Wet.P (ft)	Hd (ft)	Froude No.
2	3.07	4.37	.0500	117.83	.78	151.0138	48.91	50.50	3.09	0.08
	TOTAL FLOW			117.83		151.0138	48.91	50.50		
2	3.26	4.56	.0500	128.97	.80	160.3671	49.55	51.25	3.24	0.08
	TOTAL FLOW			128.97		160.3671	49.55	51.25		
2	3.45	4.75	.0500	140.56	.83	169.8421	50.19	52.00	3.38	0.08
	TOTAL FLOW			140.56		169.8421	50.19	52.00		
2	3.64	4.94	.0500	152.58	.85	179.4388	50.83	52.74	3.53	0.08
	TOTAL FLOW			152.58		179.4388	50.83	52.74		
2	3.83	5.13	.0500	165.05	.87	189.1574	51.47	53.49	3.68	0.08
	TOTAL FLOW			165.05		189.1574	51.47	53.49		
2	4.02	5.32	.0500	177.96	.89	198.9979	52.11	54.23	3.82	0.08
	TOTAL FLOW			177.96		198.9979	52.11	54.23		
2	4.21	5.51	.0500	191.34	.92	208.9599	52.74	54.96	3.96	0.08
3	4.21	.01	.0600	.00	.01	.0016	.32	.32	.00	0.02
	TOTAL FLOW			191.34		208.9615	53.06	55.29		
2	4.40	5.70	.0500	205.91	.94	219.0146	53.10	55.37	4.12	0.08
3	4.40	.20	.0600	.04	.07	.6480	6.48	6.48	.10	0.04
	TOTAL FLOW			205.96		219.6626	59.58	61.85		
1	4.59	.09	.0800	.00	.03	.1330	2.96	2.96	.04	0.02
2	4.59	5.89	.0500	221.43	.97	229.1302	53.29	55.59	4.30	0.08
3	4.59	.39	.0600	.33	.09	3.8466	27.19	27.19	.14	0.04
	TOTAL FLOW			221.76		233.1098	83.44	85.74		
1	4.78	.28	.0800	.08	.06	1.2878	9.20	9.20	.14	0.03

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Name.... EAST RISER DITCH

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Solution to Mannings Open Channel Flow Equation
(Computed values are based on normal depth.)

IRREGULAR CROSS SECTION

Slope = .000160 ft/ft

FLOW RATE COMPUTED SEPARATELY FOR EACH SEGMENT.

COMPOSITE CROSS SECTION

Seg. No.	Elev. (ft)	Max. Depth (ft)	Seg. n	Flow (cfs)	Avg.Vel (ft/sec)	Area (sq.ft)	Top W (ft)	Wet.P (ft)	Hd (ft)	Froude No.
2	4.78	6.08	.0500	237.98	.99	239.2553	53.29	55.59	4.49	0.08
3	4.78	.58	.0600	1.35	.14	9.3427	29.71	29.72	.31	0.05
	TOTAL FLOW			239.42		249.8858	92.20	94.51		
1	4.97	.47	.0800	.32	.09	3.6285	15.44	15.45	.23	0.03
2	4.97	6.27	.0500	255.00	1.02	249.3805	53.29	55.59	4.68	0.08
3	4.97	.77	.0600	2.92	.19	15.1300	31.21	31.24	.48	0.05
	TOTAL FLOW			258.25		268.1390	99.94	102.27		
1	5.16	.66	.0800	.80	.11	7.1553	21.68	21.69	.33	0.03
2	5.16	6.46	.0500	272.49	1.05	259.5056	53.29	55.59	4.87	0.08
3	5.16	.96	.0600	4.87	.23	21.3256	34.25	34.28	.62	0.05
	TOTAL FLOW			278.16		287.9865	109.22	111.56		
1	5.35	.85	.0800	1.58	.13	11.8680	27.92	27.94	.42	0.04
2	5.35	6.65	.0500	290.44	1.08	269.6307	53.29	55.59	5.06	0.08
3	5.35	1.15	.0600	7.27	.26	28.1477	37.57	37.61	.75	0.05
	TOTAL FLOW			299.28		309.6465	118.78	121.13		
1	5.40	.90	.0800	1.84	.14	13.3054	29.57	29.58	.45	0.04
2	5.40	6.70	.0500	295.24	1.08	272.2953	53.29	55.59	5.11	0.08
3	5.40	1.20	.0600	7.98	.27	30.0479	38.44	38.48	.78	0.05
	TOTAL FLOW			305.06		315.6485	121.30	123.65		
1	5.41	.91	.0800	1.89	.14	13.6027	29.90	29.91	.45	0.04
2	5.41	6.71	.0500	296.20	1.09	272.8282	53.29	55.59	5.12	0.08
3	5.41	1.21	.0600	7.07	.23	30.5133	47.88	47.92	.64	0.05
	TOTAL FLOW			305.17		316.9441	131.07	133.42		
1	5.54	1.04	.0800	2.70	.15	17.7667	34.17	34.18	.52	0.04
2	5.54	6.84	.0500	308.84	1.10	279.7559	53.29	55.59	5.25	0.08
3	5.54	1.34	.0600	7.65	.20	38.9206	78.21	78.25	.50	0.05
	TOTAL FLOW			319.20		336.4433	165.67	168.02		

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Solution to Mannings Open Channel Flow Equation
(Computed values are based on normal depth.)

IRREGULAR CROSS SECTION

Slope = .000160 ft/ft

FLOW RATE COMPUTED SEPARATELY FOR EACH SEGMENT.

COMPOSITE CROSS SECTION

Seg. No.	Elev. (ft)	Max. Depth (ft)	Seg. n	Flow (cfs)	Avg.Vel (ft/sec)	Area (sq.ft)	Top W (ft)	Wet.P (ft)	Hd (ft)	Froude No.
1	5.73	1.23	.0800	4.22	.17	24.8515	40.41	40.43	.61	0.04
2	5.73	7.03	.0500	327.70	1.13	289.8810	53.29	55.59	5.44	0.09
3	5.73	1.53	.0600	11.56	.20	56.5241	107.09	107.13	.53	0.05
	TOTAL FLOW			343.48		371.2567	200.79	203.15		
1	5.92	1.42	.0800	6.19	.19	33.1222	46.65	46.67	.71	0.04
2	5.92	7.22	.0500	347.00	1.16	300.0062	53.29	55.59	5.63	0.09
3	5.92	1.72	.0600	17.45	.22	79.6148	135.97	136.01	.59	0.05
	TOTAL FLOW			370.64		412.7432	235.91	238.27		
1	6.11	.11	.0800	2.27	.05	50.1895	595.87	595.87	.08	0.03
SPLIT FLOW...										
1	6.11	1.61	.0800	.46	.19	2.4656	3.06	3.46	.80	0.04
2	6.11	7.41	.0500	366.73	1.18	310.1313	53.29	55.59	5.82	0.09
3	6.11	1.91	.0600	26.68	.25	107.5113	152.46	152.51	.71	0.05
	TOTAL FLOW			396.14		470.2977	804.69	807.43		
1	6.30	1.80	.0800	24.20	.11	222.5170	706.58	706.61	.31	0.03
2	6.30	7.60	.0500	386.90	1.21	320.2565	53.29	55.59	6.01	0.09
3	6.30	2.10	.0600	38.79	.28	137.1897	159.94	159.99	.86	0.05
	TOTAL FLOW			449.89		679.9631	919.81	922.18		
1	6.49	1.99	.0800	52.19	.14	360.3769	744.58	744.61	.48	0.04
2	6.49	7.79	.0500	407.51	1.23	330.3816	53.29	55.59	6.20	0.09
3	6.49	2.29	.0600	52.89	.31	168.2894	167.42	167.47	1.01	0.06
	TOTAL FLOW			512.59		859.0478	965.29	967.67		
1	6.68	2.18	.0800	88.73	.18	505.4571	782.58	782.61	.65	0.04
2	6.68	7.98	.0500	428.53	1.26	340.5067	53.29	55.59	6.39	0.09
3	6.68	2.48	.0600	68.96	.34	200.8106	174.90	174.96	1.15	0.06
	TOTAL FLOW			586.22		1046.7740	1010.78	1013.15		

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Solution to Mannings Open Channel Flow Equation
(Computed values are based on normal depth.)

IRREGULAR CROSS SECTION

Slope = .000160 ft/ft

FLOW RATE COMPUTED SEPARATELY FOR EACH SEGMENT.

COMPOSITE CROSS SECTION

Seg. No.	Elev. (ft)	Max. Depth (ft)	Seg. n	Flow (cfs)	Avg.Vel (ft/sec)	Area (sq.ft)	Top W (ft)	Wet.P (ft)	Hd (ft)	Froude No.
1	6.87	2.37	.0800	133.35	.20	657.7571	820.58	820.61	.80	0.04
2	6.87	8.17	.0500	449.98	1.28	350.6319	53.29	55.59	6.58	0.09
3	6.87	2.67	.0600	87.00	.37	234.7533	182.39	182.44	1.29	0.06
	TOTAL FLOW			670.32		1243.14	2010	1056.26	1058.63	
1	7.06	2.56	.0800	185.80	.23	817.2774	858.58	858.61	.95	0.04
2	7.06	8.36	.0500	471.84	1.31	360.7570	53.29	55.59	6.77	0.09
3	7.06	2.86	.0600	107.01	.40	270.1173	189.87	189.92	1.42	0.06
	TOTAL FLOW			764.66		1448.15	2011	01.74	1104.12	
1	7.25	2.75	.0800	245.98	.25	984.0176	896.58	896.61	1.10	0.04
2	7.25	8.55	.0500	494.12	1.33	370.8822	53.29	55.59	6.96	0.09
3	7.25	3.05	.0600	129.02	.42	306.9029	197.35	197.41	1.56	0.06
	TOTAL FLOW			869.12		1661.80	3011	47.22	1149.60	
1	7.44	2.94	.0800	313.84	.27	1157.9780	934.58	934.61	1.24	0.04
2	7.44	8.74	.0500	516.81	1.36	381.0073	53.29	55.59	7.15	0.09
3	7.44	3.24	.0600	153.04	.44	345.1098	204.83	204.89	1.68	0.06
	TOTAL FLOW			983.69		1884.09	5011	92.70	1195.09	
1	7.63	3.13	.0800	389.40	.29	1339.1580	972.58	972.61	1.38	0.04
2	7.63	8.93	.0500	539.90	1.38	391.1325	53.29	55.59	7.34	0.09
3	7.63	3.43	.0600	179.11	.47	384.7383	212.31	212.37	1.81	0.06
	TOTAL FLOW			1108.40		2115.02	9012	38.18	1240.57	
1	7.82	3.32	.0800	472.69	.31	1527.55	8010	10.58	1010.61	1.51	0.04
2	7.82	9.12	.0500	563.39	1.40	401.2576	53.29	55.59	7.53	0.09
3	7.82	3.62	.0600	207.24	.49	425.7880	219.79	219.86	1.94	0.06
	TOTAL FLOW			1243.32		2354.60	4012	83.66	1286.06	
1	8.00	3.50	.0800	558.79	.33	1712.70	3010	46.58	1046.61	1.64	0.04
2	8.00	9.30	.0500	586.02	1.43	410.8499	53.29	55.59	7.71	0.09

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Solution to Mannings Open Channel Flow Equation
(Computed values are based on normal depth.)

IRREGULAR CROSS SECTION

Slope = .000160 ft/ft

FLOW RATE COMPUTED SEPARATELY FOR EACH SEGMENT.

COMPOSITE CROSS SECTION

Seg. No.	Elev. (ft)	Max. Depth (ft)	Seg. n	Flow (cfs)	Avg.Vel (ft/sec)	Area (sq.ft)	Top W (ft)	Wet.P (ft)	Hd (ft)	Froude No.
3	8.00	3.80	.0600	235.82	.51	465.98	86.88	226.95	2.05	0.06
	TOTAL FLOW			1380.62		2589.54	101326.75	1329.15		

SOLUTION TO MANNINGS OPEN CHANNEL FLOW EQUATION
(Computed values are based on normal depth.)

Q = (k/n) * A * (R**2/3) * (S**1/2)

where:	English Units	SI units
Q = Channel flow	cfs	cms
k = Mannings constant	1.485919	1.0
n = Mannings n	no units	no units
R = Hydraulic radius, A/WP	ft	m
A = X-section flow area	sq.ft.	sq.m.
WP = Wetted perimeter	ft	m
S = Slope	ft/ft	m/m

ADDITIONAL OUTPUT VARIABLES:
Vel= Q/A
Hd = A/TpW
F = Vel / (g * Hd)**1/2

where:	English Units	SI units
Vel= Velocity	ft/sec	m/sec
Q = Channel flow	cfs	cms
A = X-section flow area	sq.ft.	sq.m.
Hd = Hydraulic depth	ft	m
TpW= Top width for flow area	ft	m
g = Acceleration of gravity	ft/sec**2	m/sec**2
F = Froude No.	no units	no units

(Subcritical: F < 1; Critical: F = 1; Supercritical: F > 1)

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Index of Starting Page Numbers for ID Names

----- E -----
EAST RISER DITCH... 1.01, 1.09

Project: PA NY/NJ -TEB Runway I-19 Improvements **Sheet:** 1/4
Subject: HEC-HMS Diversion flow over Redneck Avenue **Date:** 12/22/2008

Objective: Obtain the diverted flows over Redneck Avenue from the existing conditions HEC-RAS model.

Total Flow	Flow to RNAD (cfs)	Flow D/S to ERD (cfs)
0	0	0
335.2	122	213
415.9	196	220
465	242	223
645.2	407	238
764.4	517	247

Flows entered in the HEC-HMS model

DIVERT

Inflow (cfs)	Diverted Flow (cfs)
0	0
335.2	122
415.9	196
465	242
645.2	407
764.4	517

Existing Condition HEC-RAS Run 26
for Split Flow over
Redneck Ave

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HEC-RAS Plan: Exist River: EB Riser Ditch Reach: Exist

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Exist	-5	2 yr	212.97	-1.31	2.85	0.60	2.96	0.002003	2.66	79.92	25.66	0.27
Exist	-5	10 yr	219.74	-1.31	2.92	0.63	3.03	0.002002	2.69	81.74	25.88	0.27
Exist	-5	25 yr	223.28	-1.31	2.96	0.65	3.07	0.002002	2.70	82.68	25.99	0.27
Exist	-5	100 yr	237.76	-1.31	3.10	0.73	3.22	0.002001	2.75	86.50	26.42	0.27
Exist	-5	100 yr + 25	247.30	-1.31	3.20	0.78	3.32	0.002001	2.78	88.99	26.71	0.27
Exist	1.0	2 yr	212.97	-1.31	3.61		3.68	0.001065	2.12	100.26	27.95	0.20
Exist	1.0	10 yr	219.74	-1.31	3.68		3.75	0.001072	2.15	102.32	28.17	0.20
Exist	1.0	25 yr	223.28	-1.31	3.72		3.79	0.001076	2.16	103.38	28.28	0.20
Exist	1.0	100 yr	237.76	-1.31	3.87		3.95	0.001089	2.21	107.70	28.74	0.20
Exist	1.0	100 yr + 25	247.30	-1.31	3.97		4.05	0.001098	2.24	110.50	29.03	0.20
Exist	1.14	2 yr	212.97	-3.04	3.66		3.70	0.000390	1.52	140.33	28.74	0.12
Exist	1.14	10 yr	219.74	-3.04	3.73		3.77	0.000398	1.54	142.46	28.82	0.12
Exist	1.14	25 yr	223.28	-3.04	3.77		3.81	0.000402	1.56	143.56	28.86	0.12
Exist	1.14	100 yr	237.76	-3.04	3.93		3.97	0.000418	1.61	147.97	29.02	0.13
Exist	1.14	100 yr + 25	247.30	-3.04	4.02		4.07	0.000428	1.64	150.82	29.13	0.13
Exist	1.47		Culvert									
Exist	1.80	2 yr	212.97	-3.04	3.86	-1.16	3.89	0.000047	1.31	162.40	35.54	0.11
Exist	1.80	10 yr	219.74	-3.04	3.95	-1.13	3.98	0.000048	1.33	165.43	35.98	0.11
Exist	1.80	25 yr	223.28	-3.04	3.99	-1.11	4.02	0.000049	1.34	167.01	36.20	0.11
Exist	1.80	100 yr	237.76	-3.04	4.17	-1.03	4.20	0.000050	1.37	173.50	37.11	0.11
Exist	1.80	100 yr + 25	247.30	-3.04	4.28	-0.98	4.31	0.000051	1.39	177.79	37.70	0.11
Exist	1.81	2 yr	212.97	-3.04	3.76	-0.28	3.99	0.030358	3.82	55.79	8.20	0.26
Exist	1.81	10 yr	219.74	-3.04	3.84	-0.23	4.08	0.031556	3.89	56.45	8.20	0.26
Exist	1.81	25 yr	223.28	-3.04	3.89	-0.19	4.13	0.032183	3.93	56.79	8.20	0.26
Exist	1.81	100 yr	237.76	-3.04	4.05	-0.07	4.31	0.034759	4.09	58.17	8.20	0.27
Exist	1.81	100 yr + 25	247.30	-3.04	4.16	0.01	4.43	0.036462	4.19	59.06	8.20	0.27
Exist	1.82	2 yr	212.97	-3.04	4.03		4.05	0.000043	1.27	168.24	36.37	0.10
Exist	1.82	10 yr	219.74	-3.04	4.12		4.14	0.000044	1.28	171.59	36.84	0.10
Exist	1.82	25 yr	223.28	-3.04	4.16		4.19	0.000044	1.29	173.34	37.09	0.10
Exist	1.82	100 yr	237.76	-3.04	4.36		4.38	0.000045	1.32	180.55	38.07	0.11
Exist	1.82	100 yr + 25	247.30	-3.04	4.48		4.51	0.000046	1.33	185.33	38.71	0.11
Exist	2.30	2 yr	212.97	-1.82	4.03		4.06	0.000403	1.41	151.49	39.62	0.13
Exist	2.30	10 yr	219.74	-1.82	4.12		4.15	0.000402	1.42	155.14	40.02	0.13
Exist	2.30	25 yr	223.28	-1.82	4.17		4.20	0.000402	1.42	157.05	40.24	0.13
Exist	2.30	100 yr	237.76	-1.82	4.36		4.39	0.000398	1.44	164.86	41.39	0.13
Exist	2.30	100 yr + 25	247.30	-1.82	4.48		4.52	0.000392	1.45	170.13	43.28	0.13
Exist	3.50	2 yr	212.97	-2.07	4.07		4.10	0.000329	1.36	171.48	92.92	0.12
Exist	3.50	10 yr	219.74	-2.07	4.17		4.19	0.000321	1.37	180.33	100.30	0.12
Exist	3.50	25 yr	223.28	-2.07	4.21		4.24	0.000316	1.37	185.19	104.13	0.11
Exist	3.50	100 yr	237.76	-2.07	4.40		4.43	0.000296	1.36	205.62	106.56	0.11
Exist	3.50	100 yr + 25	247.30	-2.07	4.53		4.56	0.000283	1.35	218.92	106.74	0.11
Exist	4.30	2 yr	212.97	-1.99	4.11		4.13	0.000247	1.05	203.35	58.58	0.10
Exist	4.30	10 yr	219.74	-1.99	4.20		4.22	0.000242	1.05	208.71	60.02	0.10
Exist	4.30	25 yr	223.28	-1.99	4.25		4.26	0.000239	1.06	211.56	61.22	0.10
Exist	4.30	100 yr	237.76	-1.99	4.44		4.45	0.000228	1.07	223.64	66.06	0.10
Exist	4.30	100 yr + 25	247.30	-1.99	4.56		4.58	0.000222	1.08	231.96	69.20	0.10
Exist	5.15	2 yr	212.97	-1.70	4.13		4.14	0.000179	1.00	232.37	219.50	0.09
Exist	5.15	10 yr	219.74	-1.70	4.22		4.23	0.000178	1.00	252.47	221.69	0.09
Exist	5.15	25 yr	223.28	-1.70	4.27		4.28	0.000177	1.00	262.96	222.83	0.09
Exist	5.15	100 yr	237.76	-1.70	4.46		4.47	0.000171	0.98	305.87	227.41	0.08
Exist	5.15	100 yr + 25	247.30	-1.70	4.58		4.59	0.000164	0.96	334.17	230.38	0.08
Exist	5.40	2 yr	212.97	-1.60	4.13		4.15	0.000256	1.17	199.26	195.95	0.10
Exist	5.40	10 yr	219.74	-1.60	4.22		4.24	0.000250	1.17	217.30	199.98	0.10
Exist	5.40	25 yr	223.28	-1.60	4.27		4.29	0.000246	1.17	226.78	202.06	0.10
Exist	5.40	100 yr	237.76	-1.60	4.46		4.48	0.000228	1.14	266.12	210.49	0.10
Exist	5.40	100 yr + 25	247.30	-1.60	4.58		4.60	0.000214	1.12	292.50	216.74	0.09
Exist	6.30	2 yr	212.97	-3.14	4.15		4.17	0.000266	1.20	188.80	135.25	0.10
Exist	6.30	10 yr	219.74	-3.14	4.24		4.27	0.000267	1.20	201.50	144.52	0.10
Exist	6.30	25 yr	223.28	-3.14	4.29		4.31	0.000268	1.20	208.41	149.48	0.10
Exist	6.30	100 yr	237.76	-3.14	4.48		4.50	0.000265	1.19	238.64	169.48	0.10
Exist	6.30	100 yr + 25	247.30	-3.14	4.60		4.62	0.000259	1.17	260.23	182.42	0.10
Exist	6.50		Culvert									
Exist	6.70	2 yr	212.97	-3.18	4.90	-1.18	4.92	0.000026	1.06	200.87	50.85	0.08
Exist	6.70	10 yr	219.74	-3.18	5.02	-1.15	5.04	0.000026	1.07	207.93	68.63	0.08
Exist	6.70	25 yr	223.28	-3.18	5.07	-1.13	5.09	0.000026	1.08	211.90	76.84	0.08

HEC-RAS Plan: Exist River: EB Riser Ditch Reach: Exist (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Exist	6.70	100 yr	237.76	-3.18	5.26	-1.07	5.28	0.000027	1.11	228.86	109.26	0.08
Exist	6.70	100 yr + 25	247.30	-3.18	5.36	-1.02	5.38	0.000027	1.13	241.35	129.40	0.08
Exist	6.94	2 yr	212.97	-1.15	4.90		4.92	0.000040	1.18	183.20	54.97	0.10
Exist	6.94	10 yr	219.74	-1.15	5.02		5.04	0.000040	1.18	189.93	58.80	0.10
Exist	6.94	25 yr	223.28	-1.15	5.07		5.09	0.000039	1.18	193.19	60.56	0.10
Exist	6.94	100 yr	237.76	-1.15	5.26		5.28	0.000039	1.20	206.47	86.91	0.10
Exist	6.94	100 yr + 25	247.30	-1.15	5.36		5.38	0.000039	1.22	216.47	104.03	0.10
Exist	7.20	2 yr	212.97	-1.89	4.93		4.93	0.000020	0.33	649.46	163.62	0.03
Exist	7.20	10 yr	219.74	-1.89	5.04		5.05	0.000019	0.33	668.87	164.31	0.03
Exist	7.20	25 yr	223.28	-1.89	5.10		5.10	0.000019	0.33	677.87	164.64	0.03
Exist	7.20	100 yr	237.76	-1.89	5.28		5.28	0.000019	0.34	708.43	165.72	0.03
Exist	7.20	100 yr + 25	247.30	-1.89	5.39		5.39	0.000019	0.34	725.93	166.34	0.03
Exist	8.50	2 yr	212.97	-1.12	4.92	0.11	4.93	0.000100	0.82	268.38	88.85	0.07
Exist	8.50	10 yr	219.74	-1.12	5.04	0.13	5.05	0.000097	0.82	279.29	97.21	0.07
Exist	8.50	25 yr	223.28	-1.12	5.10	0.14	5.11	0.000096	0.83	284.88	106.43	0.07
Exist	8.50	100 yr	237.76	-1.12	5.28	0.18	5.29	0.000095	0.84	306.06	129.81	0.06
Exist	8.50	100 yr + 25	247.30	-1.12	5.39	0.21	5.40	0.000094	0.85	320.78	149.66	0.07
Exist	9.80	2 yr	212.97	-1.26	4.94	0.09	4.95	0.000116	0.87	248.87	72.33	0.07
Exist	9.80	10 yr	219.74	-1.26	5.05	0.12	5.07	0.000114	0.88	257.70	78.45	0.07
Exist	9.80	25 yr	223.28	-1.26	5.11	0.12	5.12	0.000113	0.88	262.08	82.28	0.07
Exist	9.80	100 yr	237.76	-1.26	5.29	0.17	5.31	0.000113	0.90	278.47	95.24	0.07
Exist	9.80	100 yr + 25	247.30	-1.26	5.40	0.20	5.41	0.000114	0.91	288.88	102.62	0.07
Exist	11.50	2 yr	212.97	-0.99	4.96	0.34	4.97	0.000103	0.84	262.68	81.73	0.07
Exist	11.50	10 yr	219.74	-0.99	5.07	0.37	5.08	0.000101	0.84	272.59	86.96	0.07
Exist	11.50	25 yr	223.28	-0.99	5.13	0.37	5.14	0.000100	0.84	277.39	89.38	0.07
Exist	11.50	100 yr	237.76	-0.99	5.31	0.42	5.32	0.000099	0.86	295.61	110.29	0.07
Exist	11.50	100 yr + 25	247.30	-0.99	5.42	0.44	5.43	0.000099	0.87	307.93	123.72	0.07
Exist	13.0	2 yr	212.97	-0.72	4.97	0.73	4.99	0.000159	0.99	232.88	93.56	0.08
Exist	13.0	10 yr	219.74	-0.72	5.09	0.75	5.10	0.000152	0.99	244.22	100.03	0.08
Exist	13.0	25 yr	223.28	-0.72	5.14	0.77	5.16	0.000149	0.99	249.73	103.03	0.08
Exist	13.0	100 yr	237.76	-0.72	5.33	0.82	5.34	0.000142	0.99	269.68	113.24	0.08
Exist	13.0	100 yr + 25	247.30	-0.72	5.43	0.85	5.45	0.000139	0.99	281.91	119.06	0.08
Exist	14.0	2 yr	212.97	-0.53	4.99		5.00	0.000145	0.96	239.11	82.22	0.08
Exist	14.0	10 yr	219.74	-0.53	5.11		5.12	0.000140	0.96	248.75	83.68	0.08
Exist	14.0	25 yr	223.28	-0.53	5.16		5.17	0.000137	0.96	253.29	84.36	0.08
Exist	14.0	100 yr	237.76	-0.53	5.34		5.36	0.000133	0.97	269.07	89.09	0.08
Exist	14.0	100 yr + 25	247.30	-0.53	5.45		5.46	0.000132	0.98	278.70	94.44	0.08
Exist	15.0	2 yr	212.97	-0.65	5.01		5.02	0.000135	0.90	276.04	117.90	0.08
Exist	15.0	10 yr	219.74	-0.65	5.12		5.13	0.000126	0.88	289.77	119.44	0.07
Exist	15.0	25 yr	223.28	-0.65	5.18		5.19	0.000123	0.88	296.22	120.51	0.07
Exist	15.0	100 yr	237.76	-0.65	5.36		5.37	0.000114	0.87	318.66	124.14	0.07
Exist	15.0	100 yr + 25	247.30	-0.65	5.46		5.47	0.000111	0.87	331.80	126.23	0.07
Exist	15.50	2 yr	212.97	-1.33	5.01		5.02	0.000095	0.80	303.50	122.24	0.06
Exist	15.50	10 yr	219.74	-1.33	5.13		5.14	0.000091	0.80	317.62	122.46	0.06
Exist	15.50	25 yr	223.28	-1.33	5.18		5.19	0.000089	0.79	324.19	122.56	0.06
Exist	15.50	100 yr	237.76	-1.33	5.37		5.37	0.000086	0.79	346.65	122.91	0.06
Exist	15.50	100 yr + 25	247.30	-1.33	5.47		5.48	0.000084	0.79	359.54	123.11	0.06
Exist	16.04	2 yr	212.97	-3.31	5.00		5.04	0.000069	1.63	131.89	61.22	0.11
Exist	16.04	10 yr	219.74	-3.31	5.12		5.16	0.000069	1.65	135.78	82.73	0.12
Exist	16.04	25 yr	223.28	-3.31	5.17		5.21	0.000069	1.66	138.28	99.22	0.12
Exist	16.04	100 yr	237.76	-3.31	5.35		5.40	0.000071	1.72	149.15	120.29	0.12
Exist	16.04	100 yr + 25	247.30	-3.31	5.46		5.50	0.000072	1.75	156.51	121.28	0.12
Exist	18.03		Culvert									
Exist	20.03	2 yr	212.97	-3.59	6.19	-1.41	6.21	0.000032	1.24	272.71	272.44	0.07
Exist	20.03	10 yr	219.74	-3.59	6.28	-1.37	6.30	0.000031	1.24	291.45	275.95	0.07
Exist	20.03	25 yr	223.28	-3.59	6.31	-1.35	6.33	0.000032	1.25	299.64	277.47	0.07
Exist	20.03	100 yr	237.76	-3.59	6.44	-1.27	6.46	0.000032	1.28	328.99	282.83	0.08
Exist	20.03	100 yr + 25	247.30	-3.59	6.50	-1.22	6.53	0.000033	1.30	344.45	285.60	0.08
Exist	20.50	2 yr	221.21	-2.50	6.21		6.22	0.000066	0.73	408.57	268.31	0.05
Exist	20.50	10 yr	234.43	-2.50	6.30		6.30	0.000068	0.75	430.96	271.80	0.06
Exist	20.50	25 yr	242.00	-2.50	6.33		6.34	0.000070	0.77	440.77	273.31	0.06
Exist	20.50	100 yr	270.12	-2.50	6.46		6.47	0.000077	0.81	475.81	278.64	0.06
Exist	20.50	100 yr + 25	289.50	-2.50	6.52		6.53	0.000083	0.85	494.22	281.40	0.06
Exist	21.50	2 yr	249.69	-1.38	6.22		6.23	0.000076	0.77	433.72	299.23	0.06
Exist	21.50	10 yr	279.69	-1.38	6.30		6.31	0.000088	0.84	458.92	308.40	0.06

low D/S ERD →

HEC-RAS Plan: Exist River: EB Riser Ditch Reach: Exist (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Exist	21.50	25 yr	296.56	-1.38	6.34		6.35	0.000095	0.88	470.07	312.38	0.07
Exist	21.50	100 yr	358.09	-1.38	6.46		6.48	0.000122	1.01	510.61	326.42	0.07
Exist	21.50	100 yr + 25	397.80	-1.38	6.53		6.55	0.000142	1.10	532.35	333.70	0.08
Exist	24.00	2 yr	328.55	-0.97	6.24		6.25	0.000117	0.95	555.84	553.69	0.07
Exist	24.00	10 yr	397.66	-0.97	6.33		6.34	0.000154	1.10	604.36	558.66	0.08
Exist	24.00	25 yr	438.47	-0.97	6.37		6.38	0.000178	1.19	626.92	560.87	0.09
Exist	24.00	100 yr	589.57	-0.97	6.50		6.53	0.000272	1.50	703.54	568.69	0.11
Exist	24.00	100 yr + 25	683.56	-0.97	6.58		6.61	0.000334	1.68	745.22	572.85	0.12
Exist	24.75		Lat Struct									
Exist	26.00	2 yr	335.20	-0.61	6.26		6.28	0.000126	0.99	501.80	475.53	0.08
Exist	26.00	10 yr	415.90	-0.61	6.36		6.38	0.000175	1.18	547.71	493.34	0.09
Exist	26.00	25 yr	465.00	-0.61	6.40		6.42	0.000209	1.30	569.43	501.55	0.10
Exist	26.00	100 yr	645.20	-0.61	6.56		6.59	0.000337	1.68	650.13	530.94	0.12
Exist	26.00	100 yr + 25	764.40	-0.61	6.64		6.69	0.000429	1.91	696.36	547.07	0.14
Exist	28.00	2 yr	335.20	-0.18	6.29		6.31	0.000167	1.10	456.94	488.97	0.09
Exist	28.00	10 yr	415.90	-0.18	6.40		6.42	0.000228	1.29	509.82	517.01	0.10
Exist	28.00	25 yr	465.00	-0.18	6.45		6.47	0.000268	1.41	536.45	535.23	0.11
Exist	28.00	100 yr	645.20	-0.18	6.63		6.67	0.000414	1.79	643.76	623.75	0.14
Exist	28.00	100 yr + 25	764.40	-0.18	6.73		6.78	0.000506	2.00	710.36	644.24	0.15
Exist	30.00	2 yr	335.20	-1.29	6.32		6.33	0.000112	0.97	589.96	682.53	0.07
Exist	30.00	10 yr	415.90	-1.29	6.44		6.45	0.000149	1.14	670.60	700.49	0.08
Exist	30.00	25 yr	465.00	-1.29	6.50		6.52	0.000173	1.23	711.76	709.48	0.09
Exist	30.00	100 yr	645.20	-1.29	6.71		6.74	0.000252	1.52	864.97	741.99	0.11
Exist	30.00	100 yr + 25	764.40	-1.29	6.83		6.86	0.000302	1.69	956.97	760.85	0.12
Exist	32.00	2 yr	335.20	-1.29	6.34		6.35	0.000084	0.88	720.78	930.28	0.06
Exist	32.00	10 yr	415.90	-1.29	6.47		6.48	0.000109	1.01	837.98	959.96	0.07
Exist	32.00	25 yr	465.00	-1.29	6.53		6.55	0.000125	1.09	899.08	975.08	0.08
Exist	32.00	100 yr	645.20	-1.29	6.76		6.78	0.000174	1.32	1126.72	1029.45	0.09
Exist	32.00	100 yr + 25	764.40	-1.29	6.89		6.91	0.000203	1.45	1265.06	1061.13	0.10
Exist	34.00	2 yr	335.20	-1.69	6.36		6.37	0.000070	0.78	1074.78	1070.09	0.06
Exist	34.00	10 yr	415.90	-1.69	6.49		6.50	0.000087	0.88	1215.96	1106.55	0.06
Exist	34.00	25 yr	465.00	-1.69	6.56		6.57	0.000098	0.94	1290.40	1125.29	0.07
Exist	34.00	100 yr	645.20	-1.69	6.80		6.81	0.000128	1.10	1566.08	1192.15	0.08
Exist	34.00	100 yr + 25	764.40	-1.69	6.94		6.95	0.000146	1.19	1733.78	1231.04	0.08
Exist	36.00	2 yr	335.20	-1.93	6.38		6.38	0.000027	0.49	1602.81	1166.11	0.03
Exist	36.00	10 yr	415.90	-1.93	6.51		6.51	0.000034	0.56	1759.96	1203.49	0.04
Exist	36.00	25 yr	465.00	-1.93	6.58		6.58	0.000039	0.60	1843.08	1222.80	0.04
Exist	36.00	100 yr	645.20	-1.93	6.82		6.82	0.000054	0.73	2148.77	1290.22	0.05
Exist	36.00	100 yr + 25	764.40	-1.93	6.96		6.97	0.000063	0.79	2333.40	1322.28	0.05
Exist	38.00	2 yr	335.20	-2.03	6.38		6.38	0.000016	0.38	2150.13	1281.40	0.03
Exist	38.00	10 yr	415.90	-2.03	6.52		6.52	0.000020	0.43	2323.75	1308.99	0.03
Exist	38.00	25 yr	465.00	-2.03	6.58		6.59	0.000023	0.46	2415.09	1323.27	0.03
Exist	38.00	100 yr	645.20	-2.03	6.83		6.83	0.000032	0.56	2746.46	1367.91	0.04
Exist	38.00	100 yr + 25	764.40	-2.03	6.97		6.98	0.000038	0.61	2943.66	1390.79	0.04

lat flow →

Project: PA NY/NJ -TEB Runway I-19 Improvements **Sheet:** 1/6
Subject: HEC-HMS Channel 2a and 2b Storage **Date:** 12/22/2008

Objective: Obtain the Channel 2a and Channel 2b Storage, Discharge and elevation from the existing conditions HEC-RAS model.

Channel 2a

Storage (ac-ft)	Flow D/S to ERD (cfs)
0	0
6.12	213
6.37	220
6.48	223
6.9	238
7.18	247

Channel 2a

Elevation (ft)	Storage (ac-ft)
0	0
4.96	6.12
5.07	6.37
5.13	6.48
5.31	6.9
5.42	7.18

Channel 2b

Storage (ac-ft)	Flow D/S to ERD
0	0
1.93	213
2.03	220
2.09	223
2.33	238
2.48	247

Channel 2b

Elevation (ft)	Storage (ac-ft)
0	0
4.07	1.93
4.17	2.03
4.21	2.09
4.4	2.33
4.53	2.48

Note: Channel 2a is the East Riser Ditch between the Gate B Access Road and I-19 Safety Runway. Channel 2b is the East Riser Ditch between Moonachie Avenue and Gate B Access Road.

HEC-RAS Plan: Exist River: EB Riser Ditch Reach: Exist

Reach	River Sta	Profile	Q Total (cfs)	W.S. Elev (ft)	Volume (acre-ft)
Exist	-5	2 yr	212.97	2.85	
Exist	-5	10 yr	219.74	2.92	
Exist	-5	25 yr	223.28	2.96	
Exist	-5	100 yr	237.76	3.10	
Exist	-5	100 yr + 25	247.30	3.20	
Exist	1.0	2 yr	212.97	3.61	1.03
Exist	1.0	10 yr	219.74	3.68	1.06
Exist	1.0	25 yr	223.28	3.72	1.07
Exist	1.0	100 yr	237.76	3.87	1.11
Exist	1.0	100 yr + 25	247.30	3.97	1.14
Exist	1.14	2 yr	212.97	3.66	1.07
Exist	1.14	10 yr	219.74	3.73	1.10
Exist	1.14	25 yr	223.28	3.77	1.11
Exist	1.14	100 yr	237.76	3.93	1.16
Exist	1.14	100 yr + 25	247.30	4.02	1.19
Exist	1.47		Culvert		
Exist	1.80	2 yr	212.97	3.86	0.11
Exist	1.80	10 yr	219.74	3.95	0.11
Exist	1.80	25 yr	223.28	3.99	0.11
Exist	1.80	100 yr	237.76	4.17	0.11
Exist	1.80	100 yr + 25	247.30	4.28	0.12
Exist	1.81	2 yr	212.97	3.76	0.11
Exist	1.81	10 yr	219.74	3.84	0.12
Exist	1.81	25 yr	223.28	3.89	0.12
Exist	1.81	100 yr	237.76	4.05	0.12
Exist	1.81	100 yr + 25	247.30	4.16	0.12
Exist	1.82	2 yr	212.97	4.03	0.12
Exist	1.82	10 yr	219.74	4.12	0.12
Exist	1.82	25 yr	223.28	4.16	0.12
Exist	1.82	100 yr	237.76	4.36	0.12
Exist	1.82	100 yr + 25	247.30	4.48	0.12
Exist	2.30	2 yr	212.97	4.03	0.29
Exist	2.30	10 yr	219.74	4.12	0.30
Exist	2.30	25 yr	223.28	4.17	0.30
Exist	2.30	100 yr	237.76	4.36	0.31
Exist	2.30	100 yr + 25	247.30	4.48	0.32
Exist	3.50	2 yr	212.97	4.07	0.74
Exist	3.50	10 yr	219.74	4.17	0.76
Exist	3.50	25 yr	223.28	4.21	0.77
Exist	3.50	100 yr	237.76	4.40	0.82
Exist	3.50	100 yr + 25	247.30	4.53	0.85
Exist	4.30	2 yr	212.97	4.11	1.08

Moonachie Ave

Elevation, Discharge Channel 2B

3/16

HEC-RAS Plan: Exist River: EB Riser Ditch Reach: Exist (Continued)

Reach	River Sta	Profile	Q Total	W.S. Elev	Volume
			(cfs)	(ft)	(acre-ft)
Exist	4.30	10 yr	219.74	4.20	1.11
Exist	4.30	25 yr	223.28	4.25	1.13
Exist	4.30	100 yr	237.76	4.44	1.21
Exist	4.30	100 yr + 25	247.30	4.56	1.27
Exist	5.15	2 yr	212.97	4.13	1.51
Exist	5.15	10 yr	219.74	4.22	1.57
Exist	5.15	25 yr	223.28	4.27	1.60
Exist	5.15	100 yr	237.76	4.46	1.74
Exist	5.15	100 yr + 25	247.30	4.58	1.84
Exist	5.40	2 yr	212.97	4.13	1.63
Exist	5.40	10 yr	219.74	4.22	1.71
Exist	5.40	25 yr	223.28	4.27	1.75
Exist	5.40	100 yr	237.76	4.46	1.91
Exist	5.40	100 yr + 25	247.30	4.58	2.02
Exist	6.30	2 yr	212.97	4.15	2.04
Exist	6.30	10 yr	219.74	4.24	2.14
Exist	6.30	25 yr	223.28	4.29	2.20
Exist	6.30	100 yr	237.76	4.48	2.44
Exist	6.30	100 yr + 25	247.30	4.60	2.60
Exist	6.50		Culvert		
Exist	6.70	2 yr	212.97	4.90	0.04
Exist	6.70	10 yr	219.74	5.02	0.04
Exist	6.70	25 yr	223.28	5.07	0.05
Exist	6.70	100 yr	237.76	5.26	0.06
Exist	6.70	100 yr + 25	247.30	5.36	0.06
Exist	6.94	2 yr	212.97	4.90	0.15
Exist	6.94	10 yr	219.74	5.02	0.15
Exist	6.94	25 yr	223.28	5.07	0.16
Exist	6.94	100 yr	237.76	5.26	0.18
Exist	6.94	100 yr + 25	247.30	5.36	0.19
Exist	7.20	2 yr	212.97	4.93	0.40
Exist	7.20	10 yr	219.74	5.04	0.41
Exist	7.20	25 yr	223.28	5.10	0.42
Exist	7.20	100 yr	237.76	5.28	0.45
Exist	7.20	100 yr + 25	247.30	5.39	0.48
Exist	8.50	2 yr	212.97	4.92	1.76
Exist	8.50	10 yr	219.74	5.04	1.83
Exist	8.50	25 yr	223.28	5.10	1.85
Exist	8.50	100 yr	237.76	5.28	1.97
Exist	8.50	100 yr + 25	247.30	5.39	2.04
Exist	9.80	2 yr	212.97	4.94	2.53
Exist	9.80	10 yr	219.74	5.05	2.62

Channel 2b between Moonachie Ave (R.S. 1-8) and Gate B Access Road (R.S. 6-30)

Profile	R.S 1.8	R.S. 6.3	Not ac-ft
2	0.11	2.04	1.93
10	0.11	2.14	2.03
25	0.11	2.20	2.09
100	0.11	2.44	2.33
100+25	0.12	2.60	2.48

Gate B Access Road

HEC-RAS Plan: Exist River: EB Riser Ditch Reach: Exist (Continued)

Reach	River Sta	Profile	Q Total (cfs)	W.S. Elev (ft)	Volume (acre-ft)
Exist	9.80	25 yr	223.28	5.11	2.67
Exist	9.80	100 yr	237.76	5.29	2.83
Exist	9.80	100 yr + 25	247.30	5.40	2.94
Exist	11.50	2 yr	212.97	4.96	3.53
Exist	11.50	10 yr	219.74	5.07	3.65
Exist	11.50	25 yr	223.28	5.13	3.71
Exist	11.50	100 yr	237.76	5.31	3.94
Exist	11.50	100 yr + 25	247.30	5.42	4.09
Exist	13.0	2 yr	212.97	4.97	4.38
Exist	13.0	10 yr	219.74	5.09	4.54
Exist	13.0	25 yr	223.28	5.14	4.62
Exist	13.0	100 yr	237.76	5.33	4.91
Exist	13.0	100 yr + 25	247.30	5.43	5.10
Exist	14.0	2 yr	212.97	4.99	4.93
Exist	14.0	10 yr	219.74	5.11	5.12
Exist	14.0	25 yr	223.28	5.16	5.21
Exist	14.0	100 yr	237.76	5.34	5.54
Exist	14.0	100 yr + 25	247.30	5.45	5.76
Exist	15.0	2 yr	212.97	5.01	5.53
Exist	15.0	10 yr	219.74	5.12	5.74
Exist	15.0	25 yr	223.28	5.18	5.84
Exist	15.0	100 yr	237.76	5.36	6.22
Exist	15.0	100 yr + 25	247.30	5.46	6.46
Exist	15.50	2 yr	212.97	5.01	5.86
Exist	15.50	10 yr	219.74	5.13	6.09
Exist	15.50	25 yr	223.28	5.18	6.20
Exist	15.50	100 yr	237.76	5.37	6.60
Exist	15.50	100 yr + 25	247.30	5.47	6.85
Exist	16.04	2 yr	212.97	5.00	6.16
Exist	16.04	10 yr	219.74	5.12	6.41
Exist	16.04	25 yr	223.28	5.17	6.53
Exist	16.04	100 yr	237.76	5.35	6.96
Exist	16.04	100 yr + 25	247.30	5.46	7.24
Exist	18.03		Culvert		
Exist	20.03	2 yr	212.97	6.19	0.50
Exist	20.03	10 yr	219.74	6.28	0.54
Exist	20.03	25 yr	223.28	6.31	0.56
Exist	20.03	100 yr	237.76	6.44	0.64
Exist	20.03	100 yr + 25	247.30	6.50	0.69
Exist	20.50	2 yr	221.21	6.21	0.87
Exist	20.50	10 yr	234.43	6.30	0.94
Exist	20.50	25 yr	242.00	6.33	0.97

Channel 2a (R.S. 6-70)

Volume between Gate B Access Road and Runway 1-19 Culvert (R.S. 16.04)

Profile	R.S 6.70	R.S 16.04	Net ac-ft
2	0.04	6.16	6.12
10	0.04	6.41	6.37
25	0.05	6.53	6.48
100	0.06	6.96	6.90
100+25	0.06	7.24	6.18

Runway 1-19 Culvert

HEC-RAS Plan: Exist River: EB Riser Ditch Reach: Exist (Continued)

Reach	River Sta	Profile	Q Total	W.S. Elev	Volume
			(cfs)	(ft)	(acre-ft)
Exist	20.50	100 yr	270.12	6.46	1.08
Exist	20.50	100 yr + 25	289.50	6.52	1.15
Exist	21.50	2 yr	249.69	6.22	1.84
Exist	21.50	10 yr	279.69	6.30	1.96
Exist	21.50	25 yr	296.56	6.34	2.01
Exist	21.50	100 yr	358.09	6.46	2.21
Exist	21.50	100 yr + 25	397.80	6.53	2.33
Exist	24.00	2 yr	328.55	6.24	4.68
Exist	24.00	10 yr	397.66	6.33	5.01
Exist	24.00	25 yr	438.47	6.37	5.16
Exist	24.00	100 yr	589.57	6.50	5.70
Exist	24.00	100 yr + 25	683.56	6.58	5.99
Exist	24.75		Lat Struct		
Exist	26.00	2 yr	335.20	6.26	7.11
Exist	26.00	10 yr	415.90	6.36	7.65
Exist	26.00	25 yr	465.00	6.40	7.90
Exist	26.00	100 yr	645.20	6.56	8.81
Exist	26.00	100 yr + 25	764.40	6.64	9.30
Exist	28.00	2 yr	335.20	6.29	9.31
Exist	28.00	10 yr	415.90	6.40	10.08
Exist	28.00	25 yr	465.00	6.45	10.44
Exist	28.00	100 yr	645.20	6.63	11.78
Exist	28.00	100 yr + 25	764.40	6.73	12.53
Exist	30.00	2 yr	335.20	6.32	11.71
Exist	30.00	10 yr	415.90	6.44	12.79
Exist	30.00	25 yr	465.00	6.50	13.31
Exist	30.00	100 yr	645.20	6.71	15.24
Exist	30.00	100 yr + 25	764.40	6.83	16.36
Exist	32.00	2 yr	335.20	6.34	14.72
Exist	32.00	10 yr	415.90	6.47	16.25
Exist	32.00	25 yr	465.00	6.53	17.01
Exist	32.00	100 yr	645.20	6.76	19.81
Exist	32.00	100 yr + 25	764.40	6.89	21.46
Exist	34.00	2 yr	335.20	6.36	18.80
Exist	34.00	10 yr	415.90	6.49	20.91
Exist	34.00	25 yr	465.00	6.56	21.96
Exist	34.00	100 yr	645.20	6.80	25.90
Exist	34.00	100 yr + 25	764.40	6.94	28.23
Exist	36.00	2 yr	335.20	6.38	24.91
Exist	36.00	10 yr	415.90	6.51	27.69
Exist	36.00	25 yr	465.00	6.58	29.10
Exist	36.00	100 yr	645.20	6.82	34.34

HEC-RAS Plan: Exist River: EB Riser Ditch Reach: Exist (Continued)

Reach	River Sta	Profile	Q Total	W.S. Elev	Volume
			(cfs)	(ft)	(acre-ft)
Exist	36.00	100 yr + 25	764.40	6.96	37.47
Exist	38.00	2 yr	335.20	6.38	33.52
Exist	38.00	10 yr	415.90	6.52	37.06
Exist	38.00	25 yr	465.00	6.58	38.87
Exist	38.00	100 yr	645.20	6.83	45.58
Exist	38.00	100 yr + 25	764.40	6.97	49.58

HUYLER STREET PUMP STATION

DRAINAGE SUBAREA BOUNDARY

1
439 AC

2
123 AC

3
60 AC

4

D.A. #1
Tc PATH

ELEV. 0.0
(Tc PATH)

EL. 20.0
(Tc PATH)

Tc

BM 37

BM 9

BM 11

Boro Hall

Park

Cem

HACKENSACK

SOUTH HACKENSACK

TETERBORO

TETERBORO AIRPORT

RUNWAY 1-19

HUYLER

PO

St Mark's Ch

Jackson Temple

Courthouse

MAIN

ROUTE 46

RIVER

HUDSON

PHILLIPS

ELM

CYPRESS

AVENUE

WEST

2

N

CHANZA

D.A. = 10 ACRES
D.A. #6

D.A. #5
D.A. = 11 ACRES

CHANZA

Tc

WETLAND NBA

WETLAND AK

WETLAND

CULVERTS

CULVERTS

WETLAND NHL

TEB - EMAS
RUNWAY 1-19
ONSITE D.A.'S
MAP # 2

SOURCE: PA NJ/NJ SECTOR MAPS

1" = 300'

DITCH PIPED TO TETERBORO PUMP STATION, WEST RIVER DITCH

3

TETERBORO AIRPORT

RUNWAY

HEISLER ST.

CHANNEL

Wetland #1

Existing Drive

Piped To

D.A. = 60 AC. Tc

D.A. = 140 Acres

CHANN 2b

CHANN 2

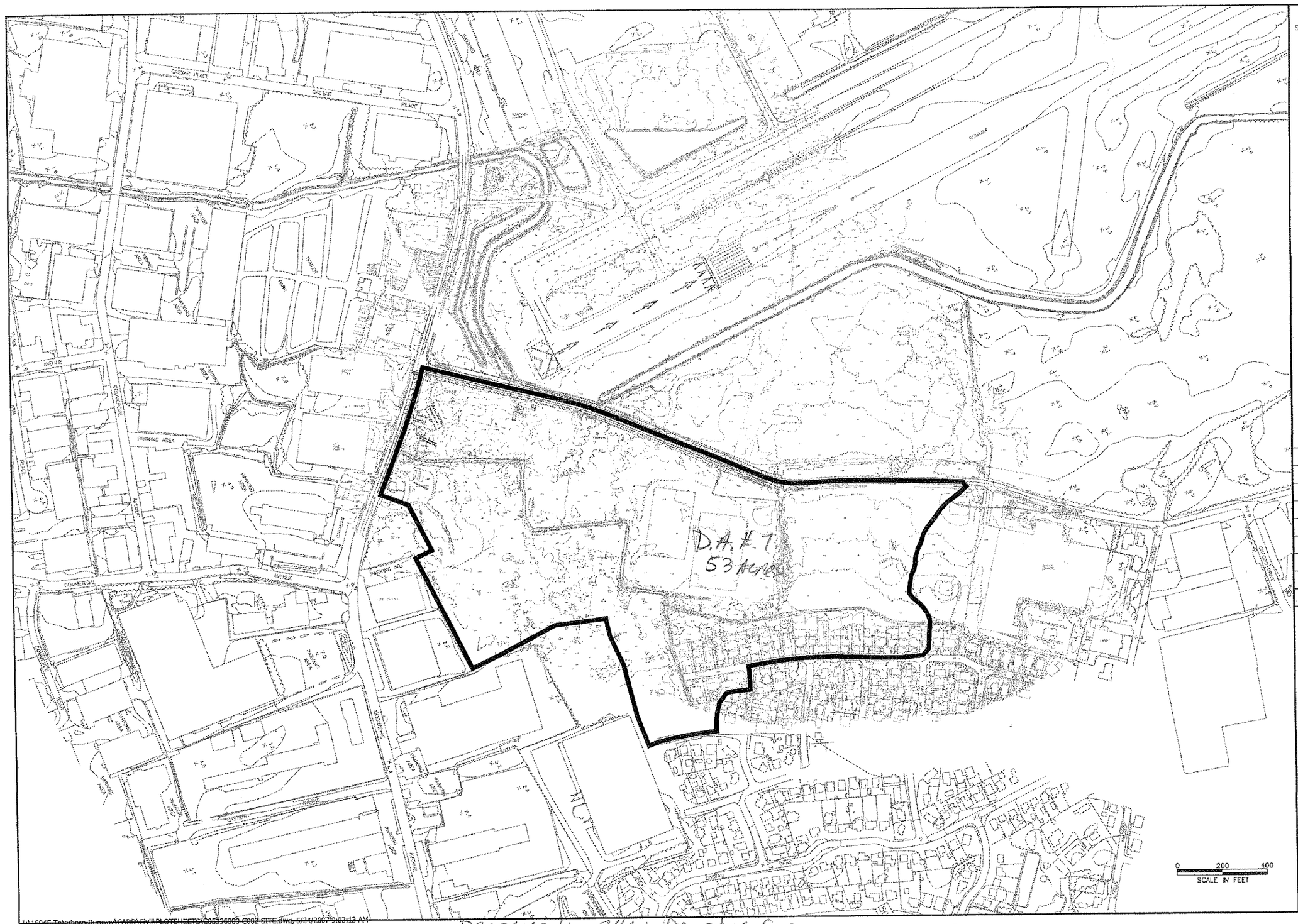
Gate B Access Road

TOTAL AREA = 720 ACRES

SOURCE: NJMC Mapping

TEB- EMAS Runway 1-19
Drainage Area Map #1

1" = 600'



Sheet 4 of

THE PORT AUTHORITY
OF NY & NJ

No.	Date	Revision	Approved

ENGINEERING DEPARTMENT

TETERBORO AIRPORT

CIVIL
Title

RUNWAY 1-19 SAFETY AREA IMPROVEMENTS

SITE PLAN

This drawing subject to conditions in contract. All inventions, ideas, designs and methods herein are reserved to Port Authority and may not be used without its written consent.

JJC	JMB	
Designed by	Drawn by	Checked by

Date: June 2007

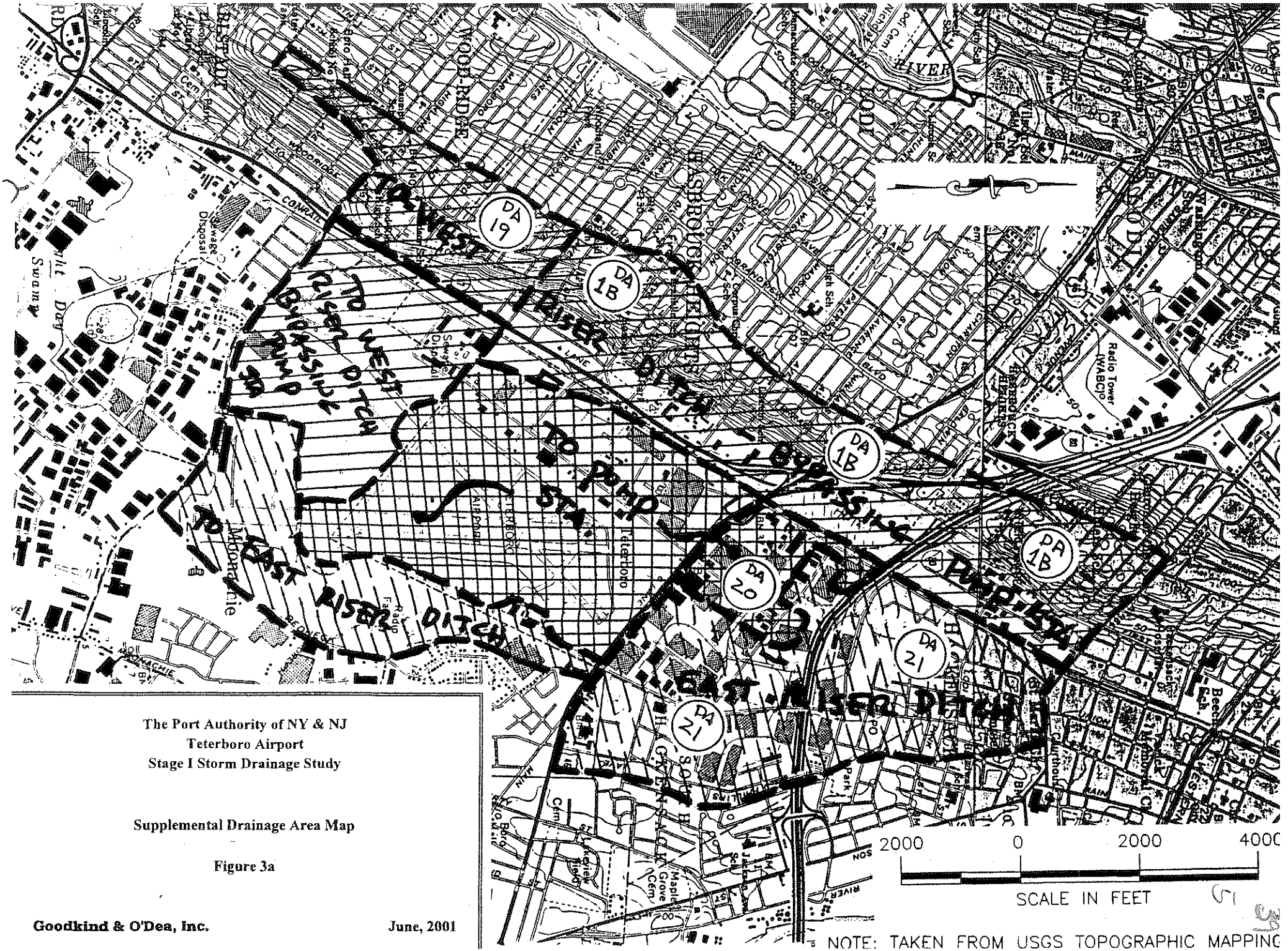
Contract Number: TEB-144.005

Drawing Number: C002

PID# 05396000

I:\16945-Teterboro-Runway\CADD\Civil\PLOTSHEETS\C05396000-C002-SITE.dwg, 5/24/2007 9:03:13 AM

PREPARED by CHA & DONOHUE Eng.

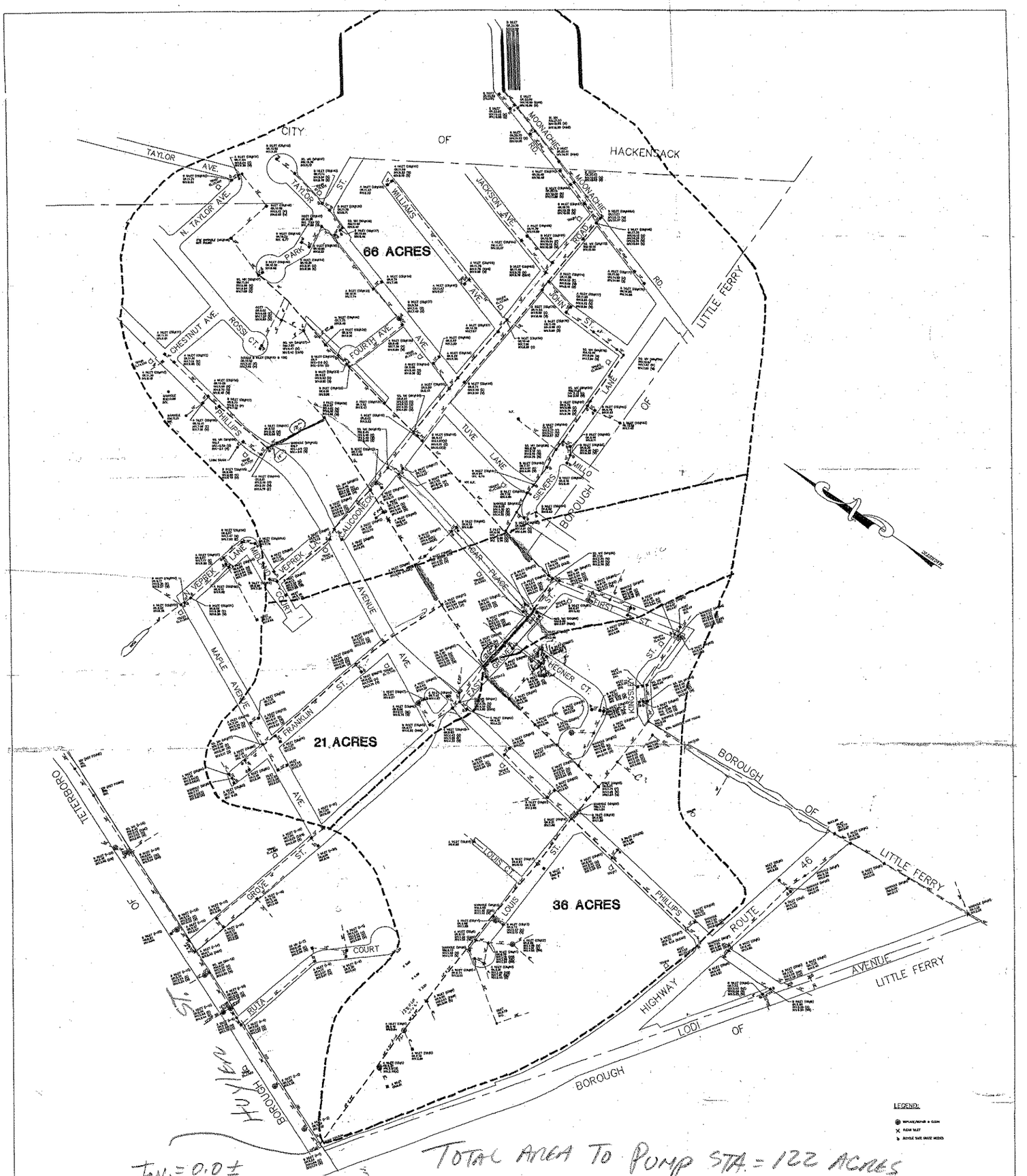


The Port Authority of NY & NJ
Teterboro Airport
Stage I Storm Drainage Study

Supplemental Drainage Area Map

Figure 3a

Goodkind & O'Dea, Inc. June, 2001



INV. = 0.0 ±

TOTAL AREA TO PUMP STA. = 122 ACRES

NO.	DATE	DESCRIPTION	DRAWN BY	DESIGN BY	CHECKED BY

BOSWELL McCLAVE ENGINEERING
ENGINEERS – SURVEYORS – PLANNERS – SCIENTISTS
330 PHILLIPS AVENUE • SOUTH HACKENSACK, N.J. 07606

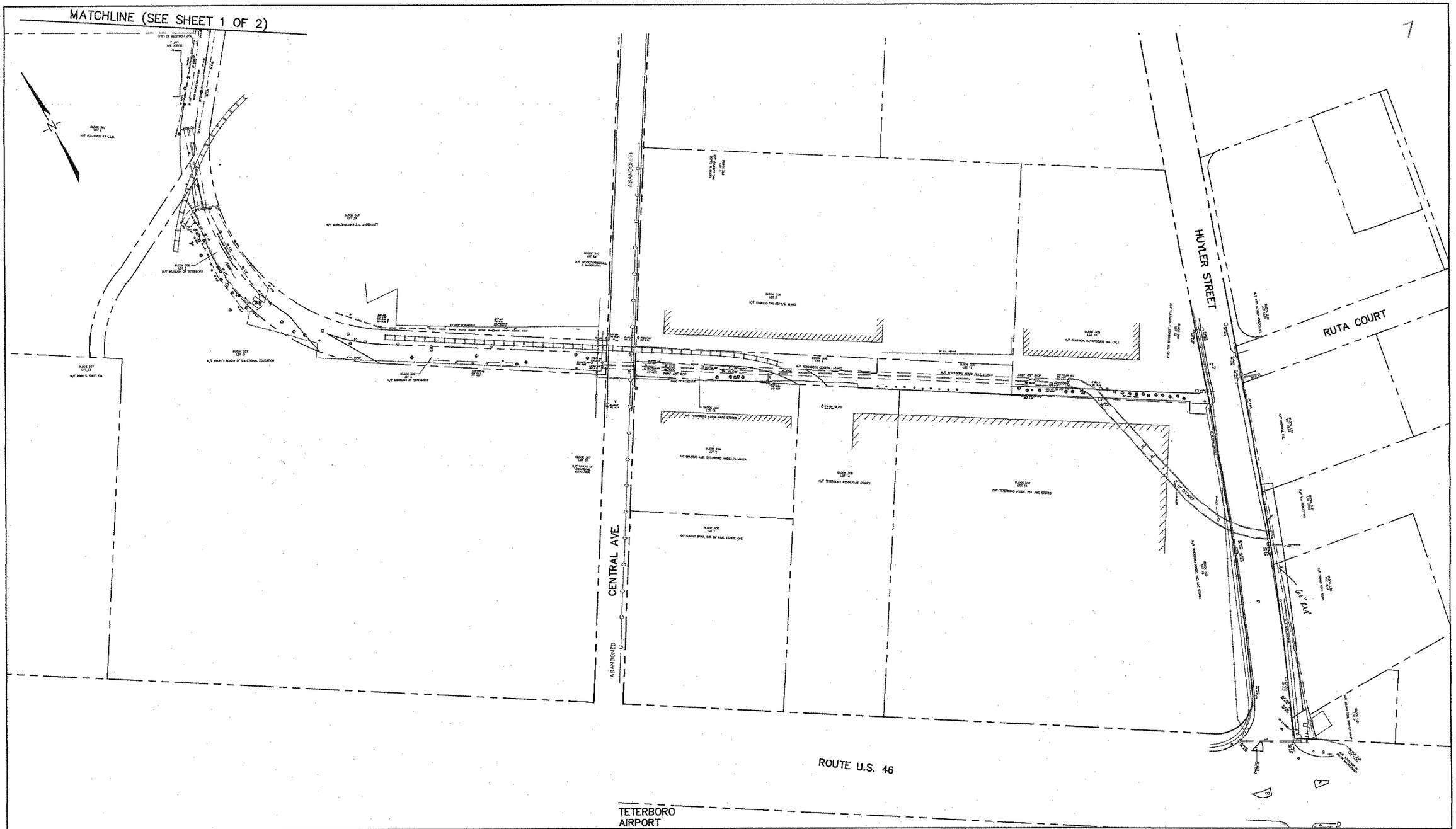
STEPHEN T. BOSWELL
PROFESSIONAL ENGINEER, N.J. LIC. 34680

HORMOZ PAZWASH
PROFESSIONAL ENGINEER N.J. LIC. NO. 31433

HUYLER ST. PUMP STATION
STORM DRAIN MAP
TOWNSHIP OF SOUTH HACKENSACK
BERGEN COUNTY NEW JERSEY

SURVEYED BY	DRAWN BY	CHECKED BY	SCALE:	JOB NO.:	DATE:
	TVD		1" = 100'	SH-113	JULY 7, 1995

DRAWING NO. SH-113 SHEET 1 OF 1



NO.	DATE	DESCRIPTION	SURVEYED BY	DRAWN BY	DESIGNED BY	CHECKED BY

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N.J. CERTIFICATE OF AUTHORIZATION NO. 24GA27958000

STEPHEN T. BOSWELL
PROFESSIONAL ENGINEER N.J. LIC. 34680

CHRISTOPHER J. NASH
PROFESSIONAL ENGINEER N.J. LIC. 31605

EAST RISER DITCH IMPROVEMENTS

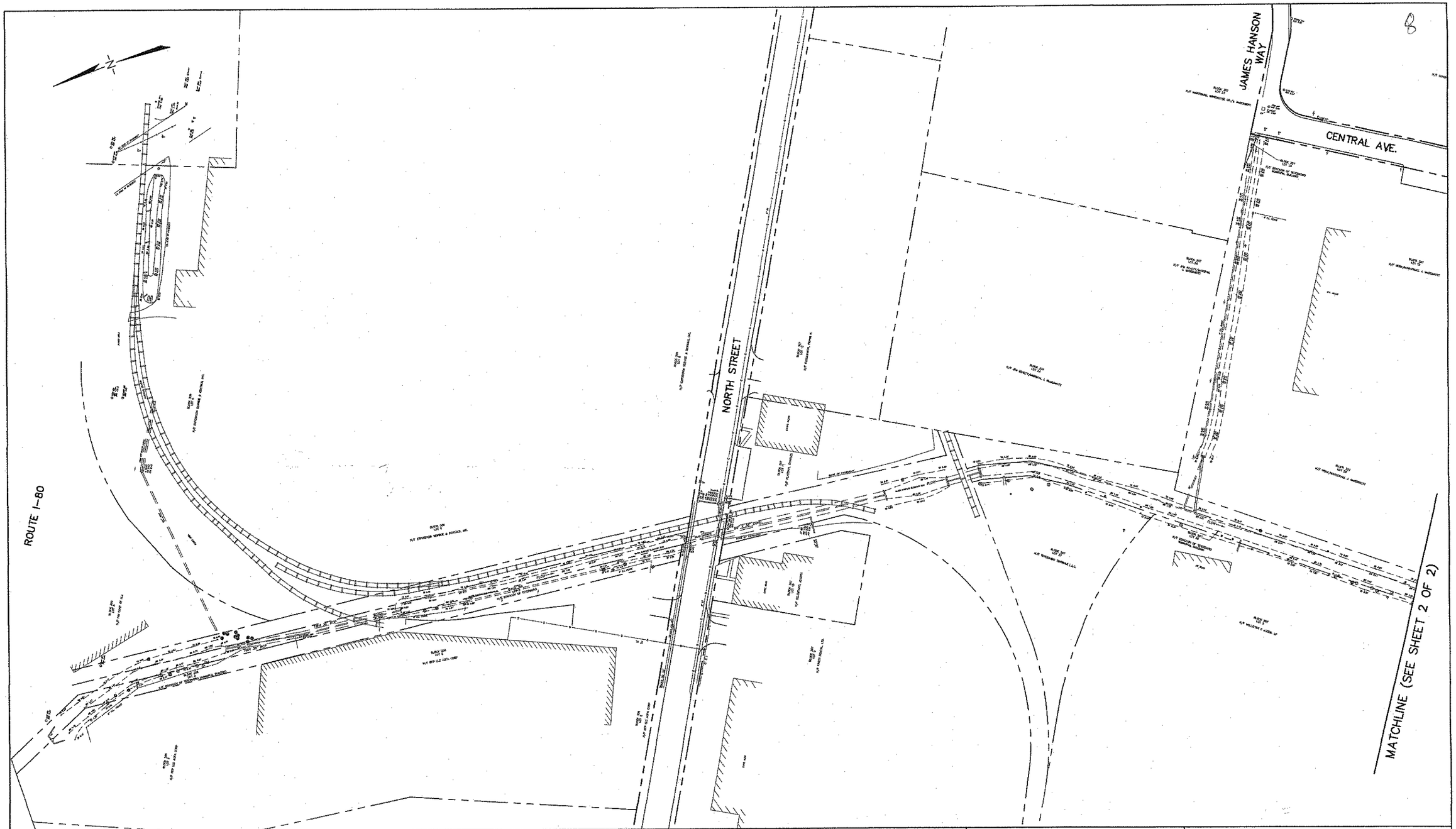
EXISTING CONDITIONS PLAN –2–

BOROUGH OF TETERBORO

BERGEN COUNTY NEW JERSEY

SURVEYED BY JCR DRAWN BY HD	DESIGNED BY MJK/BVT CHECKED BY BVT	SCALE: 1" = 60'	JOB NO. TE-333	DATE 4/17/2003

CADD FILE: TE-333-CP SHEET 2 OF 2



NO.	DATE	DESCRIPTION	SURVEYED BY	DRAWN BY	DESIGNED BY	CHECKED BY

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ENGINEERS – SURVEYORS – PLANNERS – SCIENTISTS
330 PHILLIPS AVENUE • SOUTH HACKENSACK, N.J. 07606
N.J. CERTIFICATE OF AUTHORIZATION NO. 24GA27958000

STEPHEN T. BOSWELL
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CHRISTOPHER J. NASH
PROFESSIONAL ENGINEER N.J. LIC. 31605

EAST RISER DITCH IMPROVEMENTS

EXISTING CONDITIONS PLAN –1–

BOROUGH OF TETERBORO
BERGEN COUNTY NEW JERSEY

SURVEYED BY JCR DRAWN BY HD	DESIGNED BY MJK/BVT CHECKED BY BVT	SCALE: AS SHOWN	JOB NO. TE-333	DATE 4/17/2003

CADD FILE: TE-333-CP SHEET 1 OF 2

1/3

TD

TEB Runway 1-19 EMAS
Revised Hydrology - TC - Subarea 1
Bergen County, New Jersey

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Tribe #1 DA 1A							
SHEET	100	0.0030	0.240				0.500
SHALLOW	500	0.0050	0.025				0.097
CHANNEL	10000	(ESTIMATED VEL)				2.000	1.389
					Time of Concentration		1.986
Tribe #2 DA 1B							
SHEET	100	0.0030	0.240				0.500
SHALLOW	500	0.0050	0.025				0.097
CHANNEL	10000	(ESTIMATED VEL)				4.000	0.694
					Time of Concentration		1.291

Average = 1.64 Hours

From NJDOT Figure 10-B, Kirpich Nomograph

Tc = 1.67 Hours

∴ USE Tc = 1.67 Hours

TD

TEB Runway 1-19 EMAS
Revised Hydrology - TC
Bergen County, New Jersey

2/3

Sub-Area Time of Concentration Details

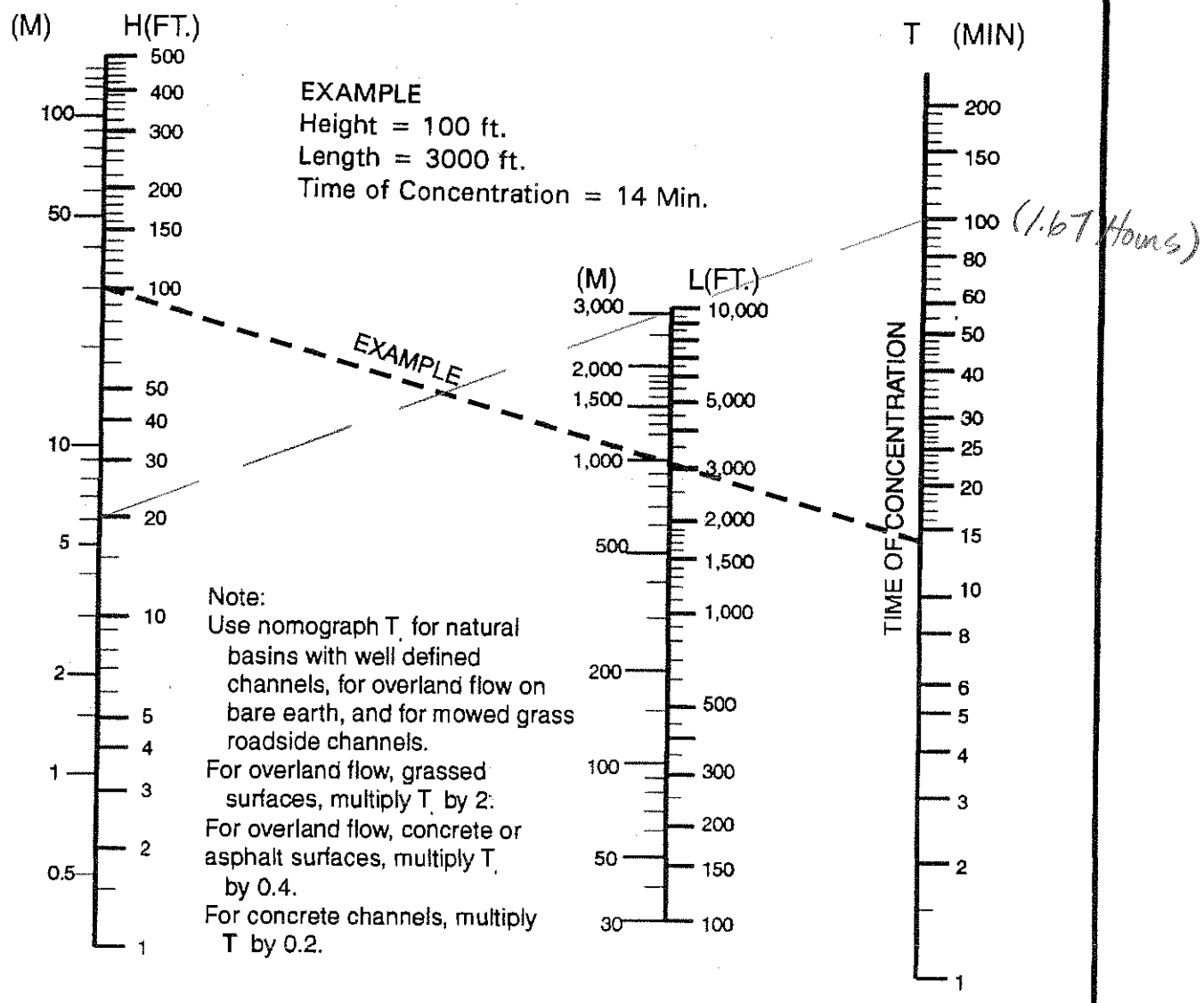
Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
DA 4							
SHEET	100	0.0030	0.400				0.753
SHALLOW	1500	0.0050	0.050				0.365
CHANNEL	5000					1.500	0.926
					Time of Concentration		2.044
DA 3							
SHEET	100	0.0050	0.240				0.408
SHALLOW	400	0.0050	0.025				0.077
CHANNEL	800	(PIPED FLOW, ESTIMATE VEL.)				2.500	0.089
					Time of Concentration		0.574
DA 5							
SHEET	100	0.0080	0.240				0.338
SHALLOW	300	0.0080	0.050				0.058
CHANNEL	1000					2.500	0.111
					Time of Concentration		0.507
DA 6							
SHEET	100	0.0040	0.400				0.671
SHALLOW	400	0.0040	0.050				0.109
CHANNEL	1000					1.500	0.185
					Time of Concentration		0.965

DRAINAGE AREA 1 3/3

TIME OF CONCENTRATION - OVERLAND FLOW (FOR USE IN RATIONAL FORMULA)

FIGURE 10 - B

L = 10,000, H = 20 feet



Note:
Use nomograph T_c for natural basins with well defined channels, for overland flow on bare earth, and for mowed grass roadside channels.
For overland flow, grassed surfaces, multiply T_c by 2.
For overland flow, concrete or asphalt surfaces, multiply T_c by 0.4.
For concrete channels, multiply T by 0.2.

Based on study by P.Z. Kirpich,
Civil Engineering, Vol. 10, No.6, June 1940, p.362

EDWARDS AND KELCEY
CONSULTING ENGINEERS

PROJECT TEB Community 1-19 - Hydrology FILE NO.
SUBJECT Peruvis CN SHEET NO. 1 OF 2
COMPUTED BY T.D. CHECKED BY DATE

DETERMINE PERVIOUS CN'S FOR DRAINAGE AREAS

MOST OF DRAINAGE AREA IS URBAN LAND (CN) (SEE SOIL MAP) WITH SOME SURROUNDING "B" SOIL

DUE TO FLAT AREAS, USE "B" SOIL, REF TR-55 FOR LAND USE

DRAINAGE AREA 1

MOSTLY FULLY DEVELOPED, USE OPEN SPACE GOOD CONDITION

CN = 61

DRAINAGE AREA 2

CN N/A → USED HUXLEY ST. PUMP STATION FLOW CAPACITY OF 35.5 CFS

DRAINAGE AREA 3

MOSTLY DEVELOPED

USE 90% OPEN SPACE, GOOD CONDITION, CN = 61
USE 10% WOODS, GOOD CONDITION, CN = 55

WEIGHTED PERVIOUS CN = 60

DRAINAGE AREA 4

USE 20% OPEN SPACE, CN = 61
USE 80% WOODS, CN = 55

WEIGHTED CN = 56

EDWARDS AND KELCEY
CONSULTING ENGINEERS

PROJECT ..... FILE NO. .....
SUBJECT ..... Peanuts CN (Continued) ..... SHEET NO. 2 OF 2
COMPUTED BY ..... CHECKED BY ..... DATE .....

Drainage Area 5

Use 95% open space, CN = 61
Use 5% woods, CN = 55

Weighted CN = 61

Drainage Area 6

Use 85% open space, CN = 61
Use 15% woods, CN = 55

Weighted CN = 60

EMAS TETERBORO
DRAINAGE AREA – % Impervious

1/6

DRAINAGE AREA 1			
ZONE	AREA(AC)	%IMP	$Area_W$
HACKENSACK			
B1	36.30	33%	11.98
M1	36.25	50%	18.13
B2	4.95	33%	1.63
R2B	5.78	30%	1.73
R2	9.98	30%	2.99
	0.38	30%	0.11
R2A	1.10	30%	0.33
SO. HACKENSACK			
A	5.20	60%	3.12
	19.02	60%	11.41
	6.94	60%	4.16
B	5.39	70%	3.77
	1.36	70%	0.95
	1.13	70%	0.79
C	149.49	70%	104.64
C-MOD.	1.25	80%	1.00
TETERBORO			
	154.72	70%	108.30
TOTAL	439.24	---	275.07
AVERAGE % IMPERVIOUS			0.63

DRAINAGE AREA 3			
ZONE	AREA(AC)	%IMP	$Area_W$
Residential	14.43	38%	5.48
Industrial	48.05	72%	34.60
TOTAL	62.48	---	40.08
AVERAGE % IMPERVIOUS			0.64

DRAINAGE AREA 4		
IMP(AC)	AREA(AC)	%IMP
19.84	140.68	14%

DRAINAGE AREA 5		
IMP(AC)	AREA(AC)	%IMP
1.89	11.07	17%

DRAINAGE AREA 6		
IMP(AC)	AREA(AC)	%IMP
39.32	71.52	55%

EMAS TETERBORO
DRAINAGE AREA 1

2

ZONE	AREA(AC)	%IMP	$Area_W$
HACKENSACK			
B1	36.30	33%	11.98
M1	36.25	50%	18.13
B2	4.95	33%	1.63
R2B	5.78	30%	1.73
R2	9.98	30%	2.99
	0.38	30%	0.11
R2A	1.10	30%	0.33
SO. HACKENSACK			
A	5.20	60%	3.12
	19.02	60%	11.41
	6.94	60%	4.16
B	5.39	70%	3.77
	1.36	70%	0.95
	1.13	70%	0.79
C	149.49	70%	104.64
C-MOD.	1.25	80%	1.00
TETERBORO			
	154.72	70%	108.30
TOTAL	439.24	---	275.07
AVERAGE % IMPERVIOUS			0.63

EMAS TETERBORO
DRAINAGE AREA 3

ZONE	AREA(AC)	%IMP	$Area_W$
Residential	14.43	38%	5.48
Industrial	48.05	72%	34.60
TOTAL	62.48	---	40.08
AVERAGE % IMPERVIOUS			0.64

3

4

EMAS TETERBORO
DRAINAGE AREA 4

IMP(AC)	AREA(AC)	%IMP
19.84	140.68	14%

4

EMAS TETERBORO
DRAINAGE AREA 5

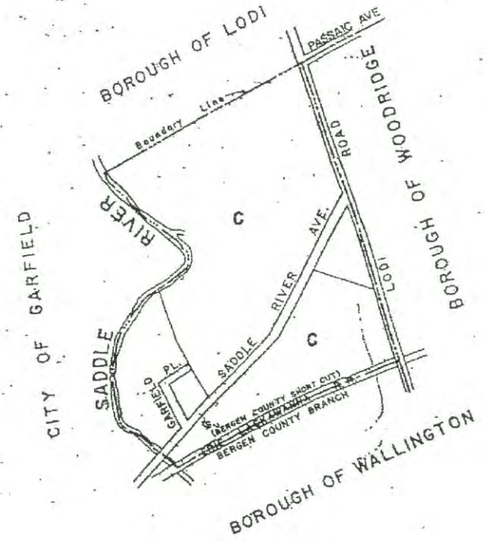
IMP(AC)	AREA(AC)	%IMP
1.89	11.07	17%

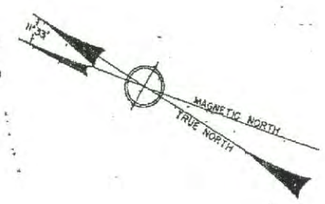
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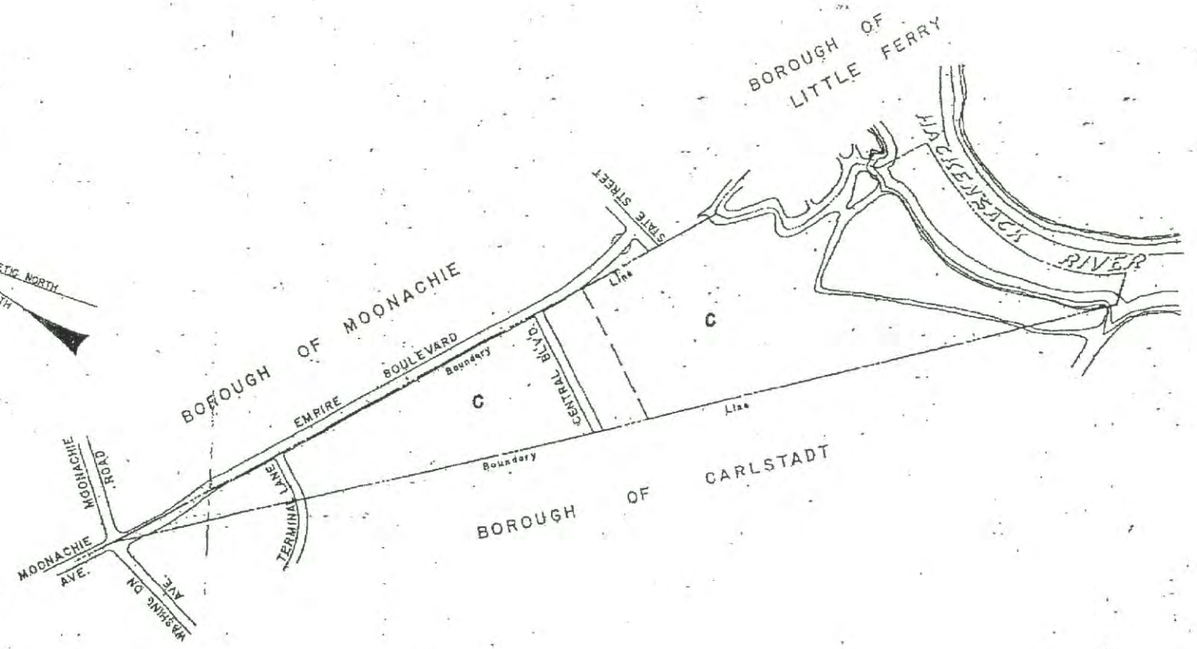
EMAS TETERBORO
DRAINAGE AREA 6

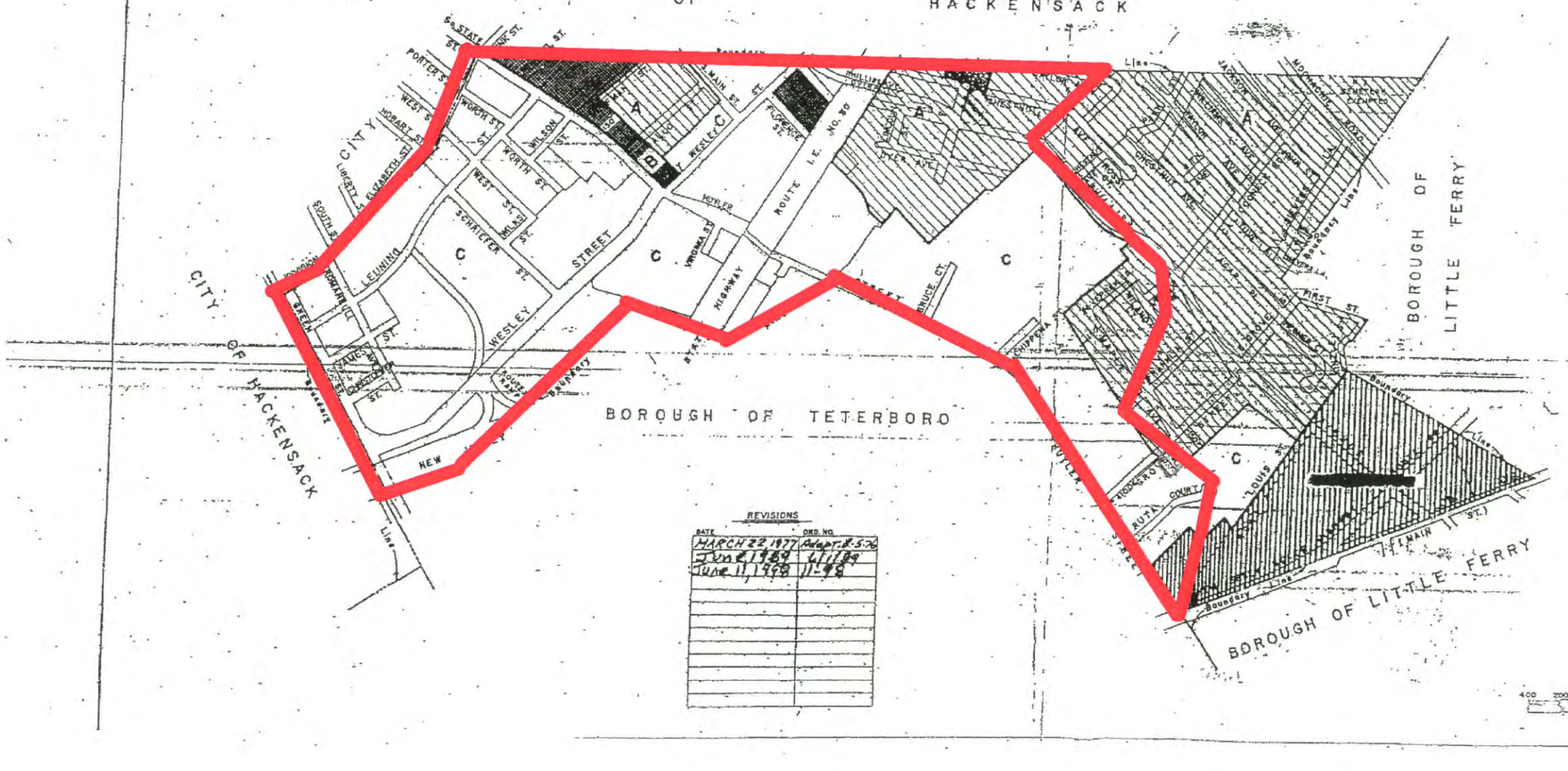
IMP(AC)	AREA(AC)	%IMP
39.32	71.52	55%

9/9









REVISIONS

DATE	ORD. NO.
MARCH 22 1977	Adopt-8-5-76
June 2 1988	11-88
June 11, 1998	11-98

ZONE USE LEGEND	MIN. LOT SIZE ACRE	MAX IMP AREA %
A RESIDENTIAL	0.11	60
B COMMERCIAL	0.11	70
C INDUSTRIAL	0.46	70
C- MODIFIED OFFICE HOTELS	1.8	80
SCR- SENIOR CITIZEN MULTIFAMILY RES-ZONE	0.46	80

DRAINAGE AREA NO. 1

ZONING MAP

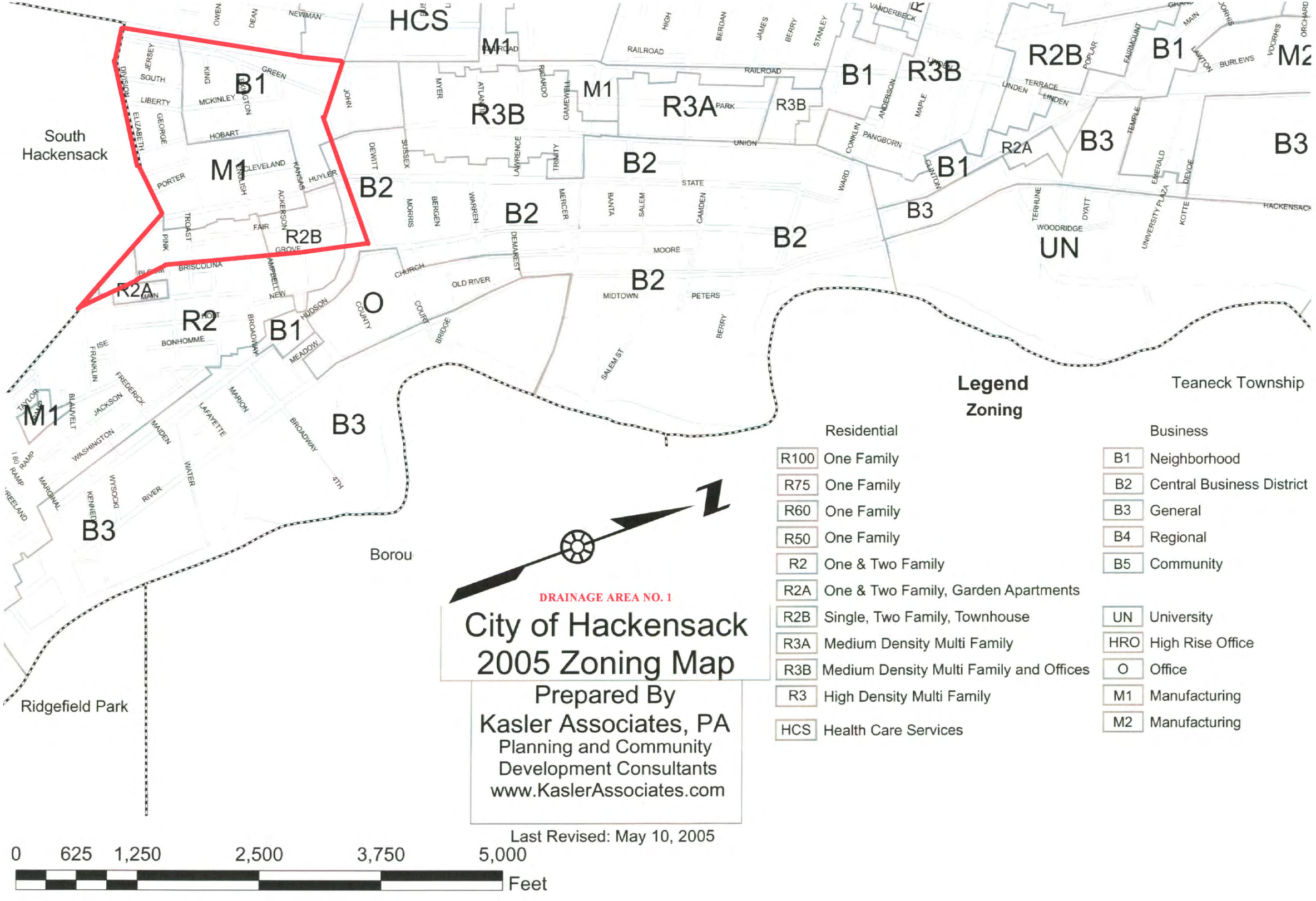
TOWNSHIP OF SOUTH HACKENSACK

BERGEN COUNTY NEW JERSEY

DECEMBER 1969

SCALE 400 200 0 200 400 800 1200

KENNETH G.B. JOB
PROFESSIONAL ENGINEER & LAND SURVEYOR
108 HUDSON STREET
HACKENSACK, NEW JERSEY



Legend

Zoning

Teaneck Township

Residential		Business	
R100	One Family	B1	Neighborhood
R75	One Family	B2	Central Business District
R60	One Family	B3	General
R50	One Family	B4	Regional
R2	One & Two Family	B5	Community
R2A	One & Two Family, Garden Apartments		
R2B	Single, Two Family, Townhouse	UN	University
R3A	Medium Density Multi Family	HRO	High Rise Office
R3B	Medium Density Multi Family and Offices	O	Office
R3	High Density Multi Family	M1	Manufacturing
HCS	Health Care Services	M2	Manufacturing

DRAINAGE AREA NO. 1

City of Hackensack 2005 Zoning Map

Prepared By
Kasler Associates, PA
Planning and Community
Development Consultants
www.KaslerAssociates.com

Last Revised: May 10, 2005

0 625 1,250 2,500 3,750 5,000 Feet

ZONE DESIGNATIONS

- AVIATION FACILITIES (AF)
- COMMERCIAL PARK (CP)
- ENVIRONMENTAL CONSERVATION (EC)
- HEAVY INDUSTRIAL (HI)
- HIGHWAY COMMERCIAL (HC)
- INTERMODAL A (IA)
- INTERMODAL B (IB)
- LIGHT INDUSTRIAL A (LI-A)
- LIGHT INDUSTRIAL B (LI-B)
- LOW DENSITY RESIDENTIAL (LDR)
- NEIGHBORHOOD COMMERCIAL (NC)
- PARKS AND RECREATION (PA)
- PLANNED RESIDENTIAL (PR)
- PUBLIC UTILITIES (PU)
- REGIONAL COMMERCIAL (RC)
- SPORTS & EXPOSITION (SE)
- TRANSPORTATION CENTER (TC)
- WATERFRONT RECREATION (WR)

STATE OF NEW JERSEY

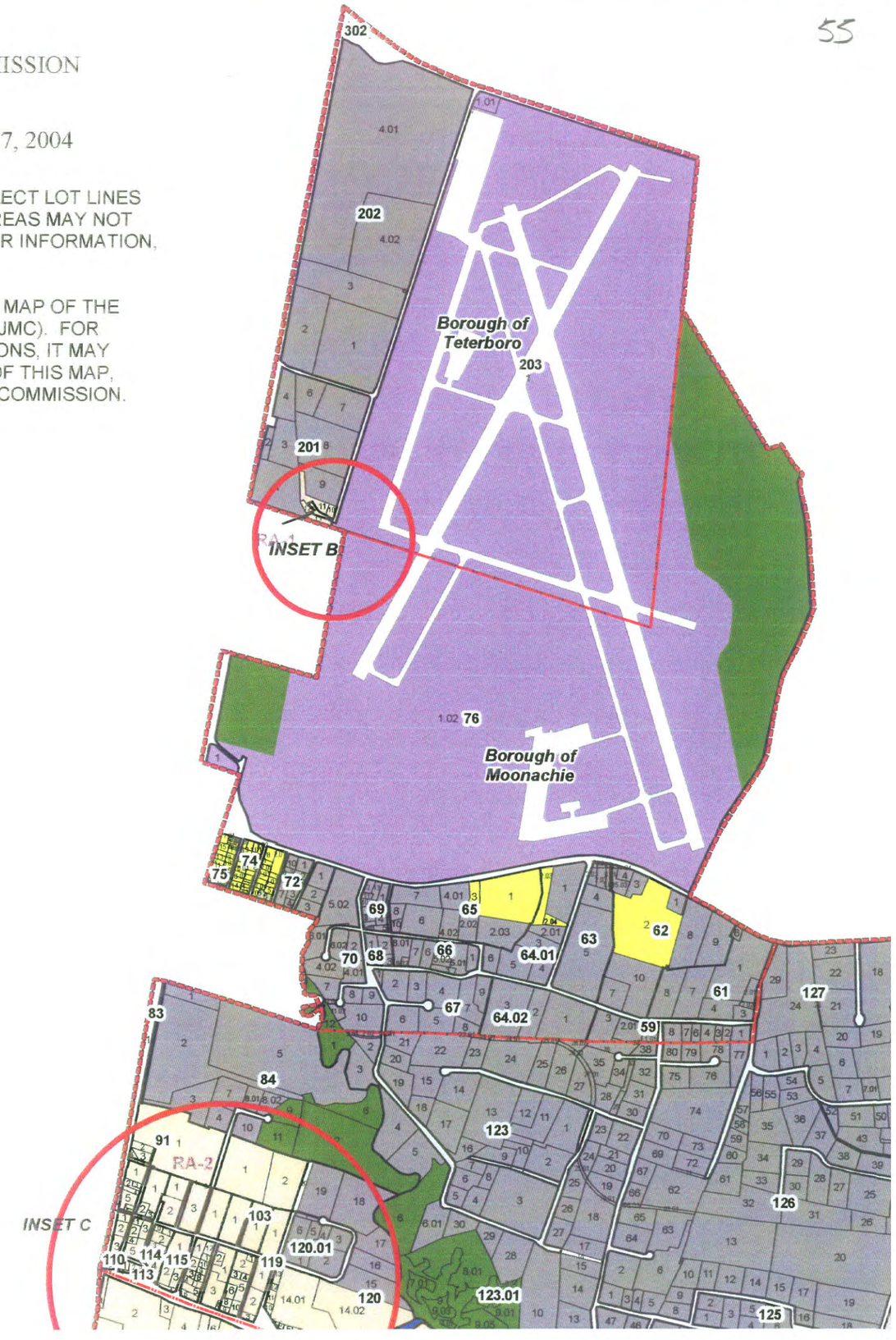
NEW JERSEY MEADOWLANDS COMMISSION

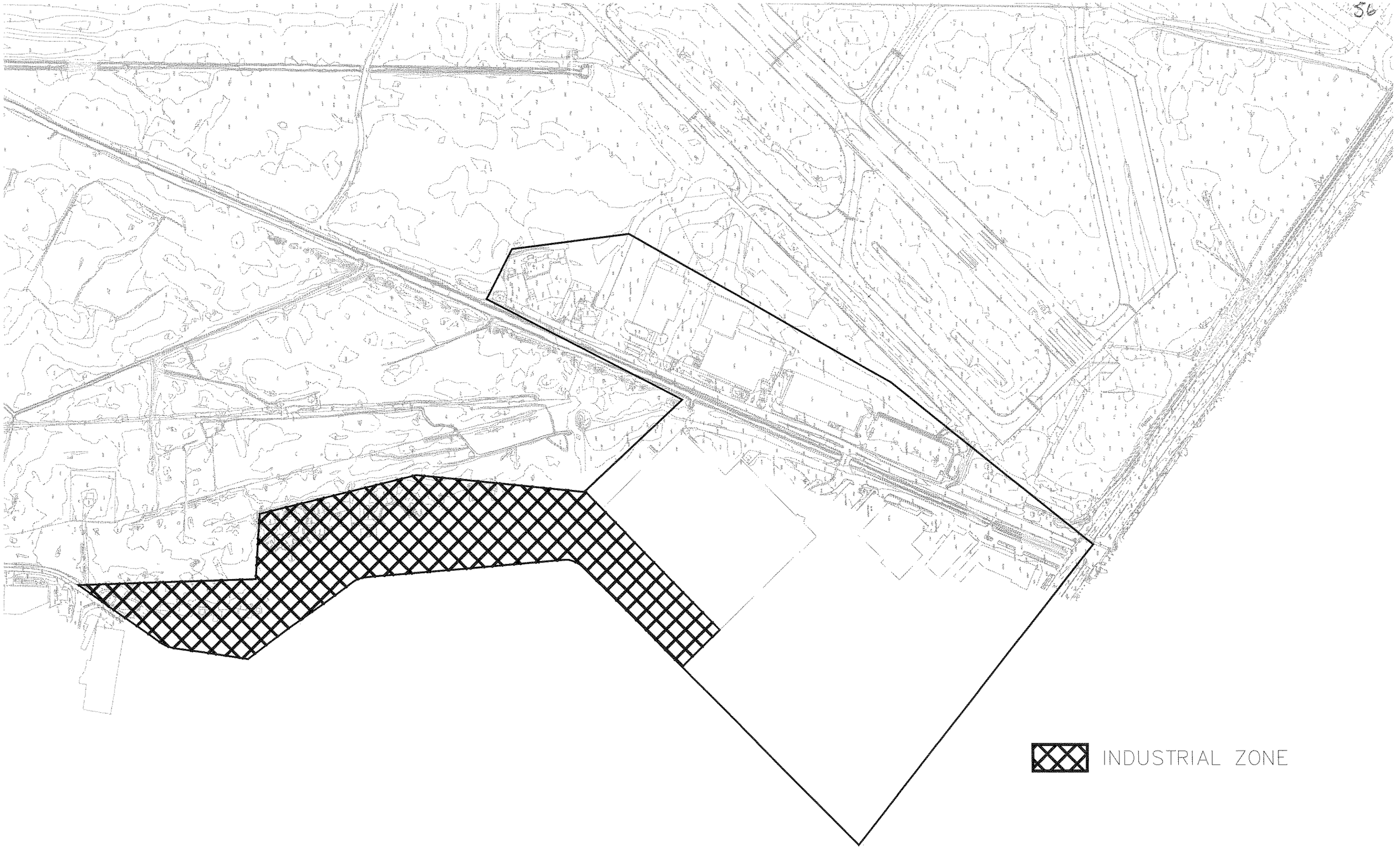
PROPOSED OCTOBER 6, 2003

REVISED AND ADOPTED FEBRUARY 17, 2004

PARCEL CONFIGURATIONS ON THIS MAP REFLECT LOT LINES TAKEN FROM MUNICIPAL TAX MAPS. SOME AREAS MAY NOT SHOW CURRENT SUBDIVISIONS. FOR FURTHER INFORMATION, PLEASE CONTACT THE NJMC.

THIS MAP IS A COPY OF THE OFFICIAL ZONING MAP OF THE NEW JERSEY MEADOWLANDS COMMISSION (NJMC). FOR VERIFICATION OF ACTUAL ZONING DESIGNATIONS, IT MAY BE NECESSARY TO REFER TO THE ORIGINAL OF THIS MAP, WHICH IS ON DISPLAY AT THE OFFICE OF THE COMMISSION.





INDUSTRIAL ZONE

DRAINAGE AREA NO. 3

INDUSTRIAL ZONE

IMPERVIOUS AREA

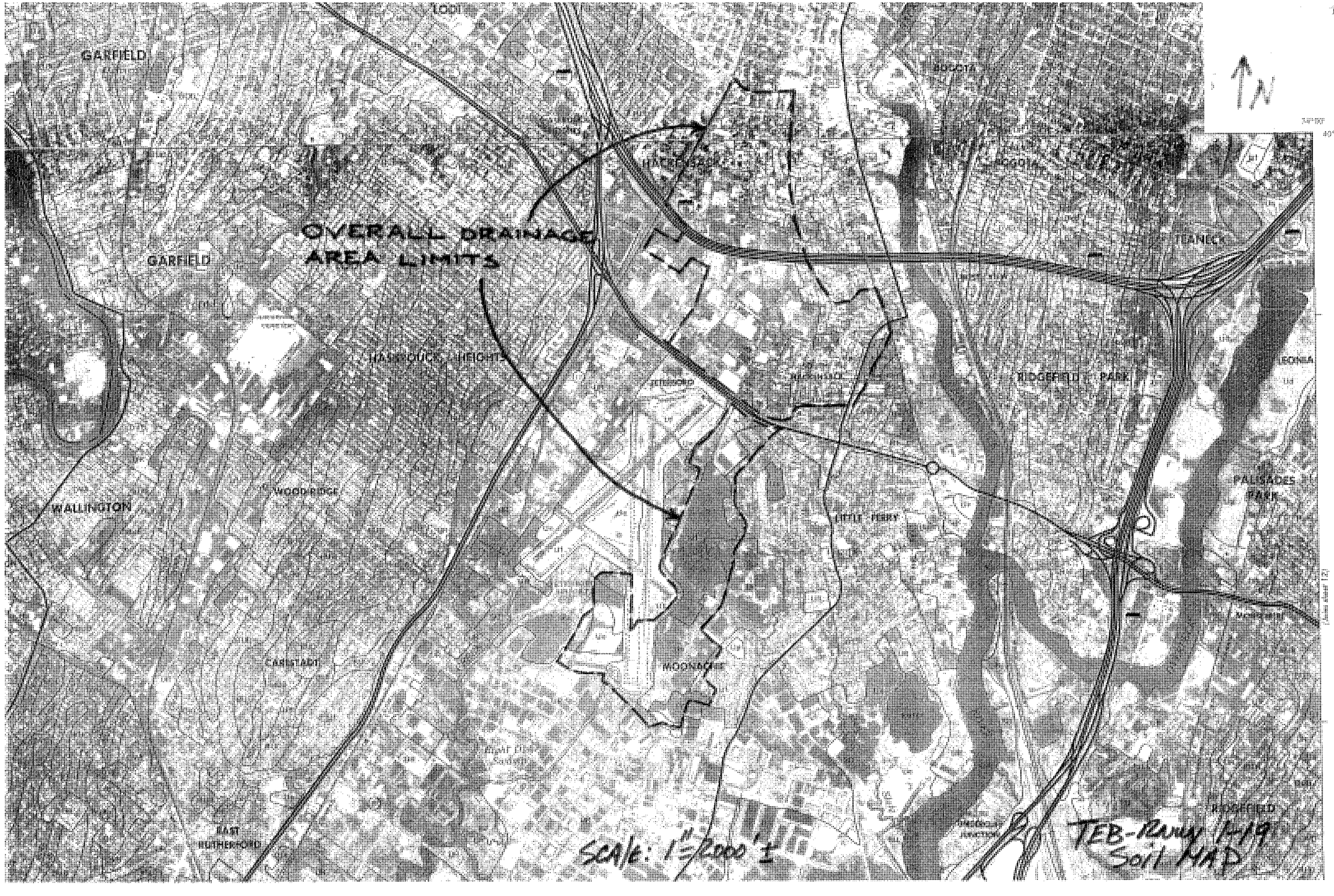
DRAINAGE AREA NO. 4

IMPERVIOUS AREA

DRAINAGE AREA NO. 5

PERVIOUS AREA

DRAINAGE AREA NO. 6


OVERALL DRAINAGE AREA LIMITS
GARFIELD
WALLINGTON
CARLSTADT
RIDGEFIELD PARK
LITTLE FERRY
PALISADES PARK
LEONIA
SCALE: 1"=2000'
TEB-Army 1/19
Soil MAP

DONOHUE ENGINEERING
34 East Prospect Street, P.O. Box 114, Waldwick, NJ 07463
Tel. (201) 444-6500 Fax. (201) 444-9986

June 14, 2007

Mr. Tracy Gunther
Clough Harbour & Associates, LLP
2001 Route 46, Suite 107
Parsippany, NJ 07054

Re: Redneck Avenue Relocation – Teterboro Airport - NYNJPA

Dear Tracy:

Attached is following summary:

Redneck Drainage Ditch [AREA 1]

Drainage Area – 52.75 acres
CN = 84 (see attached)
TC = 2 hours (see attached)

Storm	Flow
2 year	27 cfs
10 year	52 cfs
100 year	99 cfs

Time for Drainage Area to reach peak = 13.58 hours (see Attached)

Moonachie Avenue culvert not included in hydraulic model of Redneck Ditch Analysis

No overland flow from East Riser Ditch included in Redneck Ditch Analysis.

Floodway +/- 10' beyond top of ditch bank along ditch

NJDEP Flood Hazard Analysis (1.25% larger than 100 year storm) not reviewed only 100-year storm flows for hydraulic analysis.

Very truly yours,

Thomas E. Donohue, P.E.

TED
200708.03

62

Worksheet 2: Runoff curve number and runoff

Project BOONEK DITCH DRAINAGE By TGD Date 5/9/07

Location TETERBORO, NJ Checked ____ Date ____

Circle one: ~~Present~~ Developed DA

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN 1/ Table 2-2	Fig. 2-3	Fig. 2-4	Area ☒ acres ☐ mi² ☐ %	Product of CN x area
D	IMPERVIOUS	98			0.62	60.76
D	RESIDENTIAL	92			4.93	453.56
D	GRAVEL	91			3.22	293.02
D	DIRT	89			1.81	161.09
D	WOODS	82			22.53	1847.46
D	TALL GRASS (FIELD)	77			7.27	559.79
D	LAWN	84			12.37	1039.08
				Totals =	52.75	4414.76

1/ Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{4414.76}{52.75} = 83.6$ Use CN = 84

2. Runoff

	Storm #1	Storm #2	Storm #3
Frequency ..... yr			
Rainfall, P (24-hour) ..... in			
Runoff, Q ..... in (Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)			

4.93

Worksheet 3: Time of concentration (T_c) or travel time (T_t)

Project: REDNECK DRAINAGE DITCH By: TED Date: 5/8/07

Location: TETERBORO, NJ Checked: ____ Date: ____

Circle one: (Present) Developed DA

Circle one: (T_c) T_t through subarea

NOTES: Space for as many as two segments per flow type can be used for each worksheet.

Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to T_c only)

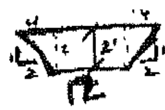
	Segment ID	A-B	B-C	
1. Surface description (table 3-1)		LAWN	LAWN	
2. Manning's roughness coeff., n (table 3-1)		.24	.24	
3. Flow length, L (total L ≤ 300 ft)	ft	150	375	
4. Two-yr 24-hr rainfall, P_2	in	3.3	3.3	
5. Land slope, s	ft/ft	.005	.008	
6. $T_t = \frac{0.007\,(nL)^{0.8}}{P_2^{0.5}\,s^{0.4}}$ Compute T_t	hr	.56	+ .97	= 1.53

Shallow concentrated flow

	Segment ID			
7. Surface description (paved or unpaved)				
8. Flow length, L	ft			
9. Watercourse slope, s	ft/ft			
10. Average velocity, V (figure 3-1)	ft/s			
11. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr		+	=

Channel flow

	Segment ID	C-D		
12. Cross sectional flow area, a	ft^2	32		
13. Wetted perimeter, p_w	ft	21		
14. Hydraulic radius, $r = \frac{a}{p_w}$ Compute r	ft	1.52		
15. Channel slope, s	ft/ft	.0009		
16. Manning's roughness coeff., n		.025		
17. $V = \frac{1.49\,r^{2/3}\,s^{1/2}}{n}$ Compute V	ft/s	2.3		
18. Flow length, L	ft	3055		
19. $T_t = \frac{L}{3600\,V}$ Compute T_t	hr	.37	+	= .37
20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)	hr			1.90



114 mins

3580 AVG .002

SAY 2 HRS 120 min

LAG (1.2)

64

1/6

Global Pump Marketing, Inc.
Northeast Office
P.O. Box 233
Blooming Grove, NY 10914
Ph. 845.496.8001 Fax: 845.497.7812

October 11, 2000

From Boswell Engineering

Rapid Pump & Meter
285 Straight St.
Paterson, NJ 07509

Att: Rich Taylor

Project: Hyler Street Pump Station
Ritz Atro archimedean screw pumps.
Engineer: Boswell Engineers
General Contractor: Rapid Pump & Meter
Ritz-Atro: Representative: Rayburn Associates

SUBMITTAL DATA No.1
FOR APPROVAL

(13) sets technical data attached including dimensions, materials of construction and data cut sheets. Please review and return (3) sets stamped "approved" to Rayburn Associates with note to proceed and release into production. This project is on HOLD until submittal data is approved by the Engineer and forwarded to Ritz-Atro for release.

Best Regards,

Global Pump Marketing, Inc.

Chris Otto
Northeast Regional Manager

BOSWELL ENGINEERING
South Hackensack, NJ 07606
Furnish As Submitted ☑
Furnish As Corrected ☐
Revise and Resubmit ☐
Submit Specified Item ☐
Rejected ☐
By TJ
Date 10/20/00
CONTRACTOR IS NOT RELIEVED OF RESPONSIBILITY FOR CORRECTNESS OF DIMENSIONS OR COMPLYING WITH REQUIREMENTS OF PLANS AND SPECIFICATIONS.

SUBMITTAL DATA No. 1

2

HYLER STREET PUMP STATION

RITZ-ATRO

ARCHIMEDEAN SCREW PUMPS

Table of Contents

3

HYLER STREET PUMP STATION
RITZ-ATRO
ARCHIMEDEAN SCREW PUMPS

Section I: **Technical Data**

Section II: **Product Cut Sheets**

Section III: **Bearing Supports**

Section IV: **Technical Drawing**

4

SECTION I

Project: Hyler Street P.S
Our Ref.: A 00.5480

5

Technical data screw pump 1 : (south wall):

Manufacturer:	RITZ-ATRO		
Type :	1121/3		
Liquid:	Flood water		
Delivery Point:	StP	2.91	m
Chute Point:	SP	2.59	m
Filling Point:	FP	1.50	m
Touch Point:	TP	0.15	m
Angle of Installation:		30	°
Capacity:		1262	l / s = 42.15 ops
Lift (FP-StP):		1.41	meter
Rotation speed:		28.68	rpm
Absorbed power:		22.08	kW

Dimensions:

Screw diameter:	2100	mm
Number of flights:	3	
Tube diameter:	1016.0	mm
Thickness of tube:	8.0	mm
Thickness of flights:	6.00	mm
Thickness of side profiles:	3.00	mm
Length of flights:	4880	mm
Length of tube:	5260	mm
Inner trough diameter:	2100	mm
Thickness of trough:	5.0	mm
Length of trough:	5406	mm

Materials:

Centre tube / helices:	mild steel St 37-2
Trough / side profiles:	mild steel St 37-2
Upper bearing housing:	cast iron GG-25
Lower bearing housing:	mild steel St 37-2
Bearing bush:	PAN Pb Bz 15
Grease line:	stainless steel 304
Fixing elements:	stainless steel 304

Corrosion protection of screw pump, steel trough, bottom bearing and side profiles:

- Shot blasting acc. to SA 2.5
- Zinc-rich epoxy primer
- Several coatings of 2-components epoxy paint

Total thickness of painting: approx. 280 microns

Weight of screw pump incl. bearings/trough: approx. 4860 kgs

Number of screw pumps(s): 1

Project: Hyler Street P.S
Our Ref.: A 00.5480

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Technical data screw pump 2 : (north wall):

Manufacturer:	RITZ-ATRO
Type :	1125/3
Liquid:	Flood water

Delivery Point:	StP	2.97	m
Chute Point:	SP	2.59	m
Filling Point:	FP	1.57	m
Touch Point:	TP	0.15	m
Angle of Installation:		40	°
Capacity:		1262	l / s
Lift (FP-StP):		1.40	meter
Rotation speed:		26.98	rpm
Absorbed power:		26.65	kW

Dimensions:

Screw diameter:	2500	mm
Number of flights:	3	
Tube diameter:	1220.0	mm
Thickness of tube:	10.0	mm
Thickness of flights:	7.00	mm
Thickness of side profiles:	3.00	mm
Length of flights:	3796	mm
Length of tube:	4176	mm
Inner trough diameter:	2500	mm
Thickness of trough:	6.0	mm
Length of trough:	4322	mm

Materials:

Centre tube / helices:	mild steel St 37-2
Trough / side profiles:	mild steel St 37-2
Upper bearing housing:	cast iron GG-25
Lower bearing housing:	mild steel St 37-2
Bearing bush:	PAN Pb Bz 15
Grease line:	stainless steel 304
Fixing elements:	stainless steel 304

Corrosion protection of screw pump, steel trough, bottom bearing and side profiles:

- Shot blasting acc. to SA 2.5
- Zinc-rich epoxy primer
- Several coatings of 2-components epoxy paint

Total thickness of painting: approx. 280 microns

Weight of screw pump incl. bearings/trough: approx. 6050 kgs

Number of screw pumps(s): 1

Table 3-3
New Jersey 24-Hour Rainfall Frequency Data
Rainfall amounts in Inches

County	Rainfall Frequency Data						
	1-Year	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Atlantic	2.8	3.3	4.3	5.2	6.5	7.6	8.9
Bergen	2.8	3.3	4.3	5.1	6.3	7.3	8.4
Burlington	2.8	3.4	4.3	5.2	6.4	7.6	8.8
Camden	2.8	3.3	4.3	5.1	6.3	7.3	8.5
Cape May	2.8	3.3	4.2	5.1	6.4	7.5	8.8
Cumberland	2.8	3.3	4.2	5.1	6.4	7.5	8.8
Essex	2.8	3.4	4.4	5.2	6.4	7.5	8.7
Gloucester	2.8	3.3	4.2	5.0	6.2	7.3	8.5
Hudson	2.7	3.3	4.2	5.0	6.2	7.2	8.3
Hunterdon	2.9	3.4	4.3	5.0	6.1	7.0	8.0
Mercer	2.8	3.3	4.2	5.0	6.2	7.2	8.3
Middlesex	2.8	3.3	4.3	5.1	6.4	7.4	8.6
Monmouth	2.9	3.4	4.4	5.2	6.5	7.7	8.9
Morris	3.0	3.5	4.5	5.2	6.3	7.3	8.3
Ocean	3.0	3.4	4.5	5.4	6.7	7.9	9.2
Passaic	3.0	3.5	4.4	5.3	6.5	7.5	8.7
Salem	2.8	3.3	4.2	5.0	6.2	7.3	8.5
Somerset	2.8	3.3	4.3	5.0	6.2	7.2	8.2
Sussex	2.7	3.2	4.0	4.7	5.7	6.6	7.6
Union	2.8	3.4	4.4	5.2	6.4	7.5	8.7
Warren	2.8	3.3	4.2	4.9	5.9	6.8	7.8

Central to the NRCS methodology is the concept of the Curve Number (CN) which relates to the runoff depth and is itself characteristic of the soil type and the surface cover. CN's in Table 2-2 (*a* to *d*) of the TR-55 Manual (June 1986) represent average antecedent runoff condition for urban, cultivated agricultural, other agricultural, and arid and semiarid rangeland uses. Infiltration rates of soils vary widely and are affected by subsurface permeability as well as surface intake rates. Soils are classified into four Hydrologic Soil Groups (A, B, C, and D) according to their minimum infiltration rate. Appendix A of the TR-55 Manual defines the four groups and provides a list of most of the soils in the United States and their group classification. The soils in the area of interest may be identified from a soil survey report, which can be obtained from the local Soil Conservation District offices.

Several techniques have been developed and are currently available to engineers for the estimation of runoff volume and peak discharge using the NRCS methodology. Some of the more commonly used of these methods are summarized below:

A. **NRCS Technical Release 55** (TR-55): The procedures outlined in this document are the most widely used for the computation of ☐tormwater

Ref: NJDOT Drainage Design Manual, dated Aug. 2006.

VOLUME COMPUTATION

Project: Teterboro Runway 1 Study
Prepared By: EDWARDS & KELCEY
Prepared On: Jul-07 By: KMT

EXISTING - RED NECK AVENUE DITCH - DRAINAGE AREA

ELEVATION	AREA ACRE	AVG. AREA ACRE	DISTANCE FT	INCRE. VOLUME ACRE-FT	CUML. TOTAL ACRE-FT
0.79	0				
		0.31	1.00	0.31	0.31
2	0.62				
		1.26	1.00	1.26	1.57
3	1.90				
		5.86	1.00	5.86	7.43
4	9.82				
		17.86	1.00	17.86	25.29
5	25.89				
		31.72	1.00	31.72	57.01
6	37.55				

For Hec-1 Modeling

Project: ExistingF Simulation Run: 2-yr 12-17-08

Start of Run: 14Aug2008, 00:00
End of Run: 15Aug2008, 00:06
Compute Time: 23Dec2008, 14:42:52

Basin Model: Existing Model 12-17-0
Meteorologic Model: 2-year
Control Specifications: Control 1

Volume Units: IN

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
CHAN1	Not Specified	323.4	14Aug2008, 15:00	
CHAN2A	Not Specified	209.8	14Aug2008, 15:12	
CHAN2B	Not Specified	209.4	14Aug2008, 15:18	
DA-01	0.6860	292.0	14Aug2008, 13:06	2.23
DA-03	0.0938	69.5	14Aug2008, 12:24	2.27
DA-04	0.2188	22.7	14Aug2008, 13:24	0.71
DA-06	0.1094	55.9	14Aug2008, 12:36	2.00
DA-5	0.0171	5.2	14Aug2008, 12:24	0.96
DA-7	0.0828	28.6	14Aug2008, 13:18	1.73
DIVERT	Not Specified	213.2	14Aug2008, 14:54	
EMONAV	Not Specified	210.1	14Aug2008, 15:18	
JA-DB	0.1094	0.0	15Aug2008, 00:06	0.01
PUMP	Not Specified	85.5	14Aug2008, 00:06	
RNAD-E	0.0828	131.1	14Aug2008, 15:12	18.33
T-1	Not Specified	377.5	14Aug2008, 13:06	
T-2	Not Specified	401.6	14Aug2008, 13:00	
T-3	Not Specified	335.2	14Aug2008, 14:54	
T-ALL	Not Specified	340.8	14Aug2008, 15:12	
T-RNA	0.0828	134.7	14Aug2008, 14:42	22.54

Project: ExistingF
Simulation Run: 2-yr 12-17-08 Reservoir: RNAD-E

Start of Run:	14Aug2008, 00:00	Basin Model:	Existing Model 12-17-08
End of Run:	15Aug2008, 00:06	Meteorologic Model:	2-year
Compute Time:	23Dec2008, 14:42:52	Control Specifications:	Control 1

Volume Units: IN

Computed Results

Peak Inflow :	134.7 (CFS)	Date/Time of Peak Inflow :	14Aug2008, 14:42
Peak Outflow :	131.1 (CFS)	Date/Time of Peak Outflow :	14Aug2008, 15:12
Total Inflow :	22.54 (IN)	Peak Storage :	26.3 (AC-FT)
Total Outflow :	18.33 (IN)	Peak Elevation :	5.028 (FT)

Project: ExistingF Simulation Run: 10-yr 12-17-08

Start of Run: 14Aug2008, 00:00 Basin Model: Existing Model 12-17-0
End of Run: 15Aug2008, 00:06 Meteorologic Model: 10-year
Compute Time: 23Dec2008, 14:43:02 Control Specifications: Control 1

Volume Units: IN

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
CHAN1	Not Specified	399.2	14Aug2008, 16:24	
CHAN2A	Not Specified	219.7	14Aug2008, 16:36	
CHAN2B	Not Specified	219.7	14Aug2008, 16:42	
DA-01	0.6860	494.7	14Aug2008, 13:06	3.69
DA-03	0.0938	118.1	14Aug2008, 12:24	3.74
DA-04	0.2188	58.5	14Aug2008, 13:24	1.61
DA-06	0.1094	97.9	14Aug2008, 12:36	3.39
DA-5	0.0171	12.8	14Aug2008, 12:24	2.04
DA-7	0.0828	54.7	14Aug2008, 13:18	3.30
DIVERT	Not Specified	219.9	14Aug2008, 16:18	
EMONAV	Not Specified	220.6	14Aug2008, 16:42	
JA-DB	0.1094	0.1	15Aug2008, 00:06	0.01
PUMP	Not Specified	85.5	14Aug2008, 00:06	
RNAD-E	0.0828	207.5	14Aug2008, 16:12	27.70
T-1	Not Specified	580.2	14Aug2008, 13:06	
T-2	Not Specified	620.6	14Aug2008, 13:00	
T-3	Not Specified	415.9	14Aug2008, 16:18	
T-ALL	Not Specified	427.9	14Aug2008, 16:18	
T-RNA	0.0828	208.1	14Aug2008, 16:00	32.10

Project: ExistingF
Simulation Run: 10-yr 12-17-08 Reservoir: RNAD-E

Start of Run:	14Aug2008, 00:00	Basin Model:	Existing Model 12-17-08
End of Run:	15Aug2008, 00:06	Meteorologic Model:	10-year
Compute Time:	23Dec2008, 14:43:02	Control Specifications:	Control 1

Volume Units: IN

Computed Results

Peak Inflow :	208.1 (CFS)	Date/Time of Peak Inflow :	14Aug2008, 16:00
Peak Outflow :	207.5 (CFS)	Date/Time of Peak Outflow :	14Aug2008, 16:12
Total Inflow :	32.10 (IN)	Peak Storage :	28.0 (AC-FT)
Total Outflow :	27.70 (IN)	Peak Elevation :	5.092 (FT)

Project: ExistingF Simulation Run: 100-yr 12-17-08

Start of Run: 14Aug2008, 00:00
End of Run: 15Aug2008, 00:06
Compute Time: 23Dec2008, 14:43:05

Basin Model: Existing Model 12-17-0
Meteorologic Model: 100-year
Control Specifications: Control 1

Volume Units: IN

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
CHAN1	Not Specified	587.5	14Aug2008, 16:54	
CHAN2A	Not Specified	235.4	14Aug2008, 17:12	
CHAN2B	Not Specified	235.2	14Aug2008, 17:24	
DA-01	0.6860	904.4	14Aug2008, 13:06	6.59
DA-03	0.0938	215.7	14Aug2008, 12:24	6.66
DA-04	0.2188	153.6	14Aug2008, 13:24	3.82
DA-06	0.1094	185.5	14Aug2008, 12:36	6.21
DA-5	0.0171	30.0	14Aug2008, 12:24	4.52
DA-7	0.0828	103.9	14Aug2008, 13:18	6.37
DIVERT	Not Specified	235.9	14Aug2008, 16:48	
EMONAV	Not Specified	250.9	14Aug2008, 16:48	
JA-DB	0.1094	24.0	14Aug2008, 15:06	1.53
PUMP	Not Specified	85.5	14Aug2008, 00:06	
RNAD-E	0.0828	394.5	14Aug2008, 17:06	52.26
T-1	Not Specified	989.9	14Aug2008, 13:06	
T-2	Not Specified	1063.7	14Aug2008, 13:00	
T-3	Not Specified	618.5	14Aug2008, 16:48	
T-ALL	Not Specified	645.2	14Aug2008, 17:06	
T-RNA	0.0828	398.9	14Aug2008, 16:48	57.02

Project: ExistingF
Simulation Run: 100-yr 12-17-08 Reservoir: RNAD-E

Start of Run:	14Aug2008, 00:00	Basin Model:	Existing Model 12-17-08
End of Run:	15Aug2008, 00:06	Meteorologic Model:	100-year
Compute Time:	23Dec2008, 14:43:05	Control Specifications:	Control 1

Volume Units: IN

Computed Results

Peak Inflow :	398.9 (CFS)	Date/Time of Peak Inflow :	14Aug2008, 16:48
Peak Outflow :	394.5 (CFS)	Date/Time of Peak Outflow :	14Aug2008, 17:06
Total Inflow :	57.02 (IN)	Peak Storage :	32.4 (AC-FT)
Total Outflow :	52.26 (IN)	Peak Elevation :	5.249 (FT)

Project: ExistingF Simulation Run: 100-yr + 25% 12-17-08

Start of Run: 14Aug2008, 00:00
End of Run: 15Aug2008, 00:06
Compute Time: 23Dec2008, 14:44:07

Basin Model: Existing Model 12-17-0
Meteorologic Model: 100-year
Control Specifications: Control 1

Volume Units: IN

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
CHAN1	Not Specified	721.6	14Aug2008, 16:36	
CHAN2A	Not Specified	246.4	14Aug2008, 17:00	
CHAN2B	Not Specified	246.2	14Aug2008, 17:12	
DA-01	0.6860	1130.5	14Aug2008, 13:06	8.24
DA-03	0.0938	269.7	14Aug2008, 12:24	8.33
DA-04	0.2188	192.0	14Aug2008, 13:24	4.77
DA-06	0.1094	231.9	14Aug2008, 12:36	7.76
DA-5	0.0171	37.5	14Aug2008, 12:24	5.66
DA-7	0.0828	129.9	14Aug2008, 13:18	7.96
DIVERT	Not Specified	247.5	14Aug2008, 16:36	
EMONAV	Not Specified	283.3	14Aug2008, 14:06	
JA-DB	0.1094	53.1	14Aug2008, 14:00	3.07
PUMP	Not Specified	85.5	14Aug2008, 00:06	
RNAD-E	0.0828	530.7	14Aug2008, 16:48	66.93
T-1	Not Specified	1216.0	14Aug2008, 13:06	
T-2	Not Specified	1308.2	14Aug2008, 13:00	
T-3	Not Specified	764.4	14Aug2008, 16:36	
T-ALL	Not Specified	798.4	14Aug2008, 16:48	
T-RNA	0.0828	539.5	14Aug2008, 16:30	71.88

Project: ExistingF
Simulation Run: 100-yr + 25% 12-17-08 Reservoir: RNAD-E

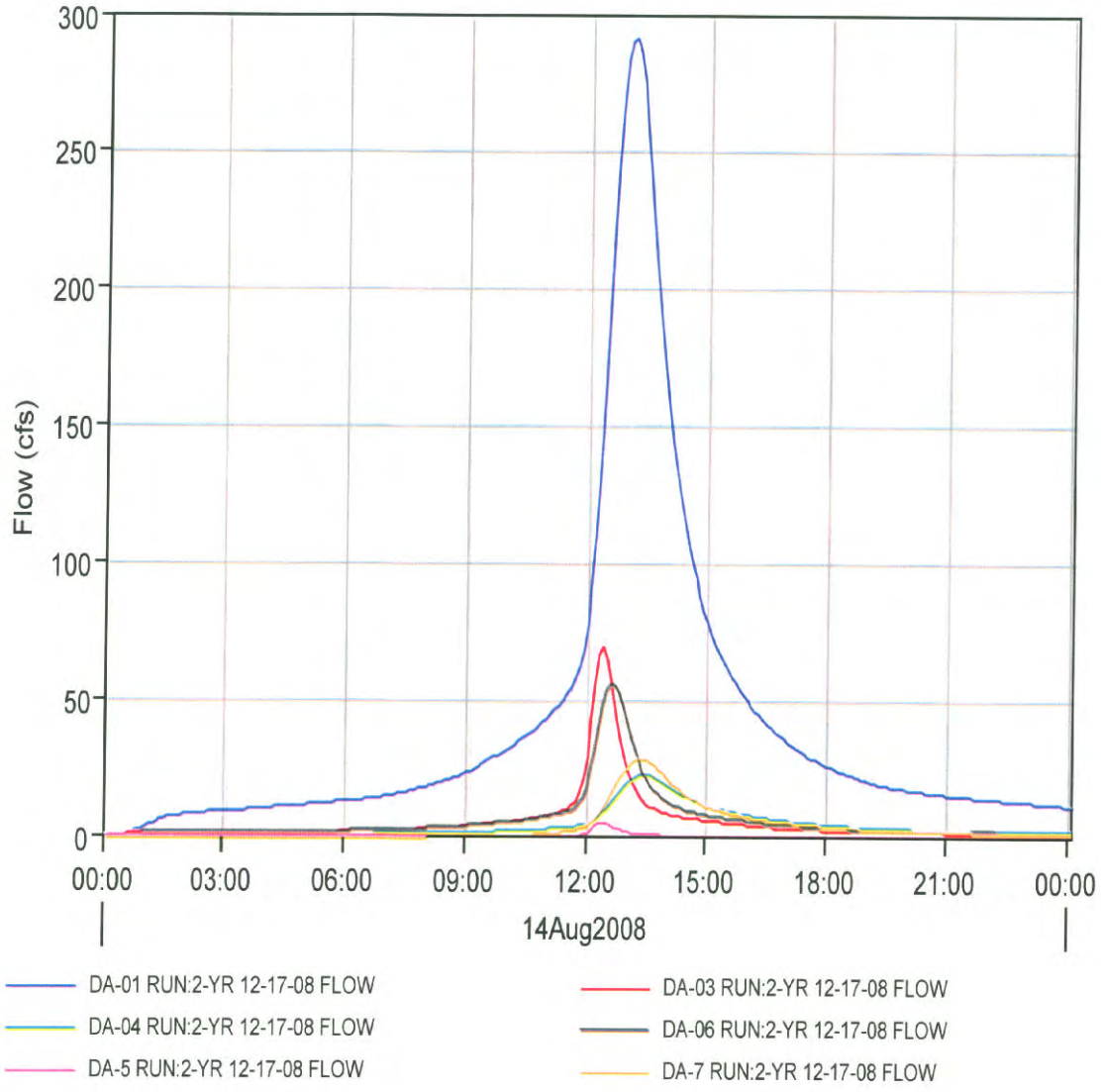
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End of Run:	15Aug2008, 00:06	Meteorologic Model:	100-year
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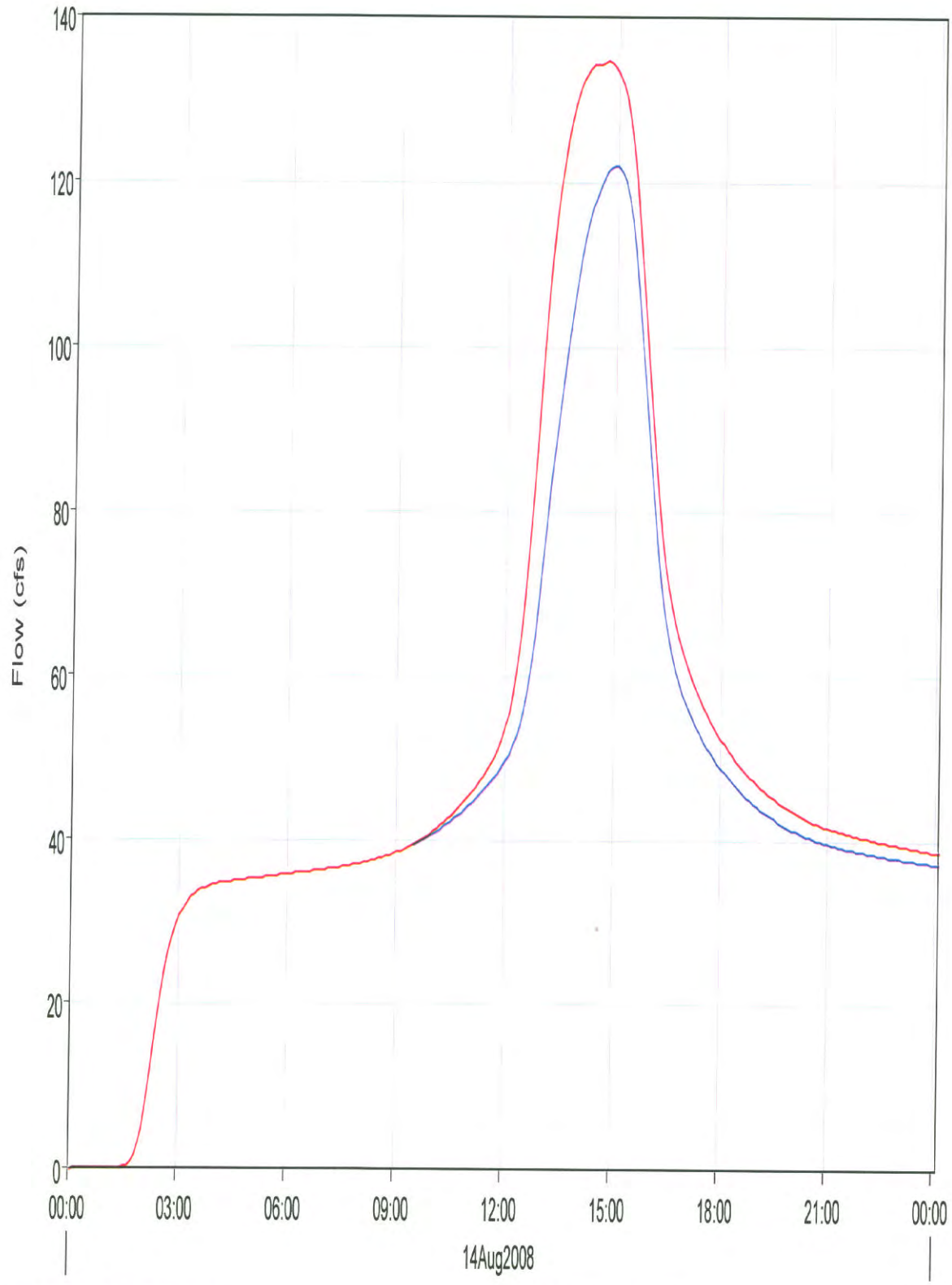
Volume Units: IN

Computed Results

Peak Inflow :	539.5 (CFS)	Date/Time of Peak Inflow :	14Aug2008, 16:30
Peak Outflow :	530.7 (CFS)	Date/Time of Peak Outflow :	14Aug2008, 16:48
Total Inflow :	71.88 (IN)	Peak Storage :	35.8 (AC-FT)
Total Outflow :	66.93 (IN)	Peak Elevation :	5.363 (FT)

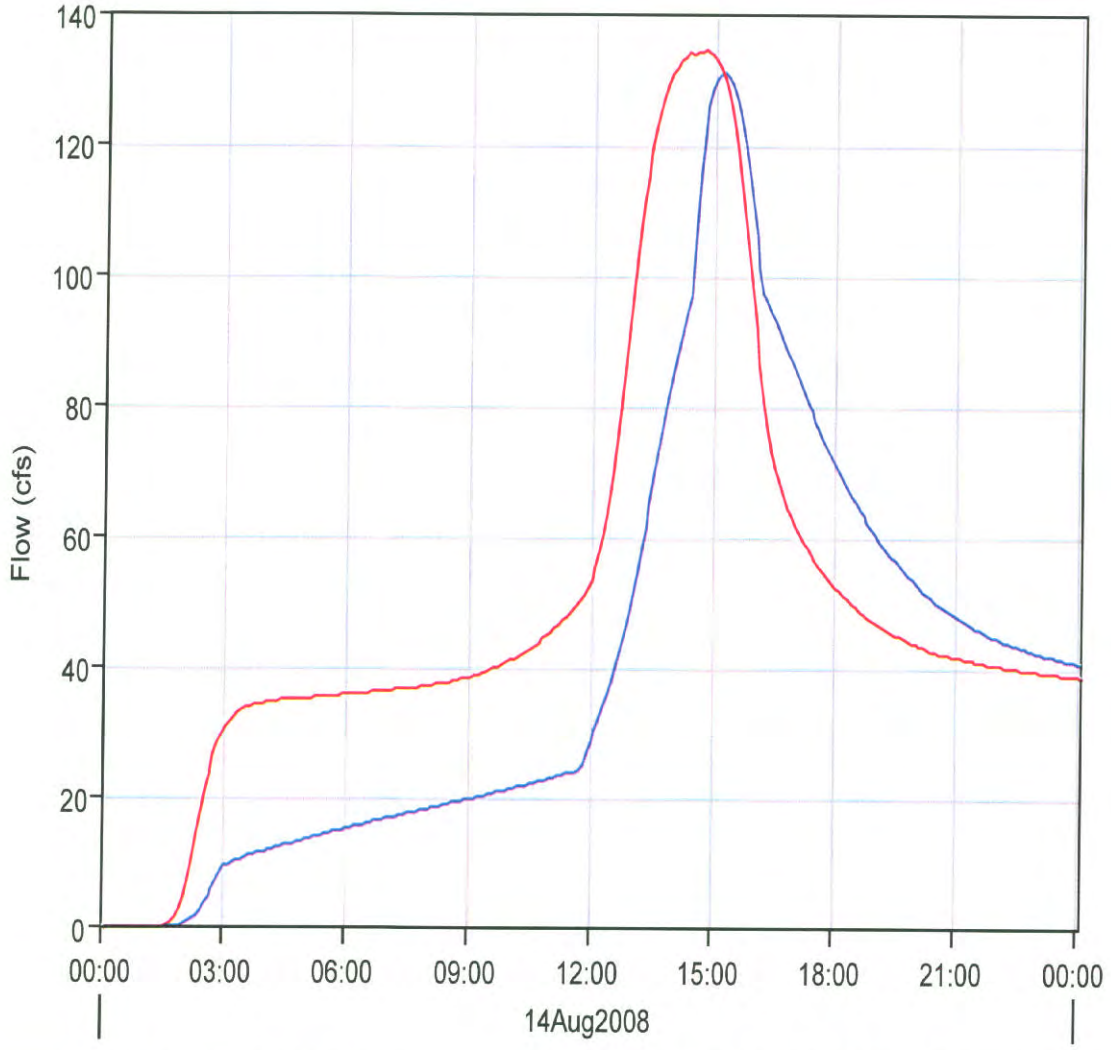
2-Yr Hydrographs





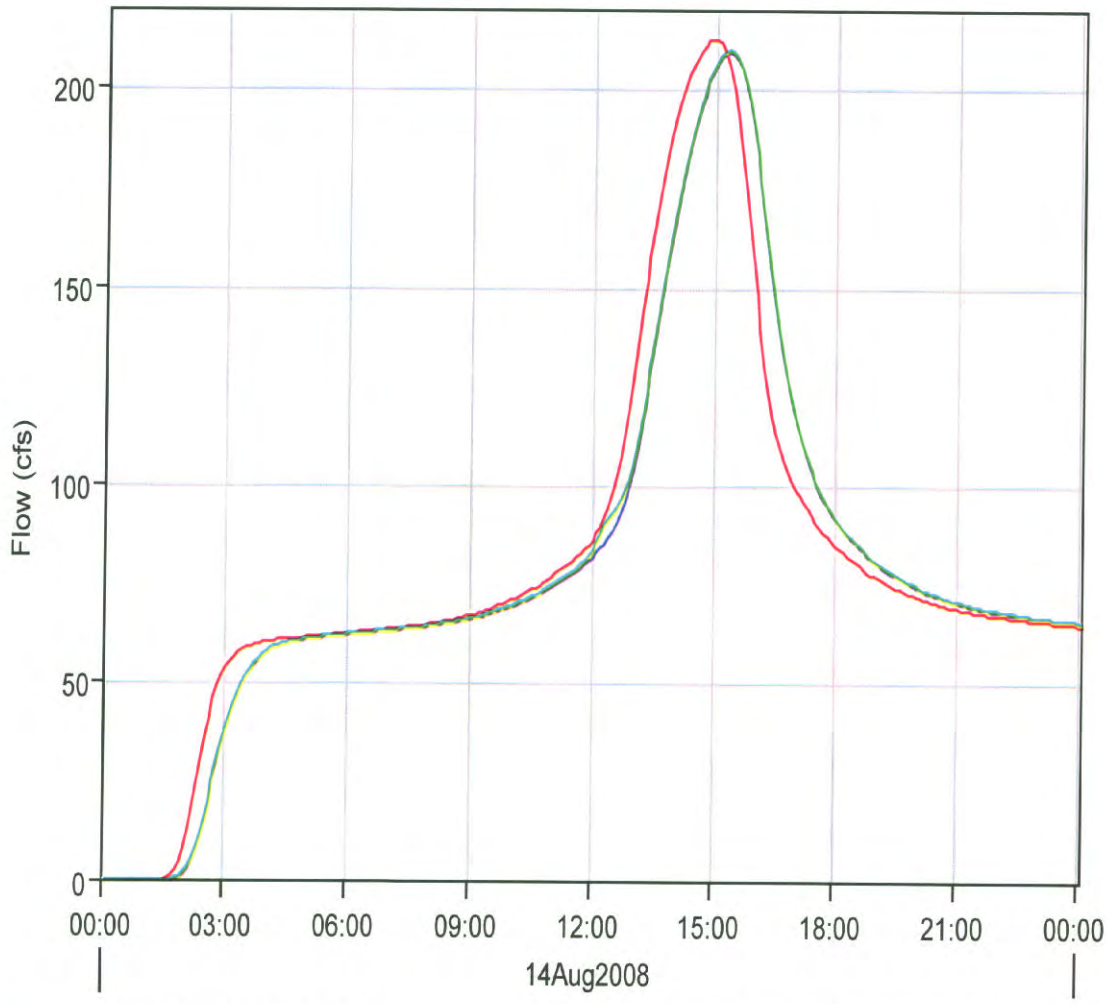
↳ Total Overflow into RNAO from ERO (typ.)

↳ Overflow into RNAO plus OA-7 (typ.)



↳ Flow at Moonachie for RNAD

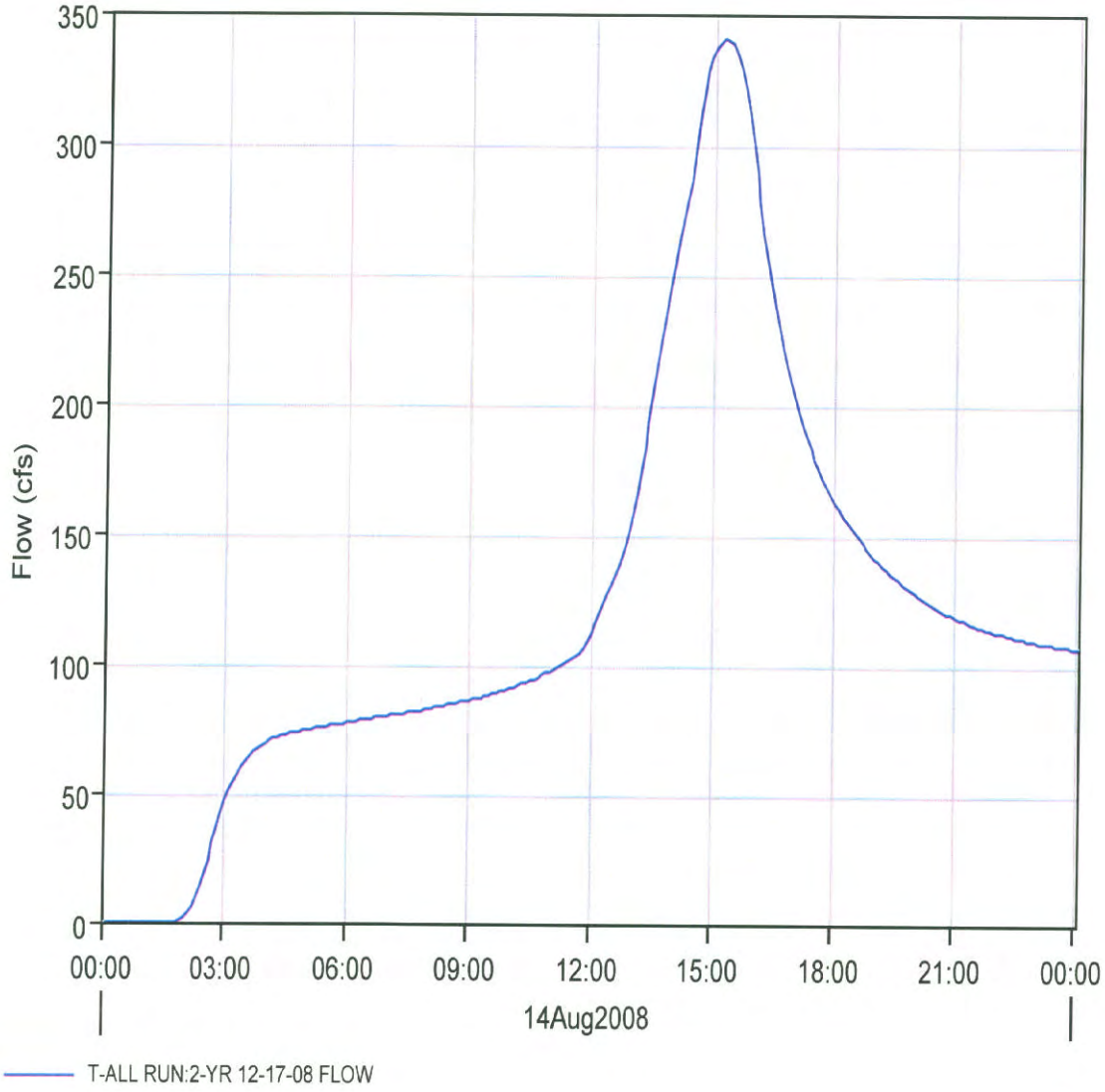
↳ Overflow into RNAD plus DA-7

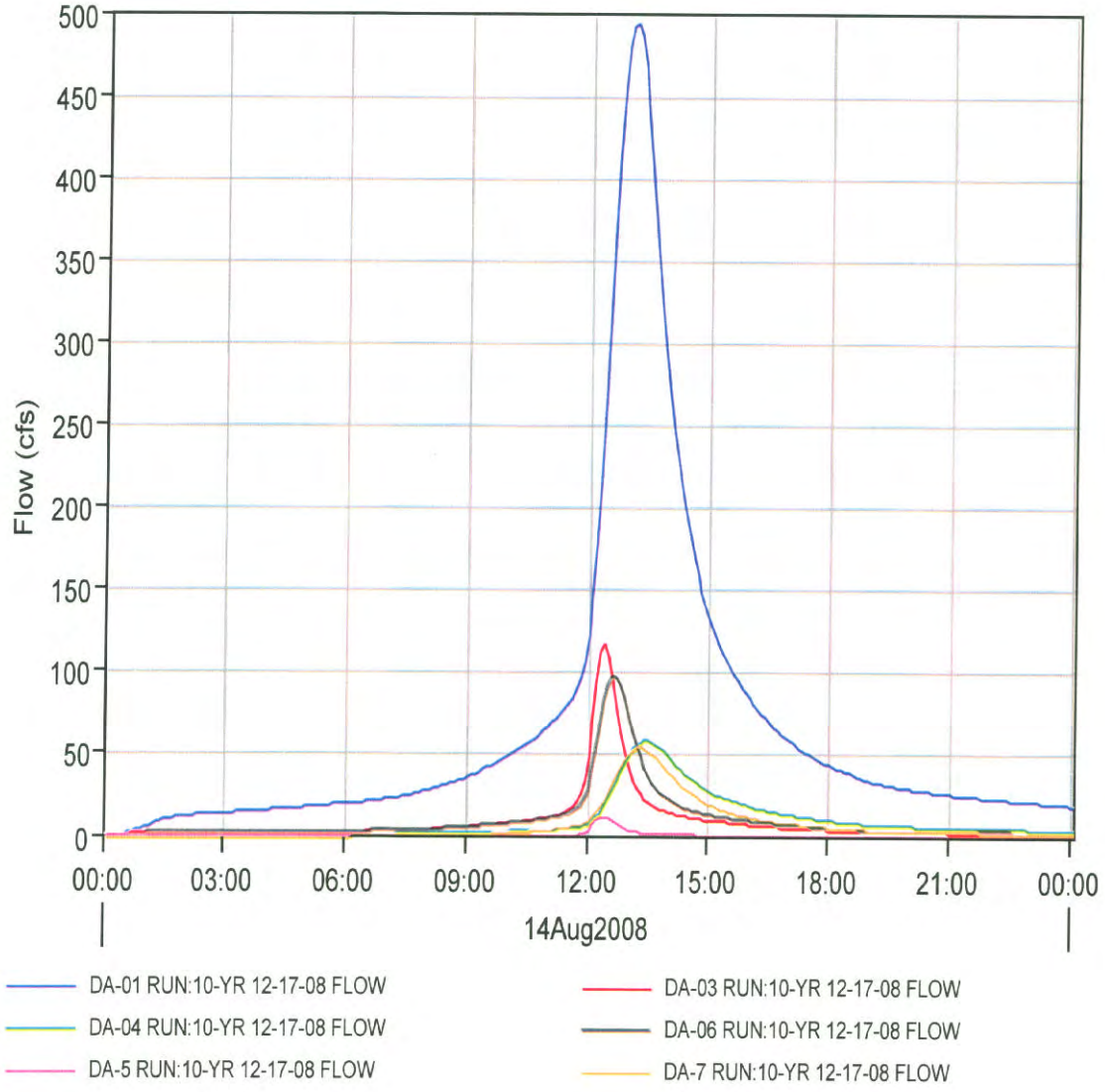


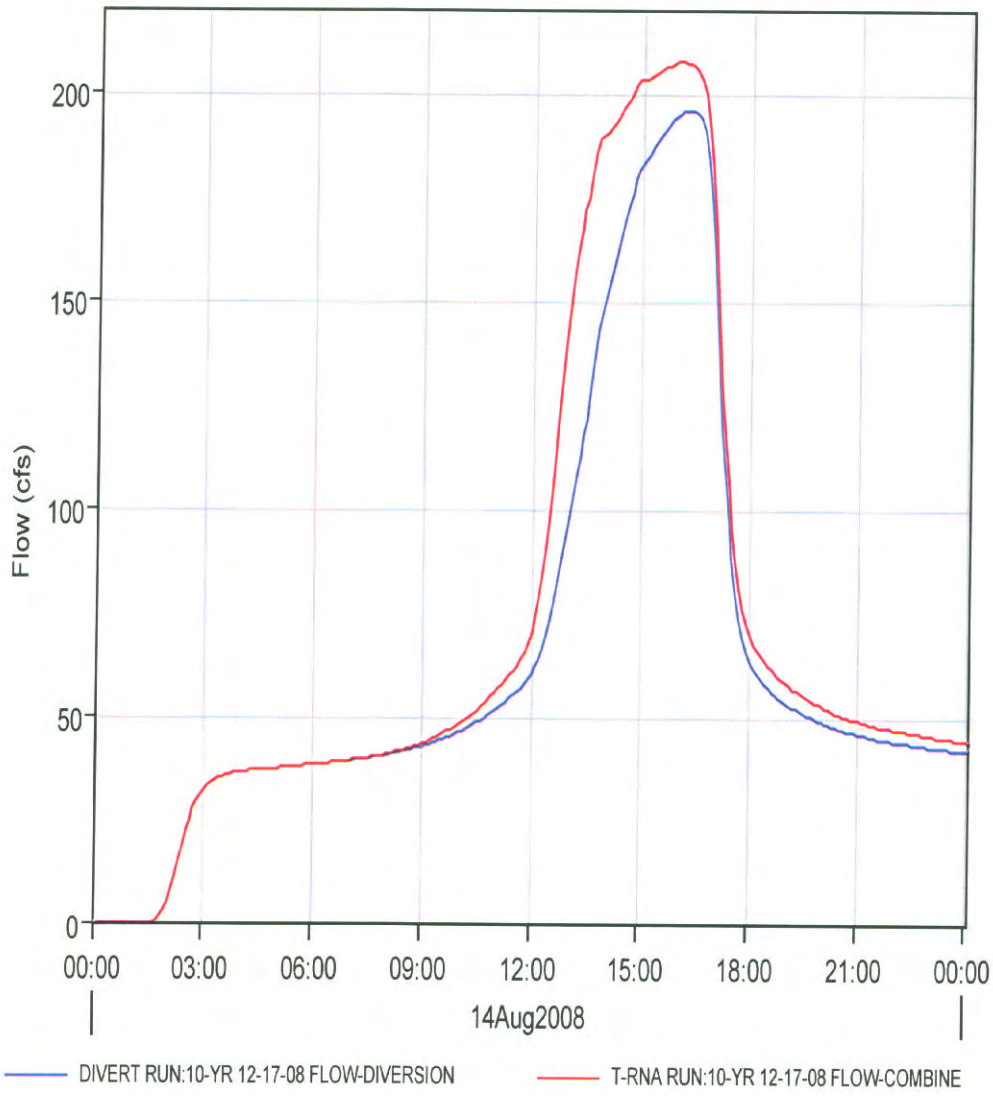
↳ Flow at Moonachie for ERD (typ.)

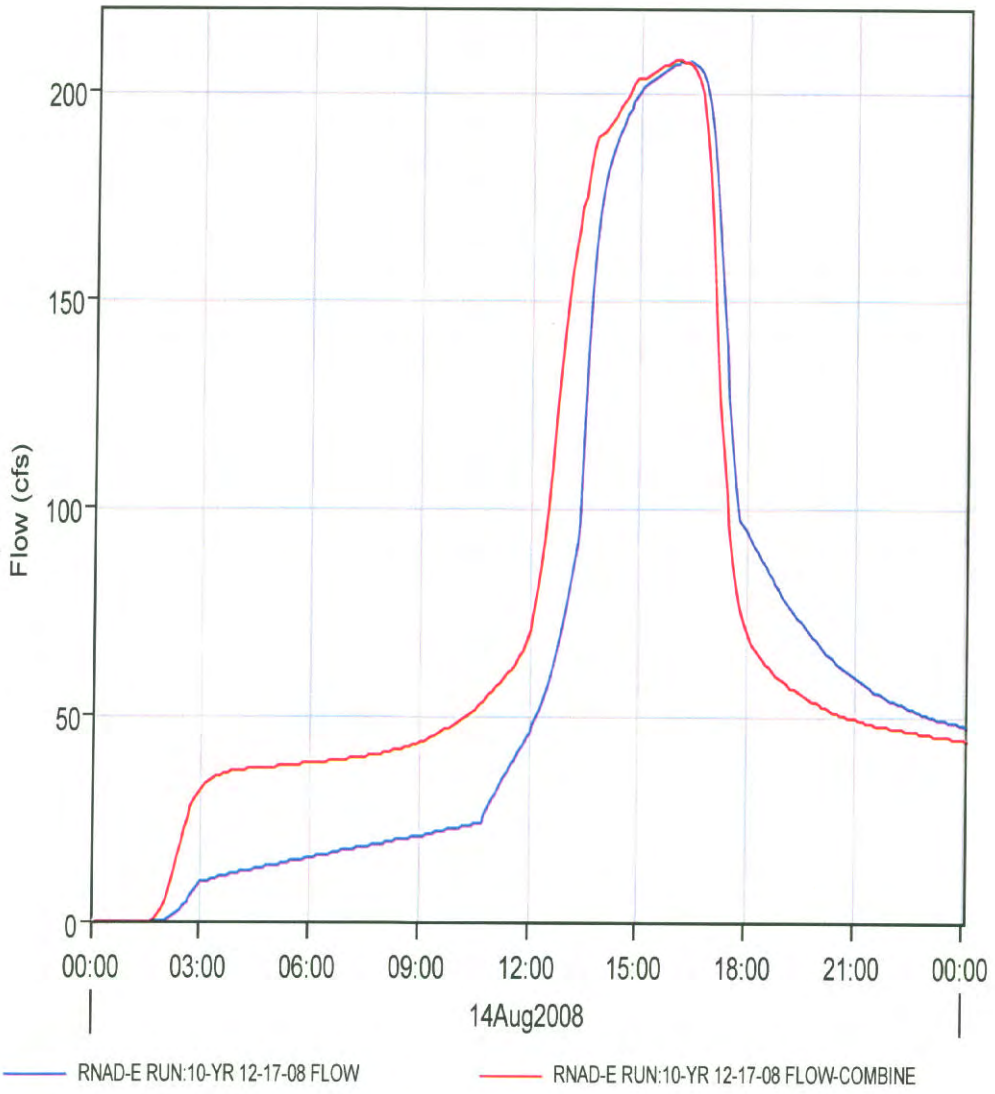
↳ Flow btwn Gate B Access Rd & Moonachie Ave for ERD (typ.)

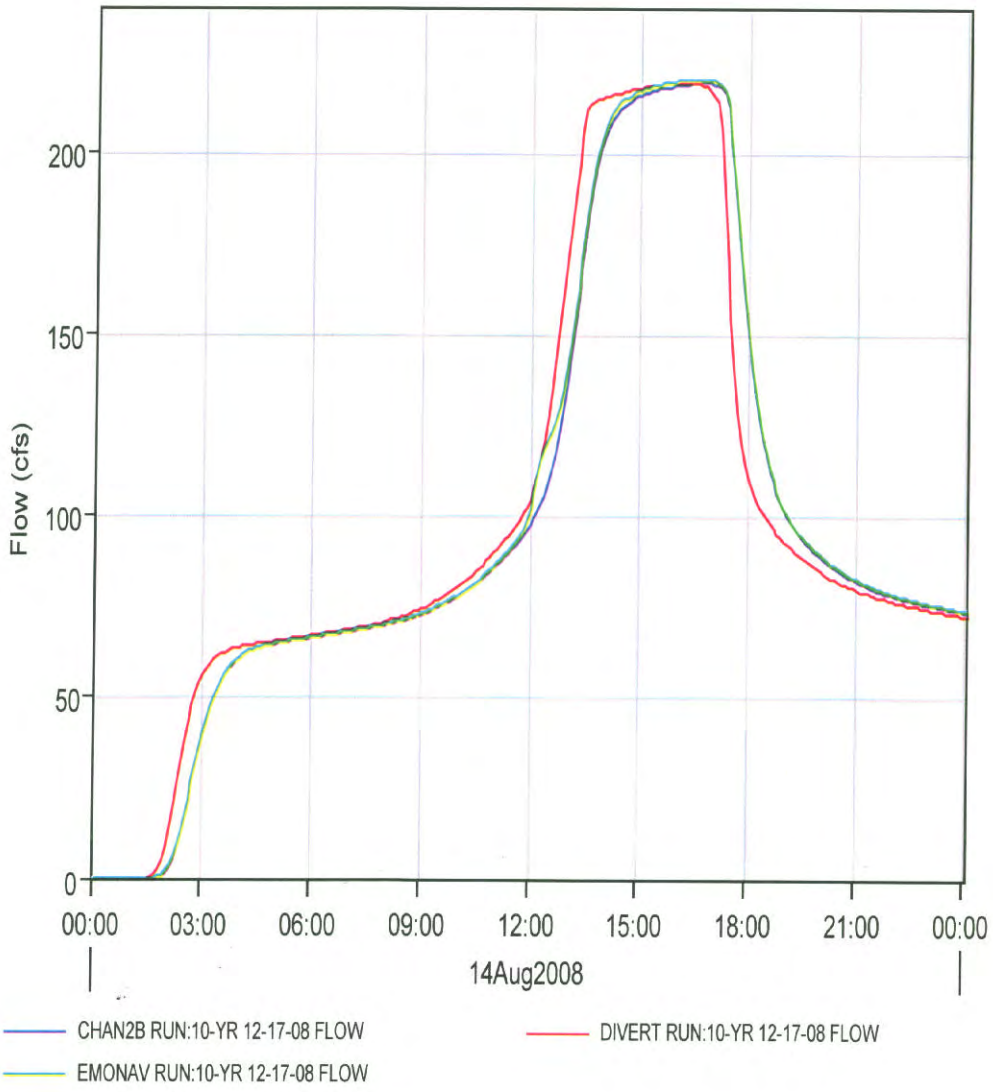
↳ Flow into ERD from Overflow weir (typ.)

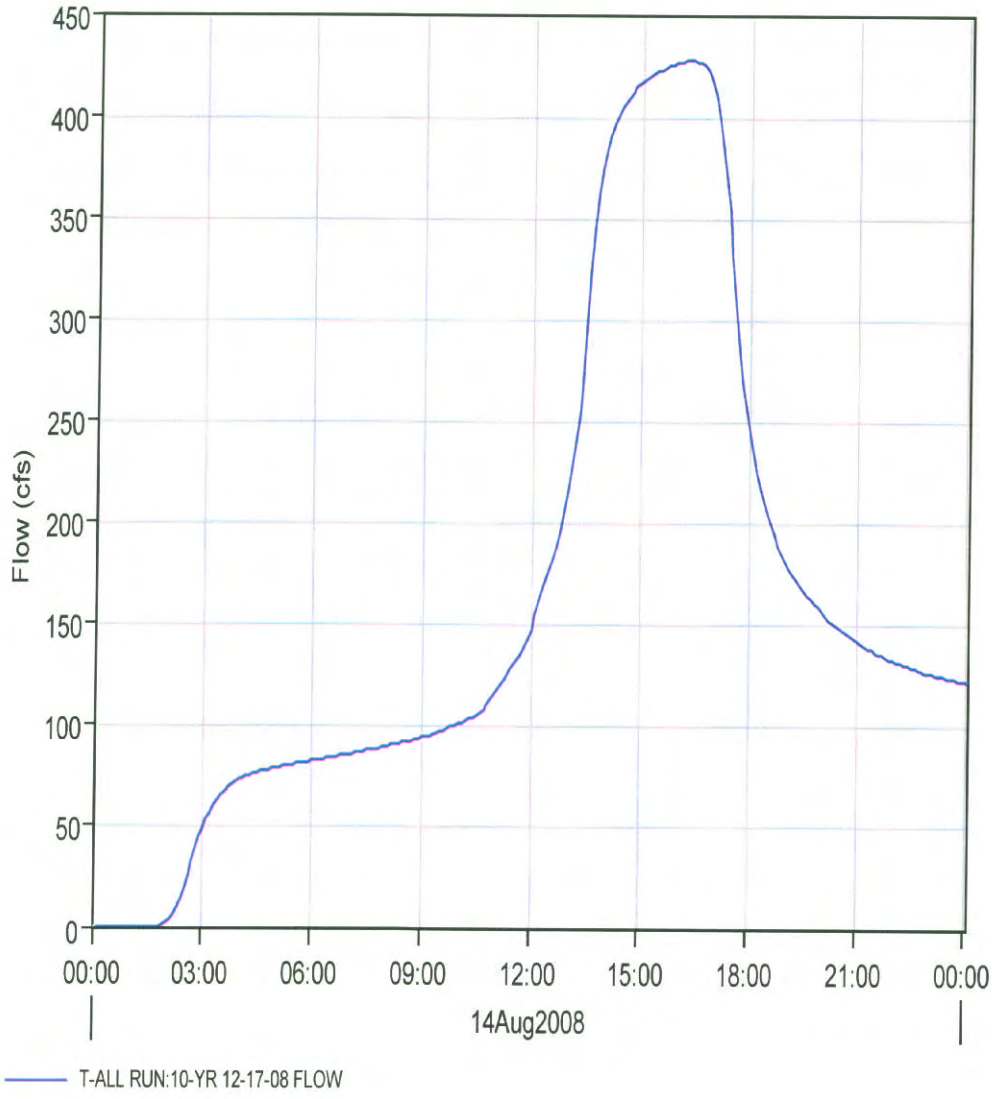

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Flow (cfs)
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03:00
06:00
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12:00
15:00
18:00
21:00
00:00
14Aug2008
T-ALL RUN:2-YR 12-17-08 FLOW

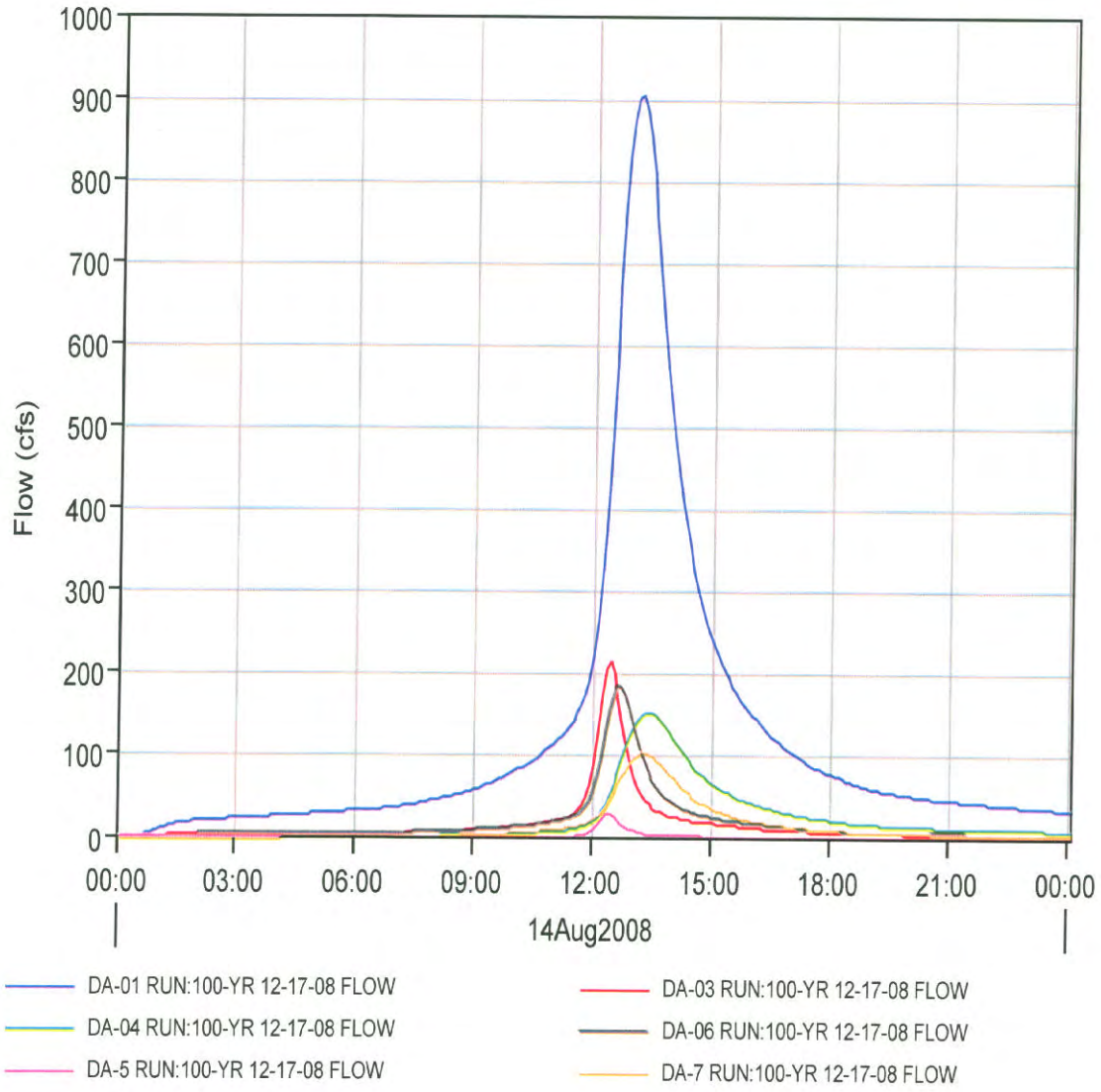

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15:00
18:00
21:00
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14Aug2008
DA-01 RUN:10-YR 12-17-08 FLOW
DA-03 RUN:10-YR 12-17-08 FLOW
DA-04 RUN:10-YR 12-17-08 FLOW
DA-06 RUN:10-YR 12-17-08 FLOW
DA-5 RUN:10-YR 12-17-08 FLOW
DA-7 RUN:10-YR 12-17-08 FLOW

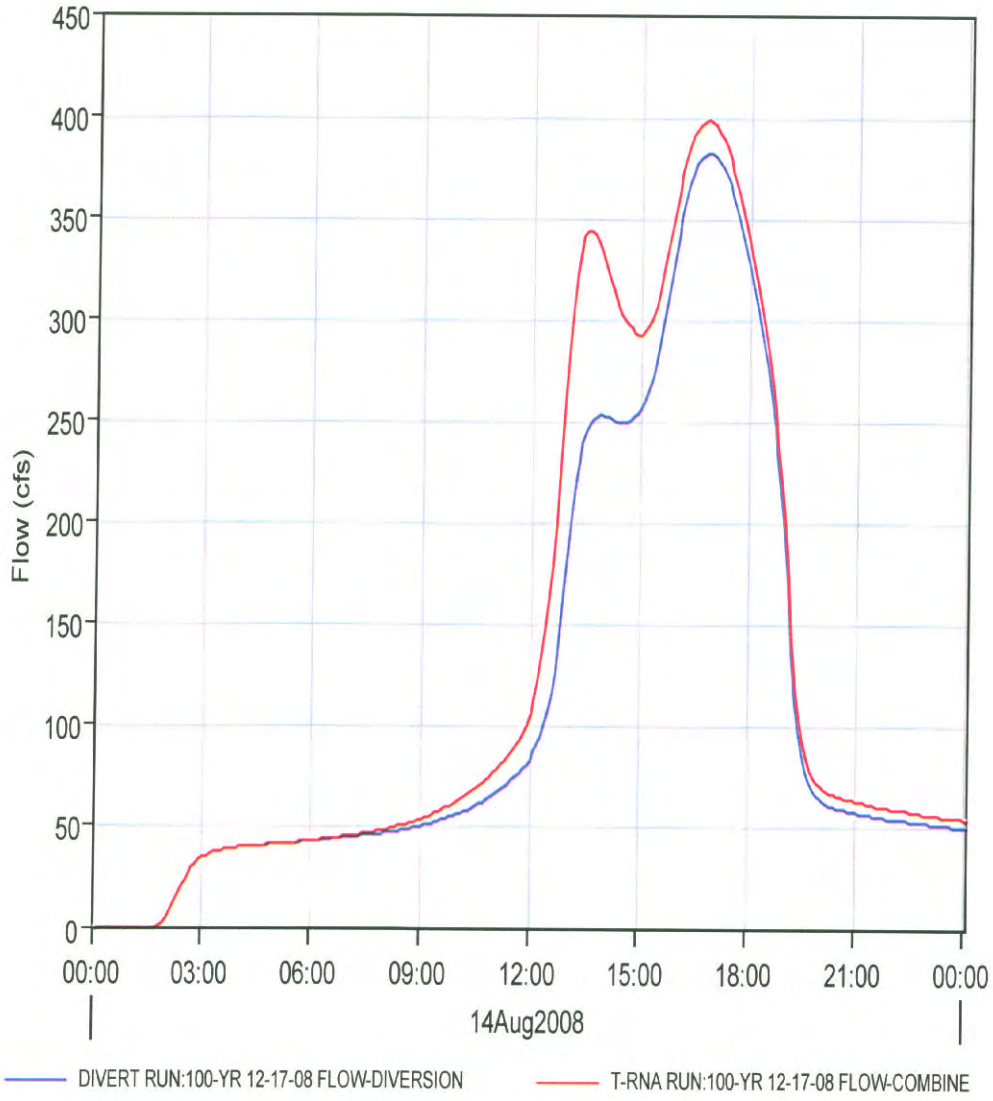

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Flow (cfs)
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14Aug2008
DIVERT RUN:10-YR 12-17-08 FLOW-DIVERSION
T-RNA RUN:10-YR 12-17-08 FLOW-COMBINE

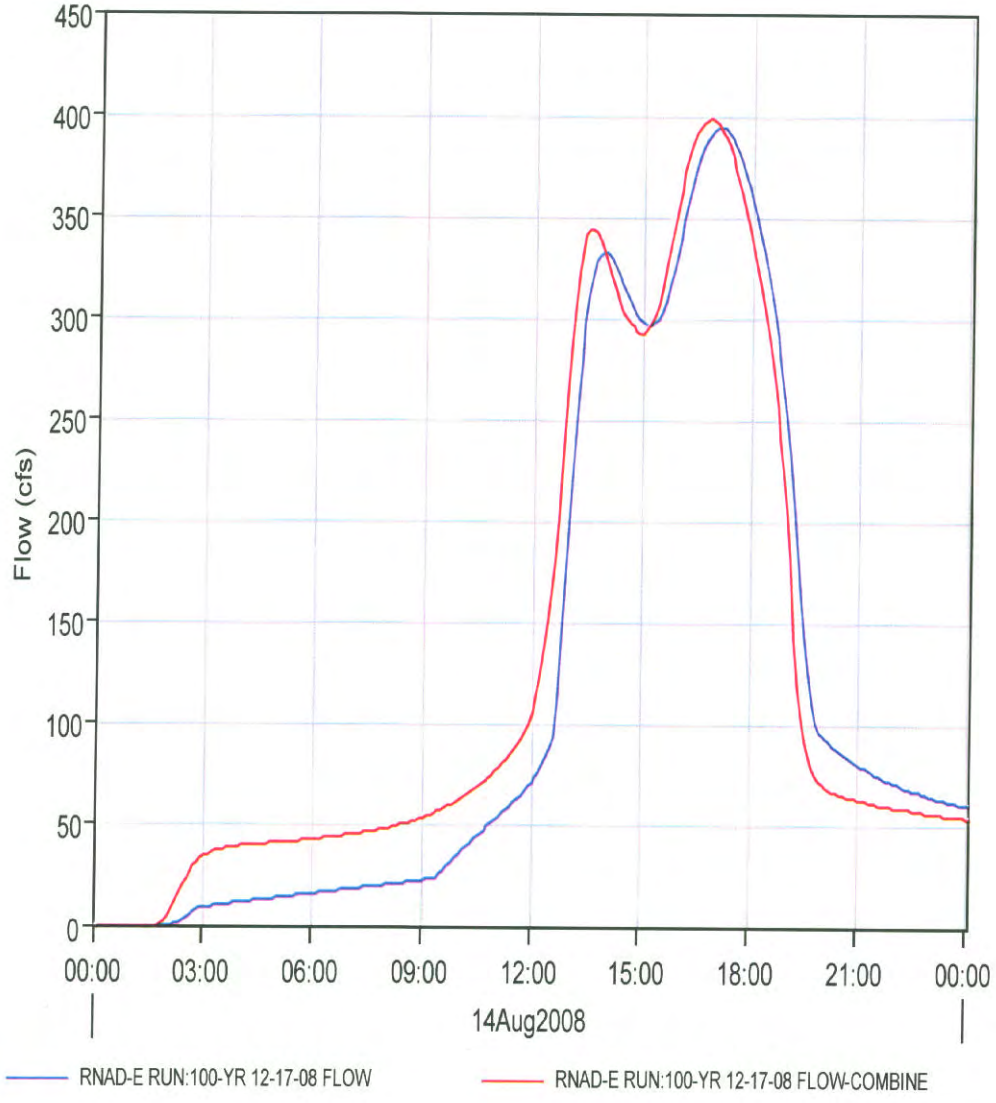

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Flow (cfs)
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14Aug2008
RNAD-E RUN:10-YR 12-17-08 FLOW
RNAD-E RUN:10-YR 12-17-08 FLOW-COMBINE

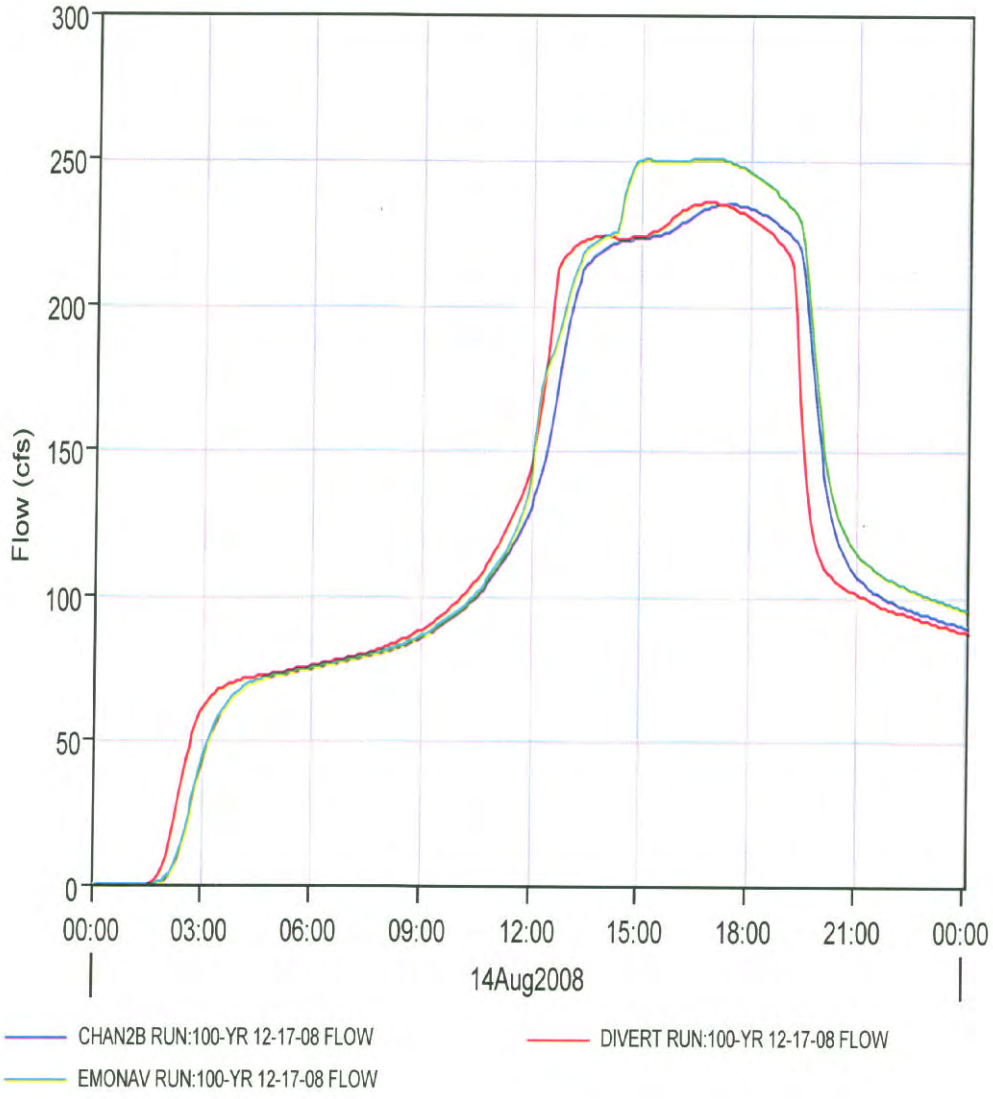

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Flow (cfs)
00:00
03:00
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15:00
18:00
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14Aug2008
CHAN2B RUN:10-YR 12-17-08 FLOW
DIVERT RUN:10-YR 12-17-08 FLOW
EMONAV RUN:10-YR 12-17-08 FLOW

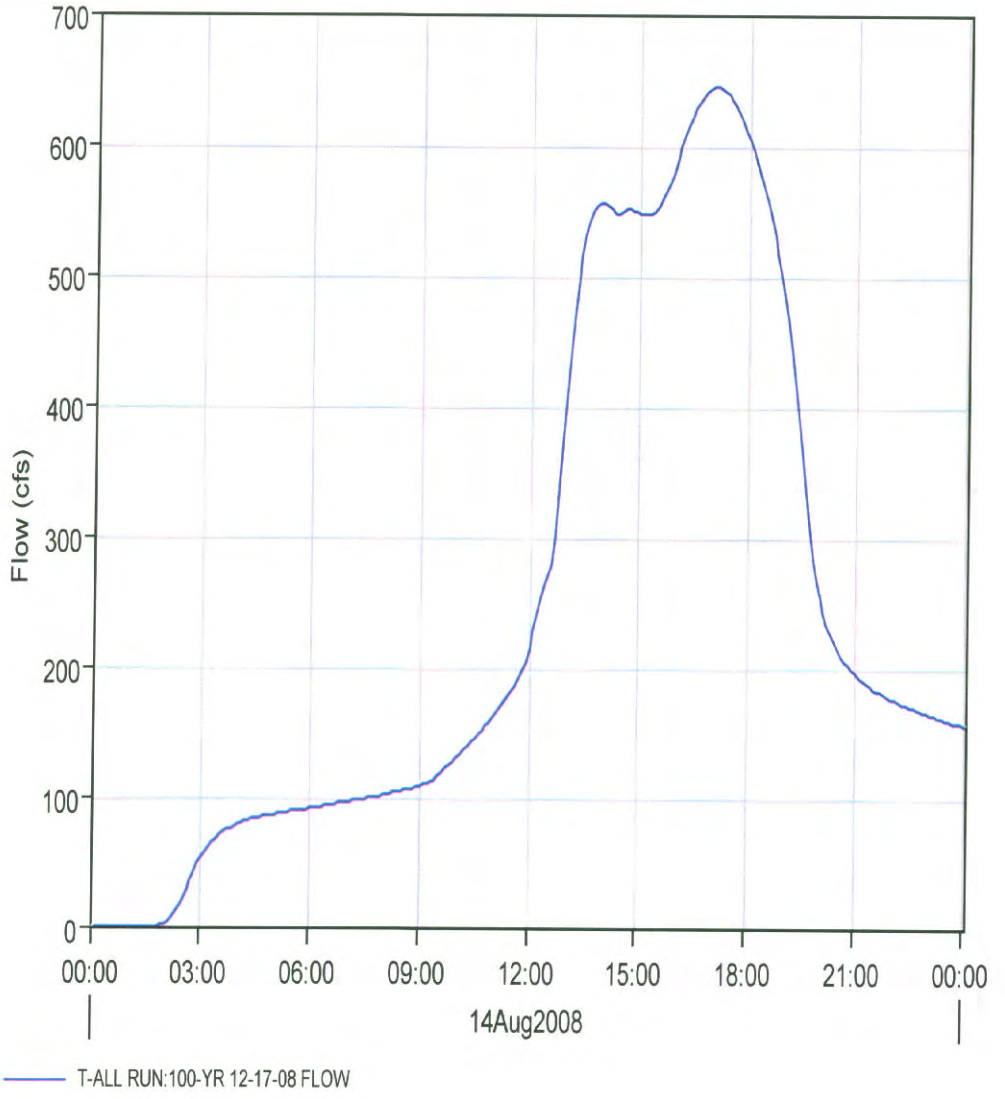

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Flow (cfs)
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03:00
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14Aug2008
T-ALL RUN:10-YR 12-17-08 FLOW

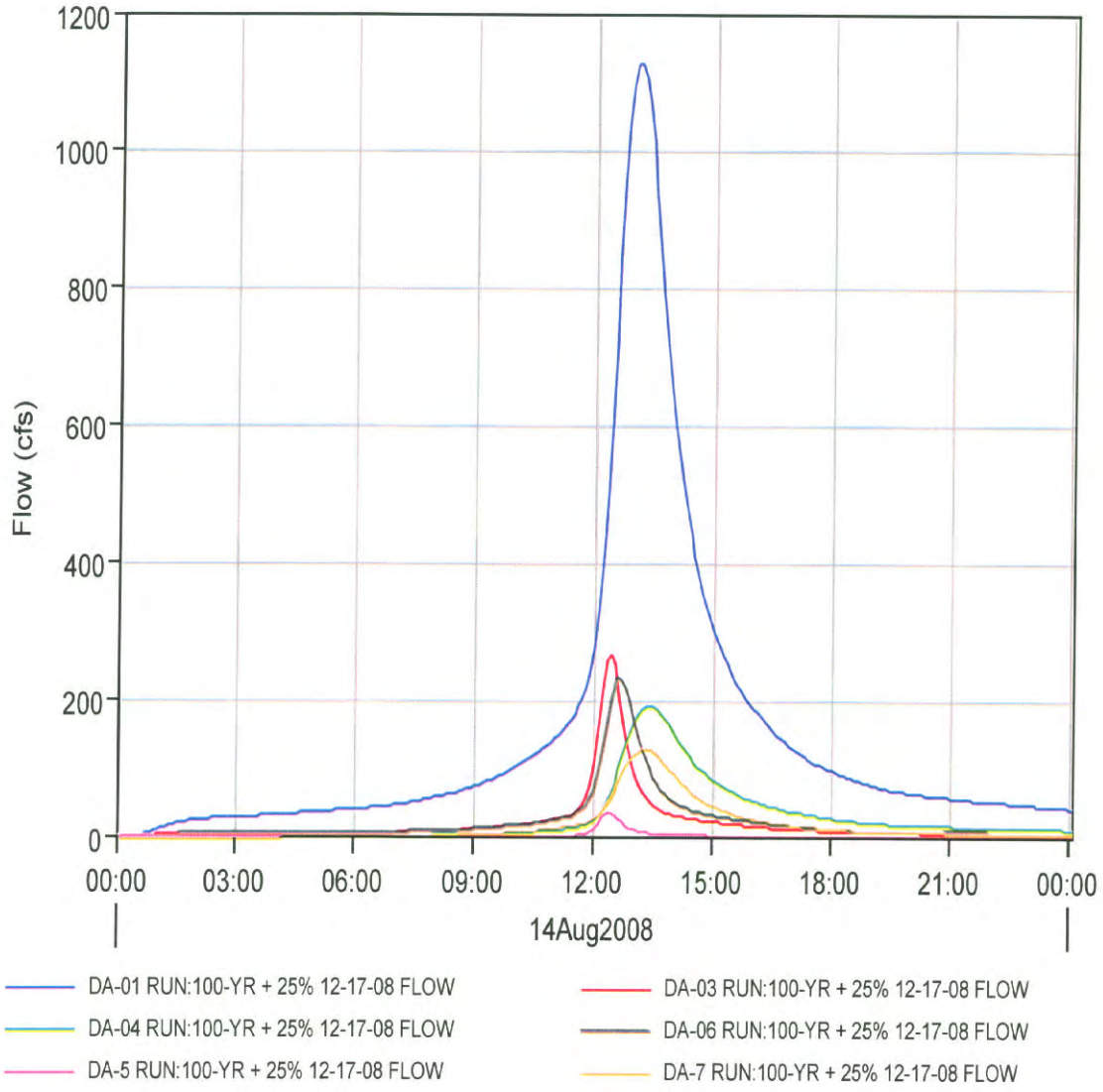

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700
600
500
400
300
200
100
0
Flow (cfs)
00:00
03:00
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09:00
12:00
15:00
18:00
21:00
00:00
14Aug2008
DA-01 RUN:100-YR 12-17-08 FLOW
DA-03 RUN:100-YR 12-17-08 FLOW
DA-04 RUN:100-YR 12-17-08 FLOW
DA-06 RUN:100-YR 12-17-08 FLOW
DA-5 RUN:100-YR 12-17-08 FLOW
DA-7 RUN:100-YR 12-17-08 FLOW

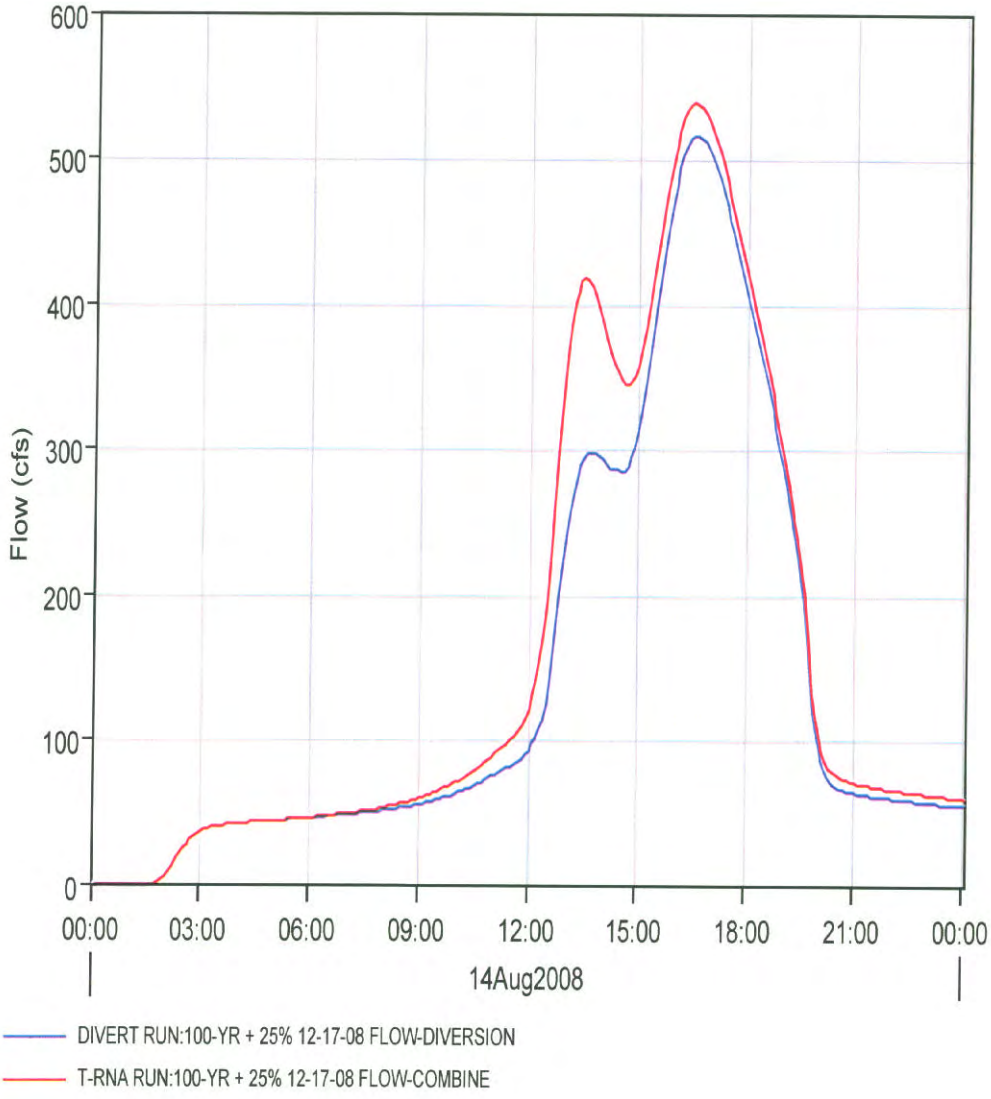

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Flow (cfs)
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03:00
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14Aug2008
DIVERT RUN:100-YR 12-17-08 FLOW-DIVERSION
T-RNA RUN:100-YR 12-17-08 FLOW-COMBINE

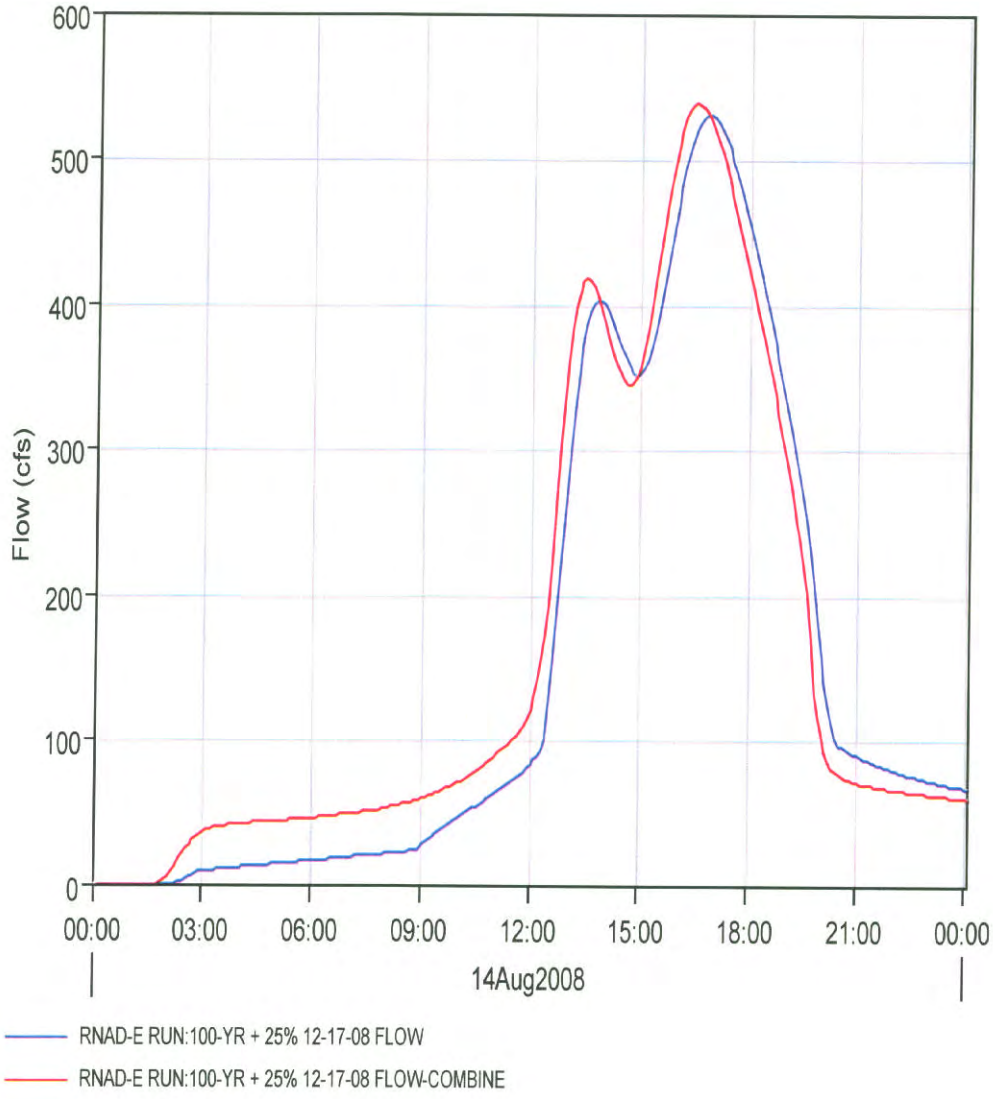

450
400
350
300
250
200
150
100
50
0
Flow (cfs)
00:00
03:00
06:00
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12:00
15:00
18:00
21:00
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14Aug2008
RNAD-E RUN:100-YR 12-17-08 FLOW
RNAD-E RUN:100-YR 12-17-08 FLOW-COMBINE

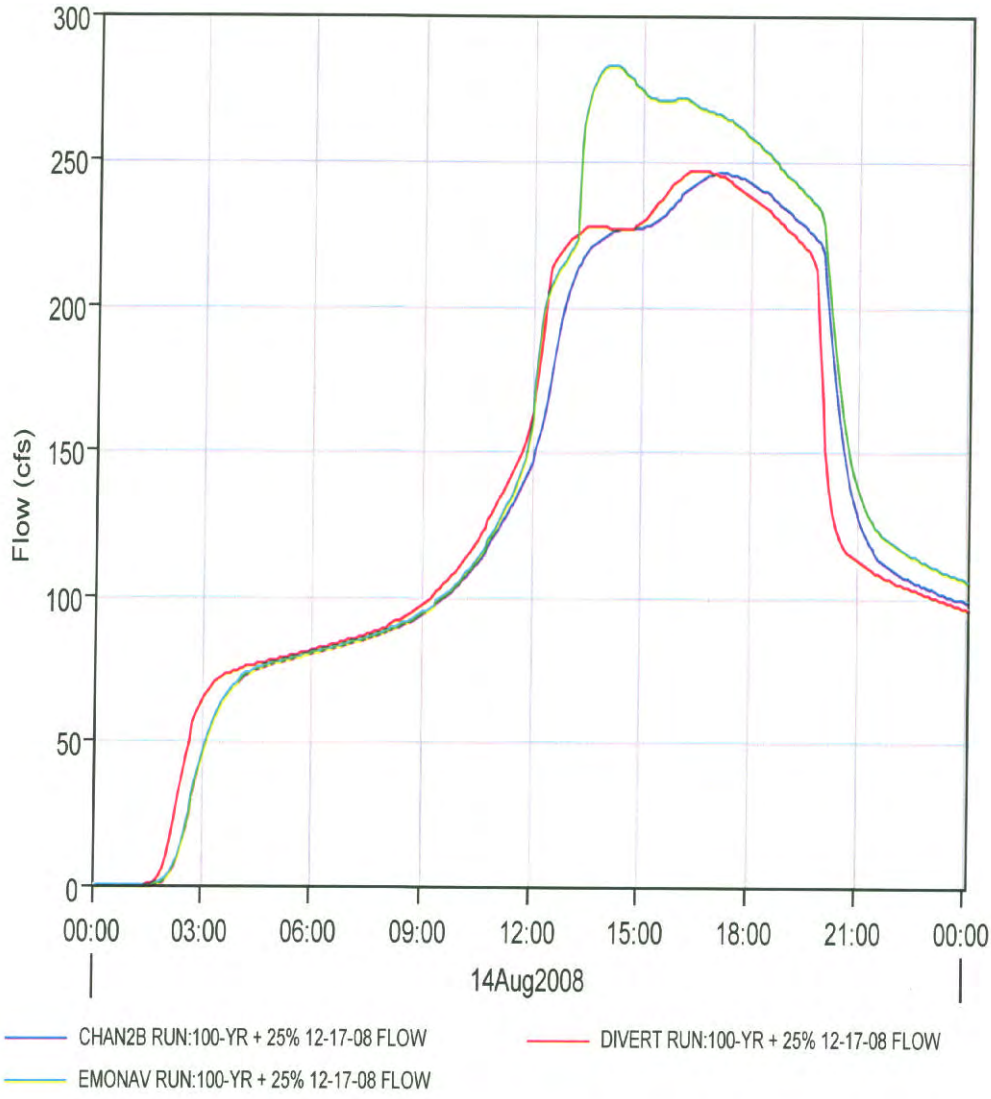

300
250
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150
100
50
0
Flow (cfs)
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
14Aug2008
CHAN2B RUN:100-YR 12-17-08 FLOW
DIVERT RUN:100-YR 12-17-08 FLOW
EMONAV RUN:100-YR 12-17-08 FLOW

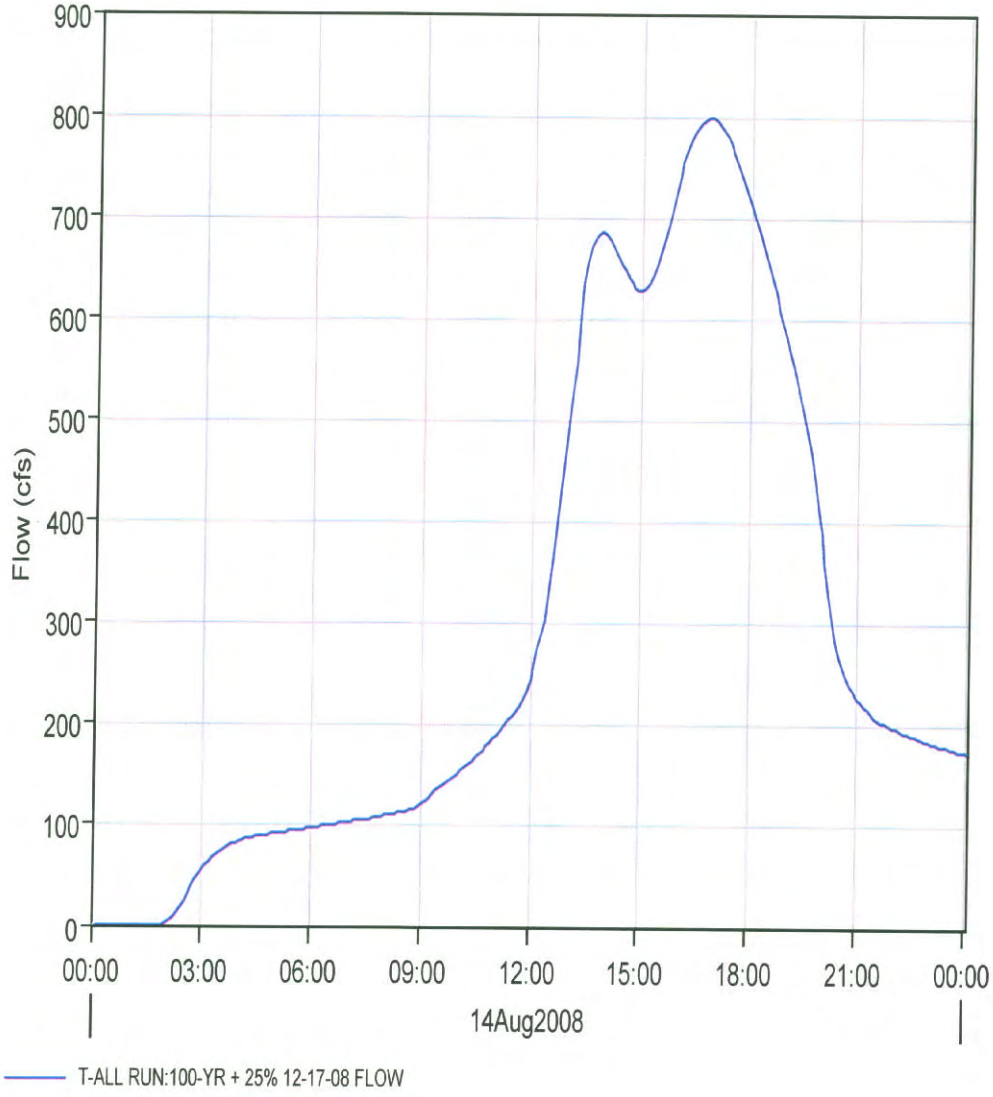

700
600
500
400
300
200
100
0
Flow (cfs)
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
14Aug2008
T-ALL RUN:100-YR 12-17-08 FLOW


1200
1000
800
600
400
200
0
Flow (cfs)
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
14Aug2008
DA-01 RUN:100-YR + 25% 12-17-08 FLOW
DA-03 RUN:100-YR + 25% 12-17-08 FLOW
DA-04 RUN:100-YR + 25% 12-17-08 FLOW
DA-06 RUN:100-YR + 25% 12-17-08 FLOW
DA-5 RUN:100-YR + 25% 12-17-08 FLOW
DA-7 RUN:100-YR + 25% 12-17-08 FLOW


600
500
400
300
200
100
0
Flow (cfs)
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
14Aug2008
DIVERT RUN:100-YR + 25% 12-17-08 FLOW-DIVERSION
T-RNA RUN:100-YR + 25% 12-17-08 FLOW-COMBINE


600
500
400
300
200
100
0
Flow (cfs)
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
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14Aug2008
RNAD-E RUN:100-YR + 25% 12-17-08 FLOW
RNAD-E RUN:100-YR + 25% 12-17-08 FLOW-COMBINE

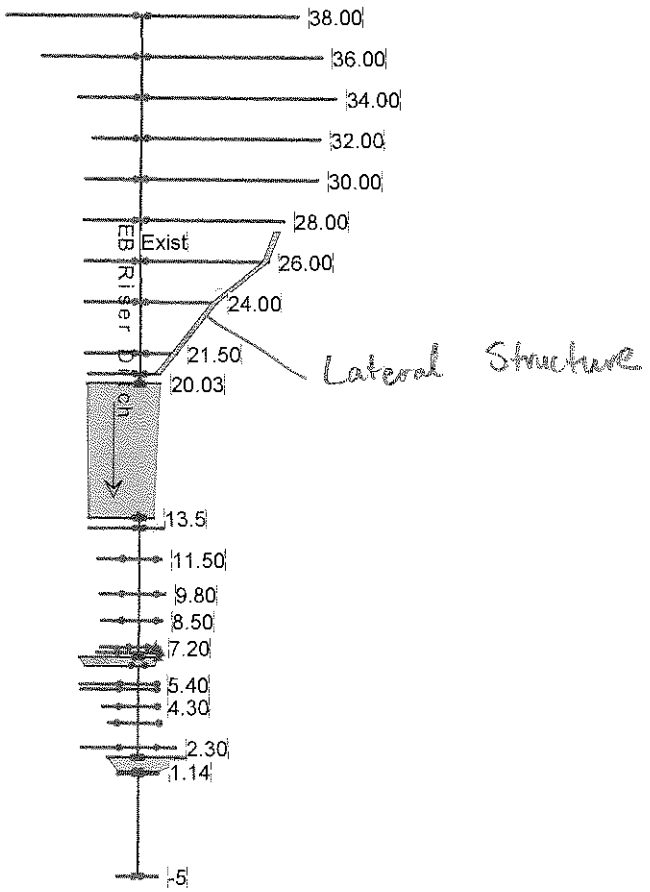

300
250
200
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100
50
0
Flow (cfs)
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
14Aug2008
CHAN2B RUN:100-YR + 25% 12-17-08 FLOW
DIVERT RUN:100-YR + 25% 12-17-08 FLOW
EMONAV RUN:100-YR + 25% 12-17-08 FLOW


900
800
700
600
500
400
300
200
100
0
Flow (cfs)
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
14Aug2008
T-ALL RUN:100-YR + 25% 12-17-08 FLOW

– Proposed HEC-RAS Model and Supportive Computations
EAST RISER DITCH

58 Sheets

PROPOSED
EAST RISER DITCH



Some schematic data outside default extents (see View/Set Schematic Plot Extents...)
None of the XS's are Geo-Referenced (Geo-Ref user entered XS, Geo-Ref interpolated XS, Non Geo-Ref user entered XS, Non Geo-Ref interpolated XS)

Note: Refer to Permit Plans for HEC-RAS X-Section (NE[redacted]-NE[redacted])

HEC-RAS Plan: PropRev River: EB Riser Ditch Reach: Exist

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Exist	-5	2 yr	216.18	-1.31	2.88	0.61	2.99	0.002003	2.68	80.78	25.76	0.27
Exist	-5	10 yr	220.33	-1.31	2.93	0.64	3.04	0.002002	2.69	81.90	25.89	0.27
Exist	-5	100 yr	228.97	-1.31	3.01	0.68	3.13	0.002002	2.72	84.19	26.16	0.27
Exist	-5	100 yr + 25	234.33	-1.31	3.07	0.71	3.18	0.002001	2.74	85.60	26.32	0.27
Exist	1.0	2 yr	216.18	-1.31	3.64		3.71	0.001069	2.14	101.23	28.05	0.20
Exist	1.0	10 yr	220.33	-1.31	3.69		3.76	0.001073	2.15	102.49	28.19	0.20
Exist	1.0	100 yr	228.97	-1.31	3.78		3.85	0.001081	2.18	105.09	28.46	0.20
Exist	1.0	100 yr + 25	234.33	-1.31	3.83		3.91	0.001086	2.20	106.68	28.63	0.20
Exist	1.14	2 yr	216.18	-3.04	3.70		3.73	0.000394	1.53	141.34	28.78	0.12
Exist	1.14	10 yr	220.33	-3.04	3.74		3.78	0.000398	1.54	142.64	28.83	0.12
Exist	1.14	100 yr	228.97	-3.04	3.83		3.87	0.000408	1.58	145.31	28.93	0.12
Exist	1.14	100 yr + 25	234.33	-3.04	3.89		3.93	0.000414	1.59	146.94	28.99	0.12
Exist	1.47		Culvert									
Exist	1.80	2 yr	216.18	-3.04	3.90	-1.15	3.93	0.000048	1.32	163.83	35.75	0.11
Exist	1.80	10 yr	220.33	-3.04	3.96	-1.12	3.98	0.000048	1.33	165.69	36.01	0.11
Exist	1.80	100 yr	228.97	-3.04	4.06	-1.08	4.09	0.000049	1.35	169.56	36.56	0.11
Exist	1.80	100 yr + 25	234.33	-3.04	4.13	-1.05	4.16	0.000050	1.36	171.96	36.89	0.11
Exist	1.81	2 yr	216.18	-3.04	3.80	-0.26	4.03	0.030926	3.85	56.10	8.20	0.26
Exist	1.81	10 yr	220.33	-3.04	3.85	-0.22	4.09	0.031662	3.90	56.51	8.20	0.26
Exist	1.81	100 yr	228.97	-3.04	3.95	-0.14	4.20	0.033195	3.99	57.34	8.20	0.27
Exist	1.81	100 yr + 25	234.33	-3.04	4.01	-0.10	4.27	0.034148	4.05	57.84	8.20	0.27
Exist	1.82	2 yr	216.18	-3.04	4.07		4.09	0.000044	1.27	169.82	36.60	0.10
Exist	1.82	10 yr	220.33	-3.04	4.12		4.15	0.000044	1.28	171.88	36.88	0.10
Exist	1.82	100 yr	228.97	-3.04	4.24		4.27	0.000045	1.30	176.17	37.47	0.11
Exist	1.82	100 yr + 25	234.33	-3.04	4.31		4.34	0.000045	1.31	178.83	37.84	0.11
Exist	2.30	2 yr	216.18	-1.82	4.10		4.10	0.000045	0.41	525.49	175.18	0.04
Exist	2.30	10 yr	220.33	-1.82	4.16		4.16	0.000044	0.41	535.38	175.47	0.04
Exist	2.30	100 yr	228.97	-1.82	4.27		4.28	0.000042	0.41	555.80	176.06	0.04
Exist	2.30	100 yr + 25	234.33	-1.82	4.34		4.35	0.000041	0.41	568.38	176.42	0.04
Exist	3.50	2 yr	216.18	-2.07	4.11		4.11	0.000037	0.37	587.32	226.67	0.04
Exist	3.50	10 yr	220.33	-2.07	4.16		4.16	0.000036	0.37	600.21	231.30	0.04
Exist	3.50	100 yr	228.97	-2.07	4.28		4.28	0.000035	0.37	627.53	237.81	0.04
Exist	3.50	100 yr + 25	234.33	-2.07	4.35		4.35	0.000034	0.37	644.49	238.03	0.04
Exist	4.30	2 yr	216.18	-1.99	4.11		4.11	0.000037	0.38	565.44	181.11	0.04
Exist	4.30	10 yr	220.33	-1.99	4.16		4.17	0.000036	0.38	575.63	181.48	0.04
Exist	4.30	100 yr	228.97	-1.99	4.28		4.28	0.000035	0.38	596.80	184.03	0.04
Exist	4.30	100 yr + 25	234.33	-1.99	4.35		4.35	0.000034	0.38	609.96	185.59	0.04
Exist	5.15	2 yr	216.18	-1.70	4.11		4.11	0.000037	0.39	574.83	343.79	0.04
Exist	5.15	10 yr	220.33	-1.70	4.17		4.17	0.000036	0.39	594.17	344.67	0.04
Exist	5.15	100 yr	228.97	-1.70	4.28		4.29	0.000034	0.39	634.17	346.48	0.04
Exist	5.15	100 yr + 25	234.33	-1.70	4.35		4.36	0.000033	0.38	658.86	347.59	0.04
Exist	5.40	2 yr	216.18	-1.60	4.11		4.12	0.000042	0.41	548.99	322.48	0.04
Exist	5.40	10 yr	220.33	-1.60	4.17		4.17	0.000041	0.40	567.18	324.99	0.04
Exist	5.40	100 yr	228.97	-1.60	4.28		4.29	0.000039	0.40	605.07	330.16	0.04
Exist	5.40	100 yr + 25	234.33	-1.60	4.36		4.36	0.000037	0.40	628.67	333.34	0.04
Exist	6.30	2 yr	216.18	-3.14	4.12		4.14	0.000281	1.24	183.99	131.68	0.10
Exist	6.30	10 yr	220.33	-3.14	4.17		4.20	0.000281	1.24	191.53	137.23	0.10
Exist	6.30	100 yr	228.97	-3.14	4.29		4.31	0.000282	1.24	208.06	149.24	0.10
Exist	6.30	100 yr + 25	234.33	-3.14	4.36		4.38	0.000281	1.23	218.93	156.73	0.10
Exist	6.50		Culvert									
Exist	6.70	2 yr	216.18	-3.18	4.89	-1.17	4.91	0.000025	1.09	200.25	48.98	0.08
Exist	6.70	10 yr	220.33	-3.18	4.96	-1.15	4.98	0.000025	1.09	204.39	60.37	0.08
Exist	6.70	100 yr	228.97	-3.18	5.10	-1.11	5.12	0.000025	1.11	214.04	80.94	0.08
Exist	6.70	100 yr + 25	234.33	-3.18	5.17	-1.08	5.19	0.000025	1.12	220.23	92.83	0.08
Exist	6.94	2 yr	216.18	-1.15	4.91		4.91	0.000003	0.30	715.87	197.92	0.03
Exist	6.94	10 yr	220.33	-1.15	4.99		4.99	0.000003	0.30	730.94	198.63	0.03
Exist	6.94	100 yr	228.97	-1.15	5.13		5.13	0.000003	0.30	758.32	199.88	0.03
Exist	6.94	100 yr + 25	234.33	-1.15	5.20		5.20	0.000003	0.30	772.73	200.49	0.03
Exist	7.20	2 yr	216.18	-1.89	4.91		4.91	0.000023	0.35	624.98	162.17	0.03
Exist	7.20	10 yr	220.33	-1.89	4.99		4.99	0.000022	0.35	637.33	162.81	0.03
Exist	7.20	100 yr	228.97	-1.89	5.13		5.13	0.000022	0.35	659.78	163.97	0.03
Exist	7.20	100 yr + 25	234.33	-1.89	5.20		5.20	0.000021	0.35	671.60	164.58	0.03

HEC-RAS Plan: PropRev River: EB Riser Ditch Reach: Exist (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Exist	8.50	2 yr	216.18	-1.12	4.92		4.92	0.000019	0.32	681.44	172.04	0.03
Exist	8.50	10 yr	220.33	-1.12	4.99		4.99	0.000018	0.32	694.52	172.47	0.03
Exist	8.50	100 yr	228.97	-1.12	5.13		5.13	0.000018	0.32	718.25	173.26	0.03
Exist	8.50	100 yr + 25	234.33	-1.12	5.20		5.20	0.000017	0.32	730.74	173.86	0.03
Exist	9.80	2 yr	216.18	-1.26	4.92		4.92	0.000022	0.35	620.16	156.52	0.03
Exist	9.80	10 yr	220.33	-1.26	4.99		5.00	0.000022	0.35	632.05	156.97	0.03
Exist	9.80	100 yr	228.97	-1.26	5.13		5.13	0.000021	0.35	654.18	165.96	0.03
Exist	9.80	100 yr + 25	234.33	-1.26	5.20		5.21	0.000021	0.35	666.30	170.86	0.03
Exist	11.50	2 yr	216.18	-0.99	4.92		4.92	0.000024	0.36	600.80	150.91	0.03
Exist	11.50	10 yr	220.33	-0.99	5.00		5.00	0.000023	0.36	612.25	151.34	0.03
Exist	11.50	100 yr	228.97	-0.99	5.14		5.14	0.000023	0.36	633.03	151.75	0.03
Exist	11.50	100 yr + 25	234.33	-0.99	5.21		5.21	0.000022	0.36	643.95	151.96	0.03
Exist	13.0	2 yr	216.18	-0.72	4.92		4.93	0.000088	0.67	321.70	126.48	0.06
Exist	13.0	10 yr	220.33	-0.72	5.00		5.01	0.000087	0.67	328.10	134.47	0.06
Exist	13.0	100 yr	228.97	-0.72	5.14		5.14	0.000083	0.67	339.74	141.00	0.06
Exist	13.0	100 yr + 25	234.33	-0.72	5.21		5.22	0.000082	0.68	345.84	144.43	0.06
Exist	13.5	2 yr	216.18	-2.70	4.89	-0.54	4.98	0.000427	2.37	91.12	89.13	0.15
Exist	13.5	10 yr	220.33	-2.70	4.97	-0.51	5.06	0.000429	2.39	92.01	93.25	0.15
Exist	13.5	100 yr	228.97	-2.70	5.10	-0.45	5.20	0.000438	2.45	93.63	100.66	0.15
Exist	13.5	100 yr + 25	234.33	-2.70	5.17	-0.42	5.27	0.000445	2.48	94.48	104.54	0.16
Exist	16.76		Culvert									
Exist	20.03	2 yr	216.18	-2.40	5.74	-0.24	5.82	0.000054	2.21	97.69	208.65	0.14
Exist	20.03	10 yr	220.33	-2.40	5.85	-0.21	5.93	0.000054	2.23	99.00	238.03	0.14
Exist	20.03	100 yr	228.97	-2.40	6.06	-0.16	6.14	0.000053	2.26	101.52	266.90	0.14
Exist	20.03	100 yr + 25	234.33	-2.40	6.18	-0.12	6.26	0.000053	2.28	102.93	271.86	0.14
Exist	20.50	2 yr	216.18	-2.50	5.83		5.84	0.000092	0.82	308.88	252.23	0.06
Exist	20.50	10 yr	220.33	-2.50	5.94		5.95	0.000086	0.81	337.27	256.91	0.06
Exist	20.50	100 yr	228.97	-2.50	6.15		6.16	0.000075	0.78	393.02	265.87	0.06
Exist	20.50	100 yr + 25	234.33	-2.50	6.27		6.28	0.000070	0.76	425.40	270.94	0.06
Exist	21.50	2 yr	218.49	-1.38	5.84		5.85	0.000081	0.77	335.40	216.16	0.06
Exist	21.50	10 yr	223.67	-1.38	5.95		5.96	0.000077	0.76	360.45	236.07	0.06
Exist	21.50	100 yr	244.78	-1.38	6.16		6.17	0.000077	0.77	416.84	292.92	0.06
Exist	21.50	100 yr + 25	267.24	-1.38	6.28		6.29	0.000082	0.81	452.71	306.17	0.06
Exist	24.00	2 yr	334.84	-0.97	5.86		5.88	0.000181	1.13	383.97	287.03	0.09
Exist	24.00	10 yr	415.61	-0.97	5.98		6.00	0.000251	1.35	418.93	344.52	0.11
Exist	24.00	100 yr	599.08	-0.97	6.19		6.23	0.000411	1.77	529.23	549.74	0.14
Exist	24.00	100 yr + 25	716.90	-0.97	6.32		6.37	0.000507	2.00	597.79	557.99	0.15
Exist	26.00	2 yr	335.20	-0.61	5.90		5.92	0.000181	1.13	362.36	173.04	0.09
Exist	26.00	10 yr	415.90	-0.61	6.03		6.05	0.000249	1.35	395.28	414.89	0.11
Exist	26.00	100 yr	618.50	-0.61	6.27		6.32	0.000426	1.82	506.53	477.40	0.14
Exist	26.00	100 yr + 25	764.40	-0.61	6.42		6.48	0.000555	2.12	576.92	504.35	0.16
Exist	26.5		Lat Struct									
Exist	28.00	2 yr	335.20	-0.18	5.94		5.96	0.000240	1.26	316.41	170.30	0.10
Exist	28.00	10 yr	415.90	-0.18	6.08		6.11	0.000324	1.49	359.58	427.60	0.12
Exist	28.00	100 yr	618.50	-0.18	6.36		6.41	0.000523	1.95	493.21	508.37	0.15
Exist	28.00	100 yr + 25	764.40	-0.18	6.53		6.60	0.000651	2.22	585.37	584.04	0.17
Exist	30.00	2 yr	335.20	-1.29	5.98		6.00	0.000163	1.13	374.36	238.85	0.09
Exist	30.00	10 yr	415.90	-1.29	6.14		6.16	0.000214	1.32	467.81	654.39	0.10
Exist	30.00	100 yr	618.50	-1.29	6.46		6.50	0.000319	1.67	686.89	704.06	0.12
Exist	30.00	100 yr + 25	764.40	-1.29	6.66		6.70	0.000379	1.86	826.90	734.05	0.13
Exist	32.00	2 yr	335.20	-1.29	6.01		6.03	0.000122	1.02	440.31	590.66	0.08
Exist	32.00	10 yr	415.90	-1.29	6.18		6.20	0.000160	1.19	572.47	891.30	0.09
Exist	32.00	100 yr	618.50	-1.29	6.52		6.55	0.000223	1.46	893.28	973.65	0.10
Exist	32.00	100 yr + 25	764.40	-1.29	6.73		6.76	0.000254	1.59	1099.71	1023.15	0.11
Exist	34.00	2 yr	335.20	-1.69	6.04		6.05	0.000122	0.99	745.90	979.93	0.07
Exist	34.00	10 yr	415.90	-1.69	6.22		6.23	0.000139	1.08	922.47	1029.32	0.08
Exist	34.00	100 yr	618.50	-1.69	6.56		6.59	0.000168	1.23	1309.15	1129.96	0.09
Exist	34.00	100 yr + 25	764.40	-1.69	6.79		6.80	0.000183	1.31	1556.29	1189.83	0.09
Exist	36.00	2 yr	335.20	-1.93	6.07		6.07	0.000042	0.60	1253.96	1078.50	0.04
Exist	36.00	10 yr	415.90	-1.93	6.24		6.25	0.000050	0.66	1450.90	1128.79	0.05
Exist	36.00	100 yr	618.50	-1.93	6.61		6.61	0.000066	0.79	1878.84	1231.02	0.05
Exist	36.00	100 yr + 25	764.40	-1.93	6.82		6.83	0.000076	0.86	2150.55	1290.53	0.06

HEC-RAS Plan: PropRev River: EB Riser Ditch Reach: Exist (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Exist	38.00	2 yr	335.20	-2.03	6.07		6.08	0.000026	0.46	1765.73	1218.11	0.03
Exist	38.00	10 yr	415.90	-2.03	6.25		6.26	0.000030	0.51	1988.12	1255.12	0.04
Exist	38.00	100 yr	518.50	-2.03	6.62		6.62	0.000039	0.60	2460.75	1330.35	0.04
Exist	38.00	100 yr + 25	764.40	-2.03	6.84		6.84	0.000045	0.66	2754.01	1368.79	0.05

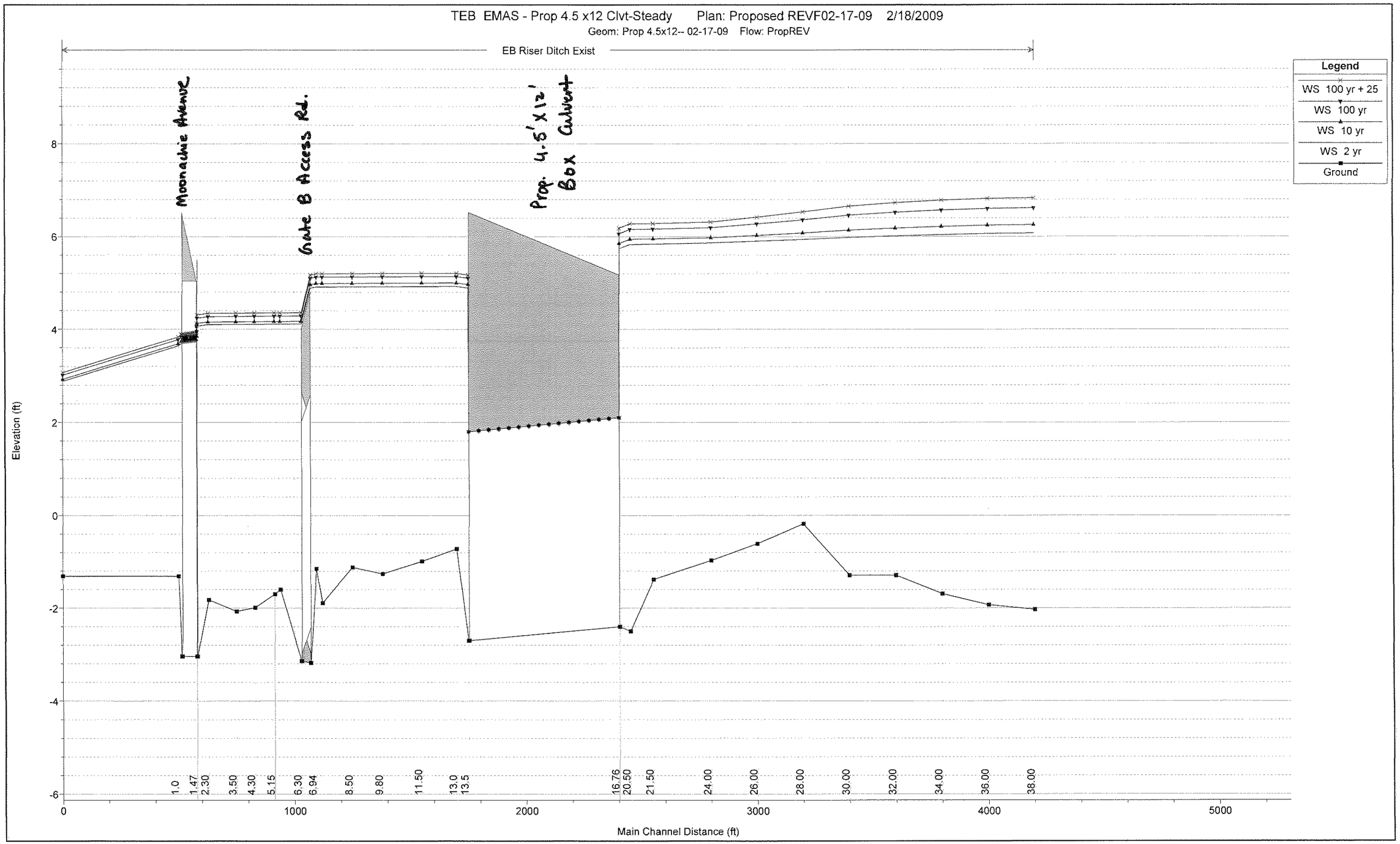
HEC-RAS Plan: PropRev River: EB Riser Ditch Reach: Exist

Reach	River Sta	Profile	E.G. US. (ft)	W.S. US (ft)	E.G. IC (ft)	E.G. OC (ft)	Min El Weir Flow (ft)	Q Culv Group (cfs)	Q Weir (cfs)	Delta WS (ft)	Culv Vel US (ft/s)	Culv Vel DS (ft/s)
Exist	1.47 Culvert #1	2 yr	3.93	3.90	0.16	3.93	6.51	216.18		0.21	2.90	2.91
Exist	1.47 Culvert #1	10 yr	3.98	3.96	0.21	3.98	6.51	220.33		0.21	2.95	2.96
Exist	1.47 Culvert #1	100 yr	4.09	4.06	0.30	4.09	6.51	228.97		0.23	3.04	3.05
Exist	1.47 Culvert #1	100 yr + 25	4.16	4.13	0.35	4.16	6.51	234.33		0.24	3.09	3.10
Exist	6.50 Culvert #1	2 yr	4.91	4.89	1.56	4.91	4.81	107.85	0.47	0.77	5.49	5.49
Exist	6.50 Culvert #2	2 yr	4.91	4.89	2.04	4.91	4.81	107.86	0.47	0.77	5.49	5.49
Exist	6.50 Culvert #1	10 yr	4.98	4.96	1.60	4.98	4.81	109.20	1.93	0.79	5.56	5.56
Exist	6.50 Culvert #2	10 yr	4.98	4.96	2.08	4.98	4.81	109.21	1.93	0.79	5.56	5.56
Exist	6.50 Culvert #1	100 yr	5.12	5.10	1.64	5.12	4.81	110.65	7.66	0.81	5.64	5.64
Exist	6.50 Culvert #2	100 yr	5.12	5.10	2.12	5.12	4.81	110.66	7.66	0.81	5.64	5.64
Exist	6.50 Culvert #1	100 yr + 25	5.19	5.17	1.64	5.19	4.81	110.70	12.91	0.81	5.64	5.64
Exist	6.50 Culvert #2	100 yr + 25	5.19	5.17	2.12	5.19	4.81	110.71	12.91	0.81	5.64	5.64
Exist	16.76 Culvert #1	2 yr	5.82	5.74	1.06	5.82	6.53	216.18		0.85	4.00	4.00
Exist	16.76 Culvert #1	10 yr	5.93	5.85	1.11	5.93	6.53	220.33		0.88	4.08	4.08
Exist	16.76 Culvert #1	100 yr	6.14	6.06	1.20	6.14	6.53	228.97		0.96	4.24	4.24
Exist	16.76 Culvert #1	100 yr + 25	6.26	6.18	1.26	6.26	6.53	234.33		1.00	4.34	4.34

Velocity is greater than 3.0 ft/sec
∴ EOP is required downstream of the proposed culvert.

TEB EMAS - Prop 4.5 x12 Clvt-Steady Plan: Proposed REVF02-17-09 2/18/2009

Geom: Prop 4.5x12-- 02-17-09 Flow: PropREV



1 in Horiz. = 400 ft 1 in Vert. = 2 ft

CHA GRADED LATERAL STRUCTURE (Overflow Weir)

1" = 50'

±5.5

STA 0 66 164.5 255.5 300.5 437.5 522.5 592.5 627.5 698.5
ELEV 6.85 6.83 6.63 6.79 6 5.5 5.5 5.5 6 7

HEC-RAS Version 4.0.0 March 2008
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X      X   X     X  X    X
X     X  X        X           X   X     X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X           X  X      X    X        X
X     X  X        X    X      X   X     X    X        X
X     X  XXXXXX    XXXX       X    X    X    X   XXXXX
```

PROJECT DATA
Project Title: TEB EMAS - Prop 4.5 x12 Clvt-Steady
Project File : ProposedREVF.prj
Run Date and Time: 2/18/2009 2:28:10 PM

Project in English units

Project Description:
PA NY&NJ Teterboro Airport
Runway 1-19 Safety Improvements

Sections looking
dounstream (south)
Sections extended based on available mapping

Proposed
Conditions

Starting W.S. = Normal Depth (S=.002)
Culverts assumed
clean

Steady Flow

Revised inflow due to revised Channel 1 Routing.

Revised Flow
Proposed 4.5 x 12 ft Box Culvert
Diversion Analysis
(Proposed Lateral Striucture)

Revised Red Neck Ave Grading - Revised Lateral
Structure for Overflow
Revise to maintain existing Red Neck Ave Grades at
overflow area

Lowered Culvert
Proposed channel (Sections 10-15)
Channel
Cleaning not considered in hydraulics

PLAN DATA

Plan Title: Proposed REVF02-17-09
Plan File : j:\2006 Projects\060070.005\TEB EMAS Stream Encroachment Permit\Documents\Rev
HEC-RAS\ERD\Prop 02-17-09\ProposedREVF.p02

Geometry Title: Prop 4.5x12-- 02-17-09
Geometry File : j:\2006 Projects\060070.005\TEB EMAS Stream Encroachment Permit\Documents\Rev
HEC-RAS\ERD\Prop 02-17-09\ProposedREVF.g01

Flow Title   : PropREV
Flow File   : j:\2006 Projects\060070.005\TEB EMAS Stream Encroachment Permit\Documents\Rev
HEC-RAS\ERD\Prop 02-17-09\ProposedREVF.f05

Plan Description:
Revised Weir Shifted up to 5.5 ft at the center Revised Expanision and

Contraction Coefficient downstream of Gate B access road.

Plan Summary Information:

Number of:	Cross Sections	= 31	Multiple Openings	=	0
	Culverts	= 3	Inline Structures	=	0
	Bridges	= 0	Lateral Structures	=	1

Computational Information

Water surface calculation tolerance	= 0.01
Critical depth calculation tolerance	= 0.01
Maximum number of iterations	= 20
Maximum difference tolerance	= 0.3
Flow tolerance factor	= 0.001

Computation Options

Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: PropREV
Flow File : j:\2006 Projects\060070.005\TEB EMAS Stream Encroachment Permit\Documents\Rev HEC-RAS\ERD\Prop 02-17-09\ProposedREVF.f05

Flow Data (cfs)

River	Reach	RS	2 yr	10 yr	25 yr	100 yr	100 yr + 25
EB Riser Ditch	Exist	38.00	335.2	415.9	465	618.5	764.4

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
EB Riser Ditch	Exist	2 yr		Normal S = 0.002
EB Riser Ditch	Exist	10 yr		Normal S = 0.002
EB Riser Ditch	Exist	25 yr		Normal S = 0.002
EB Riser Ditch	Exist	100 yr		Normal S = 0.002

GEOMETRY DATA

Geometry Title: Prop 4.5x12-- 02-17-09
Geometry File : j:\2006 Projects\060070.005\TEB EMAS Stream Encroachment Permit\Documents\Rev HEC-RAS\ERD\Prop 02-17-09\ProposedREVF.g01

CROSS SECTION

RIVER: EB Riser Ditch
REACH: Exist RS: 38.00

INPUT
Description: Section 30
Station Elevation Data num= 33

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-665	7	-516	6	-430	5	-314	5.3	-246	5
-204	4	-165	3.8	-96	4	-30	5	0	5.1
4.76	5.17	46.96	6.04	71.55	6.05	77.77	.55	102.82	-2.03
118.46	.25	129.49	7.94	152.12	7.94	171	5.98	195.2	5.09
200	5	288	4.25	307	4.21	412	5	462	5
479	5.2	486	5	590	4	596	3.5	611	4
682	5	731	6	763	6.7				

Manning's n values num= 3

Sta	n Val	Sta	n Val	Sta	n Val

-665 .08 71.55 .05 129.49 .06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
71.55	129.49	200	200	.1	.3

CROSS SECTION OUTPUT Profile #2 yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	6.08	Wt. n-Val.	0.080	0.050	0.060
Vel Head (ft)	0.00	Reach Len. (ft)	200.00	200.00	200.00
W.S. Elev (ft)	6.07	Flow Area (sq ft)	680.21	321.18	764.34
Crit W.S. (ft)		Area (sq ft)	680.21	321.18	764.34
E.G. Slope (ft/ft)	0.000026	Flow (cfs)	69.55	148.52	117.13
Q Total (cfs)	335.20	Top Width (ft)	598.56	55.26	564.28
Top Width (ft)	1218.11	Avg. Vel. (ft/s)	0.10	0.46	0.15
Vel Total (ft/s)	0.19	Hydr. Depth (ft)	1.14	5.81	1.35
Max Chl Dpth (ft)	8.10	Conv. (cfs)	13757.8	29380.5	23171.3
Conv. Total (cfs)	66309.6	Wetted Per. (ft)	598.60	59.47	564.37
Length Wtd. (ft)	200.00	Shear (lb/sq ft)	0.00	0.01	0.00
Min Ch El (ft)	-2.03	Stream Power (lb/ft s)	0.00	0.00	0.00
Alpha	2.92	Cum Volume (acre-ft)	5.29	12.44	7.13
Frctn Loss (ft)	0.01	Cum SA (acres)	11.03	7.03	9.62
C & E Loss (ft)	0.00				

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #10 yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	6.26	Wt. n-Val.	0.080	0.050	0.060
Vel Head (ft)	0.00	Reach Len. (ft)	200.00	200.00	200.00
W.S. Elev (ft)	6.25	Flow Area (sq ft)	790.26	331.14	866.72
Crit W.S. (ft)		Area (sq ft)	790.26	331.14	866.72
E.G. Slope (ft/ft)	0.000030	Flow (cfs)	93.64	168.14	154.13
Q Total (cfs)	415.90	Top Width (ft)	625.36	55.52	574.24
Top Width (ft)	1255.12	Avg. Vel. (ft/s)	0.12	0.51	0.18
Vel Total (ft/s)	0.21	Hydr. Depth (ft)	1.26	5.96	1.51
Max Chl Dpth (ft)	8.28	Conv. (cfs)	17156.1	30806.4	28240.0
Conv. Total (cfs)	76202.6	Wetted Per. (ft)	625.39	59.79	574.33
Length Wtd. (ft)	200.00	Shear (lb/sq ft)	0.00	0.01	0.00
Min Ch El (ft)	-2.03	Stream Power (lb/ft s)	0.00	0.01	0.00
Alpha	2.72	Cum Volume (acre-ft)	7.62	12.75	8.40
Frctn Loss (ft)	0.01	Cum SA (acres)	17.29	7.05	10.15
C & E Loss (ft)	0.00				

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #100 yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	6.62	Wt. n-Val.	0.080	0.050	0.060
Vel Head (ft)	0.00	Reach Len. (ft)	200.00	200.00	200.00
W.S. Elev (ft)	6.62	Flow Area (sq ft)	1028.85	351.54	1080.36
Crit W.S. (ft)		Area (sq ft)	1028.85	351.54	1080.36
E.G. Slope (ft/ft)	0.000039	Flow (cfs)	157.65	211.50	249.35
Q Total (cfs)	618.50	Top Width (ft)	679.83	56.05	594.47
Top Width (ft)	1330.35	Avg. Vel. (ft/s)	0.15	0.60	0.23
Vel Total (ft/s)	0.25	Hydr. Depth (ft)	1.51	6.27	1.82
Max Chl Dpth (ft)	8.65	Conv. (cfs)	25188.9	33792.7	39839.5
Conv. Total (cfs)	98821.1	Wetted Per. (ft)	679.87	60.43	594.59
Length Wtd. (ft)	200.00	Shear (lb/sq ft)	0.00	0.01	0.00
Min Ch El (ft)	-2.03	Stream Power (lb/ft s)	0.00	0.01	0.00
Alpha	2.39	Cum Volume (acre-ft)	13.51	13.40	11.13
Frctn Loss (ft)	0.01	Cum SA (acres)	20.41	7.08	11.07
C & E Loss (ft)	0.00				

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #100 yr + 25

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	6.84	Wt. n-Val.	0.080	0.050	0.060
Vel Head (ft)	0.00	Reach Len. (ft)	200.00	200.00	200.00
W.S. Elev (ft)	6.84	Flow Area (sq ft)	1179.96	363.74	1210.31
Crit W.S. (ft)		Area (sq ft)	1179.96	363.74	1210.31
E.G. Slope (ft/ft)	0.000045	Flow (cfs)	205.52	238.57	320.31
Q Total (cfs)	764.40	Top Width (ft)	712.18	56.36	600.25
Top Width (ft)	1368.79	Avg. Vel. (ft/s)	0.17	0.66	0.26
Vel Total (ft/s)	0.28	Hydr. Depth (ft)	1.66	6.45	2.02
Max Chl Dpth (ft)	8.87				

Conv. Total (cfs)	114132.1	Conv. (cfs)	30686.2	35621.1	47824.8
Length Wtd. (ft)	200.00	Wetted Per. (ft)	712.22	60.81	600.52
Min Ch El (ft)	-2.03	Shear (lb/sq ft)	0.00	0.02	0.01
Alpha	2.23	Stream Power (lb/ft s)	0.00	0.01	0.00
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	17.32	13.78	12.85
C & E Loss (ft)	0.00	Cum SA (acres)	21.58	7.09	11.58

Warning: Divided flow computed for this cross-section.
Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: EB Riser Ditch
REACH: Exist RS: 36.00

INPUT
Description: Section 29
Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-775	7	-555	6	-313	5	-248	4.95	-152	5
0	5.9	42.8	5.98	73.04	5.7	77.01	.34	100	-1.93
119.23	.46	123.56	2.33	131.27	7.98	137.19	8.76	152.09	8.99
168.49	6	200	5.4	243	5	312	4	403	4.2
502	5	545	6	589	6.8				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-775	.08	73.04	.05	131.27	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
73.04	131.27	189	200	212	.1 .3

CROSS SECTION OUTPUT Profile #2 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	6.07	Element			
Vel Head (ft)	0.00	Wt. n-Val.	0.080	0.050	0.060
W.S. Elev (ft)	6.07	Reach Len. (ft)	189.00	200.00	212.00
Crit W.S. (ft)		Flow Area (sq ft)	418.55	330.32	505.09
E.G. Slope (ft/ft)	0.000042	Area (sq ft)	418.55	330.32	505.09
Q Total (cfs)	335.20	Flow (cfs)	38.03	198.82	98.35
Top Width (ft)	1078.50	Top Width (ft)	642.42	55.62	380.46
Vel Total (ft/s)	0.27	Avg. Vel. (ft/s)	0.09	0.60	0.19
Max Chl Dpth (ft)	8.00	Hydr. Depth (ft)	0.65	5.94	1.33
Conv. Total (cfs)	51495.1	Conv. (cfs)	5842.5	30544.1	15108.5
Length Wtd. (ft)	200.91	Wetted Per. (ft)	642.42	60.19	380.50
Min Ch El (ft)	-1.93	Shear (lb/sq ft)	0.00	0.01	0.00
Alpha	3.18	Stream Power (lb/ft s)	0.00	0.01	0.00
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	2.77	10.94	4.21
C & E Loss (ft)	0.00	Cum SA (acres)	8.18	6.78	7.46

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	6.25	Element			
Vel Head (ft)	0.00	Wt. n-Val.	0.080	0.050	0.060
W.S. Elev (ft)	6.24	Reach Len. (ft)	189.00	200.00	212.00
Crit W.S. (ft)		Flow Area (sq ft)	536.68	340.27	573.94
E.G. Slope (ft/ft)	0.000050	Area (sq ft)	536.68	340.27	573.94
Q Total (cfs)	415.90	Flow (cfs)	60.08	226.11	129.71
Top Width (ft)	1128.79	Top Width (ft)	681.68	55.86	391.26
Vel Total (ft/s)	0.29	Avg. Vel. (ft/s)	0.11	0.66	0.23
Max Chl Dpth (ft)	8.17	Hydr. Depth (ft)	0.79	6.09	1.47
Conv. Total (cfs)	58833.6	Conv. (cfs)	8499.3	31985.4	18349.0
Length Wtd. (ft)	200.69	Wetted Per. (ft)	681.68	60.49	391.31
Min Ch El (ft)	-1.93	Shear (lb/sq ft)	0.00	0.02	0.00
Alpha	3.14	Stream Power (lb/ft s)	0.00	0.01	0.00
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	4.57	11.21	5.09
C & E Loss (ft)	0.00	Cum SA (acres)	14.29	6.80	7.94

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	6.61	Element			
Vel Head (ft)	0.00	Wt. n-Val.	0.080	0.050	0.060
W.S. Elev (ft)	6.61	Reach Len. (ft)	189.00	200.00	212.00
Crit W.S. (ft)		Flow Area (sq ft)	798.40	360.62	719.83
E.G. Slope (ft/ft)	0.000066	Area (sq ft)	798.40	360.62	719.83
Q Total (cfs)	618.50	Flow (cfs)	124.37	284.42	209.71
Top Width (ft)	1231.02	Top Width (ft)	761.47	56.36	413.19
Vel Total (ft/s)	0.33	Avg. Vel. (ft/s)	0.16	0.79	0.29
Max Chl Dpth (ft)	8.54	Hydr. Depth (ft)	1.05	6.40	1.74
Conv. Total (cfs)	76111.7	Conv. (cfs)	15304.9	35000.5	25806.3
Length Wtd. (ft)	200.25	Wetted Per. (ft)	761.48	61.10	413.28
Min Ch El (ft)	-1.93	Shear (lb/sq ft)	0.00	0.02	0.01
Alpha	2.95	Stream Power (lb/ft s)	0.00	0.02	0.00
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	9.32	11.76	7.00
C & E Loss (ft)	0.00	Cum SA (acres)	17.10	6.82	8.76

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 yr + 25

			Left OB	Channel	Right OB
E.G. Elev (ft)	6.83	Element			
Vel Head (ft)	0.01	Wt. n-Val.	0.080	0.050	0.060
W.S. Elev (ft)	6.82	Reach Len. (ft)	189.00	200.00	212.00
Crit W.S. (ft)		Flow Area (sq ft)	967.53	372.79	810.23
E.G. Slope (ft/ft)	0.000076	Area (sq ft)	967.53	372.79	810.23
Q Total (cfs)	764.40	Flow (cfs)	176.02	320.27	268.10
Top Width (ft)	1290.53	Top Width (ft)	808.86	56.65	425.02
Vel Total (ft/s)	0.36	Avg. Vel. (ft/s)	0.18	0.86	0.33
Max Chl Dpth (ft)	8.75	Hydr. Depth (ft)	1.20	6.58	1.91
Conv. Total (cfs)	87938.4	Conv. (cfs)	20250.2	36845.0	30843.2
Length Wtd. (ft)	200.01	Wetted Per. (ft)	808.87	61.47	425.15
Min Ch El (ft)	-1.93	Shear (lb/sq ft)	0.01	0.03	0.01
Alpha	2.81	Stream Power (lb/ft s)	0.00	0.02	0.00
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	12.39	12.09	8.21
C & E Loss (ft)	0.00	Cum SA (acres)	18.09	6.83	9.23

Warning: Divided flow computed for this cross-section.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: EB Riser Ditch
REACH: Exist RS: 34.00

INPUT
Description: Section 28

Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-847	7	-627	6	-332	5	-26	6	0	6
63.47	5.77	76.02	5.57	80.47	1.21	99.25	-1.69	115.84	.72
124.6	4.43	169.55	5.18	200	5.3	341	6	402	7
412	7.2								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-847	.08	76.02	.05	124.6	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
76.02	124.6	191	200	210	.1 .3

CROSS SECTION OUTPUT Profile #2 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	6.05	Element			
Vel Head (ft)	0.01	Wt. n-Val.	0.080	0.050	0.060
W.S. Elev (ft)	6.04	Reach Len. (ft)	191.00	200.00	210.00
Crit W.S. (ft)		Flow Area (sq ft)	342.00	268.45	135.45
E.G. Slope (ft/ft)	0.000122	Area (sq ft)	342.00	268.45	135.45
Q Total (cfs)	335.20	Flow (cfs)	43.07	265.20	26.93
Top Width (ft)	979.93	Top Width (ft)	712.36	48.58	218.99

Vel Total (ft/s)	0.45	Avg. Vel. (ft/s)	0.13	0.99	0.20
Max Chl Dpth (ft)	7.73	Hydr. Depth (ft)	0.48	5.53	0.62
Conv. Total (cfs)	30311.6	Conv. (cfs)	3894.7	23981.8	2435.2
Length Wtd. (ft)	200.02	Wetted Per. (ft)	712.37	51.51	219.00
Min Ch El (ft)	-1.69	Shear (lb/sq ft)	0.00	0.04	0.00
Alpha	3.85	Stream Power (lb/ft s)	0.00	0.04	0.00
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	1.12	9.57	2.65
C & E Loss (ft)	0.00	Cum SA (acres)	5.24	6.54	6.00

CROSS SECTION OUTPUT Profile #10 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	6.23	Element			
Vel Head (ft)	0.01	Wt. n-Val.	0.080	0.050	0.060
W.S. Elev (ft)	6.22	Reach Len. (ft)	191.00	200.00	210.00
Crit W.S. (ft)		Flow Area (sq ft)	470.59	276.99	174.88
E.G. Slope (ft/ft)	0.000139	Area (sq ft)	470.59	276.99	174.88
Q Total (cfs)	415.90	Flow (cfs)	75.46	297.87	42.57
Top Width (ft)	1029.32	Top Width (ft)	751.03	48.58	229.71
Vel Total (ft/s)	0.45	Avg. Vel. (ft/s)	0.16	1.08	0.24
Max Chl Dpth (ft)	7.91	Hydr. Depth (ft)	0.63	5.70	0.76
Conv. Total (cfs)	35277.8	Conv. (cfs)	6400.4	25266.4	3611.0
Length Wtd. (ft)	199.95	Wetted Per. (ft)	751.03	51.51	229.72
Min Ch El (ft)	-1.69	Shear (lb/sq ft)	0.01	0.05	0.01
Alpha	4.13	Stream Power (lb/ft s)	0.00	0.05	0.00
Frctn Loss (ft)	0.03	Cum Volume (acre-ft)	2.39	9.80	3.27
C & E Loss (ft)	0.00	Cum SA (acres)	11.18	6.56	6.43

CROSS SECTION OUTPUT Profile #100 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	6.59	Element			
Vel Head (ft)	0.01	Wt. n-Val.	0.080	0.050	0.060
W.S. Elev (ft)	6.58	Reach Len. (ft)	191.00	200.00	210.00
Crit W.S. (ft)		Flow Area (sq ft)	753.69	294.39	261.07
E.G. Slope (ft/ft)	0.000168	Area (sq ft)	753.69	294.39	261.07
Q Total (cfs)	618.50	Flow (cfs)	170.16	362.46	85.89
Top Width (ft)	1129.96	Top Width (ft)	829.82	48.58	251.56
Vel Total (ft/s)	0.47	Avg. Vel. (ft/s)	0.23	1.23	0.33
Max Chl Dpth (ft)	8.27	Hydr. Depth (ft)	0.91	6.06	1.04
Conv. Total (cfs)	47722.7	Conv. (cfs)	13129.0	27966.6	6627.1
Length Wtd. (ft)	199.49	Wetted Per. (ft)	829.83	51.51	251.57
Min Ch El (ft)	-1.69	Shear (lb/sq ft)	0.01	0.06	0.01
Alpha	4.11	Stream Power (lb/ft s)	0.00	0.07	0.00
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)	5.95	10.26	4.61
C & E Loss (ft)	0.00	Cum SA (acres)	13.65	6.58	7.14

CROSS SECTION OUTPUT Profile #100 yr + 25

			Left OB	Channel	Right OB
E.G. Elev (ft)	6.80	Element			
Vel Head (ft)	0.01	Wt. n-Val.	0.080	0.050	0.060
W.S. Elev (ft)	6.79	Reach Len. (ft)	191.00	200.00	210.00
Crit W.S. (ft)		Flow Area (sq ft)	935.49	304.74	316.05
E.G. Slope (ft/ft)	0.000183	Area (sq ft)	935.49	304.74	316.05
Q Total (cfs)	764.40	Flow (cfs)	245.12	400.22	119.05
Top Width (ft)	1189.83	Top Width (ft)	876.70	48.58	264.56
Vel Total (ft/s)	0.49	Avg. Vel. (ft/s)	0.26	1.31	0.38
Max Chl Dpth (ft)	8.48	Hydr. Depth (ft)	1.07	6.27	1.19
Conv. Total (cfs)	56580.8	Conv. (cfs)	18144.1	29624.6	8812.1
Length Wtd. (ft)	199.20	Wetted Per. (ft)	876.71	51.51	264.57
Min Ch El (ft)	-1.69	Shear (lb/sq ft)	0.01	0.07	0.01
Alpha	3.93	Stream Power (lb/ft s)	0.00	0.09	0.01
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)	8.27	10.53	5.47
C & E Loss (ft)	0.00	Cum SA (acres)	14.43	6.59	7.55

CROSS SECTION

RIVER: EB Riser Ditch
REACH: Exist RS: 32.00

INPUT
Description: Section 27
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-772	7	-572	6	-279	6	0	6.1	18.73	6.15
74.58	4.54	82	.59	100.19	-1.29	122.28	.44	127.87	4.2

134.35	4.41	156.15	4.58	159.32	5.04	166.31	5.4	173.06	5.37
200	5.5	276	6	339	7.6				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-772	.08	74.58	.05	127.87	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
74.58	127.87	200	200	.1	.3

CROSS SECTION OUTPUT Profile #2 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	6.03	Element			
Vel Head (ft)	0.01	Wt. n-Val.	0.080	0.050	0.060
W.S. Elev (ft)	6.01	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)		Flow Area (sq ft)	42.42	304.29	93.60
E.G. Slope (ft/ft)	0.000122	Area (sq ft)	42.42	304.29	93.60
Q Total (cfs)	335.20	Flow (cfs)	6.37	310.04	18.79
Top Width (ft)	590.66	Top Width (ft)	388.66	53.29	148.72
Vel Total (ft/s)	0.76	Avg. Vel. (ft/s)	0.15	1.02	0.20
Max Chl Dpth (ft)	7.30	Hydr. Depth (ft)	0.11	5.71	0.63
Conv. Total (cfs)	30366.4	Conv. (cfs)	576.9	28087.5	1702.0
Length Wtd. (ft)	200.00	Wetted Per. (ft)	388.68	55.59	148.76
Min Ch El (ft)	-1.29	Shear (lb/sq ft)	0.00	0.04	0.00
Alpha	1.66	Stream Power (lb/ft s)	0.00	0.04	0.00
Frctn Loss (ft)	0.03	Cum Volume (acre-ft)	0.27	8.25	2.10
C & E Loss (ft)	0.00	Cum SA (acres)	2.83	6.31	5.11

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #10 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	6.20	Element			
Vel Head (ft)	0.02	Wt. n-Val.	0.080	0.050	0.060
W.S. Elev (ft)	6.18	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)		Flow Area (sq ft)	140.51	313.13	118.83
E.G. Slope (ft/ft)	0.000160	Area (sq ft)	140.51	313.13	118.83
Q Total (cfs)	415.90	Flow (cfs)	11.52	373.19	31.18
Top Width (ft)	891.30	Top Width (ft)	682.75	53.29	155.25
Vel Total (ft/s)	0.73	Avg. Vel. (ft/s)	0.08	1.19	0.26
Max Chl Dpth (ft)	7.47	Hydr. Depth (ft)	0.21	5.88	0.77
Conv. Total (cfs)	32833.0	Conv. (cfs)	909.7	29461.5	2461.8
Length Wtd. (ft)	200.00	Wetted Per. (ft)	682.78	55.59	155.30
Min Ch El (ft)	-1.29	Shear (lb/sq ft)	0.00	0.06	0.01
Alpha	2.42	Stream Power (lb/ft s)	0.00	0.07	0.00
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)	1.05	8.44	2.56
C & E Loss (ft)	0.00	Cum SA (acres)	8.04	6.32	5.50

CROSS SECTION OUTPUT Profile #100 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	6.55	Element			
Vel Head (ft)	0.03	Wt. n-Val.	0.080	0.050	0.060
W.S. Elev (ft)	6.52	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)		Flow Area (sq ft)	387.24	331.47	174.57
E.G. Slope (ft/ft)	0.000223	Area (sq ft)	387.24	331.47	174.57
Q Total (cfs)	618.50	Flow (cfs)	69.00	483.52	65.98
Top Width (ft)	973.65	Top Width (ft)	751.56	53.29	168.80
Vel Total (ft/s)	0.69	Avg. Vel. (ft/s)	0.18	1.46	0.38
Max Chl Dpth (ft)	7.81	Hydr. Depth (ft)	0.52	6.22	1.03
Conv. Total (cfs)	41435.2	Conv. (cfs)	4622.7	32392.2	4420.3
Length Wtd. (ft)	200.00	Wetted Per. (ft)	751.59	55.59	168.85
Min Ch El (ft)	-1.29	Shear (lb/sq ft)	0.01	0.08	0.01
Alpha	3.51	Stream Power (lb/ft s)	0.00	0.12	0.01
Frctn Loss (ft)	0.05	Cum Volume (acre-ft)	3.45	8.82	3.56
C & E Loss (ft)	0.00	Cum SA (acres)	10.18	6.34	6.13

CROSS SECTION OUTPUT Profile #100 yr + 25

			Left OB	Channel	Right OB
E.G. Elev (ft)	6.76	Element			
Vel Head (ft)	0.03	Wt. n-Val.	0.080	0.050	0.060
W.S. Elev (ft)	6.73	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)		Flow Area (sq ft)	546.91	342.48	210.31
E.G. Slope (ft/ft)	0.000254	Area (sq ft)	546.91	342.48	210.31
Q Total (cfs)	764.40	Flow (cfs)	126.34	544.97	93.09
Top Width (ft)	1023.15	Top Width (ft)	792.91	53.29	176.94
Vel Total (ft/s)	0.70	Avg. Vel. (ft/s)	0.23	1.59	0.44

Max Chl Dpth (ft)	8.02	Hydr. Depth (ft)	0.69	6.43	1.19
Conv. Total (cfs)	47979.6	Conv. (cfs)	7930.0	34206.6	5843.0
Length Wtd. (ft)	200.00	Wetted Per. (ft)	792.94	55.59	177.00
Min Ch El (ft)	-1.29	Shear (lb/sq ft)	0.01	0.10	0.02
Alpha	3.80	Stream Power (lb/ft s)	0.00	0.16	0.01
Frctn Loss (ft)	0.06	Cum Volume (acre-ft)	5.02	9.04	4.20
C & E Loss (ft)	0.00	Cum SA (acres)	10.77	6.35	6.48

CROSS SECTION

RIVER: EB Riser Ditch
REACH: Exist RS: 30.00

INPUT
Description: Section 26
Station Elevation Data num= 26

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-765	8	-712	7	-704	7	-651	7	-465	7
-381	6	-365	6	-258	6	-35	6	0	6
7.65	6.01	31.61	5.85	66.96	5.82	73.86	5.65	82.75	.61
100	-1.29	118.34	.62	121.72	1.82	125.61	4.4	181.51	5.3
187.38	5.49	192.97	5.42	200	5.4	252	6	322	7
371	8								

Manning's n values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-765	.08	73.86	.05	125.61	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
73.86	125.61	200	200	.1	.3

CROSS SECTION OUTPUT Profile #2 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	6.00	Element			
Vel Head (ft)	0.02	Wt. n-Val.	0.080	0.050	0.060
W.S. Elev (ft)	5.98	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)		Flow Area (sq ft)	8.27	277.59	88.50
E.G. Slope (ft/ft)	0.000163	Area (sq ft)	8.27	277.59	88.50
Q Total (cfs)	335.20	Flow (cfs)	0.51	312.47	22.22
Top Width (ft)	238.85	Top Width (ft)	62.18	51.75	124.92
Vel Total (ft/s)	0.90	Avg. Vel. (ft/s)	0.06	1.13	0.25
Max Chl Dpth (ft)	7.27	Hydr. Depth (ft)	0.13	5.36	0.71
Conv. Total (cfs)	26272.0	Conv. (cfs)	40.0	24490.3	1741.7
Length Wtd. (ft)	200.00	Wetted Per. (ft)	62.18	54.27	124.94
Min Ch El (ft)	-1.29	Shear (lb/sq ft)	0.00	0.05	0.01
Alpha	1.48	Stream Power (lb/ft s)	0.00	0.06	0.00
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)	0.16	6.91	1.68
C & E Loss (ft)	0.00	Cum SA (acres)	1.79	6.07	4.48

CROSS SECTION OUTPUT Profile #10 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	6.16	Element			
Vel Head (ft)	0.02	Wt. n-Val.	0.080	0.050	0.060
W.S. Elev (ft)	6.14	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)		Flow Area (sq ft)	73.29	285.65	108.86
E.G. Slope (ft/ft)	0.000214	Area (sq ft)	73.29	285.65	108.86
Q Total (cfs)	415.90	Flow (cfs)	5.80	376.09	34.01
Top Width (ft)	654.39	Top Width (ft)	466.53	51.75	136.11
Vel Total (ft/s)	0.89	Avg. Vel. (ft/s)	0.08	1.32	0.31
Max Chl Dpth (ft)	7.43	Hydr. Depth (ft)	0.16	5.52	0.80
Conv. Total (cfs)	28406.8	Conv. (cfs)	396.4	25687.6	2322.8
Length Wtd. (ft)	200.00	Wetted Per. (ft)	466.53	54.27	136.13
Min Ch El (ft)	-1.29	Shear (lb/sq ft)	0.00	0.07	0.01
Alpha	1.99	Stream Power (lb/ft s)	0.00	0.09	0.00
Frctn Loss (ft)	0.05	Cum Volume (acre-ft)	0.55	7.07	2.04
C & E Loss (ft)	0.00	Cum SA (acres)	5.40	6.08	4.83

CROSS SECTION OUTPUT Profile #100 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	6.50	Element			
Vel Head (ft)	0.04	Wt. n-Val.	0.080	0.050	0.060
W.S. Elev (ft)	6.46	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)		Flow Area (sq ft)	228.14	302.34	156.41
E.G. Slope (ft/ft)	0.000319	Area (sq ft)	228.14	302.34	156.41
Q Total (cfs)	618.50	Flow (cfs)	45.27	504.67	68.56

Top Width (ft)	704.06	Top Width (ft)	493.62	51.75	158.69
Vel Total (ft/s)	0.90	Avg. Vel. (ft/s)	0.20	1.67	0.44
Max Chl Dpth (ft)	7.75	Hydr. Depth (ft)	0.46	5.84	0.99
Conv. Total (cfs)	34606.7	Conv. (cfs)	2533.0	28237.8	3835.9
Length Wtd. (ft)	200.00	Wetted Per. (ft)	493.63	54.27	158.71
Min Ch El (ft)	-1.29	Shear (lb/sq ft)	0.01	0.11	0.02
Alpha	2.83	Stream Power (lb/ft s)	0.00	0.19	0.01
Frctn Loss (ft)	0.08	Cum Volume (acre-ft)	2.03	7.37	2.80
C & E Loss (ft)	0.00	Cum SA (acres)	7.32	6.10	5.38

CROSS SECTION OUTPUT Profile #100 yr + 25

E.G. Elev (ft)	6.70	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.04	Wt. n-Val.	0.080	0.050	0.060
W.S. Elev (ft)	6.66	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)		Flow Area (sq ft)	325.85	312.42	188.63
E.G. Slope (ft/ft)	0.000379	Area (sq ft)	325.85	312.42	188.63
Q Total (cfs)	764.40	Flow (cfs)	87.38	580.45	96.57
Top Width (ft)	734.05	Top Width (ft)	509.98	51.75	172.32
Vel Total (ft/s)	0.92	Avg. Vel. (ft/s)	0.27	1.86	0.51
Max Chl Dpth (ft)	7.95	Hydr. Depth (ft)	0.64	6.04	1.09
Conv. Total (cfs)	39275.0	Conv. (cfs)	4489.8	29823.7	4961.5
Length Wtd. (ft)	200.00	Wetted Per. (ft)	509.98	54.27	172.34
Min Ch El (ft)	-1.29	Shear (lb/sq ft)	0.02	0.14	0.03
Alpha	3.12	Stream Power (lb/ft s)	0.00	0.25	0.01
Frctn Loss (ft)	0.10	Cum Volume (acre-ft)	3.01	7.54	3.29
C & E Loss (ft)	0.00	Cum SA (acres)	7.78	6.11	5.68

CROSS SECTION

RIVER: EB Riser Ditch
REACH: Exist RS: 28.00

INPUT
Description: Section 25
Station Elevation Data num= 24

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-600	7	-394	7	-250	6	-211	6	-49	6
-22	6	0	6.2	27.36	6.59	66.91	6.43	74.47	6.6
83.1	.8	87.76	.69	96.66	-.18	107.87	-.1	118.44	.72
123.43	2.97	128.92	4.93	188.81	5.46	194.71	5.34	200	5.4
251	6	302	7	369	8	380	8.3		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-600	.08	74.47	.05	128.92	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
74.47	128.92	200	200	200	.1	.3

CROSS SECTION OUTPUT Profile #2 yr

E.G. Elev (ft)	5.96	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.02	Wt. n-Val.		0.050	0.060
W.S. Elev (ft)	5.94	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)		Flow Area (sq ft)		253.39	63.01
E.G. Slope (ft/ft)	0.000240	Area (sq ft)		253.39	63.01
Q Total (cfs)	335.20	Flow (cfs)		319.19	16.01
Top Width (ft)	170.30	Top Width (ft)		53.47	116.84
Vel Total (ft/s)	1.06	Avg. Vel. (ft/s)		1.26	0.25
Max Chl Dpth (ft)	6.12	Hydr. Depth (ft)		4.74	0.54
Conv. Total (cfs)	21652.3	Conv. (cfs)		20618.4	1033.9
Length Wtd. (ft)	200.00	Wetted Per. (ft)		55.93	116.84
Min Ch El (ft)	-0.18	Shear (lb/sq ft)		0.07	0.01
Alpha	1.35	Stream Power (lb/ft s)		0.09	0.00
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)	0.14	5.70	1.34
C & E Loss (ft)	0.00	Cum SA (acres)	1.65	5.82	3.93

CROSS SECTION OUTPUT Profile #10 yr

E.G. Elev (ft)	6.11	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.03	Wt. n-Val.	0.080	0.050	0.060
W.S. Elev (ft)	6.08	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)		Flow Area (sq ft)	18.60	260.89	80.09
E.G. Slope (ft/ft)	0.000324	Area (sq ft)	18.60	260.89	80.09

Q Total (cfs)	415.90	Flow (cfs)	1.11	388.41	26.38
Top Width (ft)	427.60	Top Width (ft)	247.86	53.67	126.07
Vel Total (ft/s)	1.16	Avg. Vel. (ft/s)	0.06	1.49	0.33
Max Chl Dpth (ft)	6.26	Hydr. Depth (ft)	0.08	4.86	0.64
Conv. Total (cfs)	23107.3	Conv. (cfs)	61.5	21580.2	1465.6
Length Wtd. (ft)	200.00	Wetted Per. (ft)	247.86	56.18	126.08
Min Ch El (ft)	-0.18	Shear (lb/sq ft)	0.00	0.09	0.01
Alpha	1.55	Stream Power (lb/ft s)	0.00	0.14	0.00
Frctn Loss (ft)	0.06	Cum Volume (acre-ft)	0.34	5.81	1.61
C & E Loss (ft)	0.00	Cum SA (acres)	3.76	5.84	4.23

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	6.41	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.05	Wt. n-Val.	0.080	0.050	0.060
W.S. Elev (ft)	6.36	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)		Flow Area (sq ft)	98.94	276.23	118.04
E.G. Slope (ft/ft)	0.000523	Area (sq ft)	98.94	276.23	118.04
Q Total (cfs)	618.50	Flow (cfs)	19.47	539.53	59.50
Top Width (ft)	508.37	Top Width (ft)	313.68	54.10	140.59
Vel Total (ft/s)	1.25	Avg. Vel. (ft/s)	0.20	1.95	0.50
Max Chl Dpth (ft)	6.54	Hydr. Depth (ft)	0.32	5.11	0.84
Conv. Total (cfs)	27046.9	Conv. (cfs)	851.4	23593.7	2601.7
Length Wtd. (ft)	200.00	Wetted Per. (ft)	313.69	56.69	140.60
Min Ch El (ft)	-0.18	Shear (lb/sq ft)	0.01	0.16	0.03
Alpha	2.13	Stream Power (lb/ft s)	0.00	0.31	0.01
Frctn Loss (ft)	0.09	Cum Volume (acre-ft)	1.28	6.04	2.17
C & E Loss (ft)	0.00	Cum SA (acres)	5.47	5.86	4.69

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #100 yr + 25

E.G. Elev (ft)	6.60	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.06	Wt. n-Val.	0.080	0.050	0.060
W.S. Elev (ft)	6.53	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)		Flow Area (sq ft)	157.13	285.48	142.77
E.G. Slope (ft/ft)	0.000651	Area (sq ft)	157.13	285.48	142.77
Q Total (cfs)	764.40	Flow (cfs)	43.03	633.79	87.58
Top Width (ft)	584.04	Top Width (ft)	380.40	54.35	149.29
Vel Total (ft/s)	1.31	Avg. Vel. (ft/s)	0.27	2.22	0.61
Max Chl Dpth (ft)	6.71	Hydr. Depth (ft)	0.41	5.25	0.96
Conv. Total (cfs)	29953.9	Conv. (cfs)	1686.1	24835.9	3431.9
Length Wtd. (ft)	200.00	Wetted Per. (ft)	380.41	57.00	149.30
Min Ch El (ft)	-0.18	Shear (lb/sq ft)	0.02	0.20	0.04
Alpha	2.42	Stream Power (lb/ft s)	0.00	0.45	0.02
Frctn Loss (ft)	0.12	Cum Volume (acre-ft)	1.90	6.17	2.53
C & E Loss (ft)	0.00	Cum SA (acres)	5.74	5.87	4.94

Warning: Divided flow computed for this cross-section.

LATERAL STRUCTURE

RIVER: EB Riser Ditch
REACH: Exist RS: 26.5

INPUT
Description: Proposed Flow over Revised Wier- Red Neck Ave
Lateral structure position = Left overbank
Distance from Upstream XS =
Deck/Roadway Width = 30
Weir Coefficient = 2.8
Weir Flow Reference = Water Surface
Weir Embankment Coordinates num = 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6.85	66	6.83	164.5	6.663	255.5	6.79	300.5	6
437.5	5.5	522.5	5.5	592.5	5.5	627.5	6	698.5	7

Weir crest shape = Broad Crested

CROSS SECTION

RIVER: EB Riser Ditch
REACH: Exist RS: 26.00

INPUT
Description: Section 24
Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-523	8	-297	7	-171	6	-7	6	0	6.1
5.8	6.15	15.14	5.92	75.07	5.93	82.1	.95	97	-.56
99.11	-.61	118.9	.35	130.33	4.51	162.93	4.94	183.74	5.01
200	5.2	255	6	317	7	375	8		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-523	.08	75.07	.05	130.33	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
75.07	130.33	200	200	.1	.3

CROSS SECTION OUTPUT Profile #2 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	5.92	Element			
Vel Head (ft)	0.02	Wt. n-Val.		0.050	0.060
W.S. Elev (ft)	5.90	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)		Flow Area (sq ft)		275.00	87.36
E.G. Slope (ft/ft)	0.000181	Area (sq ft)		275.00	87.36
Q Total (cfs)	335.20	Flow (cfs)		311.37	23.83
Top Width (ft)	173.04	Top Width (ft)		55.22	117.82
Vel Total (ft/s)	0.93	Avg. Vel. (ft/s)		1.13	0.27
Max Chl Dpth (ft)	6.51	Hydr. Depth (ft)		4.98	0.74
Conv. Total (cfs)	24936.7	Conv. (cfs)		23164.2	1772.4
Length Wtd. (ft)	200.00	Wetted Per. (ft)		57.63	117.83
Min Ch El (ft)	-0.61	Shear (lb/sq ft)		0.05	0.01
Alpha	1.40	Stream Power (lb/ft s)		0.06	0.00
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)	0.14	4.48	0.99
C & E Loss (ft)	0.00	Cum SA (acres)	1.65	5.57	3.39

CROSS SECTION OUTPUT Profile #10 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	6.05	Element			
Vel Head (ft)	0.03	Wt. n-Val.	0.080	0.050	0.060
W.S. Elev (ft)	6.03	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)		Flow Area (sq ft)	10.62	281.94	102.72
E.G. Slope (ft/ft)	0.000249	Area (sq ft)	10.62	281.94	102.72
Q Total (cfs)	415.90	Flow (cfs)	0.50	380.46	34.94
Top Width (ft)	414.89	Top Width (ft)	233.34	55.26	126.29
Vel Total (ft/s)	1.05	Avg. Vel. (ft/s)	0.05	1.35	0.34
Max Chl Dpth (ft)	6.64	Hydr. Depth (ft)	0.05	5.10	0.81
Conv. Total (cfs)	26381.5	Conv. (cfs)	31.8	24133.3	2216.4
Length Wtd. (ft)	200.00	Wetted Per. (ft)	233.34	57.68	126.30
Min Ch El (ft)	-0.61	Shear (lb/sq ft)	0.00	0.08	0.01
Alpha	1.51	Stream Power (lb/ft s)	0.00	0.10	0.00
Frctn Loss (ft)	0.05	Cum Volume (acre-ft)	0.28	4.57	1.19
C & E Loss (ft)	0.00	Cum SA (acres)	2.65	5.59	3.65

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #100 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	6.32	Element			
Vel Head (ft)	0.05	Wt. n-Val.	0.080	0.050	0.060
W.S. Elev (ft)	6.27	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)		Flow Area (sq ft)	75.07	295.61	135.85
E.G. Slope (ft/ft)	0.000426	Area (sq ft)	75.07	295.61	135.85
Q Total (cfs)	618.50	Flow (cfs)	11.95	539.01	67.54
Top Width (ft)	477.40	Top Width (ft)	280.52	55.26	141.62
Vel Total (ft/s)	1.22	Avg. Vel. (ft/s)	0.16	1.82	0.50
Max Chl Dpth (ft)	6.88	Hydr. Depth (ft)	0.27	5.35	0.96
Conv. Total (cfs)	29965.7	Conv. (cfs)	579.1	26114.5	3272.1
Length Wtd. (ft)	200.00	Wetted Per. (ft)	280.52	57.68	141.63
Min Ch El (ft)	-0.61	Shear (lb/sq ft)	0.01	0.14	0.03
Alpha	1.96	Stream Power (lb/ft s)	0.00	0.25	0.01
Frctn Loss (ft)	0.08	Cum Volume (acre-ft)	0.88	4.73	1.59
C & E Loss (ft)	0.00	Cum SA (acres)	4.10	5.61	4.04

CROSS SECTION OUTPUT Profile #100 yr + 25

			Left OB	Channel	Right OB
E.G. Elev (ft)	6.48	Element			
Vel Head (ft)	0.06	Wt. n-Val.	0.080	0.050	0.060
W.S. Elev (ft)	6.42	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)		Flow Area (sq ft)	116.59	303.53	156.79
E.G. Slope (ft/ft)	0.000555	Area (sq ft)	116.59	303.53	156.79
Q Total (cfs)	764.40	Flow (cfs)	27.26	643.11	94.02
Top Width (ft)	504.35	Top Width (ft)	298.58	55.26	150.51
Vel Total (ft/s)	1.32	Avg. Vel. (ft/s)	0.23	2.12	0.60
Max Chl Dpth (ft)	7.03	Hydr. Depth (ft)	0.39	5.49	1.04
Conv. Total (cfs)	32438.5	Conv. (cfs)	1156.9	27291.5	3990.1
Length Wtd. (ft)	200.00	Wetted Per. (ft)	298.59	57.68	150.52
Min Ch El (ft)	-0.61	Shear (lb/sq ft)	0.01	0.18	0.04
Alpha	2.18	Stream Power (lb/ft s)	0.00	0.39	0.02
Frctn Loss (ft)	0.11	Cum Volume (acre-ft)	1.27	4.82	1.84
C & E Loss (ft)	0.00	Cum SA (acres)	4.18	5.62	4.25

CROSS SECTION

RIVER: EB Riser Ditch
REACH: Exist RS: 24.00

INPUT
Description: Section 23
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-276	6	-151	6	-136	6.2	-121	6	0	5.6
7.85	5.63	33.95	6	72.49	5.97	81.2	.42	86.44	.26
100.67	-.97	118.03	.82	127.02	4.87	175.51	4.77	200	5
264	6	321	7	374	8				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-276	.08	72.49	.05	127.02	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
72.49	127.02	250	250	.1	.3

CROSS SECTION OUTPUT Profile #2 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	5.88	Element			
Vel Head (ft)	0.02	Wt. n-Val.	0.080	0.050	0.060
W.S. Elev (ft)	5.86	Reach Len. (ft)	250.00	250.00	250.00
Crit W.S. (ft)		Flow Area (sq ft)	14.47	270.96	98.54
E.G. Slope (ft/ft)	0.000181	Area (sq ft)	14.47	270.96	98.54
Q Total (cfs)	334.84	Flow (cfs)	0.97	306.34	27.53
Top Width (ft)	287.03	Top Width (ft)	104.36	54.36	128.30
Vel Total (ft/s)	0.87	Avg. Vel. (ft/s)	0.07	1.13	0.28
Max Chl Dpth (ft)	6.83	Hydr. Depth (ft)	0.14	4.98	0.77
Conv. Total (cfs)	24892.7	Conv. (cfs)	72.0	22774.3	2046.5
Length Wtd. (ft)	250.00	Wetted Per. (ft)	104.37	56.97	128.31
Min Ch El (ft)	-0.97	Shear (lb/sq ft)	0.00	0.05	0.01
Alpha	1.55	Stream Power (lb/ft s)	0.00	0.06	0.00
Frctn Loss (ft)	0.03	Cum Volume (acre-ft)	0.11	3.23	0.56
C & E Loss (ft)	0.00	Cum SA (acres)	1.41	5.32	2.82

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #10 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	6.00	Element			
Vel Head (ft)	0.03	Wt. n-Val.	0.080	0.050	0.060
W.S. Elev (ft)	5.98	Reach Len. (ft)	250.00	250.00	250.00
Crit W.S. (ft)		Flow Area (sq ft)	28.54	277.07	113.32
E.G. Slope (ft/ft)	0.000251	Area (sq ft)	28.54	277.07	113.32
Q Total (cfs)	415.61	Flow (cfs)	2.82	373.34	39.44
Top Width (ft)	344.52	Top Width (ft)	154.52	54.53	135.48
Vel Total (ft/s)	0.99	Avg. Vel. (ft/s)	0.10	1.35	0.35
Max Chl Dpth (ft)	6.95	Hydr. Depth (ft)	0.18	5.08	0.84
Conv. Total (cfs)	26251.0	Conv. (cfs)	178.1	23581.5	2491.4
Length Wtd. (ft)	250.00	Wetted Per. (ft)	154.52	57.17	135.48
Min Ch El (ft)	-0.97	Shear (lb/sq ft)	0.00	0.08	0.01
Alpha	1.67	Stream Power (lb/ft s)	0.00	0.10	0.00
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)	0.19	3.28	0.69
C & E Loss (ft)	0.01	Cum SA (acres)	1.76	5.34	3.05

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #100 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	6.23	Element			
Vel Head (ft)	0.04	Wt. n-Val.	0.080	0.050	0.060
W.S. Elev (ft)	6.19	Reach Len. (ft)	250.00	250.00	250.00
Crit W.S. (ft)		Flow Area (sq ft)	96.54	288.82	143.87
E.G. Slope (ft/ft)	0.000411	Area (sq ft)	96.54	288.82	143.87
Q Total (cfs)	599.08	Flow (cfs)	16.17	512.05	70.87
Top Width (ft)	549.74	Top Width (ft)	347.29	54.53	147.92
Vel Total (ft/s)	1.13	Avg. Vel. (ft/s)	0.17	1.77	0.49
Max Chl Dpth (ft)	7.16	Hydr. Depth (ft)	0.28	5.30	0.97
Conv. Total (cfs)	29567.5	Conv. (cfs)	798.0	25271.9	3497.6
Length Wtd. (ft)	250.00	Wetted Per. (ft)	347.49	57.17	147.93
Min Ch El (ft)	-0.97	Shear (lb/sq ft)	0.01	0.13	0.02
Alpha	2.12	Stream Power (lb/ft s)	0.00	0.23	0.01
Frctn Loss (ft)	0.05	Cum Volume (acre-ft)	0.49	3.38	0.95
C & E Loss (ft)	0.01	Cum SA (acres)	2.66	5.36	3.38

Warning: Divided flow computed for this cross-section.
Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION OUTPUT Profile #100 yr + 25

			Left OB	Channel	Right OB
E.G. Elev (ft)	6.37	Element			
Vel Head (ft)	0.05	Wt. n-Val.	0.080	0.050	0.060
W.S. Elev (ft)	6.32	Reach Len. (ft)	250.00	250.00	250.00
Crit W.S. (ft)		Flow Area (sq ft)	139.63	295.56	162.60
E.G. Slope (ft/ft)	0.000507	Area (sq ft)	139.63	295.56	162.60
Q Total (cfs)	716.90	Flow (cfs)	31.73	591.53	93.65
Top Width (ft)	557.99	Top Width (ft)	348.49	54.53	154.97
Vel Total (ft/s)	1.20	Avg. Vel. (ft/s)	0.23	2.00	0.58
Max Chl Dpth (ft)	7.29	Hydr. Depth (ft)	0.40	5.42	1.05
Conv. Total (cfs)	31829.2	Conv. (cfs)	1408.6	26262.9	4157.7
Length Wtd. (ft)	250.00	Wetted Per. (ft)	348.81	57.17	154.98
Min Ch El (ft)	-0.97	Shear (lb/sq ft)	0.01	0.16	0.03
Alpha	2.33	Stream Power (lb/ft s)	0.00	0.33	0.02
Frctn Loss (ft)	0.06	Cum Volume (acre-ft)	0.69	3.44	1.11
C & E Loss (ft)	0.01	Cum SA (acres)	2.69	5.37	3.55

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: EB Riser Ditch
REACH: Exist RS: 21.50

INPUT
Description: Section 22
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-83	5.8	-73	5.6	-35	6	0	6.1	50.95	7.33
68.82	6.07	81.53	.22	88.41	-.99	101.92	-1.38	109.33	.02
114.83	.41	122.86	5.37	154.8	5.4	191.91	5.21	200	5.2
266	6	321	7	367	8				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-83	.08	68.82	.05	122.86	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
68.82	122.86	100	100	100	.1 .3

CROSS SECTION OUTPUT Profile #2 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	5.85	Element			
Vel Head (ft)	0.01	Wt. n-Val.	0.080	0.050	0.060
W.S. Elev (ft)	5.84	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)		Flow Area (sq ft)	4.11	274.95	56.34
E.G. Slope (ft/ft)	0.000081	Area (sq ft)	4.11	274.95	56.34
Q Total (cfs)	218.49	Flow (cfs)	0.17	211.13	7.19
Top Width (ft)	216.16	Top Width (ft)	32.74	53.54	129.89
Vel Total (ft/s)	0.65	Avg. Vel. (ft/s)	0.04	0.77	0.13

Max Chl Dpth (ft)	7.22	Hydr. Depth (ft)	0.13	5.14	0.43
Conv. Total (cfs)	24301.6	Conv. (cfs)	19.2	23483.1	799.4
Length Wtd. (ft)	100.00	Wetted Per. (ft)	32.78	56.43	129.89
Min Ch El (ft)	-1.38	Shear (lb/sq ft)	0.00	0.02	0.00
Alpha	1.34	Stream Power (lb/ft s)	0.00	0.02	0.00
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.05	1.66	0.12
C & E Loss (ft)	0.00	Cum SA (acres)	1.02	5.01	2.08

Warning: Divided flow computed for this cross-section.
Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION OUTPUT Profile #10 yr

E.G. Elev (ft)	5.96	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.01	Wt. n-Val.	0.080	0.050	0.060
W.S. Elev (ft)	5.95	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)		Flow Area (sq ft)	8.32	280.90	71.23
E.G. Slope (ft/ft)	0.000077	Area (sq ft)	8.32	280.90	71.23
Q Total (cfs)	223.67	Flow (cfs)	0.45	213.28	9.93
Top Width (ft)	236.07	Top Width (ft)	43.26	53.78	139.03
Vel Total (ft/s)	0.62	Avg. Vel. (ft/s)	0.05	0.76	0.14
Max Chl Dpth (ft)	7.33	Hydr. Depth (ft)	0.19	5.22	0.51
Conv. Total (cfs)	25440.3	Conv. (cfs)	51.4	24259.4	1129.5
Length Wtd. (ft)	100.00	Wetted Per. (ft)	43.42	56.70	139.03
Min Ch El (ft)	-1.38	Shear (lb/sq ft)	0.00	0.02	0.00
Alpha	1.43	Stream Power (lb/ft s)	0.00	0.02	0.00
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.08	1.68	0.16
C & E Loss (ft)	0.00	Cum SA (acres)	1.20	5.03	2.26

Warning: Divided flow computed for this cross-section.
Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	6.17	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.01	Wt. n-Val.	0.080	0.050	0.060
W.S. Elev (ft)	6.16	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)		Flow Area (sq ft)	22.40	292.31	102.12
E.G. Slope (ft/ft)	0.000077	Area (sq ft)	22.40	292.31	102.12
Q Total (cfs)	244.78	Flow (cfs)	1.48	226.31	16.99
Top Width (ft)	292.92	Top Width (ft)	86.85	54.04	152.03
Vel Total (ft/s)	0.59	Avg. Vel. (ft/s)	0.07	0.77	0.17
Max Chl Dpth (ft)	7.54	Hydr. Depth (ft)	0.26	5.41	0.67
Conv. Total (cfs)	27946.6	Conv. (cfs)	169.2	25837.6	1939.8
Length Wtd. (ft)	100.00	Wetted Per. (ft)	87.22	56.99	152.04
Min Ch El (ft)	-1.38	Shear (lb/sq ft)	0.00	0.02	0.00
Alpha	1.61	Stream Power (lb/ft s)	0.00	0.02	0.00
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.15	1.72	0.24
C & E Loss (ft)	0.00	Cum SA (acres)	1.42	5.05	2.52

Warning: Divided flow computed for this cross-section.
Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION OUTPUT Profile #100 yr + 25

E.G. Elev (ft)	6.29	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.01	Wt. n-Val.	0.080	0.050	0.060
W.S. Elev (ft)	6.28	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)		Flow Area (sq ft)	33.21	298.78	120.73
E.G. Slope (ft/ft)	0.000082	Area (sq ft)	33.21	298.78	120.73
Q Total (cfs)	267.24	Flow (cfs)	2.81	241.93	22.50
Top Width (ft)	306.17	Top Width (ft)	93.51	54.04	158.62
Vel Total (ft/s)	0.59	Avg. Vel. (ft/s)	0.08	0.81	0.19
Max Chl Dpth (ft)	7.66	Hydr. Depth (ft)	0.36	5.53	0.76
Conv. Total (cfs)	29601.6	Conv. (cfs)	311.3	26798.1	2492.3
Length Wtd. (ft)	100.00	Wetted Per. (ft)	94.01	56.99	158.63
Min Ch El (ft)	-1.38	Shear (lb/sq ft)	0.00	0.03	0.00
Alpha	1.71	Stream Power (lb/ft s)	0.00	0.02	0.00
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.19	1.74	0.29
C & E Loss (ft)	0.00	Cum SA (acres)	1.43	5.05	2.65

Warning: Divided flow computed for this cross-section.
Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: EB Riser Ditch
REACH: Exist RS: 20.50

INPUT
Description: Section 21
Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	5.3	16.87	5.72	59.14	5.56	73.56	5.59	77.65	3.67
84.14	.47	99.81	-2.5	113.49	.48	120.89	4.37	122.7	5.55
145.58	5.48	200	5.5	218	5.6	251	5.8	293	6.8
308	7.2	323	7.4	327	7.6	341	7.8	352	8

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	73.56	.05	122.7	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
73.56	122.7	90	47	20	.3	.5

CROSS SECTION OUTPUT Profile #2 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	5.84	Element			
Vel Head (ft)	0.01	Wt. n-Val.	0.060	0.050	0.060
W.S. Elev (ft)	5.83	Reach Len. (ft)	90.00	47.00	20.00
Crit W.S. (ft)		Flow Area (sq ft)	17.05	256.88	34.96
E.G. Slope (ft/ft)	0.000092	Area (sq ft)	17.05	256.88	34.96
Q Total (cfs)	216.18	Flow (cfs)	1.52	211.20	3.46
Top Width (ft)	252.23	Top Width (ft)	73.56	49.14	129.53
Vel Total (ft/s)	0.70	Avg. Vel. (ft/s)	0.09	0.82	0.10
Max Chl Dpth (ft)	8.33	Hydr. Depth (ft)	0.23	5.23	0.27
Conv. Total (cfs)	22599.1	Conv. (cfs)	158.5	22079.0	361.5
Length Wtd. (ft)	46.93	Wetted Per. (ft)	74.09	52.22	129.53
Min Ch El (ft)	-2.50	Shear (lb/sq ft)	0.00	0.03	0.00
Alpha	1.35	Stream Power (lb/ft s)	0.00	0.02	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.03	1.05	0.01
C & E Loss (ft)	0.02	Cum SA (acres)	0.89	4.90	1.79

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION OUTPUT Profile #10 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	5.95	Element			
Vel Head (ft)	0.01	Wt. n-Val.	0.060	0.050	0.060
W.S. Elev (ft)	5.94	Reach Len. (ft)	90.00	47.00	20.00
Crit W.S. (ft)		Flow Area (sq ft)	25.25	262.35	49.66
E.G. Slope (ft/ft)	0.000086	Area (sq ft)	25.25	262.35	49.66
Q Total (cfs)	220.33	Flow (cfs)	2.82	211.65	5.87
Top Width (ft)	256.91	Top Width (ft)	73.56	49.14	134.21
Vel Total (ft/s)	0.65	Avg. Vel. (ft/s)	0.11	0.81	0.12
Max Chl Dpth (ft)	8.44	Hydr. Depth (ft)	0.34	5.34	0.37
Conv. Total (cfs)	23808.1	Conv. (cfs)	304.8	22869.4	633.9
Length Wtd. (ft)	46.92	Wetted Per. (ft)	74.21	52.22	134.21
Min Ch El (ft)	-2.50	Shear (lb/sq ft)	0.00	0.03	0.00
Alpha	1.47	Stream Power (lb/ft s)	0.00	0.02	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.04	1.06	0.02
C & E Loss (ft)	0.02	Cum SA (acres)	1.06	4.91	1.95

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION OUTPUT Profile #100 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	6.16	Element			
Vel Head (ft)	0.01	Wt. n-Val.	0.060	0.050	0.060
W.S. Elev (ft)	6.15	Reach Len. (ft)	90.00	47.00	20.00
Crit W.S. (ft)		Flow Area (sq ft)	40.94	272.84	79.24
E.G. Slope (ft/ft)	0.000075	Area (sq ft)	40.94	272.84	79.24
Q Total (cfs)	228.97	Flow (cfs)	5.90	211.60	11.47
Top Width (ft)	265.87	Top Width (ft)	73.56	49.14	143.17
Vel Total (ft/s)	0.58	Avg. Vel. (ft/s)	0.14	0.78	0.14
Max Chl Dpth (ft)	8.65	Hydr. Depth (ft)	0.56	5.55	0.55
Conv. Total (cfs)	26416.2	Conv. (cfs)	680.8	24412.5	1323.0
Length Wtd. (ft)	46.88	Wetted Per. (ft)	74.42	52.22	143.17
Min Ch El (ft)	-2.50	Shear (lb/sq ft)	0.00	0.02	0.00
Alpha	1.64	Stream Power (lb/ft s)	0.00	0.02	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.08	1.07	0.04

C & E Loss (ft)	0.02	Cum SA (acres)	1.23	4.93	2.18

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION OUTPUT Profile #100 yr + 25

E.G. Elev (ft)	6.28	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.01	Wt. n-Val.	0.060	0.050	0.060
W.S. Elev (ft)	6.27	Reach Len. (ft)	90.00	47.00	20.00
Crit W.S. (ft)		Flow Area (sq ft)	49.82	278.77	96.82
E.G. Slope (ft/ft)	0.000070	Area (sq ft)	49.82	278.77	96.82
Q Total (cfs)	234.33	Flow (cfs)	7.88	211.37	15.08
Top Width (ft)	270.94	Top Width (ft)	73.56	49.14	148.24
Vel Total (ft/s)	0.55	Avg. Vel. (ft/s)	0.16	0.76	0.16
Max Chl Dpth (ft)	8.77	Hydr. Depth (ft)	0.68	5.67	0.65
Conv. Total (cfs)	28051.1	Conv. (cfs)	943.1	25303.0	1805.0
Length Wtd. (ft)	46.85	Wetted Per. (ft)	74.54	52.22	148.24
Min Ch El (ft)	-2.50	Shear (lb/sq ft)	0.00	0.02	0.00
Alpha	1.72	Stream Power (lb/ft s)	0.00	0.02	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.09	1.07	0.04
C & E Loss (ft)	0.02	Cum SA (acres)	1.23	4.94	2.30

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: EB Riser Ditch
REACH: Exist RS: 20.03

INPUT
Description: Section 20 - U/S Side of Proposed Culvert
Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	5.8	11.27	5.17	13.62	5.36	17.84	5.35	36.11	5.82
57.37	5.91	72.11	5.5	82.32	6.04	92	-2.4	108	-2.4
114.08	5.45	150	5.51	200	5.5	223	5.6	256	5.8
298	6.8	313	7.2	328	7.4	332	7.6	346	7.8
357	8								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	82.32	.02	114.08	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
82.32	114.08	653	653	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	94	6.5	F
106	357	6.5	F

CROSS SECTION OUTPUT Profile #2 yr

E.G. Elev (ft)	5.82	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.08	Wt. n-Val.		0.020	
W.S. Elev (ft)	5.74	Reach Len. (ft)	653.00	653.00	653.00
Crit W.S. (ft)	-0.24	Flow Area (sq ft)		97.69	
E.G. Slope (ft/ft)	0.000054	Area (sq ft)	10.20	193.88	27.13
Q Total (cfs)	216.18	Flow (cfs)		216.18	
Top Width (ft)	208.65	Top Width (ft)	45.14	31.42	132.09
Vel Total (ft/s)	2.21	Avg. Vel. (ft/s)		2.21	
Max Chl Dpth (ft)	8.14	Hydr. Depth (ft)		8.14	
Conv. Total (cfs)	29369.3	Conv. (cfs)		29369.3	
Length Wtd. (ft)	653.00	Wetted Per. (ft)		12.00	
Min Ch El (ft)	-2.40	Shear (lb/sq ft)		0.03	
Alpha	1.00	Stream Power (lb/ft s)		0.06	
Frctn Loss (ft)		Cum Volume (acre-ft)		0.81	
C & E Loss (ft)		Cum SA (acres)	0.77	4.85	1.73

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10 yr

E.G. Elev (ft)	5.93	Element	Left OB	Channel	Right OB

Vel Head (ft)	0.08	Wt. n-Val.		0.020	
W.S. Elev (ft)	5.85	Reach Len. (ft)	653.00	653.00	653.00
Crit W.S. (ft)	-0.21	Flow Area (sq ft)		99.00	
E.G. Slope (ft/ft)	0.000054	Area (sq ft)	15.90	197.33	42.47
Q Total (cfs)	220.33	Flow (cfs)		220.33	
Top Width (ft)	238.03	Top Width (ft)	62.46	31.54	144.03
Vel Total (ft/s)	2.23	Avg. Vel. (ft/s)		2.23	
Max Chl Dpth (ft)	8.25	Hydr. Depth (ft)		8.25	
Conv. Total (cfs)	30032.3	Conv. (cfs)		30032.3	
Length Wtd. (ft)	653.00	Wetted Per. (ft)		12.00	
Min Ch El (ft)	-2.40	Shear (lb/sq ft)		0.03	
Alpha	1.00	Stream Power (lb/ft s)		0.06	
Frctn Loss (ft)		Cum Volume (acre-ft)		0.81	
C & E Loss (ft)		Cum SA (acres)	0.92	4.86	1.88

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid,
energy was used.

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	6.14	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.08	Wt. n-Val.		0.020	
W.S. Elev (ft)	6.06	Reach Len. (ft)	653.00	653.00	653.00
Crit W.S. (ft)	-0.16	Flow Area (sq ft)		101.52	
E.G. Slope (ft/ft)	0.000053	Area (sq ft)	32.31	203.96	73.56
Q Total (cfs)	228.97	Flow (cfs)		228.97	
Top Width (ft)	266.90	Top Width (ft)	82.32	31.76	152.82
Vel Total (ft/s)	2.26	Avg. Vel. (ft/s)		2.26	
Max Chl Dpth (ft)	8.46	Hydr. Depth (ft)		8.46	
Conv. Total (cfs)	31313.5	Conv. (cfs)		31313.5	
Length Wtd. (ft)	653.00	Wetted Per. (ft)		12.00	
Min Ch El (ft)	-2.40	Shear (lb/sq ft)		0.03	
Alpha	1.00	Stream Power (lb/ft s)		0.06	
Frctn Loss (ft)		Cum Volume (acre-ft)		0.81	
C & E Loss (ft)		Cum SA (acres)	1.07	4.88	2.11

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid,
energy was used.

CROSS SECTION OUTPUT Profile #100 yr + 25

E.G. Elev (ft)	6.26	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.08	Wt. n-Val.		0.020	
W.S. Elev (ft)	6.18	Reach Len. (ft)	653.00	653.00	653.00
Crit W.S. (ft)	-0.12	Flow Area (sq ft)		102.93	
E.G. Slope (ft/ft)	0.000053	Area (sq ft)	42.03	207.71	91.90
Q Total (cfs)	234.33	Flow (cfs)		234.33	
Top Width (ft)	271.86	Top Width (ft)	82.32	31.76	157.78
Vel Total (ft/s)	2.28	Avg. Vel. (ft/s)		2.28	
Max Chl Dpth (ft)	8.58	Hydr. Depth (ft)		8.58	
Conv. Total (cfs)	32045.4	Conv. (cfs)		32045.4	
Length Wtd. (ft)	653.00	Wetted Per. (ft)		12.00	
Min Ch El (ft)	-2.40	Shear (lb/sq ft)		0.03	
Alpha	1.00	Stream Power (lb/ft s)		0.07	
Frctn Loss (ft)		Cum Volume (acre-ft)		0.81	
C & E Loss (ft)		Cum SA (acres)	1.07	4.89	2.23

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid,
energy was used.

CULVERT

RIVER: EB Riser Ditch
REACH: Exist RS: 16.76

INPUT
Description: Runway 119 - 4.5 ft x 12 ft opening
Superimposed high ground
between culverts as top of road
Distance from Upstream XS = .5
Deck/Roadway Width = 650
Weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates
num= 5

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
82.32	6.04	-5	92.5	6.28	-5	107.9	6.26	-5
200	7.4	-5	357	8	-5			

Upstream Bridge Cross Section Data
Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	5.8	11.27	5.17	13.62	5.36	17.84	5.35	36.11	5.82
57.37	5.91	72.11	5.5	82.32	6.04	92	-2.4	108	-2.4
114.08	5.45	150	5.51	200	5.5	223	5.6	256	5.8
298	6.8	313	7.2	328	7.4	332	7.6	346	7.8
357	8								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	82.32	.02	114.08	.04

Bank Sta: Left Right Coeff Contr. Expan.
82.32 114.08 .1 .3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	94	6.5	F
106	357	6.5	F

Downstream Deck/Roadway Coordinates
num= 5

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
30	6.5	-5	107.9	7	-5	200	7.5	-5
320	8	-5	345	8	-5			

Downstream Bridge Cross Section Data
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
26.99	9.83	36.14	4.89	75.66	3.58	91	-2.7	108	-2.7
120.33	4.8	164.97	5.64	223.14	5.51	235.59	5.6	284.58	5.68
320	6.3	330	6.4	345	6.6				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
26.99	.04	75.66	.05	120.33	.04

Bank Sta: Left Right Coeff Contr. Expan.
75.66 120.33 .3 .5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
26.99	93.5	6	F
105.5	345	6	F

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
Downstream Embankment side slope = 0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .95
Elevation at which weir flow begins =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Culverts = 1

Culvert Name	Shape	Rise	Span
Culvert #1	Box	4.5	12

FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG

Culvert	Upstrm Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss Coef	Exit Loss Coef
	.5	650	.015	.015	0	.5	1

Upstream Elevation = -2.4
Centerline Station = 100
Downstream Elevation = -2.7
Centerline Station = 100

CROSS SECTION

RIVER: EB Riser Ditch
REACH: Exist RS: 13.5

INPUT

Description: Section 15.5 - D/S Face of proposed culvert

Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
26.99	9.83	36.14	4.89	75.66	3.58	91	-2.7	108	-2.7
120.33	4.8	164.97	5.64	223.14	5.51	235.59	5.6	284.58	5.68
320	6.3	330	6.4	345	6.6				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
26.99	.04	75.66	.05	120.33	.04

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

75.66 120.33 60 50 80 .3 .5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
26.99	93.5	6	F
105.5	345	6	F

CROSS SECTION OUTPUT Profile #2 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	4.98	Element			
Vel Head (ft)	0.09	Wt. n-Val.		0.050	
W.S. Elev (ft)	4.89	Reach Len. (ft)	60.00	50.00	80.00
Crit W.S. (ft)	-0.54	Flow Area (sq ft)		91.12	
E.G. Slope (ft/ft)	0.000427	Area (sq ft)	26.00	244.77	0.23
Q Total (cfs)	216.18	Flow (cfs)		216.18	
Top Width (ft)	89.13	Top Width (ft)	39.53	44.67	4.94
Vel Total (ft/s)	2.37	Avg. Vel. (ft/s)		2.37	
Max Chl Dpth (ft)	7.59	Hydr. Depth (ft)		7.59	
Conv. Total (cfs)	10460.6	Conv. (cfs)		10460.6	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		12.00	
Min Ch El (ft)	-2.70	Shear (lb/sq ft)		0.20	
Alpha	1.00	Stream Power (lb/ft s)		0.48	
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.04	8.88	0.00
C & E Loss (ft)	0.04	Cum SA (acres)	0.14	4.28	0.70

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #10 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	5.06	Element			
Vel Head (ft)	0.09	Wt. n-Val.		0.050	
W.S. Elev (ft)	4.97	Reach Len. (ft)	60.00	50.00	80.00
Crit W.S. (ft)	-0.51	Flow Area (sq ft)		92.01	
E.G. Slope (ft/ft)	0.000429	Area (sq ft)	28.96	248.11	0.75
Q Total (cfs)	220.33	Flow (cfs)		220.33	
Top Width (ft)	93.25	Top Width (ft)	39.66	44.67	8.91
Vel Total (ft/s)	2.39	Avg. Vel. (ft/s)		2.39	
Max Chl Dpth (ft)	7.67	Hydr. Depth (ft)		7.67	
Conv. Total (cfs)	10632.8	Conv. (cfs)		10632.8	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		12.00	
Min Ch El (ft)	-2.70	Shear (lb/sq ft)		0.21	
Alpha	1.00	Stream Power (lb/ft s)		0.49	
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.05	9.05	0.00
C & E Loss (ft)	0.04	Cum SA (acres)	0.16	4.29	0.74

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #100 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	5.20	Element			
Vel Head (ft)	0.09	Wt. n-Val.		0.050	
W.S. Elev (ft)	5.10	Reach Len. (ft)	60.00	50.00	80.00
Crit W.S. (ft)	-0.45	Flow Area (sq ft)		93.63	
E.G. Slope (ft/ft)	0.000438	Area (sq ft)	34.33	254.13	2.43
Q Total (cfs)	228.97	Flow (cfs)		228.97	
Top Width (ft)	100.66	Top Width (ft)	39.91	44.67	16.08
Vel Total (ft/s)	2.45	Avg. Vel. (ft/s)		2.45	
Max Chl Dpth (ft)	7.80	Hydr. Depth (ft)		7.80	

Conv. Total (cfs)	10946.2	Conv. (cfs)		10946.2	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		12.00	
Min Ch El (ft)	-2.70	Shear (lb/sq ft)		0.21	
Alpha	1.00	Stream Power (lb/ft s)		0.52	
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.07	9.37	0.01
C & E Loss (ft)	0.04	Cum SA (acres)	0.16	4.31	0.85

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid,
energy was used.

CROSS SECTION OUTPUT Profile #100 yr + 25

E.G. Elev (ft)	5.27	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.10	Wt. n-Val.		0.050	
W.S. Elev (ft)	5.17	Reach Len. (ft)	60.00	50.00	80.00
Crit W.S. (ft)	-0.42	Flow Area (sq ft)		94.48	
E.G. Slope (ft/ft)	0.000445	Area (sq ft)	37.14	257.28	3.70
Q Total (cfs)	234.33	Flow (cfs)		234.33	
Top Width (ft)	104.54	Top Width (ft)	40.04	44.67	19.82
Vel Total (ft/s)	2.48	Avg. Vel. (ft/s)		2.48	
Max Chl Dpth (ft)	7.87	Hydr. Depth (ft)		7.87	
Conv. Total (cfs)	11111.6	Conv. (cfs)		11111.6	
Length Wtd. (ft)	50.00	Wetted Per. (ft)		12.00	
Min Ch El (ft)	-2.70	Shear (lb/sq ft)		0.22	
Alpha	1.00	Stream Power (lb/ft s)		0.54	
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.08	9.53	0.01
C & E Loss (ft)	0.04	Cum SA (acres)	0.16	4.32	0.90

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid,
energy was used.

CROSS SECTION

RIVER: EB Riser Ditch
REACH: Exist RS: 13.0

INPUT
Description: Section 15
Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4.5	49.55	5	66.55	1.08	81.55	1	84.12	-.26
94.29	-.58	97.28	-.46	105.27	-.72	112.7	.01	114.45	1
124.45	1.05	134.45	5	164.97	5.64	223.14	5.51	235.59	5.6
284.58	5.68	320	6.3	330	6.4	345	6.6		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	49.55	.05	134.45	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
49.55	134.45	165	150	110	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	49.55	6	T
134.55	345	6	T

CROSS SECTION OUTPUT Profile #2 yr

E.G. Elev (ft)	4.93	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.01	Wt. n-Val.		0.050	
W.S. Elev (ft)	4.92	Reach Len. (ft)	165.00	150.00	110.00
Crit W.S. (ft)		Flow Area (sq ft)		321.70	
E.G. Slope (ft/ft)	0.000088	Area (sq ft)	8.94	321.70	
Q Total (cfs)	216.18	Flow (cfs)		216.18	
Top Width (ft)	126.48	Top Width (ft)	42.10	84.38	
Vel Total (ft/s)	0.67	Avg. Vel. (ft/s)		0.67	
Max Chl Dpth (ft)	5.64	Hydr. Depth (ft)		3.81	
Conv. Total (cfs)	23009.4	Conv. (cfs)		23009.4	
Length Wtd. (ft)	150.00	Wetted Per. (ft)		86.16	
Min Ch El (ft)	-0.72	Shear (lb/sq ft)		0.02	

Alpha	1.00	Stream Power (lb/ft s)		0.01	
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.02	8.56	0.00
C & E Loss (ft)	0.00	Cum SA (acres)	0.08	4.21	0.69

Warning: Divided flow computed for this cross-section.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10 yr

E.G. Elev (ft)	5.01	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.01	Wt. n-Val.		0.050	
W.S. Elev (ft)	5.00	Reach Len. (ft)	165.00	150.00	110.00
Crit W.S. (ft)		Flow Area (sq ft)		328.10	
E.G. Slope (ft/ft)	0.000087	Area (sq ft)	12.41	328.10	0.00
Q Total (cfs)	220.33	Flow (cfs)		220.33	
Top Width (ft)	134.47	Top Width (ft)	49.55	84.90	0.02
Vel Total (ft/s)	0.67	Avg. Vel. (ft/s)		0.67	
Max Chl Dpth (ft)	5.72	Hydr. Depth (ft)		3.86	
Conv. Total (cfs)	23679.4	Conv. (cfs)		23679.4	
Length Wtd. (ft)	150.00	Wetted Per. (ft)		86.70	
Min Ch El (ft)	-0.72	Shear (lb/sq ft)		0.02	
Alpha	1.00	Stream Power (lb/ft s)		0.01	
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.02	8.72	0.00
C & E Loss (ft)	0.00	Cum SA (acres)	0.09	4.22	0.73

Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	5.14	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.01	Wt. n-Val.		0.050	0.040
W.S. Elev (ft)	5.14	Reach Len. (ft)	165.00	150.00	110.00
Crit W.S. (ft)		Flow Area (sq ft)		339.72	0.01
E.G. Slope (ft/ft)	0.000083	Area (sq ft)	19.19	339.72	0.45
Q Total (cfs)	228.97	Flow (cfs)		228.97	0.00
Top Width (ft)	141.00	Top Width (ft)	49.55	84.90	6.55
Vel Total (ft/s)	0.67	Avg. Vel. (ft/s)		0.67	0.09
Max Chl Dpth (ft)	5.86	Hydr. Depth (ft)		4.00	0.14
Conv. Total (cfs)	25093.6	Conv. (cfs)		25093.5	0.1
Length Wtd. (ft)	150.00	Wetted Per. (ft)		86.70	0.10
Min Ch El (ft)	-0.72	Shear (lb/sq ft)		0.02	0.00
Alpha	1.00	Stream Power (lb/ft s)		0.01	0.00
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.04	9.02	0.01
C & E Loss (ft)	0.00	Cum SA (acres)	0.09	4.24	0.82

Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 yr + 25

E.G. Elev (ft)	5.22	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.01	Wt. n-Val.		0.050	0.040
W.S. Elev (ft)	5.21	Reach Len. (ft)	165.00	150.00	110.00
Crit W.S. (ft)		Flow Area (sq ft)		345.82	0.02
E.G. Slope (ft/ft)	0.000082	Area (sq ft)	22.75	345.82	1.04
Q Total (cfs)	234.33	Flow (cfs)		234.33	0.00
Top Width (ft)	144.43	Top Width (ft)	49.55	84.90	9.98
Vel Total (ft/s)	0.68	Avg. Vel. (ft/s)		0.68	0.12
Max Chl Dpth (ft)	5.93	Hydr. Depth (ft)		4.07	0.21
Conv. Total (cfs)	25849.0	Conv. (cfs)		25848.7	0.3
Length Wtd. (ft)	150.00	Wetted Per. (ft)		86.70	0.10
Min Ch El (ft)	-0.72	Shear (lb/sq ft)		0.02	0.00
Alpha	1.00	Stream Power (lb/ft s)		0.01	0.00
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	0.04	9.18	0.01
C & E Loss (ft)	0.00	Cum SA (acres)	0.09	4.25	0.87

Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: EB Riser Ditch
REACH: Exist RS: 11.50

INPUT
Description: Section 14 - Proposed
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
10	16	10	5	20	1.3	79	1	80.95	-.41
93.47	-.62	107.64	-.99	117.82	-.33	119	1	150	1.16
162	5.22	190.13	5.51	216.4	5.42	262	6.3	265	6.4
284	6.6								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
10	.04	10	.05	162	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
10	162	185	170	150	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
162	284	10	T

CROSS SECTION OUTPUT Profile #2 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	4.92	Element			
Vel Head (ft)	0.00	Wt. n-Val.		0.050	
W.S. Elev (ft)	4.92	Reach Len. (ft)	185.00	170.00	150.00
Crit W.S. (ft)		Flow Area (sq ft)		600.80	
E.G. Slope (ft/ft)	0.000024	Area (sq ft)		600.80	
Q Total (cfs)	216.18	Flow (cfs)		216.18	
Top Width (ft)	150.91	Top Width (ft)		150.91	
Vel Total (ft/s)	0.36	Avg. Vel. (ft/s)		0.36	
Max Chl Dpth (ft)	5.91	Hydr. Depth (ft)		3.98	
Conv. Total (cfs)	44389.7	Conv. (cfs)		44389.7	
Length Wtd. (ft)	170.00	Wetted Per. (ft)		153.26	
Min Ch El (ft)	-0.99	Shear (lb/sq ft)		0.01	
Alpha	1.00	Stream Power (lb/ft s)		0.00	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		6.97	0.00
C & E Loss (ft)	0.00	Cum SA (acres)		3.80	0.69

CROSS SECTION OUTPUT Profile #10 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	5.00	Element			
Vel Head (ft)	0.00	Wt. n-Val.		0.050	
W.S. Elev (ft)	5.00	Reach Len. (ft)	185.00	170.00	150.00
Crit W.S. (ft)		Flow Area (sq ft)		612.25	
E.G. Slope (ft/ft)	0.000023	Area (sq ft)		612.25	
Q Total (cfs)	220.33	Flow (cfs)		220.33	
Top Width (ft)	151.34	Top Width (ft)		151.34	
Vel Total (ft/s)	0.36	Avg. Vel. (ft/s)		0.36	
Max Chl Dpth (ft)	5.99	Hydr. Depth (ft)		4.05	
Conv. Total (cfs)	45718.9	Conv. (cfs)		45718.9	
Length Wtd. (ft)	170.00	Wetted Per. (ft)		153.72	
Min Ch El (ft)	-0.99	Shear (lb/sq ft)		0.01	
Alpha	1.00	Stream Power (lb/ft s)		0.00	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		7.10	0.00
C & E Loss (ft)	0.00	Cum SA (acres)		3.81	0.73

CROSS SECTION OUTPUT Profile #100 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	5.14	Element			
Vel Head (ft)	0.00	Wt. n-Val.		0.050	
W.S. Elev (ft)	5.14	Reach Len. (ft)	185.00	170.00	150.00
Crit W.S. (ft)		Flow Area (sq ft)		633.03	
E.G. Slope (ft/ft)	0.000023	Area (sq ft)		633.03	
Q Total (cfs)	228.97	Flow (cfs)		228.97	
Top Width (ft)	151.75	Top Width (ft)		151.75	
Vel Total (ft/s)	0.36	Avg. Vel. (ft/s)		0.36	
Max Chl Dpth (ft)	6.13	Hydr. Depth (ft)		4.17	
Conv. Total (cfs)	48214.7	Conv. (cfs)		48214.7	
Length Wtd. (ft)	170.00	Wetted Per. (ft)		154.28	
Min Ch El (ft)	-0.99	Shear (lb/sq ft)		0.01	
Alpha	1.00	Stream Power (lb/ft s)		0.00	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		7.35	0.01

C & E Loss (ft)	0.00	Cum SA (acres)		3.83	0.82

CROSS SECTION OUTPUT Profile #100 yr + 25

E.G. Elev (ft)	5.21	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.		0.050	
W.S. Elev (ft)	5.21	Reach Len. (ft)	185.00	170.00	150.00
Crit W.S. (ft)		Flow Area (sq ft)		643.95	
E.G. Slope (ft/ft)	0.000022	Area (sq ft)		643.95	
Q Total (cfs)	234.33	Flow (cfs)		234.33	
Top Width (ft)	151.96	Top Width (ft)		151.96	
Vel Total (ft/s)	0.36	Avg. Vel. (ft/s)		0.36	
Max Chl Dpth (ft)	6.20	Hydr. Depth (ft)		4.24	
Conv. Total (cfs)	49545.6	Conv. (cfs)		49545.6	
Length Wtd. (ft)	170.00	Wetted Per. (ft)		154.58	
Min Ch El (ft)	-0.99	Shear (lb/sq ft)		0.01	
Alpha	1.00	Stream Power (lb/ft s)		0.00	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.00	7.48	0.01
C & E Loss (ft)	0.00	Cum SA (acres)	0.00	3.84	0.86

CROSS SECTION

RIVER: EB Riser Ditch
REACH: Exist RS: 9.80

INPUT
Description: Section 13 - Proposed
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-7	16	-7	5	3	1.4	83	1	87.2	-.93
101	-1.26	117.62	-.76	120	1	138	1.1	150	5
225	6.1	234	6.4	256	6.6				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-7	.04	-7	.05	150	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-7	150	150	130	100	.1 .3

CROSS SECTION OUTPUT Profile #2 yr

E.G. Elev (ft)	4.92	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.		0.050	
W.S. Elev (ft)	4.92	Reach Len. (ft)	150.00	130.00	100.00
Crit W.S. (ft)		Flow Area (sq ft)		620.16	
E.G. Slope (ft/ft)	0.000022	Area (sq ft)		620.16	
Q Total (cfs)	216.18	Flow (cfs)		216.18	
Top Width (ft)	156.52	Top Width (ft)		156.52	
Vel Total (ft/s)	0.35	Avg. Vel. (ft/s)		0.35	
Max Chl Dpth (ft)	6.18	Hydr. Depth (ft)		3.96	
Conv. Total (cfs)	45713.2	Conv. (cfs)		45713.2	
Length Wtd. (ft)	130.00	Wetted Per. (ft)		158.76	
Min Ch El (ft)	-1.26	Shear (lb/sq ft)		0.01	
Alpha	1.00	Stream Power (lb/ft s)		0.00	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		4.58	0.00
C & E Loss (ft)	0.00	Cum SA (acres)		3.20	0.69

CROSS SECTION OUTPUT Profile #10 yr

E.G. Elev (ft)	5.00	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.		0.050	
W.S. Elev (ft)	4.99	Reach Len. (ft)	150.00	130.00	100.00
Crit W.S. (ft)		Flow Area (sq ft)		632.05	
E.G. Slope (ft/ft)	0.000022	Area (sq ft)		632.05	
Q Total (cfs)	220.33	Flow (cfs)		220.33	
Top Width (ft)	156.97	Top Width (ft)		156.97	
Vel Total (ft/s)	0.35	Avg. Vel. (ft/s)		0.35	
Max Chl Dpth (ft)	6.25	Hydr. Depth (ft)		4.03	
Conv. Total (cfs)	47091.0	Conv. (cfs)		47091.0	
Length Wtd. (ft)	130.00	Wetted Per. (ft)		159.23	
Min Ch El (ft)	-1.26	Shear (lb/sq ft)		0.01	
Alpha	1.00	Stream Power (lb/ft s)		0.00	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		4.67	0.00
C & E Loss (ft)	0.00	Cum SA (acres)		3.21	0.73

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	5.13	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.		0.050	0.040
W.S. Elev (ft)	5.13	Reach Len. (ft)	150.00	130.00	100.00
Crit W.S. (ft)		Flow Area (sq ft)		653.59	0.59
E.G. Slope (ft/ft)	0.000021	Area (sq ft)		653.59	0.59
Q Total (cfs)	228.97	Flow (cfs)		228.95	0.02
Top Width (ft)	165.96	Top Width (ft)		157.00	8.96
Vel Total (ft/s)	0.35	Avg. Vel. (ft/s)		0.35	0.03
Max Chl Dpth (ft)	6.39	Hydr. Depth (ft)		4.16	0.07
Conv. Total (cfs)	49764.8	Conv. (cfs)		49761.3	3.6
Length Wtd. (ft)	130.00	Wetted Per. (ft)		159.39	8.96
Min Ch El (ft)	-1.26	Shear (lb/sq ft)		0.01	0.00
Alpha	1.00	Stream Power (lb/ft s)		0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		4.84	0.00
C & E Loss (ft)	0.00	Cum SA (acres)		3.23	0.80

CROSS SECTION OUTPUT Profile #100 yr + 25

E.G. Elev (ft)	5.21	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.		0.050	0.040
W.S. Elev (ft)	5.20	Reach Len. (ft)	150.00	130.00	100.00
Crit W.S. (ft)		Flow Area (sq ft)		664.89	1.41
E.G. Slope (ft/ft)	0.000021	Area (sq ft)		664.89	1.41
Q Total (cfs)	234.33	Flow (cfs)		234.28	0.05
Top Width (ft)	170.86	Top Width (ft)		157.00	13.86
Vel Total (ft/s)	0.35	Avg. Vel. (ft/s)		0.35	0.04
Max Chl Dpth (ft)	6.46	Hydr. Depth (ft)		4.23	0.10
Conv. Total (cfs)	51199.0	Conv. (cfs)		51187.6	11.4
Length Wtd. (ft)	130.00	Wetted Per. (ft)		159.46	13.87
Min Ch El (ft)	-1.26	Shear (lb/sq ft)		0.01	0.00
Alpha	1.00	Stream Power (lb/ft s)		0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.00	4.93	0.01
C & E Loss (ft)	0.00	Cum SA (acres)	0.00	3.23	0.84

CROSS SECTION

RIVER: EB Riser Ditch
REACH: Exist RS: 8.50

INPUT
Description: Section 12 - Proposed
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-44	6.5	-27	6.5	-14	1.43	75	1	79.1	-.77
99.23	-1.12	112.76	-.85	115	1	137	1.1	150	5.2
201.71	5.5	222	6.5	235	6.6	250	7		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-44	.04	-27	.05	150	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-27	150	100	130	160	.1

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
-44	-27	15	T

CROSS SECTION OUTPUT Profile #2 yr

E.G. Elev (ft)	4.92	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.		0.050	
W.S. Elev (ft)	4.92	Reach Len. (ft)	100.00	130.00	160.00
Crit W.S. (ft)		Flow Area (sq ft)		681.44	
E.G. Slope (ft/ft)	0.000019	Area (sq ft)		681.44	
Q Total (cfs)	216.18	Flow (cfs)		216.18	
Top Width (ft)	172.04	Top Width (ft)		172.04	
Vel Total (ft/s)	0.32	Avg. Vel. (ft/s)		0.32	
Max Chl Dpth (ft)	6.04	Hydr. Depth (ft)		3.96	
Conv. Total (cfs)	50254.2	Conv. (cfs)		50254.2	
Length Wtd. (ft)	130.00	Wetted Per. (ft)		174.32	
Min Ch El (ft)	-1.12	Shear (lb/sq ft)		0.00	
Alpha	1.00	Stream Power (lb/ft s)		0.00	

Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	2.64	0.00
C & E Loss (ft)	0.00	Cum SA (acres)	2.71	0.69

CROSS SECTION OUTPUT Profile #10 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	4.99	Element			
Vel Head (ft)	0.00	Wt. n-Val.		0.050	
W.S. Elev (ft)	4.99	Reach Len. (ft)	100.00	130.00	160.00
Crit W.S. (ft)		Flow Area (sq ft)		694.52	
E.G. Slope (ft/ft)	0.000018	Area (sq ft)		694.52	
Q Total (cfs)	220.33	Flow (cfs)		220.33	
Top Width (ft)	172.47	Top Width (ft)		172.47	
Vel Total (ft/s)	0.32	Avg. Vel. (ft/s)		0.32	
Max Chl Dpth (ft)	6.11	Hydr. Depth (ft)		4.03	
Conv. Total (cfs)	51781.0	Conv. (cfs)		51781.0	
Length Wtd. (ft)	130.00	Wetted Per. (ft)		174.78	
Min Ch El (ft)	-1.12	Shear (lb/sq ft)		0.00	
Alpha	1.00	Stream Power (lb/ft s)		0.00	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		2.69	0.00
C & E Loss (ft)	0.00	Cum SA (acres)		2.72	0.73

CROSS SECTION OUTPUT Profile #100 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	5.13	Element			
Vel Head (ft)	0.00	Wt. n-Val.		0.050	
W.S. Elev (ft)	5.13	Reach Len. (ft)	100.00	130.00	160.00
Crit W.S. (ft)		Flow Area (sq ft)		718.25	
E.G. Slope (ft/ft)	0.000018	Area (sq ft)		718.25	
Q Total (cfs)	228.97	Flow (cfs)		228.97	
Top Width (ft)	173.26	Top Width (ft)		173.26	
Vel Total (ft/s)	0.32	Avg. Vel. (ft/s)		0.32	
Max Chl Dpth (ft)	6.25	Hydr. Depth (ft)		4.15	
Conv. Total (cfs)	54589.9	Conv. (cfs)		54589.9	
Length Wtd. (ft)	130.00	Wetted Per. (ft)		175.61	
Min Ch El (ft)	-1.12	Shear (lb/sq ft)		0.00	
Alpha	1.00	Stream Power (lb/ft s)		0.00	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		2.79	0.00
C & E Loss (ft)	0.00	Cum SA (acres)		2.73	0.79

CROSS SECTION OUTPUT Profile #100 yr + 25

			Left OB	Channel	Right OB
E.G. Elev (ft)	5.20	Element			
Vel Head (ft)	0.00	Wt. n-Val.		0.050	
W.S. Elev (ft)	5.20	Reach Len. (ft)	100.00	130.00	160.00
Crit W.S. (ft)		Flow Area (sq ft)		730.74	
E.G. Slope (ft/ft)	0.000017	Area (sq ft)		730.74	0.00
Q Total (cfs)	234.33	Flow (cfs)		234.33	
Top Width (ft)	173.86	Top Width (ft)		173.67	0.19
Vel Total (ft/s)	0.32	Avg. Vel. (ft/s)		0.32	
Max Chl Dpth (ft)	6.32	Hydr. Depth (ft)		4.21	
Conv. Total (cfs)	56088.4	Conv. (cfs)		56088.4	
Length Wtd. (ft)	130.00	Wetted Per. (ft)		176.05	
Min Ch El (ft)	-1.12	Shear (lb/sq ft)		0.00	
Alpha	1.00	Stream Power (lb/ft s)		0.00	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.00	2.84	0.01
C & E Loss (ft)	0.00	Cum SA (acres)	0.00	2.74	0.82

CROSS SECTION

RIVER: EB Riser Ditch
REACH: Exist RS: 7.20

INPUT
Description: Section 11 - Proposed
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
8	5.9	25	6.2	53	1.15	83	1	84.63	-.43
96.02	-1.82	98.95	-1.89	100.58	-1.87	109.52	-1.06	117	1
184	1.335	196	5.5	197	5.92	249	6	290	7

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
8	.04	25	.05	197	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
25	197	9.5	26	32.5	.3	.5

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
8	25	15	T

CROSS SECTION OUTPUT Profile #2 yr

E.G. Elev (ft)	4.91	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.		0.050	
W.S. Elev (ft)	4.91	Reach Len. (ft)	9.50	26.00	32.50
Crit W.S. (ft)		Flow Area (sq ft)		624.98	
E.G. Slope (ft/ft)	0.000023	Area (sq ft)		624.98	
Q Total (cfs)	216.18	Flow (cfs)		216.18	
Top Width (ft)	162.17	Top Width (ft)		162.17	
Vel Total (ft/s)	0.35	Avg. Vel. (ft/s)		0.35	
Max Chl Dpth (ft)	6.80	Hydr. Depth (ft)		3.85	
Conv. Total (cfs)	45305.5	Conv. (cfs)		45305.5	
Length Wtd. (ft)	26.00	Wetted Per. (ft)		164.05	
Min Ch El (ft)	-1.89	Shear (lb/sq ft)		0.01	
Alpha	1.00	Stream Power (lb/ft s)		0.00	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		0.69	0.00
C & E Loss (ft)	0.00	Cum SA (acres)		2.21	0.69

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10 yr

E.G. Elev (ft)	4.99	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.		0.050	
W.S. Elev (ft)	4.99	Reach Len. (ft)	9.50	26.00	32.50
Crit W.S. (ft)		Flow Area (sq ft)		637.33	
E.G. Slope (ft/ft)	0.000022	Area (sq ft)		637.33	
Q Total (cfs)	220.33	Flow (cfs)		220.33	
Top Width (ft)	162.81	Top Width (ft)		162.81	
Vel Total (ft/s)	0.35	Avg. Vel. (ft/s)		0.35	
Max Chl Dpth (ft)	6.88	Hydr. Depth (ft)		3.91	
Conv. Total (cfs)	46682.2	Conv. (cfs)		46682.2	
Length Wtd. (ft)	26.00	Wetted Per. (ft)		164.71	
Min Ch El (ft)	-1.89	Shear (lb/sq ft)		0.01	
Alpha	1.00	Stream Power (lb/ft s)		0.00	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		0.71	0.00
C & E Loss (ft)	0.00	Cum SA (acres)		2.22	0.73

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	5.13	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.		0.050	
W.S. Elev (ft)	5.13	Reach Len. (ft)	9.50	26.00	32.50
Crit W.S. (ft)		Flow Area (sq ft)		659.78	
E.G. Slope (ft/ft)	0.000022	Area (sq ft)		659.78	
Q Total (cfs)	228.97	Flow (cfs)		228.97	
Top Width (ft)	163.97	Top Width (ft)		163.97	
Vel Total (ft/s)	0.35	Avg. Vel. (ft/s)		0.35	
Max Chl Dpth (ft)	7.02	Hydr. Depth (ft)		4.02	
Conv. Total (cfs)	49216.8	Conv. (cfs)		49216.8	
Length Wtd. (ft)	26.00	Wetted Per. (ft)		165.90	
Min Ch El (ft)	-1.89	Shear (lb/sq ft)		0.01	
Alpha	1.00	Stream Power (lb/ft s)		0.00	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		0.74	0.00
C & E Loss (ft)	0.00	Cum SA (acres)		2.23	0.79

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 yr + 25

E.G. Elev (ft)	5.20	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.		0.050	
W.S. Elev (ft)	5.20	Reach Len. (ft)	9.50	26.00	32.50
Crit W.S. (ft)		Flow Area (sq ft)		671.60	
E.G. Slope (ft/ft)	0.000021	Area (sq ft)		671.60	

Q Total (cfs)	234.33	Flow (cfs)		234.33	
Top Width (ft)	164.58	Top Width (ft)		164.58	
Vel Total (ft/s)	0.35	Avg. Vel. (ft/s)		0.35	
Max Chl Dpth (ft)	7.09	Hydr. Depth (ft)		4.08	
Conv. Total (cfs)	50569.0	Conv. (cfs)		50569.0	
Length Wtd. (ft)	26.00	Wetted Per. (ft)		166.53	
Min Ch El (ft)	-1.89	Shear (lb/sq ft)		0.01	
Alpha	1.00	Stream Power (lb/ft s)		0.00	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.00	0.75	0.01
C & E Loss (ft)	0.00	Cum SA (acres)	0.00	2.24	0.82

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: EB Riser Ditch
REACH: Exist RS: 6.94

INPUT
Description: Section 10a Proposed
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6.25	6	6.2	37.9	1.15	67.9	1	71	0
86	-1.15	93	-1	95.9	1	201.9	1.53	212.61	5.1
212.9	5.24	275	6	315	6.7				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	6	.02	212.61	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
6	212.61	10.5	24	37.5	.5	.8

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	5	15	T

CRDSS SECTION OUTPUT Profile #2 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	4.91	Element			
Vel Head (ft)	0.00	Wt. n-Val.		0.020	
W.S. Elev (ft)	4.91	Reach Len. (ft)	10.50	24.00	37.50
Crit W.S. (ft)		Flow Area (sq ft)		715.87	
E.G. Slope (ft/ft)	0.000003	Area (sq ft)		715.87	
Q Total (cfs)	216.18	Flow (cfs)		216.18	
Top Width (ft)	197.92	Top Width (ft)		197.92	
Vel Total (ft/s)	0.30	Avg. Vel. (ft/s)		0.30	
Max Chl Dpth (ft)	6.06	Hydr. Depth (ft)		3.62	
Conv. Total (cfs)	124622.8	Conv. (cfs)		124622.8	
Length Wtd. (ft)	24.00	Wetted Per. (ft)		199.59	
Min Ch El (ft)	-1.15	Shear (lb/sq ft)		0.00	
Alpha	1.00	Stream Power (lb/ft s)		0.00	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		0.29	0.00
C & E Loss (ft)	0.01	Cum SA (acres)		2.11	0.69

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	4.99	Element			
Vel Head (ft)	0.00	Wt. n-Val.		0.020	
W.S. Elev (ft)	4.99	Reach Len. (ft)	10.50	24.00	37.50
Crit W.S. (ft)		Flow Area (sq ft)		730.94	
E.G. Slope (ft/ft)	0.000003	Area (sq ft)		730.94	
Q Total (cfs)	220.33	Flow (cfs)		220.33	
Top Width (ft)	198.63	Top Width (ft)		198.63	
Vel Total (ft/s)	0.30	Avg. Vel. (ft/s)		0.30	
Max Chl Dpth (ft)	6.14	Hydr. Depth (ft)		3.68	
Conv. Total (cfs)	128713.9	Conv. (cfs)		128713.9	
Length Wtd. (ft)	24.01	Wetted Per. (ft)		200.32	
Min Ch El (ft)	-1.15	Shear (lb/sq ft)		0.00	
Alpha	1.00	Stream Power (lb/ft s)		0.00	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		0.30	0.00
C & E Loss (ft)	0.01	Cum SA (acres)		2.11	0.73

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	5.13	Element			
Vel Head (ft)	0.00	Wt. n-Val.		0.020	0.000
W.S. Elev (ft)	5.13	Reach Len. (ft)	10.50	24.00	37.50
Crit W.S. (ft)		Flow Area (sq ft)		758.32	0.00
E.G. Slope (ft/ft)	0.000003	Area (sq ft)		758.32	0.00
Q Total (cfs)	228.97	Flow (cfs)		228.97	0.00
Top Width (ft)	199.88	Top Width (ft)		199.83	0.05
Vel Total (ft/s)	0.30	Avg. Vel. (ft/s)		0.30	0.00
Max Chl Dpth (ft)	6.28	Hydr. Depth (ft)		3.79	0.01
Conv. Total (cfs)	136290.0	Conv. (cfs)		136290.0	0.0
Length Wtd. (ft)	24.01	Wetted Per. (ft)		201.55	0.06
Min Ch El (ft)	-1.15	Shear (lb/sq ft)		0.00	
Alpha	1.00	Stream Power (lb/ft s)		0.00	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		0.31	0.00
C & E Loss (ft)	0.01	Cum SA (acres)		2.12	0.79

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 yr + 25

			Left OB	Channel	Right OB
E.G. Elev (ft)	5.20	Element			
Vel Head (ft)	0.00	Wt. n-Val.		0.020	0.040
W.S. Elev (ft)	5.20	Reach Len. (ft)	10.50	24.00	37.50
Crit W.S. (ft)		Flow Area (sq ft)		772.72	0.01
E.G. Slope (ft/ft)	0.000003	Area (sq ft)		772.72	0.01
Q Total (cfs)	234.33	Flow (cfs)		234.33	0.00
Top Width (ft)	200.49	Top Width (ft)		200.28	0.20
Vel Total (ft/s)	0.30	Avg. Vel. (ft/s)		0.30	0.01
Max Chl Dpth (ft)	6.35	Hydr. Depth (ft)		3.86	0.05
Conv. Total (cfs)	140418.3	Conv. (cfs)		140418.3	0.0
Length Wtd. (ft)	24.02	Wetted Per. (ft)		202.01	0.23
Min Ch El (ft)	-1.15	Shear (lb/sq ft)		0.00	0.00
Alpha	1.00	Stream Power (lb/ft s)		0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.00	0.32	0.01
C & E Loss (ft)	0.01	Cum SA (acres)	0.00	2.13	0.82

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: EB Riser Ditch
REACH: Exist RS: 6.70

INPUT
Description: Section 10 - U/S Side of Access Road
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6.1	12.01	6.21	45.27	5.68	67.52	5.78	82.79	5.13		
91.19	-2.97	96.29	-3.18	104.08	-2.41	109.6	-2.29	116.5	4.41		
117.83	4.49	120.27	5.16	137.59	5.91	157.61	6.05	165.42	5.75		
175	5.8	215	6	390	4.8						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	82.79	.02	116.5	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
82.79	116.5	40	40	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	5	15	T

CROSS SECTION OUTPUT Profile #2 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	4.91	Element			
Vel Head (ft)	0.02	Wt. n-Val.		0.020	0.040
W.S. Elev (ft)	4.89	Reach Len. (ft)	40.00	40.00	40.00
Crit W.S. (ft)	-1.17	Flow Area (sq ft)		198.83	1.43

E.G. Slope (ft/ft)	0.000025	Area (sq ft)	198.83	1.43
Q Total (cfs)	216.18	Flow (cfs)	216.09	0.09
Top Width (ft)	48.98	Top Width (ft)	33.46	15.53
Vel Total (ft/s)	1.08	Avg. Vel. (ft/s)	1.09	0.06
Max Chl Dpth (ft)	8.07	Hydr. Depth (ft)	5.94	0.09
Conv. Total (cfs)	43484.1	Conv. (cfs)	43466.9	17.2
Length Wtd. (ft)	40.00	Wetted Per. (ft)	39.39	15.67
Min Ch El (ft)	-3.18	Shear (lb/sq ft)	0.01	0.00
Alpha	1.01	Stream Power (lb/ft s)	0.01	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)	0.04	
C & E Loss (ft)		Cum SA (acres)	2.04	0.69

CROSS SECTION OUTPUT Profile #10 yr

E.G. Elev (ft)	4.98	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.02	Wt. n-Val.		0.020	0.040
W.S. Elev (ft)	4.96	Reach Len. (ft)	40.00	40.00	40.00
Crit W.S. (ft)	-1.15	Flow Area (sq ft)		201.36	3.03
E.G. Slope (ft/ft)	0.000025	Area (sq ft)		201.36	3.03
Q Total (cfs)	220.33	Flow (cfs)		220.17	0.17
Top Width (ft)	60.37	Top Width (ft)		33.54	26.84
Vel Total (ft/s)	1.08	Avg. Vel. (ft/s)		1.09	0.06
Max Chl Dpth (ft)	8.14	Hydr. Depth (ft)		6.00	0.11
Conv. Total (cfs)	44346.4	Conv. (cfs)		44312.8	33.6
Length Wtd. (ft)	40.00	Wetted Per. (ft)		39.50	27.07
Min Ch El (ft)	-3.18	Shear (lb/sq ft)		0.01	0.00
Alpha	1.03	Stream Power (lb/ft s)		0.01	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)		0.04	
C & E Loss (ft)		Cum SA (acres)		2.05	0.72

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	5.12	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.02	Wt. n-Val.		0.020	0.040
W.S. Elev (ft)	5.10	Reach Len. (ft)	40.00	40.00	40.00
Crit W.S. (ft)	-1.11	Flow Area (sq ft)		205.95	8.09
E.G. Slope (ft/ft)	0.000025	Area (sq ft)		205.95	8.09
Q Total (cfs)	228.97	Flow (cfs)		228.47	0.50
Top Width (ft)	80.94	Top Width (ft)		33.68	47.26
Vel Total (ft/s)	1.07	Avg. Vel. (ft/s)		1.11	0.06
Max Chl Dpth (ft)	8.28	Hydr. Depth (ft)		6.12	0.17
Conv. Total (cfs)	45957.9	Conv. (cfs)		45857.2	100.6
Length Wtd. (ft)	40.00	Wetted Per. (ft)		39.70	47.64
Min Ch El (ft)	-3.18	Shear (lb/sq ft)		0.01	0.00
Alpha	1.07	Stream Power (lb/ft s)		0.01	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)		0.05	
C & E Loss (ft)		Cum SA (acres)		2.06	0.77

CROSS SECTION OUTPUT Profile #100 yr + 25

E.G. Elev (ft)	5.19	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.02	Wt. n-Val.	0.040	0.020	0.040
W.S. Elev (ft)	5.17	Reach Len. (ft)	40.00	40.00	40.00
Crit W.S. (ft)	-1.08	Flow Area (sq ft)	0.02	208.36	11.85
E.G. Slope (ft/ft)	0.000025	Area (sq ft)	0.02	208.36	11.85
Q Total (cfs)	234.33	Flow (cfs)	0.00	233.53	0.80
Top Width (ft)	92.83	Top Width (ft)	0.97	33.71	58.16
Vel Total (ft/s)	1.06	Avg. Vel. (ft/s)	0.01	1.12	0.07
Max Chl Dpth (ft)	8.35	Hydr. Depth (ft)	0.02	6.18	0.20
Conv. Total (cfs)	46879.9	Conv. (cfs)	0.1	46720.3	159.5
Length Wtd. (ft)	40.00	Wetted Per. (ft)	0.97	39.74	58.62
Min Ch El (ft)	-3.18	Shear (lb/sq ft)	0.00	0.01	0.00
Alpha	1.11	Stream Power (lb/ft s)	0.00	0.01	0.00
Frctn Loss (ft)		Cum Volume (acre-ft)		0.05	
C & E Loss (ft)		Cum SA (acres)	0.00	2.06	0.79

CULVERT

RIVER: EB Riser Ditch
REACH: Exist RS: 6.50

INPUT
Description: Access Road Twin 60 " RCPs
Distance from Upstream XS = 1

```
Deck/Roadway Width        =      38
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=       6
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
   12.01    6.21      -5    84.7       6      -5    84.7    6.26      -5
   116.7    6.33      -5   116.7       6      -5  157.61    6.05      -5

Upstream Bridge Cross Section Data
Station Elevation Data    num=      18
     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev
       0      6.1   12.01     6.21   45.27     5.68   67.52     5.78   82.79     5.13
   91.19    -2.97   96.29    -3.18  104.08    -2.41   109.6    -2.29   116.5     4.41
  117.83     4.49  120.27     5.16  137.59     5.91  157.61     6.05  165.42     5.75
     175      5.8     215        6     390      4.8

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .04   82.79     .02   116.5     .04

Bank Sta: Left   Right    Coeff Contr.   Expan.
         82.79   116.5            .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
       0       5      15          T

Downstream  Deck/Roadway Coordinates
    num=       6
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
   69.47    5.96      -5    83.4       6      -5    83.4    6.25      -5
   115.3    6.19      -5   115.3       6      -5  152.38    6.01      -5

Downstream Bridge Cross Section Data
Station Elevation Data    num=      20
     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev
   23.57     6.54   66.21     6.16   69.47     5.96   83.18      4.2   92.32    -2.36
   96.46    -2.58  103.58    -3.14  108.34    -2.98  115.42     3.05  117.21     3.16
  134.16     5.79  142.84     5.73  152.38     6.01  165.65     5.97  188.92     5.09
     200      5.2     205        5     225        4     306        4     363      4.8

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   23.57     .05   69.47     .05  134.16     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
         69.47  134.16             .5       .8

Upstream Embankment side slope             =       0 horiz. to 1.0 vertical
Downstream Embankment side slope           =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .95
Elevation at which weir flow begins        =
Energy head used in spillway design        =
Spillway height used in design             =
Weir crest shape                           = Broad Crested

Number of Culverts =  2

Culvert Name     Shape      Rise    Span
Culvert #1      Circular       5
FHWA Chart # 1 - Concrete Pipe Culvert
FHWA Scale # 1 - Square edge entrance with headwall
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                  1      38     .015     .015        0                  .5                 1
Upstream   Elevation = -2.97
           Centerline Station =  96.29
Downstream Elevation = -2.36
           Centerline Station =  96.46

Culvert Name     Shape      Rise    Span
Culvert #2      Circular       5
FHWA Chart # 1 - Concrete Pipe Culvert
FHWA Scale # 1 - Square edge entrance with headwall
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                  1      38     .015     .015        0                  .5                 1
Upstream   Elevation = -2.41
           Centerline Station =  104.08
Downstream Elevation = -2.98
```

Centerline Station = 103.58

CROSS SECTION

RIVER: EB Riser Ditch
REACH: Exist RS: 6.30

INPUT
Description: Section 9 - D/S Side of Access Road
Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
23.57	6.54	66.21	6.16	69.47	5.96	83.18	4.2	92.32	-2.36
96.46	-2.58	103.58	-3.14	108.34	-2.98	115.42	3.05	117.21	3.16
134.16	5.79	142.84	5.73	152.38	6.01	165.65	5.97	188.92	5.09
200	5.2	205	5	225	4	306	4	363	4.8

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
23.57	.05	69.47	.05	134.16	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
69.47	134.16	75	90	95	.5	.8

CROSS SECTION OUTPUT Profile #2 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	4.14	Element			
Vel Head (ft)	0.02	Wt. n-Val.		0.050	0.050
W.S. Elev (ft)	4.12	Reach Len. (ft)	75.00	90.00	95.00
Crit W.S. (ft)		Flow Area (sq ft)		173.97	10.03
E.G. Slope (ft/ft)	0.000281	Area (sq ft)		173.97	10.03
Q Total (cfs)	216.18	Flow (cfs)		215.04	1.14
Top Width (ft)	131.68	Top Width (ft)		40.08	91.60
Vel Total (ft/s)	1.17	Avg. Vel. (ft/s)		1.24	0.11
Max Chl Dpth (ft)	7.26	Hydr. Depth (ft)		4.34	0.11
Conv. Total (cfs)	12900.7	Conv. (cfs)		12832.5	68.2
Length Wtd. (ft)	90.02	Wetted Per. (ft)		44.49	91.61
Min Ch El (ft)	-3.14	Shear (lb/sq ft)		0.07	0.00
Alpha	1.10	Stream Power (lb/ft s)		0.08	0.00
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)		5.21	0.08
C & E Loss (ft)	0.02	Cum SA (acres)		2.01	0.64

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	4.20	Element			
Vel Head (ft)	0.02	Wt. n-Val.		0.050	0.050
W.S. Elev (ft)	4.17	Reach Len. (ft)	75.00	90.00	95.00
Crit W.S. (ft)		Flow Area (sq ft)		176.22	15.30
E.G. Slope (ft/ft)	0.000281	Area (sq ft)		176.22	15.30
Q Total (cfs)	220.33	Flow (cfs)		218.11	2.23
Top Width (ft)	137.23	Top Width (ft)		40.52	96.72
Vel Total (ft/s)	1.15	Avg. Vel. (ft/s)		1.24	0.15
Max Chl Dpth (ft)	7.31	Hydr. Depth (ft)		4.35	0.16
Conv. Total (cfs)	13154.4	Conv. (cfs)		13021.3	133.1
Length Wtd. (ft)	90.04	Wetted Per. (ft)		44.95	96.72
Min Ch El (ft)	-3.14	Shear (lb/sq ft)		0.07	0.00
Alpha	1.15	Stream Power (lb/ft s)		0.08	0.00
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)		5.31	0.11
C & E Loss (ft)	0.02	Cum SA (acres)		2.01	0.66

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	4.31	Element			
Vel Head (ft)	0.02	Wt. n-Val.		0.050	0.050
W.S. Elev (ft)	4.29	Reach Len. (ft)	75.00	90.00	95.00
Crit W.S. (ft)		Flow Area (sq ft)		180.98	27.08
E.G. Slope (ft/ft)	0.000282	Area (sq ft)		180.98	27.08
Q Total (cfs)	228.97	Flow (cfs)		223.57	5.40
Top Width (ft)	149.24	Top Width (ft)		41.98	107.25

Vel Total (ft/s)	1.10	Avg. Vel. (ft/s)	1.24	0.20
Max Chl Dpth (ft)	7.43	Hydr. Depth (ft)	4.31	0.25
Conv. Total (cfs)	13641.0	Conv. (cfs)	13319.5	321.5
Length Wtd. (ft)	90.09	Wetted Per. (ft)	46.44	107.26
Min Ch El (ft)	-3.14	Shear (lb/sq ft)	0.07	0.00
Alpha	1.23	Stream Power (lb/ft s)	0.08	0.00
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	5.50	0.19
C & E Loss (ft)	0.02	Cum SA (acres)	2.02	0.70

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 yr + 25

E.G. Elev (ft)	4.38	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.02	Wt. n-Val.		0.050	0.050
W.S. Elev (ft)	4.36	Reach Len. (ft)	75.00	90.00	95.00
Crit W.S. (ft)		Flow Area (sq ft)		184.00	34.93
E.G. Slope (ft/ft)	0.000281	Area (sq ft)		184.00	34.93
Q Total (cfs)	234.33	Flow (cfs)		226.40	7.93
Top Width (ft)	156.73	Top Width (ft)		42.99	113.73
Vel Total (ft/s)	1.07	Avg. Vel. (ft/s)		1.23	0.23
Max Chl Dpth (ft)	7.50	Hydr. Depth (ft)		4.28	0.31
Conv. Total (cfs)	13967.1	Conv. (cfs)		13494.7	472.5
Length Wtd. (ft)	90.13	Wetted Per. (ft)		47.46	113.75
Min Ch El (ft)	-3.14	Shear (lb/sq ft)		0.07	0.01
Alpha	1.28	Stream Power (lb/ft s)		0.08	0.00
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)		5.62	0.24
C & E Loss (ft)	0.02	Cum SA (acres)		2.03	0.72

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: EB Riser Ditch
REACH: Exist RS: 5.40

INPUT
Description: Section 8 Proposed

Station Elevation Data	num=	12							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-59	6.5	-44.5	1.6435	83.2	1	87.9	-.96	93.18	-1.6
112.12	-.9	120.55	5.18	127.12	5.2	132.61	5.39	140	4
287	4	315	4.8						

Manning's n Values	num=	3		
Sta	n Val	Sta	n Val	Sta	n Val
-59	.06	-59	.05	120.55	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-59	120.55	20	25	28	.1	.3

CROSS SECTION OUTPUT Profile #2 yr

E.G. Elev (ft)	4.12	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.		0.050	0.060
W.S. Elev (ft)	4.11	Reach Len. (ft)	20.00	25.00	28.00
Crit W.S. (ft)		Flow Area (sq ft)		532.19	16.81
E.G. Slope (ft/ft)	0.000042	Area (sq ft)		532.19	16.81
Q Total (cfs)	216.18	Flow (cfs)		215.56	0.62
Top Width (ft)	322.48	Top Width (ft)		170.94	151.54
Vel Total (ft/s)	0.39	Avg. Vel. (ft/s)		0.41	0.04
Max Chl Dpth (ft)	5.71	Hydr. Depth (ft)		3.11	0.11
Conv. Total (cfs)	33496.4	Conv. (cfs)		33400.3	96.1
Length Wtd. (ft)	25.01	Wetted Per. (ft)		173.41	151.55
Min Ch El (ft)	-1.60	Shear (lb/sq ft)		0.01	0.00
Alpha	1.06	Stream Power (lb/ft s)		0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		4.49	0.05
C & E Loss (ft)	0.00	Cum SA (acres)		1.79	0.37

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #10 yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	4.17	Wt. n-Val.		0.050	0.060
Vel Head (ft)	0.00	Reach Len. (ft)	20.00	25.00	28.00
W.S. Elev (ft)	4.17	Flow Area (sq ft)		541.79	25.38
Crit W.S. (ft)		Area (sq ft)		541.79	25.38
E.G. Slope (ft/ft)	0.000041	Flow (cfs)		219.13	1.21
Q Total (cfs)	220.33	Top Width (ft)		171.19	153.80
Top Width (ft)	324.99	Avg. Vel. (ft/s)		0.40	0.05
Vel Total (ft/s)	0.39	Hydr. Depth (ft)		3.16	0.17
Max Chl Dpth (ft)	5.77	Conv. (cfs)		34375.2	189.1
Conv. Total (cfs)	34564.3	Wetted Per. (ft)		173.68	153.82
Length Wtd. (ft)	25.02	Shear (lb/sq ft)		0.01	0.00
Min Ch El (ft)	-1.60	Stream Power (lb/ft s)		0.00	0.00
Alpha	1.08	Cum Volume (acre-ft)		4.57	0.07
Frctn Loss (ft)	0.00	Cum SA (acres)		1.79	0.39
C & E Loss (ft)	0.00				

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #100 yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	4.29	Wt. n-Val.		0.050	0.060
Vel Head (ft)	0.00	Reach Len. (ft)	20.00	25.00	28.00
W.S. Elev (ft)	4.28	Flow Area (sq ft)		561.63	43.44
Crit W.S. (ft)		Area (sq ft)		561.63	43.44
E.G. Slope (ft/ft)	0.000039	Flow (cfs)		226.15	2.82
Q Total (cfs)	228.97	Top Width (ft)		171.69	158.47
Top Width (ft)	330.16	Avg. Vel. (ft/s)		0.40	0.06
Vel Total (ft/s)	0.38	Hydr. Depth (ft)		3.27	0.27
Max Chl Dpth (ft)	5.88	Conv. (cfs)		36419.4	454.0
Conv. Total (cfs)	36873.4	Wetted Per. (ft)		174.24	158.50
Length Wtd. (ft)	25.04	Shear (lb/sq ft)		0.01	0.00
Min Ch El (ft)	-1.60	Stream Power (lb/ft s)		0.00	0.00
Alpha	1.12	Cum Volume (acre-ft)		4.73	0.11
Frctn Loss (ft)	0.00	Cum SA (acres)		1.80	0.41
C & E Loss (ft)	0.00				

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #100 yr + 25

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	4.36	Wt. n-Val.		0.050	0.060
Vel Head (ft)	0.00	Reach Len. (ft)	20.00	25.00	28.00
W.S. Elev (ft)	4.36	Flow Area (sq ft)		573.85	54.82
Crit W.S. (ft)		Area (sq ft)		573.85	54.82
E.G. Slope (ft/ft)	0.000037	Flow (cfs)		230.29	4.04
Q Total (cfs)	234.33	Top Width (ft)		172.00	161.34
Top Width (ft)	333.34	Avg. Vel. (ft/s)		0.40	0.07
Vel Total (ft/s)	0.37	Hydr. Depth (ft)		3.34	0.34
Max Chl Dpth (ft)	5.96	Conv. (cfs)		37700.1	660.9
Conv. Total (cfs)	38361.0	Wetted Per. (ft)		174.59	161.37
Length Wtd. (ft)	25.05	Shear (lb/sq ft)		0.01	0.00
Min Ch El (ft)	-1.60	Stream Power (lb/ft s)		0.00	0.00
Alpha	1.14	Cum Volume (acre-ft)		4.83	0.14
Frctn Loss (ft)	0.00	Cum SA (acres)		1.81	0.42
C & E Loss (ft)	0.00				

Warning: Divided flow computed for this cross-section.

CROSS SECTION

RIVER: EB Riser Ditch
REACH: Exist RS: 5.15

INPUT
Description: Section 7 Proposed
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-60.5	6.5	-46	1.6435	79.6	1	83.98	-.96	92.35	-1.7
114.61	-.63	122.39	5	123.7	5.28	126.83	5.19	135.47	5.21
137	4	305	4	313	4.8				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val

-60.5 .06 -60.5 .05 122.39 .06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
-60.5 122.39 60 85 100 .1 .3

CROSS SECTION OUTPUT Profile #2 yr

E.G. Elev (ft)	4.11	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.		0.050	0.060
W.S. Elev (ft)	4.11	Reach Len. (ft)	60.00	85.00	100.00
Crit W.S. (ft)		Flow Area (sq ft)		555.99	18.85
E.G. Slope (ft/ft)	0.000037	Area (sq ft)		555.99	18.85
Q Total (cfs)	216.18	Flow (cfs)		215.52	0.66
Top Width (ft)	343.79	Top Width (ft)		174.53	169.26
Vel Total (ft/s)	0.38	Avg. Vel. (ft/s)		0.39	0.03
Max Chl Dpth (ft)	5.81	Hydr. Depth (ft)		3.19	0.11
Conv. Total (cfs)	35554.0	Conv. (cfs)		35446.0	108.0
Length Wtd. (ft)	85.02	Wetted Per. (ft)		176.95	169.30
Min Ch El (ft)	-1.70	Shear (lb/sq ft)		0.01	0.00
Alpha	1.06	Stream Power (lb/ft s)		0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		4.17	0.04
C & E Loss (ft)	0.00	Cum SA (acres)		1.69	0.27

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #10 yr

E.G. Elev (ft)	4.17	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.		0.050	0.060
W.S. Elev (ft)	4.17	Reach Len. (ft)	60.00	85.00	100.00
Crit W.S. (ft)		Flow Area (sq ft)		565.80	28.37
E.G. Slope (ft/ft)	0.000036	Area (sq ft)		565.80	28.37
Q Total (cfs)	220.33	Flow (cfs)		219.05	1.28
Top Width (ft)	344.67	Top Width (ft)		174.78	169.89
Vel Total (ft/s)	0.37	Avg. Vel. (ft/s)		0.39	0.05
Max Chl Dpth (ft)	5.87	Hydr. Depth (ft)		3.24	0.17
Conv. Total (cfs)	36670.4	Conv. (cfs)		36457.3	213.1
Length Wtd. (ft)	85.04	Wetted Per. (ft)		177.22	169.96
Min Ch El (ft)	-1.70	Shear (lb/sq ft)		0.01	0.00
Alpha	1.08	Stream Power (lb/ft s)		0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		4.25	0.05
C & E Loss (ft)	0.00	Cum SA (acres)		1.69	0.28

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	4.29	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.		0.050	0.060
W.S. Elev (ft)	4.28	Reach Len. (ft)	60.00	85.00	100.00
Crit W.S. (ft)		Flow Area (sq ft)		586.06	48.11
E.G. Slope (ft/ft)	0.000034	Area (sq ft)		586.06	48.11
Q Total (cfs)	228.97	Flow (cfs)		225.98	2.99
Top Width (ft)	346.48	Top Width (ft)		175.28	171.20
Vel Total (ft/s)	0.36	Avg. Vel. (ft/s)		0.39	0.06
Max Chl Dpth (ft)	5.98	Hydr. Depth (ft)		3.34	0.28
Conv. Total (cfs)	39088.0	Conv. (cfs)		38577.0	511.0
Length Wtd. (ft)	85.10	Wetted Per. (ft)		177.78	171.31
Min Ch El (ft)	-1.70	Shear (lb/sq ft)		0.01	0.00
Alpha	1.13	Stream Power (lb/ft s)		0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		4.40	0.09
C & E Loss (ft)	0.00	Cum SA (acres)		1.70	0.30

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #100 yr + 25

E.G. Elev (ft)	4.36	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.		0.050	0.060
W.S. Elev (ft)	4.35	Reach Len. (ft)	60.00	85.00	100.00
Crit W.S. (ft)		Flow Area (sq ft)		598.54	60.32
E.G. Slope (ft/ft)	0.000033	Area (sq ft)		598.54	60.32
Q Total (cfs)	234.33	Flow (cfs)		230.05	4.28
Top Width (ft)	347.59	Top Width (ft)		175.59	172.00
Vel Total (ft/s)	0.36	Avg. Vel. (ft/s)		0.38	0.07
Max Chl Dpth (ft)	6.05	Hydr. Depth (ft)		3.41	0.35

Conv. Total (cfs)	40647.0	Conv. (cfs)		39904.5	742.5
Length Wtd. (ft)	85.14	Wetted Per. (ft)		178.13	172.14
Min Ch El (ft)	-1.70	Shear (lb/sq ft)		0.01	0.00
Alpha	1.15	Stream Power (lb/ft s)		0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		4.50	0.11
C & E Loss (ft)	0.00	Cum SA (acres)		1.71	0.31

Warning: Divided flow computed for this cross-section.

CROSS SECTION

RIVER: EB Riser Ditch
REACH: Exist RS: 4.30

INPUT
Description: Section 6 Proposed
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-68	6.5	-53.5	1.68	80.3	1	85.55	-1.17	99.73	-1.99
109.32	-1.16	120.41	4.16	137.87	5.08	169.46	4.81	200	4.7

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-68	.06	-68	.05	120.41	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-68	120.41	50	80	110	.1	.3

CROSS SECTION OUTPUT Profile #2 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	4.11	Element			
Vel Head (ft)	0.00	Wt. n-Val.		0.050	
W.S. Elev (ft)	4.11	Reach Len. (ft)	50.00	80.00	110.00
Crit W.S. (ft)		Flow Area (sq ft)		565.44	
E.G. Slope (ft/ft)	0.000037	Area (sq ft)		565.44	
Q Total (cfs)	216.18	Flow (cfs)		216.18	
Top Width (ft)	181.11	Top Width (ft)		181.11	
Vel Total (ft/s)	0.38	Avg. Vel. (ft/s)		0.38	
Max Chl Dpth (ft)	6.10	Hydr. Depth (ft)		3.12	
Conv. Total (cfs)	35623.1	Conv. (cfs)		35623.1	
Length Wtd. (ft)	80.02	Wetted Per. (ft)		183.19	
Min Ch El (ft)	-1.99	Shear (lb/sq ft)		0.01	
Alpha	1.00	Stream Power (lb/ft s)		0.00	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		3.08	0.01
C & E Loss (ft)	0.00	Cum SA (acres)		1.34	0.08

CROSS SECTION OUTPUT Profile #10 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	4.17	Element			
Vel Head (ft)	0.00	Wt. n-Val.		0.050	0.000
W.S. Elev (ft)	4.16	Reach Len. (ft)	50.00	80.00	110.00
Crit W.S. (ft)		Flow Area (sq ft)		575.63	0.00
E.G. Slope (ft/ft)	0.000036	Area (sq ft)		575.63	0.00
Q Total (cfs)	220.33	Flow (cfs)		220.33	0.00
Top Width (ft)	181.48	Top Width (ft)		181.39	0.09
Vel Total (ft/s)	0.38	Avg. Vel. (ft/s)		0.38	0.00
Max Chl Dpth (ft)	6.15	Hydr. Depth (ft)		3.17	0.00
Conv. Total (cfs)	36660.2	Conv. (cfs)		36660.2	0.0
Length Wtd. (ft)	80.03	Wetted Per. (ft)		183.49	0.09
Min Ch El (ft)	-1.99	Shear (lb/sq ft)		0.01	
Alpha	1.00	Stream Power (lb/ft s)		0.00	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		3.13	0.02
C & E Loss (ft)	0.00	Cum SA (acres)		1.35	0.09

CROSS SECTION OUTPUT Profile #100 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	4.28	Element			
Vel Head (ft)	0.00	Wt. n-Val.		0.050	0.060
W.S. Elev (ft)	4.28	Reach Len. (ft)	50.00	80.00	110.00
Crit W.S. (ft)		Flow Area (sq ft)		596.66	0.14
E.G. Slope (ft/ft)	0.000035	Area (sq ft)		596.66	0.14
Q Total (cfs)	228.97	Flow (cfs)		228.97	0.00
Top Width (ft)	184.03	Top Width (ft)		181.73	2.29
Vel Total (ft/s)	0.38	Avg. Vel. (ft/s)		0.38	0.02
Max Chl Dpth (ft)	6.27	Hydr. Depth (ft)		3.28	0.06

Conv. Total (cfs)	38868.2	Conv. (cfs)	38867.7	0.5
Length Wtd. (ft)	80.06	Wetted Per. (ft)	183.86	2.29
Min Ch El (ft)	-1.99	Shear (lb/sq ft)	0.01	0.00
Alpha	1.00	Stream Power (lb/ft s)	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	3.25	0.03
C & E Loss (ft)	0.00	Cum SA (acres)	1.35	0.10

CROSS SECTION OUTPUT Profile #100 yr + 25

E.G. Elev (ft)	4.35	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.		0.050	0.060
W.S. Elev (ft)	4.35	Reach Len. (ft)	50.00	80.00	110.00
Crit W.S. (ft)		Flow Area (sq ft)		609.61	0.35
E.G. Slope (ft/ft)	0.000034	Area (sq ft)		609.61	0.35
Q Total (cfs)	234.33	Flow (cfs)		234.32	0.01
Top Width (ft)	185.59	Top Width (ft)		181.95	3.64
Vel Total (ft/s)	0.38	Avg. Vel. (ft/s)		0.38	0.03
Max Chl Dpth (ft)	6.34	Hydr. Depth (ft)		3.35	0.10
Conv. Total (cfs)	40252.1	Conv. (cfs)		40250.3	1.8
Length Wtd. (ft)	80.08	Wetted Per. (ft)		184.08	3.65
Min Ch El (ft)	-1.99	Shear (lb/sq ft)		0.01	0.00
Alpha	1.00	Stream Power (lb/ft s)		0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		3.32	0.04
C & E Loss (ft)	0.00	Cum SA (acres)		1.36	0.11

CROSS SECTION

RIVER: EB Riser Ditch
REACH: Exist RS: 3.50

INPUT
Description: Section 5 Proposed
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-85	6.5	-70.9	1.8	86.6	1	92.92	-1.43	100.54	-2.07
108.28	-1.25	119.11	3.73	159.48	4.24				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-85	.06	-85	.05	119.11	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-85	119.11	130	120	110	.1 .3

CROSS SECTION OUTPUT Profile #2 yr

E.G. Elev (ft)	4.11	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.		0.050	0.050
W.S. Elev (ft)	4.11	Reach Len. (ft)	130.00	120.00	110.00
Crit W.S. (ft)		Flow Area (sq ft)		581.73	5.59
E.G. Slope (ft/ft)	0.000037	Area (sq ft)		581.73	5.59
Q Total (cfs)	216.18	Flow (cfs)		215.85	0.33
Top Width (ft)	226.67	Top Width (ft)		196.93	29.75
Vel Total (ft/s)	0.37	Avg. Vel. (ft/s)		0.37	0.06
Max Chl Dpth (ft)	6.18	Hydr. Depth (ft)		2.95	0.19
Conv. Total (cfs)	35409.5	Conv. (cfs)		35355.0	54.5
Length Wtd. (ft)	119.99	Wetted Per. (ft)		198.91	29.75
Min Ch El (ft)	-2.07	Shear (lb/sq ft)		0.01	0.00
Alpha	1.01	Stream Power (lb/ft s)		0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		2.03	0.01
C & E Loss (ft)	0.00	Cum SA (acres)		1.00	0.04

CROSS SECTION OUTPUT Profile #10 yr

E.G. Elev (ft)	4.16	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.00	Wt. n-Val.		0.050	0.050
W.S. Elev (ft)	4.16	Reach Len. (ft)	130.00	120.00	110.00
Crit W.S. (ft)		Flow Area (sq ft)		592.82	7.39
E.G. Slope (ft/ft)	0.000036	Area (sq ft)		592.82	7.39
Q Total (cfs)	220.33	Flow (cfs)		219.86	0.48
Top Width (ft)	231.30	Top Width (ft)		197.10	34.20
Vel Total (ft/s)	0.37	Avg. Vel. (ft/s)		0.37	0.06
Max Chl Dpth (ft)	6.23	Hydr. Depth (ft)		3.01	0.22
Conv. Total (cfs)	36543.0	Conv. (cfs)		36464.0	79.1
Length Wtd. (ft)	119.99	Wetted Per. (ft)		199.09	34.21

Min Ch El (ft)	-2.07	Shear (lb/sq ft)	0.01	0.00
Alpha	1.02	Stream Power (lb/ft s)	0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	2.06	0.01
C & E Loss (ft)	0.00	Cum SA (acres)	1.00	0.04

CROSS SECTION OUTPUT Profile #100 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	4.28	Element		0.050	0.050
Vel Head (ft)	0.00	Wt. n-Val.			
W.S. Elev (ft)	4.28	Reach Len. (ft)	130.00	120.00	110.00
Crit W.S. (ft)		Flow Area (sq ft)		615.70	11.83
E.G. Slope (ft/ft)	0.000035	Area (sq ft)		615.70	11.83
Q Total (cfs)	228.97	Flow (cfs)		228.06	0.91
Top Width (ft)	237.81	Top Width (ft)		197.44	40.37
Vel Total (ft/s)	0.36	Avg. Vel. (ft/s)		0.37	0.08
Max Chl Dpth (ft)	6.35	Hydr. Depth (ft)		3.12	0.29
Conv. Total (cfs)	38946.7	Conv. (cfs)		38791.7	155.0
Length Wtd. (ft)	119.98	Wetted Per. (ft)		199.46	40.41
Min Ch El (ft)	-2.07	Shear (lb/sq ft)		0.01	0.00
Alpha	1.03	Stream Power (lb/ft s)		0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		2.14	0.01
C & E Loss (ft)	0.00	Cum SA (acres)		1.01	0.05

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION OUTPUT Profile #100 yr + 25

			Left OB	Channel	Right OB
E.G. Elev (ft)	4.35	Element		0.050	0.050
Vel Head (ft)	0.00	Wt. n-Val.			
W.S. Elev (ft)	4.35	Reach Len. (ft)	130.00	120.00	110.00
Crit W.S. (ft)		Flow Area (sq ft)		629.78	14.71
E.G. Slope (ft/ft)	0.000034	Area (sq ft)		629.78	14.71
Q Total (cfs)	234.33	Flow (cfs)		233.04	1.29
Top Width (ft)	238.03	Top Width (ft)		197.66	40.37
Vel Total (ft/s)	0.36	Avg. Vel. (ft/s)		0.37	0.09
Max Chl Dpth (ft)	6.42	Hydr. Depth (ft)		3.19	0.36
Conv. Total (cfs)	40473.7	Conv. (cfs)		40251.1	222.6
Length Wtd. (ft)	119.97	Wetted Per. (ft)		199.69	40.48
Min Ch El (ft)	-2.07	Shear (lb/sq ft)		0.01	0.00
Alpha	1.03	Stream Power (lb/ft s)		0.00	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		2.18	0.02
C & E Loss (ft)	0.00	Cum SA (acres)		1.01	0.05

Warning: The cross-section end points had to be extended vertically for the computed water surface.

CROSS SECTION

RIVER: EB Riser Ditch
REACH: Exist RS: 2.30

INPUT
Description: Section 4 Proposed
Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-156	16	-154	15	-138	11	-131	7	-62	6
-49	1.68	86.2	1	91.47	-1.17	100.11	-1.82	107.85	-1.24
120.2	4.73	140.93	4.94	164.01	4.68	170.35	4.69	196.57	4.5
200	4.5	307	5						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-156	.06	-62	.05	120.2	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
-62	120.2	48	48	.3	.5

CROSS SECTION OUTPUT Profile #2 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	4.10	Element		0.050	
Vel Head (ft)	0.00	Wt. n-Val.			
W.S. Elev (ft)	4.10	Reach Len. (ft)	48.00	48.00	48.00
Crit W.S. (ft)		Flow Area (sq ft)		525.49	
E.G. Slope (ft/ft)	0.000045	Area (sq ft)		525.49	
Q Total (cfs)	216.18	Flow (cfs)		216.18	
Top Width (ft)	175.18	Top Width (ft)		175.18	

Vel Total (ft/s)	0.41	Avg. Vel. (ft/s)	0.41
Max Chl Dpth (ft)	5.92	Hydr. Depth (ft)	3.00
Conv. Total (cfs)	32226.1	Conv. (cfs)	32226.1
Length Wtd. (ft)	48.00	Wetted Per. (ft)	177.27
Min Ch El (ft)	-1.82	Shear (lb/sq ft)	0.01
Alpha	1.00	Stream Power (lb/ft s)	0.00
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.50
C & E Loss (ft)	0.01	Cum SA (acres)	0.48

CROSS SECTION OUTPUT Profile #10 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	4.16	Element			
Vel Head (ft)	0.00	Wt. n-Val.		0.050	
W.S. Elev (ft)	4.16	Reach Len. (ft)	48.00	48.00	48.00
Crit W.S. (ft)		Flow Area (sq ft)		535.38	
E.G. Slope (ft/ft)	0.000044	Area (sq ft)		535.38	
Q Total (cfs)	220.33	Flow (cfs)		220.33	
Top Width (ft)	175.47	Top Width (ft)		175.47	
Vel Total (ft/s)	0.41	Avg. Vel. (ft/s)		0.41	
Max Chl Dpth (ft)	5.98	Hydr. Depth (ft)		3.05	
Conv. Total (cfs)	33204.8	Conv. (cfs)		33204.8	
Length Wtd. (ft)	48.00	Wetted Per. (ft)		177.58	
Min Ch El (ft)	-1.82	Shear (lb/sq ft)		0.01	
Alpha	1.00	Stream Power (lb/ft s)		0.00	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		0.51	
C & E Loss (ft)	0.01	Cum SA (acres)		0.49	

CROSS SECTION OUTPUT Profile #100 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	4.28	Element			
Vel Head (ft)	0.00	Wt. n-Val.		0.050	
W.S. Elev (ft)	4.27	Reach Len. (ft)	48.00	48.00	48.00
Crit W.S. (ft)		Flow Area (sq ft)		555.80	
E.G. Slope (ft/ft)	0.000042	Area (sq ft)		555.80	
Q Total (cfs)	228.97	Flow (cfs)		228.97	
Top Width (ft)	176.06	Top Width (ft)		176.06	
Vel Total (ft/s)	0.41	Avg. Vel. (ft/s)		0.41	
Max Chl Dpth (ft)	6.09	Hydr. Depth (ft)		3.16	
Conv. Total (cfs)	35258.2	Conv. (cfs)		35258.2	
Length Wtd. (ft)	48.00	Wetted Per. (ft)		178.22	
Min Ch El (ft)	-1.82	Shear (lb/sq ft)		0.01	
Alpha	1.00	Stream Power (lb/ft s)		0.00	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		0.52	
C & E Loss (ft)	0.01	Cum SA (acres)		0.49	

CROSS SECTION OUTPUT Profile #100 yr + 25

			Left OB	Channel	Right OB
E.G. Elev (ft)	4.35	Element			
Vel Head (ft)	0.00	Wt. n-Val.		0.050	
W.S. Elev (ft)	4.34	Reach Len. (ft)	48.00	48.00	48.00
Crit W.S. (ft)		Flow Area (sq ft)		568.38	
E.G. Slope (ft/ft)	0.000041	Area (sq ft)		568.38	
Q Total (cfs)	234.33	Flow (cfs)		234.33	
Top Width (ft)	176.42	Top Width (ft)		176.42	
Vel Total (ft/s)	0.41	Avg. Vel. (ft/s)		0.41	
Max Chl Dpth (ft)	6.16	Hydr. Depth (ft)		3.22	
Conv. Total (cfs)	36545.1	Conv. (cfs)		36545.1	
Length Wtd. (ft)	48.00	Wetted Per. (ft)		178.61	
Min Ch El (ft)	-1.82	Shear (lb/sq ft)		0.01	
Alpha	1.00	Stream Power (lb/ft s)		0.00	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		0.53	
C & E Loss (ft)	0.01	Cum SA (acres)		0.49	

CROSS SECTION

RIVER: EB Riser Ditch
REACH: Exist RS: 1.82

INPUT
Description: Section 3B - U/S Side of Moonachie Ave - Model Natual channel upstream of Trash Rack
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-171	5	-110	6	-95	6.2	-72	6.1	-46	6

0	5.8	10.31	5.64	67.67	6.07	74.98	5.88	84.69	2.25
93.5	-3.04	106.5	-3.04	115.37	3.64	117.6	4.55	118.43	6.61
137.2	7.42	200	6.06	245	6				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-171	.04	74.98	.02	118.43	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
74.98	118.43	1	1	.3	.5

CROSS SECTION OUTPUT Profile #2 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	4.09	Element			
Vel Head (ft)	0.03	Wt. n-Val.		0.020	
W.S. Elev (ft)	4.07	Reach Len. (ft)	1.00	1.00	1.00
Crit W.S. (ft)		Flow Area (sq ft)		169.82	
E.G. Slope (ft/ft)	0.000044	Area (sq ft)		169.82	
Q Total (cfs)	216.18	Flow (cfs)		216.18	
Top Width (ft)	36.60	Top Width (ft)		36.60	
Vel Total (ft/s)	1.27	Avg. Vel. (ft/s)		1.27	
Max Chl Dpth (ft)	7.11	Hydr. Depth (ft)		4.64	
Conv. Total (cfs)	32696.2	Conv. (cfs)		32696.2	
Length Wtd. (ft)	1.00	Wetted Per. (ft)		40.71	
Min Ch El (ft)	-3.04	Shear (lb/sq ft)		0.01	
Alpha	1.00	Stream Power (lb/ft s)		0.01	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		0.12	
C & E Loss (ft)	0.06	Cum SA (acres)		0.37	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	4.15	Element			
Vel Head (ft)	0.03	Wt. n-Val.		0.020	
W.S. Elev (ft)	4.12	Reach Len. (ft)	1.00	1.00	1.00
Crit W.S. (ft)		Flow Area (sq ft)		171.88	
E.G. Slope (ft/ft)	0.000044	Area (sq ft)		171.88	
Q Total (cfs)	220.33	Flow (cfs)		220.33	
Top Width (ft)	36.88	Top Width (ft)		36.88	
Vel Total (ft/s)	1.28	Avg. Vel. (ft/s)		1.28	
Max Chl Dpth (ft)	7.16	Hydr. Depth (ft)		4.66	
Conv. Total (cfs)	33191.6	Conv. (cfs)		33191.6	
Length Wtd. (ft)	1.00	Wetted Per. (ft)		41.02	
Min Ch El (ft)	-3.04	Shear (lb/sq ft)		0.01	
Alpha	1.00	Stream Power (lb/ft s)		0.01	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		0.12	
C & E Loss (ft)	0.06	Cum SA (acres)		0.37	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	4.27	Element			
Vel Head (ft)	0.03	Wt. n-Val.		0.020	
W.S. Elev (ft)	4.24	Reach Len. (ft)	1.00	1.00	1.00
Crit W.S. (ft)		Flow Area (sq ft)		176.17	
E.G. Slope (ft/ft)	0.000045	Area (sq ft)		176.17	
Q Total (cfs)	228.97	Flow (cfs)		228.97	
Top Width (ft)	37.47	Top Width (ft)		37.47	
Vel Total (ft/s)	1.30	Avg. Vel. (ft/s)		1.30	
Max Chl Dpth (ft)	7.28	Hydr. Depth (ft)		4.70	
Conv. Total (cfs)	34230.4	Conv. (cfs)		34230.4	
Length Wtd. (ft)	1.00	Wetted Per. (ft)		41.65	
Min Ch El (ft)	-3.04	Shear (lb/sq ft)		0.01	
Alpha	1.00	Stream Power (lb/ft s)		0.02	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		0.12	
C & E Loss (ft)	0.07	Cum SA (acres)		0.37	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 yr + 25

E.G. Elev (ft)	4.34	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.03	Wt. n-Val.		0.020	
W.S. Elev (ft)	4.31	Reach Len. (ft)	1.00	1.00	1.00
Crit W.S. (ft)		Flow Area (sq ft)		178.83	
E.G. Slope (ft/ft)	0.000045	Area (sq ft)		178.83	
Q Total (cfs)	234.33	Flow (cfs)		234.33	
Top Width (ft)	37.84	Top Width (ft)		37.84	
Vel Total (ft/s)	1.31	Avg. Vel. (ft/s)		1.31	
Max Chl Dpth (ft)	7.35	Hydr. Depth (ft)		4.73	
Conv. Total (cfs)	34881.5	Conv. (cfs)		34881.5	
Length Wtd. (ft)	1.00	Wetted Per. (ft)		42.04	
Min Ch El (ft)	-3.04	Shear (lb/sq ft)		0.01	
Alpha	1.00	Stream Power (lb/ft s)		0.02	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		0.12	
C & E Loss (ft)	0.07	Cum SA (acres)		0.38	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: EB Riser Ditch
REACH: Exist RS: 1.81

INPUT
Description: Section 3A - U/S Side of Moonachie Ave - Model Existing Trash Rack, approx. 4 " spacing, 2" bars

Station Elevation Data num= 112

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-171	5	-110	6	-95	6.2	-72	6.1	-46	6
0	5.8	10.31	5.64	67.67	6.07	93.5	6	93.5	-3.04
93.8	-3.04	93.8	5.5	94	5.5	94	-3.04	94.33	-3.04
94.33	5.5	94.53	5.5	94.53	-3.04	94.86	-3.04	94.86	5.5
95.06	5.5	95.06	-3.04	95.39	-3.04	95.39	5.5	95.59	5.5
95.59	-3.04	95.92	-3.04	95.92	5.5	96.12	5.5	96.12	-3.04
96.45	-3.04	96.45	5.5	96.65	5.5	96.65	-3.04	96.98	-3.04
96.98	5.5	97.18	5.5	97.18	-3.04	97.51	-3.04	97.51	5.5
97.71	5.5	97.71	-3.04	98.04	-3.04	98.04	5.5	98.24	5.5
98.24	-3.04	98.57	-3.04	98.57	5.5	98.77	5.5	98.77	-3.04
99.1	-3.04	99.1	5.5	99.3	5.5	99.3	-3.04	99.63	-3.04
99.63	5.5	99.83	5.5	99.83	-3.04	100.16	-3.04	100.16	5.5
100.36	5.5	100.36	-3.04	100.69	-3.04	100.69	5.5	100.89	5.5
100.89	-3.04	101.22	-3.04	101.22	5.5	101.42	5.5	101.42	-3.04
101.75	-3.04	101.75	5.5	101.95	5.5	101.95	-3.04	102.28	-3.04
102.28	5.5	102.48	5.5	102.48	-3.04	102.81	-3.04	102.81	5.5
103.01	5.5	103.01	-3.04	103.34	-3.04	103.34	5.5	103.54	5.5
103.54	-3.04	103.87	-3.04	103.87	5.5	104.07	5.5	104.07	-3.04
104.4	-3.04	104.4	5.5	104.6	5.5	104.6	-3.04	104.93	-3.04
104.93	5.5	105.13	5.5	105.13	-3.04	105.46	-3.04	105.46	5.5
105.66	5.5	105.66	-3.04	105.99	-3.04	105.99	5.5	106.19	5.5
106.19	-3.04	106.5	-3.04	106.5	6	118.43	6.61	137.2	7.42
200	6.06	245	6						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-171	.04	93.5	.02	106.5	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
93.5	106.5	1	1	.3	.5

Cross Section Lid
num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
70	6	5.5	119	6	5.5

CROSS SECTION OUTPUT Profile #2 yr

E.G. Elev (ft)	4.03	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.23	Wt. n-Val.		0.020	
W.S. Elev (ft)	3.80	Reach Len. (ft)	1.00	1.00	1.00
Crit W.S. (ft)	-0.26	Flow Area (sq ft)		56.10	
E.G. Slope (ft/ft)	0.030926	Area (sq ft)		56.10	
Q Total (cfs)	216.18	Flow (cfs)		216.18	
Top Width (ft)	8.20	Top Width (ft)		8.20	
Vel Total (ft/s)	3.85	Avg. Vel. (ft/s)		3.85	
Max Chl Dpth (ft)	6.84	Hydr. Depth (ft)		6.84	
Conv. Total (cfs)	1229.3	Conv. (cfs)		1229.3	
Length Wtd. (ft)	1.00	Wetted Per. (ft)		350.29	

Min Ch El (ft)	-3.04	Shear (lb/sq ft)	0.31
Alpha	1.00	Stream Power (lb/ft s)	1.19
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.11
C & E Loss (ft)	0.10	Cum SA (acres)	0.37

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: Critical depth could not be determined within the specified number of iterations. The program used the iteration with the lowest energy.

CROSS SECTION OUTPUT Profile #10 yr

E.G. Elev (ft)	4.09	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.24	Wt. n-Val.		0.020	
W.S. Elev (ft)	3.85	Reach Len. (ft)	1.00	1.00	1.00
Crit W.S. (ft)	-0.22	Flow Area (sq ft)		56.51	
E.G. Slope (ft/ft)	0.031662	Area (sq ft)		56.51	
Q Total (cfs)	220.33	Flow (cfs)		220.33	
Top Width (ft)	8.20	Top Width (ft)		8.20	
Vel Total (ft/s)	3.90	Avg. Vel. (ft/s)		3.90	
Max Chl Dpth (ft)	6.89	Hydr. Depth (ft)		6.89	
Conv. Total (cfs)	1238.3	Conv. (cfs)		1238.3	
Length Wtd. (ft)	1.00	Wetted Per. (ft)		352.75	
Min Ch El (ft)	-3.04	Shear (lb/sq ft)		0.32	
Alpha	1.00	Stream Power (lb/ft s)		1.23	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		0.12	
C & E Loss (ft)	0.10	Cum SA (acres)		0.37	

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	4.20	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.25	Wt. n-Val.		0.020	
W.S. Elev (ft)	3.95	Reach Len. (ft)	1.00	1.00	1.00
Crit W.S. (ft)	-0.14	Flow Area (sq ft)		57.34	
E.G. Slope (ft/ft)	0.033195	Area (sq ft)		57.34	
Q Total (cfs)	228.97	Flow (cfs)		228.97	
Top Width (ft)	8.20	Top Width (ft)		8.20	
Vel Total (ft/s)	3.99	Avg. Vel. (ft/s)		3.99	
Max Chl Dpth (ft)	6.99	Hydr. Depth (ft)		6.99	
Conv. Total (cfs)	1256.7	Conv. (cfs)		1256.7	
Length Wtd. (ft)	1.00	Wetted Per. (ft)		357.81	
Min Ch El (ft)	-3.04	Shear (lb/sq ft)		0.33	
Alpha	1.00	Stream Power (lb/ft s)		1.33	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		0.12	
C & E Loss (ft)	0.11	Cum SA (acres)		0.37	

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: Critical depth could not be determined within the specified number of iterations. The program used the iteration with the lowest energy.

CROSS SECTION OUTPUT Profile #100 yr + 25

E.G. Elev (ft)	4.27	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.25	Wt. n-Val.		0.020	
W.S. Elev (ft)	4.01	Reach Len. (ft)	1.00	1.00	1.00
Crit W.S. (ft)	-0.10	Flow Area (sq ft)		57.84	
E.G. Slope (ft/ft)	0.034148	Area (sq ft)		57.84	
Q Total (cfs)	234.33	Flow (cfs)		234.33	
Top Width (ft)	8.20	Top Width (ft)		8.20	
Vel Total (ft/s)	4.05	Avg. Vel. (ft/s)		4.05	
Max Chl Dpth (ft)	7.05	Hydr. Depth (ft)		7.05	
Conv. Total (cfs)	1268.1	Conv. (cfs)		1268.1	
Length Wtd. (ft)	1.00	Wetted Per. (ft)		360.91	
Min Ch El (ft)	-3.04	Shear (lb/sq ft)		0.34	
Alpha	1.00	Stream Power (lb/ft s)		1.38	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)		0.12	
C & E Loss (ft)	0.11	Cum SA (acres)		0.38	

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: EB Riser Ditch
REACH: Exist RS: 1.80

INPUT
Description: Section 3 - U/S Side of Moonachie Ave
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-171	5	-110	6	-95	6.2	-72	6.1	-46	6
0	5.8	10.31	5.64	67.67	6.07	74.98	5.88	84.69	2.25
93.5	-3.04	106.5	-3.04	115.37	3.64	117.6	4.55	118.43	6.61
137.2	7.42	200	6.06	245	6				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-171	.04	74.98	.02	118.43	.04

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
74.98	118.43	66	66	.1	.3

CROSS SECTION OUTPUT Profile #2 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	3.93	Element			
Vel Head (ft)	0.03	Wt. n-Val.		0.020	
W.S. Elev (ft)	3.90	Reach Len. (ft)	66.00	66.00	66.00
Crit W.S. (ft)	-1.15	Flow Area (sq ft)		163.83	
E.G. Slope (ft/ft)	0.000048	Area (sq ft)		163.83	
Q Total (cfs)	216.18	Flow (cfs)		216.18	
Top Width (ft)	35.75	Top Width (ft)		35.75	
Vel Total (ft/s)	1.32	Avg. Vel. (ft/s)		1.32	
Max Chl Dpth (ft)	6.94	Hydr. Depth (ft)		4.58	
Conv. Total (cfs)	31265.2	Conv. (cfs)		31265.2	
Length Wtd. (ft)	66.00	Wetted Per. (ft)		39.80	
Min Ch El (ft)	-3.04	Shear (lb/sq ft)		0.01	
Alpha	1.00	Stream Power (lb/ft s)		0.02	
Frctn Loss (ft)		Cum Volume (acre-ft)		0.11	
C & E Loss (ft)		Cum SA (acres)		0.37	

CROSS SECTION OUTPUT Profile #10 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	3.98	Element			
Vel Head (ft)	0.03	Wt. n-Val.		0.020	
W.S. Elev (ft)	3.96	Reach Len. (ft)	66.00	66.00	66.00
Crit W.S. (ft)	-1.12	Flow Area (sq ft)		165.69	
E.G. Slope (ft/ft)	0.000048	Area (sq ft)		165.69	
Q Total (cfs)	220.33	Flow (cfs)		220.33	
Top Width (ft)	36.01	Top Width (ft)		36.01	
Vel Total (ft/s)	1.33	Avg. Vel. (ft/s)		1.33	
Max Chl Dpth (ft)	7.00	Hydr. Depth (ft)		4.60	
Conv. Total (cfs)	31707.2	Conv. (cfs)		31707.2	
Length Wtd. (ft)	66.00	Wetted Per. (ft)		40.08	
Min Ch El (ft)	-3.04	Shear (lb/sq ft)		0.01	
Alpha	1.00	Stream Power (lb/ft s)		0.02	
Frctn Loss (ft)		Cum Volume (acre-ft)		0.11	
C & E Loss (ft)		Cum SA (acres)		0.37	

CROSS SECTION OUTPUT Profile #100 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	4.09	Element			
Vel Head (ft)	0.03	Wt. n-Val.		0.020	
W.S. Elev (ft)	4.06	Reach Len. (ft)	66.00	66.00	66.00
Crit W.S. (ft)	-1.08	Flow Area (sq ft)		169.56	
E.G. Slope (ft/ft)	0.000049	Area (sq ft)		169.56	
Q Total (cfs)	228.97	Flow (cfs)		228.97	
Top Width (ft)	36.56	Top Width (ft)		36.56	
Vel Total (ft/s)	1.35	Avg. Vel. (ft/s)		1.35	
Max Chl Dpth (ft)	7.10	Hydr. Depth (ft)		4.64	
Conv. Total (cfs)	32632.4	Conv. (cfs)		32632.4	
Length Wtd. (ft)	66.00	Wetted Per. (ft)		40.67	
Min Ch El (ft)	-3.04	Shear (lb/sq ft)		0.01	
Alpha	1.00	Stream Power (lb/ft s)		0.02	

Frctn Loss (ft)		Cum Volume (acre-ft)	0.11
C & E Loss (ft)		Cum SA (acres)	0.37

CROSS SECTION OUTPUT Profile #100 yr + 25

			Left OB	Channel	Right OB
E.G. Elev (ft)	4.16	Element			
Vel Head (ft)	0.03	Wt. n-Val.		0.020	
W.S. Elev (ft)	4.13	Reach Len. (ft)	66.00	66.00	66.00
Crit W.S. (ft)	-1.05	Flow Area (sq ft)		171.96	
E.G. Slope (ft/ft)	0.000050	Area (sq ft)		171.96	
Q Total (cfs)	234.33	Flow (cfs)		234.33	
Top Width (ft)	36.89	Top Width (ft)		36.89	
Vel Total (ft/s)	1.36	Avg. Vel. (ft/s)		1.36	
Max Chl Dpth (ft)	7.17	Hydr. Depth (ft)		4.66	
Conv. Total (cfs)	33210.9	Conv. (cfs)		33210.9	
Length Wtd. (ft)	66.00	Wetted Per. (ft)		41.03	
Min Ch El (ft)	-3.04	Shear (lb/sq ft)		0.01	
Alpha	1.00	Stream Power (lb/ft s)		0.02	
Frctn Loss (ft)		Cum Volume (acre-ft)		0.11	
C & E Loss (ft)		Cum SA (acres)		0.37	

CULVERT

RIVER: EB Riser Ditch
REACH: Exist RS: 1.47

INPUT
Description: Moonachie Ave Culvert - 12'-8" x 8'-1" CMPA Bit. Coated
Assume
culvert cleaned and no debris
Distance from Upstream XS = 1
Deck/Roadway Width = 62.5
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 6

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
-95	6.2	-3.5	0	6.5	-3.5	74.98	7	-3.5
84.69	7.49	-3.5	115.37	7.42	-3.5	137.2	7.42	-3.5

Upstream Bridge Cross Section Data
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-171	5	-110	6	-95	6.2	-72	6.1	-46	6
0	5.8	10.31	5.64	67.67	6.07	74.98	5.88	84.69	2.25
93.5	-3.04	106.5	-3.04	115.37	3.64	117.6	4.55	118.43	6.61
137.2	7.42	200	6.06	245	6				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-171	.04	74.98	.02	118.43	.04

Bank Sta: Left	Right	Coeff Contr.	Expan.
74.98	118.43	.1	.3

Downstream Deck/Roadway Coordinates
num= 5

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
0	6.5	-3.5	75	7	-3.5	84.9	7	-3.5
115.55	7	-3.5	200	7	-3.5			

Downstream Bridge Cross Section Data
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	5.3	2.9	5.19	50	6.7	84.9	6.93	84.9	3.55
93.5	-3.04	106.5	-3.04	115.4	5.31	115.4	6.4	131.2	6.51
140.7	6.28	143.4	6.38	200	6.2				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	84.9	.05	115.4	.05

Bank Sta: Left	Right	Coeff Contr.	Expan.
84.9	115.4	.3	.5

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
Downstream Embankment side slope = 0 horiz. to 1.0 vertical

Maximum allowable submergence for weir flow = .95
Elevation at which weir flow begins =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Culverts = 1

Culvert Name	Shape	Rise	Span
Culvert #1	Arch	8.08	12.7

FHWA Chart # 41- Arch; Corrugated metal
FHWA Scale # 1 - 90 Degree headwall
Solution Criteria = Highest U.S. EG

Culvert	Upstrm Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss Coef	Exit Loss Coef
	1	62.5	.024	.024	0	.5	1

Upstream Elevation = -3.04
Centerline Station = 100
Downstream Elevation = -3.04
Centerline Station = 100

CROSS SECTION

RIVER: EB Riser Ditch
REACH: Exist RS: 1.14

INPUT
Description: Section 2 - D/S Side of Moonachie Ave
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	5.3	2.9	5.19	50	6.7	84.9	6.93	84.9	3.55
93.5	-3.04	106.5	-3.04	115.4	5.31	115.4	6.4	131.2	6.51
140.7	6.28	143.4	6.38	200	6.2				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.05	84.9	.05	115.4	.05

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
84.9	115.4	14	14	.3	.5

CROSS SECTION OUTPUT Profile #2 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	3.73	Element			
Vel Head (ft)	0.04	Wt. n-Val.		0.050	
W.S. Elev (ft)	3.70	Reach Len. (ft)	14.00	14.00	14.00
Crit W.S. (ft)		Flow Area (sq ft)		141.34	
E.G. Slope (ft/ft)	0.000394	Area (sq ft)		141.34	
Q Total (cfs)	216.18	Flow (cfs)		216.18	
Top Width (ft)	28.78	Top Width (ft)		28.78	
Vel Total (ft/s)	1.53	Avg. Vel. (ft/s)		1.53	
Max Chl Dpth (ft)	6.74	Hydr. Depth (ft)		4.91	
Conv. Total (cfs)	10897.0	Conv. (cfs)		10897.0	
Length Wtd. (ft)	14.00	Wetted Per. (ft)		33.83	
Min Ch El (ft)	-3.04	Shear (lb/sq ft)		0.10	
Alpha	1.00	Stream Power (lb/ft s)		0.16	
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)		1.08	
C & E Loss (ft)	0.01	Cum SA (acres)		0.32	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	3.78	Element			
Vel Head (ft)	0.04	Wt. n-Val.		0.050	
W.S. Elev (ft)	3.74	Reach Len. (ft)	14.00	14.00	14.00
Crit W.S. (ft)		Flow Area (sq ft)		142.64	
E.G. Slope (ft/ft)	0.000398	Area (sq ft)		142.64	
Q Total (cfs)	220.33	Flow (cfs)		220.33	
Top Width (ft)	28.83	Top Width (ft)		28.83	
Vel Total (ft/s)	1.54	Avg. Vel. (ft/s)		1.54	
Max Chl Dpth (ft)	6.78	Hydr. Depth (ft)		4.95	
Conv. Total (cfs)	11040.3	Conv. (cfs)		11040.3	
Length Wtd. (ft)	14.00	Wetted Per. (ft)		33.94	
Min Ch El (ft)	-3.04	Shear (lb/sq ft)		0.10	
Alpha	1.00	Stream Power (lb/ft s)		0.16	
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)		1.10	

C & E Loss (ft)	0.01	Cum SA (acres)	0.32

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	3.87	Element			
Vel Head (ft)	0.04	Wt. n-Val.		0.050	
W.S. Elev (ft)	3.83	Reach Len. (ft)	14.00	14.00	14.00
Crit W.S. (ft)		Flow Area (sq ft)		145.31	
E.G. Slope (ft/ft)	0.000408	Area (sq ft)		145.31	
Q Total (cfs)	228.97	Flow (cfs)		228.97	
Top Width (ft)	28.93	Top Width (ft)		28.93	
Vel Total (ft/s)	1.58	Avg. Vel. (ft/s)		1.58	
Max Chl Dpth (ft)	6.87	Hydr. Depth (ft)		5.02	
Conv. Total (cfs)	11335.8	Conv. (cfs)		11335.8	
Length Wtd. (ft)	14.00	Wetted Per. (ft)		34.16	
Min Ch El (ft)	-3.04	Shear (lb/sq ft)		0.11	
Alpha	1.00	Stream Power (lb/ft s)		0.17	
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)		1.13	
C & E Loss (ft)	0.01	Cum SA (acres)		0.32	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100 yr + 25

			Left OB	Channel	Right OB
E.G. Elev (ft)	3.93	Element			
Vel Head (ft)	0.04	Wt. n-Val.		0.050	
W.S. Elev (ft)	3.89	Reach Len. (ft)	14.00	14.00	14.00
Crit W.S. (ft)		Flow Area (sq ft)		146.94	
E.G. Slope (ft/ft)	0.000414	Area (sq ft)		146.94	
Q Total (cfs)	234.33	Flow (cfs)		234.33	
Top Width (ft)	28.99	Top Width (ft)		28.99	
Vel Total (ft/s)	1.59	Avg. Vel. (ft/s)		1.59	
Max Chl Dpth (ft)	6.93	Hydr. Depth (ft)		5.07	
Conv. Total (cfs)	11517.6	Conv. (cfs)		11517.6	
Length Wtd. (ft)	14.00	Wetted Per. (ft)		34.30	
Min Ch El (ft)	-3.04	Shear (lb/sq ft)		0.11	
Alpha	1.00	Stream Power (lb/ft s)		0.18	
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)		1.14	
C & E Loss (ft)	0.01	Cum SA (acres)		0.32	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: EB Riser Ditch
REACH: Exist RS: 1.0

INPUT
Description: Section 1.0
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	5.1	2.3	5.05	52.8	6.63	79.2	6.03	92.7	-1.18
96.6	-1.31	100.4	-1.3	106.3	-1.13	113.4	5.12	116.7	5.46
126.6	5.67	132.3	5.69	140.5	5.29	159.8	4.8	200	4.9

Manning's n values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	79.2	.05	116.7	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
79.2	116.7	500	500	500	.1 .3

CROSS SECTION OUTPUT Profile #2 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	3.71	Element			
Vel Head (ft)	0.07	Wt. n-Val.		0.050	
W.S. Elev (ft)	3.64	Reach Len. (ft)	500.00	500.00	500.00
Crit W.S. (ft)		Flow Area (sq ft)		101.23	
E.G. Slope (ft/ft)	0.001069	Area (sq ft)		101.23	
Q Total (cfs)	216.18	Flow (cfs)		216.18	

Top Width (ft)	28.05	Top Width (ft)	28.05
Vel Total (ft/s)	2.14	Avg. Vel. (ft/s)	2.14
Max Chl Dpth (ft)	4.95	Hydr. Depth (ft)	3.61
Conv. Total (cfs)	6612.8	Conv. (cfs)	6612.8
Length Wtd. (ft)	500.00	Wetted Per. (ft)	31.06
Min Ch El (ft)	-1.31	Shear (lb/sq ft)	0.22
Alpha	1.00	Stream Power (lb/ft s)	0.46
Frctn Loss (ft)	0.71	Cum Volume (acre-ft)	1.04
C & E Loss (ft)	0.00	Cum SA (acres)	0.31

CROSS SECTION OUTPUT Profile #10 yr

E.G. Elev (ft)	3.76	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.07	Wt. n-Val.		0.050	
W.S. Elev (ft)	3.69	Reach Len. (ft)	500.00	500.00	500.00
Crit W.S. (ft)		Flow Area (sq ft)		102.49	
E.G. Slope (ft/ft)	0.001073	Area (sq ft)		102.49	
Q Total (cfs)	220.33	Flow (cfs)		220.33	
Top Width (ft)	28.19	Top Width (ft)		28.19	
Vel Total (ft/s)	2.15	Avg. Vel. (ft/s)		2.15	
Max Chl Dpth (ft)	5.00	Hydr. Depth (ft)		3.64	
Conv. Total (cfs)	6726.9	Conv. (cfs)		6726.9	
Length Wtd. (ft)	500.00	Wetted Per. (ft)		31.23	
Min Ch El (ft)	-1.31	Shear (lb/sq ft)		0.22	
Alpha	1.00	Stream Power (lb/ft s)		0.47	
Frctn Loss (ft)	0.72	Cum Volume (acre-ft)		1.06	
C & E Loss (ft)	0.00	Cum SA (acres)		0.31	

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	3.85	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.07	Wt. n-Val.		0.050	
W.S. Elev (ft)	3.78	Reach Len. (ft)	500.00	500.00	500.00
Crit W.S. (ft)		Flow Area (sq ft)		105.09	
E.G. Slope (ft/ft)	0.001081	Area (sq ft)		105.09	
Q Total (cfs)	228.97	Flow (cfs)		228.97	
Top Width (ft)	28.46	Top Width (ft)		28.46	
Vel Total (ft/s)	2.18	Avg. Vel. (ft/s)		2.18	
Max Chl Dpth (ft)	5.09	Hydr. Depth (ft)		3.69	
Conv. Total (cfs)	6963.6	Conv. (cfs)		6963.6	
Length Wtd. (ft)	500.00	Wetted Per. (ft)		31.56	
Min Ch El (ft)	-1.31	Shear (lb/sq ft)		0.22	
Alpha	1.00	Stream Power (lb/ft s)		0.49	
Frctn Loss (ft)	0.72	Cum Volume (acre-ft)		1.09	
C & E Loss (ft)	0.00	Cum SA (acres)		0.31	

CROSS SECTION OUTPUT Profile #100 yr + 25

E.G. Elev (ft)	3.91	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.07	Wt. n-Val.		0.050	
W.S. Elev (ft)	3.83	Reach Len. (ft)	500.00	500.00	500.00
Crit W.S. (ft)		Flow Area (sq ft)		106.68	
E.G. Slope (ft/ft)	0.001086	Area (sq ft)		106.68	
Q Total (cfs)	234.33	Flow (cfs)		234.33	
Top Width (ft)	28.63	Top Width (ft)		28.63	
Vel Total (ft/s)	2.20	Avg. Vel. (ft/s)		2.20	
Max Chl Dpth (ft)	5.14	Hydr. Depth (ft)		3.73	
Conv. Total (cfs)	7110.2	Conv. (cfs)		7110.2	
Length Wtd. (ft)	500.00	Wetted Per. (ft)		31.76	
Min Ch El (ft)	-1.31	Shear (lb/sq ft)		0.23	
Alpha	1.00	Stream Power (lb/ft s)		0.50	
Frctn Loss (ft)	0.72	Cum Volume (acre-ft)		1.10	
C & E Loss (ft)	0.00	Cum SA (acres)		0.32	

CROSS SECTION

RIVER: EB Riser Ditch
REACH: Exist RS: -5

INPUT
Description: Section -5 - Copied Section 1, 500 feet downstream for model stability
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

0	5.1	2.3	5.05	52.8	6.63	79.2	6.03	92.7	-1.18
96.6	-1.31	100.4	-1.3	106.3	-1.13	113.4	5.12	116.7	5.46
126.6	5.67	132.3	5.69	140.5	5.29	159.8	4.8	200	4.9

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	79.2	.05	116.7	.06

Bank Sta: Left	Right	Coeff Contr.	Expan.
79.2	116.7	.1	.3

CROSS SECTION OUTPUT Profile #2 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	2.99	Element			
Vel Head (ft)	0.11	Wt. n-Val.		0.050	
W.S. Elev (ft)	2.88	Reach Len. (ft)			
Crit W.S. (ft)	0.61	Flow Area (sq ft)		80.78	
E.G. Slope (ft/ft)	0.002003	Area (sq ft)		80.78	
Q Total (cfs)	216.18	Flow (cfs)		216.18	
Top Width (ft)	25.76	Top Width (ft)		25.76	
Vel Total (ft/s)	2.68	Avg. Vel. (ft/s)		2.68	
Max Chl Dpth (ft)	4.19	Hydr. Depth (ft)		3.14	
Conv. Total (cfs)	4830.8	Conv. (cfs)		4830.8	
Length Wtd. (ft)		Wetted Per. (ft)		28.30	
Min Ch El (ft)	-1.31	Shear (lb/sq ft)		0.36	
Alpha	1.00	Stream Power (lb/ft s)		0.95	
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

CROSS SECTION OUTPUT Profile #10 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	3.04	Element			
Vel Head (ft)	0.11	Wt. n-Val.		0.050	
W.S. Elev (ft)	2.93	Reach Len. (ft)			
Crit W.S. (ft)	0.64	Flow Area (sq ft)		81.90	
E.G. Slope (ft/ft)	0.002002	Area (sq ft)		81.90	
Q Total (cfs)	220.33	Flow (cfs)		220.33	
Top Width (ft)	25.89	Top Width (ft)		25.89	
Vel Total (ft/s)	2.69	Avg. Vel. (ft/s)		2.69	
Max Chl Dpth (ft)	4.24	Hydr. Depth (ft)		3.16	
Conv. Total (cfs)	4924.1	Conv. (cfs)		4924.1	
Length Wtd. (ft)		Wetted Per. (ft)		28.46	
Min Ch El (ft)	-1.31	Shear (lb/sq ft)		0.36	
Alpha	1.00	Stream Power (lb/ft s)		0.97	
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

CROSS SECTION OUTPUT Profile #100 yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	3.13	Element			
Vel Head (ft)	0.11	Wt. n-Val.		0.050	
W.S. Elev (ft)	3.01	Reach Len. (ft)			
Crit W.S. (ft)	0.68	Flow Area (sq ft)		84.19	
E.G. Slope (ft/ft)	0.002002	Area (sq ft)		84.19	
Q Total (cfs)	228.97	Flow (cfs)		228.97	
Top Width (ft)	26.16	Top Width (ft)		26.16	
Vel Total (ft/s)	2.72	Avg. Vel. (ft/s)		2.72	
Max Chl Dpth (ft)	4.32	Hydr. Depth (ft)		3.22	
Conv. Total (cfs)	5117.9	Conv. (cfs)		5117.9	
Length Wtd. (ft)		Wetted Per. (ft)		28.78	
Min Ch El (ft)	-1.31	Shear (lb/sq ft)		0.37	
Alpha	1.00	Stream Power (lb/ft s)		0.99	
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

CROSS SECTION OUTPUT Profile #100 yr + 25

			Left OB	Channel	Right OB
E.G. Elev (ft)	3.18	Element			
Vel Head (ft)	0.12	Wt. n-Val.		0.050	
W.S. Elev (ft)	3.07	Reach Len. (ft)			
Crit W.S. (ft)	0.71	Flow Area (sq ft)		85.60	
E.G. Slope (ft/ft)	0.002001	Area (sq ft)		85.60	
Q Total (cfs)	234.33	Flow (cfs)		234.33	
Top Width (ft)	26.32	Top Width (ft)		26.32	
Vel Total (ft/s)	2.74	Avg. Vel. (ft/s)		2.74	
Max Chl Dpth (ft)	4.38	Hydr. Depth (ft)		3.25	

Conv. Total (cfs)	5238.0	Conv. (cfs)	5238.0
Length Wtd. (ft)		Wetted Per. (ft)	28.97
Min Ch El (ft)	-1.31	Shear (lb/sq ft)	0.37
Alpha	1.00	Stream Power (lb/ft s)	1.01
Frctn Loss (ft)		Cum Volume (acre-ft)	
C & E Loss (ft)		Cum SA (acres)	

SUMMARY OF MANNING'S N VALUES

River:EB Riser Ditch

Reach	River Sta.	n1	n2	n3
Exist	38.00	.08	.05	.06
Exist	36.00	.08	.05	.06
Exist	34.00	.08	.05	.06
Exist	32.00	.08	.05	.06
Exist	30.00	.08	.05	.06
Exist	28.00	.08	.05	.06
Exist	26.5	Lat Struct		
Exist	26.00	.08	.05	.06
Exist	24.00	.08	.05	.06
Exist	21.50	.08	.05	.06
Exist	20.50	.06	.05	.06
Exist	20.03	.04	.02	.04
Exist	16.76	Culvert		
Exist	13.5	.04	.05	.04
Exist	13.0	.04	.05	.04
Exist	11.50	.04	.05	.04
Exist	9.80	.04	.05	.04
Exist	8.50	.04	.05	.04
Exist	7.20	.04	.05	.04
Exist	6.94	.04	.02	.04
Exist	6.70	.04	.02	.04
Exist	6.50	Culvert		
Exist	6.30	.05	.05	.05
Exist	5.40	.06	.05	.06
Exist	5.15	.06	.05	.06
Exist	4.30	.06	.05	.06
Exist	3.50	.06	.05	.05
Exist	2.30	.06	.05	.05
Exist	1.82	.04	.02	.04
Exist	1.81	.04	.02	.04
Exist	1.80	.04	.02	.04
Exist	1.47	Culvert		
Exist	1.14	.05	.05	.05
Exist	1.0	.06	.05	.06
Exist	-5	.06	.05	.06

SUMMARY OF REACH LENGTHS

River: EB Riser Ditch

Reach	River Sta.	Left	Channel	Right
Exist	38.00	200	200	200
Exist	36.00	189	200	212
Exist	34.00	191	200	210
Exist	32.00	200	200	200
Exist	30.00	200	200	200
Exist	28.00	200	200	200
Exist	26.5	Lat Struct		
Exist	26.00	200	200	200
Exist	24.00	250	250	250
Exist	21.50	100	100	100
Exist	20.50	90	47	20
Exist	20.03	653	653	653
Exist	16.76	Culvert		
Exist	13.5	60	50	80
Exist	13.0	165	150	110
Exist	11.50	185	170	150
Exist	9.80	150	130	100
Exist	8.50	100	130	160

Exist	7.20	9.5	26	32.5
Exist	6.94	10.5	24	37.5
Exist	6.70	40	40	40
Exist	6.50	Culvert		
Exist	6.30	75	90	95
Exist	5.40	20	25	28
Exist	5.15	60	85	100
Exist	4.30	50	80	110
Exist	3.50	130	120	110
Exist	2.30	48	48	48
Exist	1.82	1	1	1
Exist	1.81	1	1	1
Exist	1.80	66	66	66
Exist	1.47	Culvert		
Exist	1.14	14	14	14
Exist	1.0	500	500	500
Exist	-5			

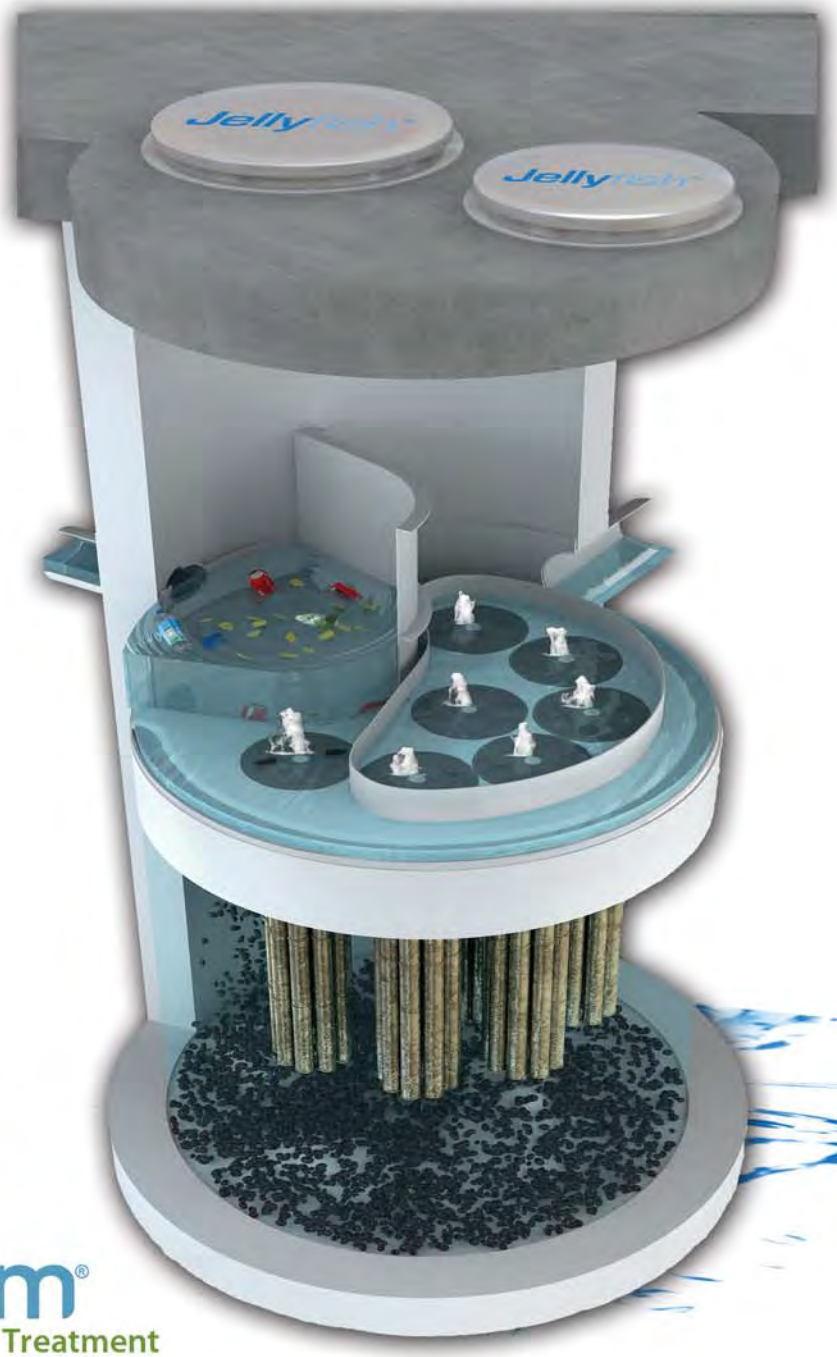
SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: EB Riser Ditch

Reach	River Sta.	Contr.	Expan.
Exist	38.00	.1	.3
Exist	36.00	.1	.3
Exist	34.00	.1	.3
Exist	32.00	.1	.3
Exist	30.00	.1	.3
Exist	28.00	.1	.3
Exist	26.5	Lat Struct	
Exist	26.00	.1	.3
Exist	24.00	.1	.3
Exist	21.50	.1	.3
Exist	20.50	.3	.5
Exist	20.03	.1	.3
Exist	16.76	Culvert	
Exist	13.5	.3	.5
Exist	13.0	.1	.3
Exist	11.50	.1	.3
Exist	9.80	.1	.3
Exist	8.50	.1	.3
Exist	7.20	.3	.5
Exist	6.94	.5	.8
Exist	6.70	.1	.3
Exist	6.50	Culvert	
Exist	6.30	.5	.8
Exist	5.40	.1	.3
Exist	5.15	.1	.3
Exist	4.30	.1	.3
Exist	3.50	.1	.3
Exist	2.30	.3	.5
Exist	1.82	.3	.5
Exist	1.81	.3	.5
Exist	1.80	.1	.3
Exist	1.47	Culvert	
Exist	1.14	.3	.5
Exist	1.0	.1	.3
Exist	-5	.1	.3

APPENDIX H

IMBRIUM SYSTEMS – JELLYFISH FILTER TECHNICAL MANUAL

Jellyfish® Filter
Technical Manual



imbrium®
Engineered Stormwater Treatment
www.imbriumsystems.com

Jellyfish® Filter

Highlights

The Jellyfish® Filter is an engineered Stormwater quality treatment technology featuring pre-treatment and membrane filtration in a compact stand-alone treatment system that removes a high level and wide variety of Stormwater pollutants. Exceptional pollutant removal is achieved at high treatment flow rates with minimal head loss and low maintenance costs. Each lightweight Jellyfish Filter cartridge contains an extraordinarily large amount of membrane surface area, resulting in superior flow capacity and pollutant removal capacity.

Jellyfish efficiently captures a high level of stormwater pollutants, including:

Pollutant Removal*

- ✓ Total Suspended Solids (TSS), median removal efficiency of 89%, including particles less than 2 microns
- ✓ Suspended Solids Concentration (SSC) 99%
- ✓ Total Nitrogen (TN), median removal efficiency of 51%
- ✓ Total Phosphorus (TP), median removal efficiency of 59%
- ✓ Total Copper (Cu), median removal efficiency of 90%
- ✓ Total Zinc (Zn), median removal efficiency of 70%
- ✓ Free Oil
- ✓ Floatiable trash and debris 100%

* Based on 3rd party field testing

Jellyfish Filter field test performance results have been verified by the New Jersey Corporation for Advanced Technology (NJCAT), through the TARP program.



Jellyfish® Filter Technical Manual

Imbrium Systems

Engineered Stormwater Treatment
www.imbriumsystems.com

USA
Phone: 301.279.8827
Toll Free: 888.279.8826

Canada/International
Phone: 416.960.9900
Toll Free: 800.565.4801
Int'l: +1.416.960.9900

Jellyfish® Filter Quick Glance

The Jellyfish® Filter is an engineered Stormwater quality treatment technology featuring pre-treatment and membrane filtration in a compact stand-alone treatment system that removes a high level and wide variety of Stormwater pollutants. Exceptional pollutant removal is achieved at high treatment flow rates with minimal head loss and low maintenance costs. Each lightweight Jellyfish Filter cartridge contains an extraordinarily large amount of membrane surface area resulting in superior flow capacity and pollutant removal capacity.

Jellyfish Filter efficiently captures a high level of stormwater pollutants, including:

Pollutant Removal*

- ✓ Total Suspended Solids (TSS), median removal efficiency of 89%, including particles less than 2 microns
- ✓ Suspended Solids Concentration (SSC) 99%
- ✓ Total Nitrogen (TN), median removal efficiency of 51%
- ✓ Total Phosphorus (TP), median removal efficiency of 59%
- ✓ Total Copper (Cu), median removal efficiency of 90%
- ✓ Total Zinc (Zn), median removal efficiency of 70%
- ✓ Free Oil
- ✓ Floatiable trash and debris 100%

* Based on 3rd party field testing

Jellyfish Filter field test performance results have been verified by the New Jersey Corporation for Advanced Technology (NJCAT), through the TARP Program.

Jellyfish cartridges are passively backwashed automatically after each storm event, which removes accumulated sediment from the membranes and significantly extends the service life of the cartridges and the maintenance interval. If required, the cartridges can be easily manually backwashed without removing the cartridges. Additionally, the lightweight cartridges can be removed by hand and externally rinsed, and rinsed cartridges then re-installed. These simple maintenance options allow for cartridge regeneration, thereby minimizing cartridge replacement costs and life-cycle treatment costs while ensuring long-term treatment performance.

Jellyfish® Filter Patent Information

Jellyfish® Filter patent information: U.S. Patent No. 8,123,935; Other U.S. Patents Pending; International Patents Pending

CANADA/INTL: 800.565.4801 **USA:** 888.279.8826

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Chapter 1

1.0 Imbrium® Systems Contact Information

Imbrium® Systems is an engineered stormwater treatment company that designs, develops, manufactures, and distributes post-construction stormwater quality treatment technologies, to protect water resources from pollutants. Imbrium has a strong record of environmental innovation in the industry as the creator of the Stormceptor® oil and sediment separator, the Jellyfish® Filter, Sorbtive®MEDIA, Sorbtive®FILTER, and Sorbtive®VAULT.

Imbrium Systems is a global company with U.S. headquarters (Imbrium Systems Corporation) located in Rockville, Maryland and Canadian and International headquarters (Imbrium Systems Incorporated and Imbrium International Limited) located in Toronto, Ontario, Canada.

The Jellyfish® Filter is represented by a variety of licensees and organizations globally.

For assistance, please contact Imbrium Systems at:

United States: 888-279-8826 or 301-279-8827
Canada / International: 800-565-4801 or 416-960-9900

Chapter 2

2.0 Jellyfish Filter Design Overview

This technical manual provides information for design and installation of the Jellyfish Filter. When designed properly in accordance with this Technical Manual, the Jellyfish Filter will exceed the performance and longevity of conventional horizontal bed and granular media filters.

Test data is available from Imbrium Systems upon request.

2.1 Jellyfish Filter Description

The Jellyfish Filter is an engineered stormwater quality treatment technology featuring unique membrane filtration in a compact stand-alone treatment system that removes a high level and wide variety of storm-water pollutants. Exceptional pollutant removal is achieved at high treatment flow rates with minimal head loss and low maintenance costs. Each lightweight Jellyfish Filter cartridge consists of multiple membrane-encased filter elements ("filtration tentacles") attached to a cartridge head plate. The filtration tentacles provide an extraordinarily large amount of surface area, resulting in superior flow capacity and suspended sediment removal capacity.

Jellyfish efficiently captures a high level of stormwater pollutants, including:

Pollutant Removal*

- Total Suspended Solids (TSS), median removal efficiency of 89%, including particles less than 2 microns
- Suspended Solids Concentration (SSC) 99%

- Total Nitrogen (TN), median removal efficiency of 51%
- Total Phosphorus (TP), median removal efficiency of 59%
- Total Copper (Cu), median removal efficiency of 90%
- Total Zinc (Zn), median removal efficiency of 70%
- Free Oil
- Floatiable trash and debris 100%

* Based on 3rd party field testing

Jellyfish Filter field test performance results have been verified by the New Jersey Corporation for Advanced Technology (NJCAT), through the TARP Program.

Jellyfish cartridges are passively backwashed automatically after each storm event, which removes accumulated sediment from the membranes and significantly extends the service life of the cartridges and the maintenance interval. If required, the cartridges can be easily manually backwashed without removing the cartridges. Additionally, the lightweight cartridges can be removed by hand and externally rinsed, and rinsed cartridges then re-installed. These simple maintenance options allow for cartridge regeneration, thereby minimizing cartridge replacement costs and life-cycle treatment costs while ensuring long-term treatment performance.

The Jellyfish Filter is comprised of several structural and functional components:

- A **cylindrical (manhole) or rectangular structure** constructed of either precast concrete or fiberglass, and available in a wide variety of sizes and configurations, serves as a vessel that provides long-lasting structural support for the system; provides hydraulic connections to the inlet and outlet pipes; provides surfaces for structural attachment of the cartridge deck and maintenance access wall; provides influent water storage and flow-through volume for pollutant separation and membrane filtration treatment; and provides a high-volume sump for storage of accumulated sediment.

- A rigid high-strength fiberglass **cartridge deck** separates the vessel into a lower chamber and upper chamber; houses the filter cartridges; provides a surface and flow path for treated water to the effluent pipe; provides double-wall containment of oil and other hydrocarbons below deck; and provides a platform for maintenance personnel to safely service the filter cartridges. The lower chamber provides influent water storage and flow-through volume for pollutant separation and membrane filtration treatment, and storage of accumulated sediment. The upper chamber provides above-deck clearance for inspection and maintenance service. The cartridge deck is securely attached to the vessel wall.

- A rigid high-strength fiberglass **maintenance access wall** attenuates influent water velocity; channels influent water into the lower chamber via a large opening in the cartridge deck; provides storage volume for floatable pollutants; and serves as a convenient inspection and maintenance access point for pollutant removal.

- **Cartridge receptacles** are secured to the cartridge deck and together with the cartridge lids, serve to securely anchor the filter cartridges into the cartridge deck.

- **Jellyfish membrane filtration cartridges** are inserted into the cartridge receptacles and secured with the cartridge lids. The filter cartridges treat the influent stormwater by filtering out fine suspended particulates (TSS) and particulate-bound pollutants on the membrane of each filtration tentacle. Filtered water passes through the membranes, flows up the center tube of each filtration tentacle and exits the top opening of each tentacle. Cartridges are available in various lengths and flow ratings. Filter cartridges are designated as either **hi-flo cartridges** or **draindown cartridges**, depending on their placement position within the cartridge deck. Cartridges placed within the backwash pool weir are automatically passively backwashed after each storm event, and are designated the hi-flo cartridges. Cartridges placed outside the backwash pool weir are not passively backwashed but facilitate the drain-down of the backwash pool and these are designated the draindown cartridges. The design flow rate of a draindown cartridge is controlled by a cartridge lid orifice to one-half the design flow rate of a hi-flo cartridge of similar length. The lower design flow rate of the draindown cartridge reduces the likelihood of occlusion prior to scheduled maintenance.

- **Cartridge lids** are fastened onto the cartridge receptacles to securely anchor the filter cartridges into the cartridge deck. The lids are removable to allow manual backflushing or removal of the filter cartridges when required during maintenance service. Cartridge lids contain a **flow control orifice** that is specifically sized for use with hi-flo and draindown cartridges. **Blank lids** have no orifice and are used to cover unoccupied cartridge receptacles in systems that do not use the full rated flow capacity of the system.

- A **separator skirt** serves as a baffle that encloses the filtration tentacles and defines the filtration zone inside the separator skirt perimeter. The separator skirt extends the full length of the filtration tentacles and prevents contam-ination of the membranes with oil and floatable debris. The separator skirt has a large opening at the bottom that allows pre-treated water to enter the filtration zone under low velocity. The separator skirt is securely attached to the underside of the cartridge deck.

- A rigid fiberglass **backwash pool weir** extends 6 inches (150 mm) above the cartridge deck and encloses the hi-flo cartridges. During inflow, filtered water exiting the hi-flo cartridges forms a pool inside the weir. If sufficient driving head is available the pool overtops the weir and spills to the cartridge deck where it subsequently flows to the outlet pipe. As the inflow event subsides and forward driving head decreases, water inthe backwash pool reverses flow direction and automatically passively backwashes the hi-flo cartridges, cleaning the membrane surfaces. Water in the lower chamber (below deck) is displaced through the draindown cartridges. This self-cleaning mechanism may occur multiple times during a single storm event as rainfall/runoff intensities rise and fall, thereby significantly extending the service life of the cartridges and the maintenance interval.

- **Optional internal bypass pressure relief pipe(s)** can be placed in one or multiple cartridge receptacles. The pressure relief pipe height and diameter can be varied to accommodate the design peak flow rate and system driving head requirements. When the internal bypass option is utilized, peak flow rates receive membrane filtration treatment up to the filtration design flow rate, with the balance of the peak flow receiving pre-treatment.

- A **deflector plate** (below-deck inlet pipe manhole configuration only) is installed across the below-deck inlet pipe opening to induce tangential water flow through the pre-treatment channel between the vessel wall and separator skirt.

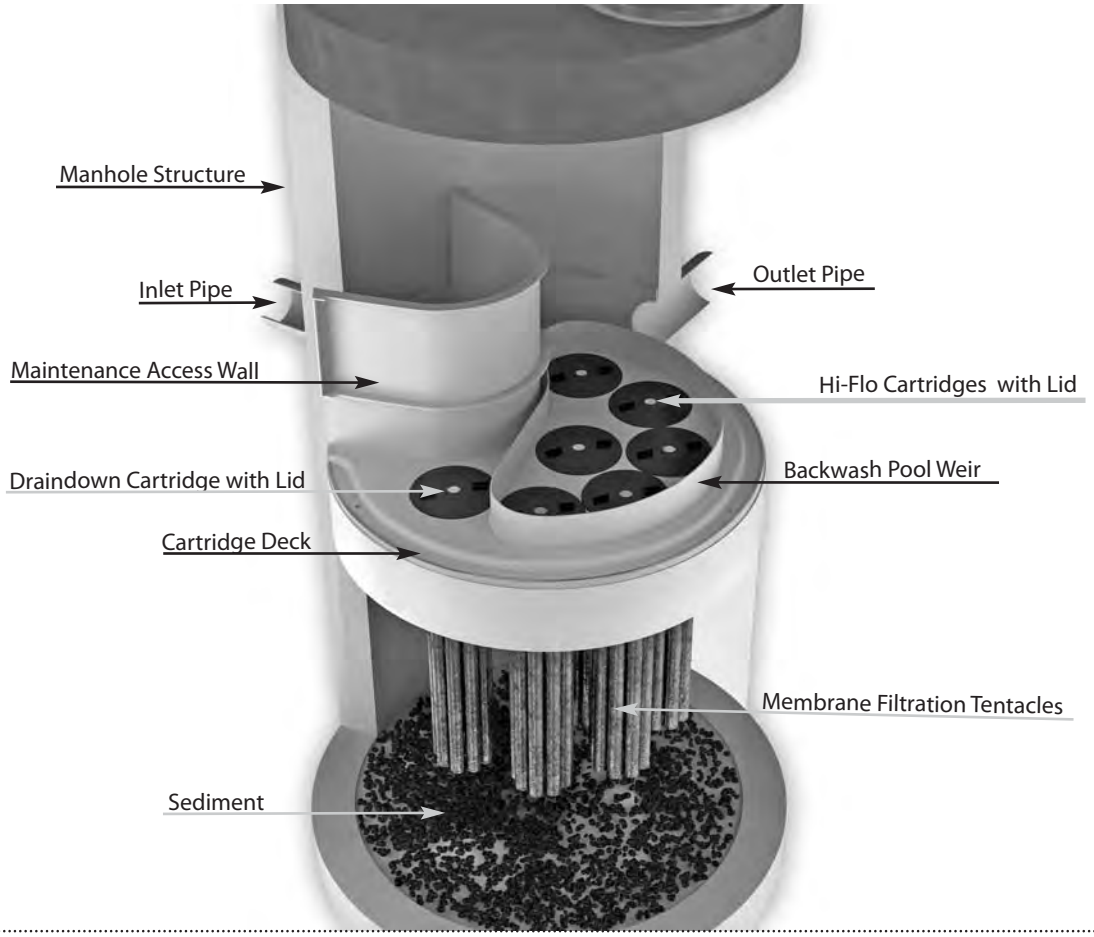
- **Standard covers, rectangular hatches, or inlet grates** are installed at the surface and are removed to allow maintenance access to the system.

- **Built-in steps or ladder(s)** allow maintenance personnel to access the cartridge deck and filter cartridges.

The Jellyfish Filter and components are depicted in **Figure 1.**

FIGURE 1

Jellyfish Filter and Components



Note: Separator Skirt Not Shown

2.2 Jellyfish Membrane Filtration Cartridge

The Jellyfish Filter utilizes multiple lightweight membrane filtration cartridges. Each cartridge consists of multiple removable filter elements ("filtration tentacles") attached to a cartridge head plate. Each filtration tentacle consists of a central perforated tube surrounded by a specialized membrane. The cylindrical filtration tentacle has a threaded pipe nipple at the top and is sealed at the bottom with an end cap. A cluster of tentacles is attached to a stainless steel head plate by inserting the top pipe nipples through the head plate holes and securing with removable nuts. A removable oil-resistant polymeric rim gasket is attached to the head plate to impart a watertight seal when the cartridge is secured into the cartridge receptacle with the cartridge lid. A Jellyfish membrane filtration cartridge is depicted in **Figure 2**.

The cartridge is available in a variety of lengths. The cartridge weight, treatment flow rate, and sediment mass loading capacity will vary depending on the cartridge length, as depicted in **Table 4**. The dry weight of a new cartridge is less than 25 pounds (11.4 kg) and the wet weight of a used cartridge is less than 50 pounds (23 kg), making a cartridge easy to install and remove by hand. No heavy lifting equipment is required.

FIGURE 2

Jellyfish Membrane Filtration Cartridge



The filtration tentacle membranes provide an extraordinarily large amount of surface area, resulting in superior flow capacity and suspended sediment removal capacity. A typical Jellyfish cartridge with eleven 54-inch (1372 mm) long filtration tentacles has 381 ft2 (35.4 m2) of membrane surface area. Hydraulic testing on a clean 54-inch (1372 mm) filter cartridge has demonstrated a flow rate of 180 gpm (11.3 L/s) at 18 inches (457 mm) of driving head.

Extensive third-party field testing, including testing at an urban site with very high intensity rainfall and runoff, has demonstrated consistently high pollutant removal performance with a conservative design flow rate of 80 gpm (5.0 L/s) for the 54-inch (1372 mm) long hi-flo cartridge and 40 gpm (2.5 L/s) for the 54-inch (1372 mm) long draindown cartridge. These values translate to a conservative design membrane filtration flux rate (flow per unit surface area) of 0.21 gpm/ft^2 (0.14 Lps/m^2) for the hi-flo cartridge and 0.11 gpm/ft^2 (0.07 Lps/m^2) for the draindown cartridge.

The standard membrane demonstrates removal of >85% of fine sediment at a design flux rate of 0.21 gpm/ft^2, based on laboratory testing with Sil-Co-Sil™106 which has a median particle size (d50) of 22 microns.

Hydraulic and sediment loading testing has demonstrated scalability of the membrane filtration surface area such that increases in the number and/or length of filtration tentacles contribute a uniform increase in total filter surface area and therefore flow capacity and sediment removal capacity. The flow rating of a particular Jellyfish Filter cartridge is based on the membrane filtration surface area of the cartridge and data collected from both laboratory testing and field testing.

The cartridge deck contains a receptacle for each filter cartridge. The cartridge is lowered down into the receptacle such that the cartridge head plate and rim gasket rest on the lip of the receptacle. A cartridge lid is fastened onto the receptacle to anchor the cartridge. Each cartridge lid contains a flow control orifice. The orifice in the hi-flo cartridge lid is larger than the orifice in the draindown cartridge lid.

Jellyfish Filter cartridges are designated as either hi-flo cartridges or draindown cartridges, depending on their placement position within the cartridge deck. Cartridges placed within the 6-inch (150 mm) high backwash pool weir that extends above the deck are automatically passively backwashed after each storm event and are designated as the hi-flo cartridges. Cartridges placed outside the backwash pool weir are not passively backwashed but facilitate the draindown of the backwash pool, and these are designated as the draindown cartridges. The design flow rate of a draindown cartridge is controlled by a cartridge lid orifice to one-half the design flow rate of a hi-flo cartridge of similar length. The lower design flow rate of the draindown cartridge reduces the likelihood of occlusion prior to scheduled maintenance.

Inflow events with driving head ranging from less than 1 inch (25 mm) up to the maximum design driving head will cause continuous forward flow and filtration treatment through the draindown cartridges. Inflow events with driving head that exceeds the 6-inch (150 mm) height of the backwash pool weir will cause continuous forward flow and filtration treatment through the hi-flo cartridges.

2.3 Jellyfish Filter Operation – Driving Head Requirement

A differential in upstream and downstream water elevation during an inflow event provides the minimal driving head required to overcome the minor cumulative friction loss through the system, at which point flow-through operation of the Jellyfish Filter commences.

For systems using an external bypass with upstream diversion structure, the driving head is calculated as the difference in elevation between the top of the diversion structure weir and the invert of the Jellyfish Filter outlet pipe. For systems using an internal bypass, the driving head is calculated as the difference in elevation between the top of the pressure relief pipe(s) and the invert of the outlet pipe.

A minimum design driving head is selected to achieve design flow rates, while accounting for gradual increase in system head loss at the design flow rate due to long-term accumulation of sediment on the filtration membranes. A clean Jellyfish Filter cartridge has flow capacity far in excess of the cartridge design flow rate at the design driving head. This ensures that design flow capacity is maintained during the period between maintenance service operations.

Typically, a minimum 18 inches (457 mm) of driving head is designed into the system but may vary from 12 to 24 inches (305 to 610 mm) depending on specific site requirements.

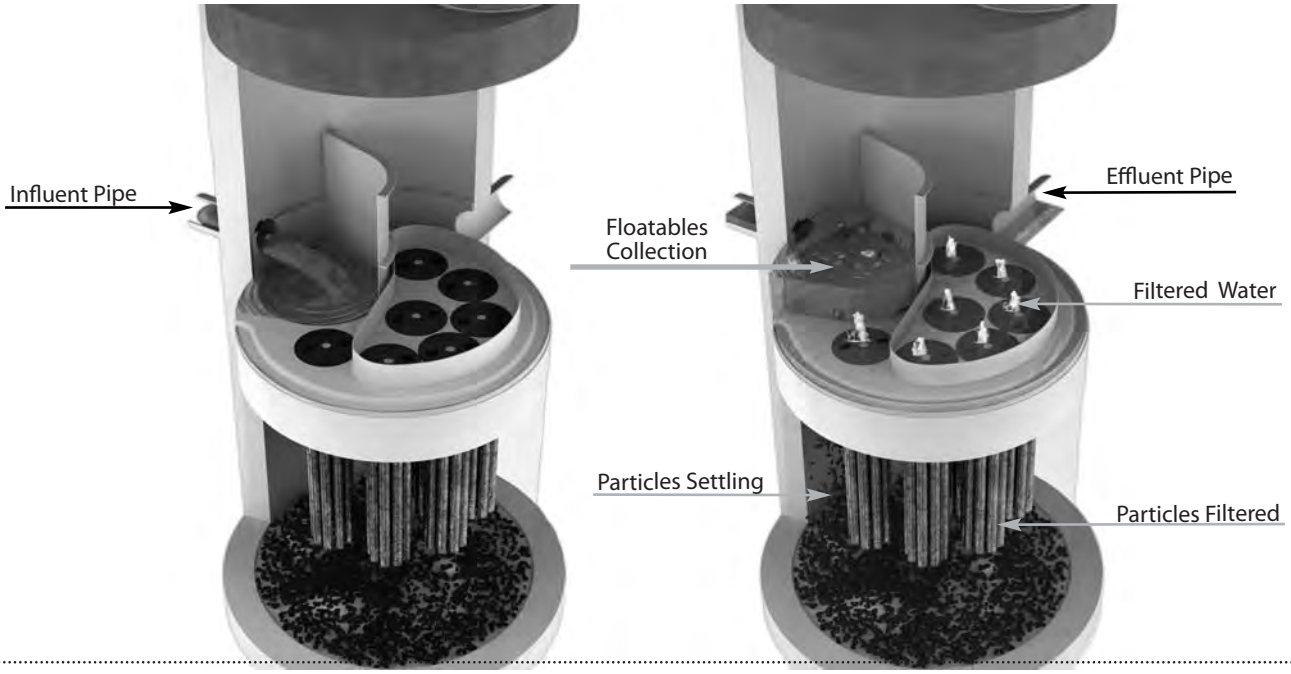
For systems that may experience submerged or backwater conditions due to dry weather base flow or tidal effects, driving head calculations must account for water elevation during the backwater condition. The Jellyfish Filter treatment functions will continue to operate during forward flow despite backwater conditions. An increase in the maintenance access wall height may be required to ensure floatables capture an increase in the height of the backwash pool weir may be required to ensure function of the automatic passive backwash feature.

2.4 Jellyfish Filter Operation – Treatment Functions

The Jellyfish Filter provides both **pre-treatment** and **membrane filtration** treatment to remove pollutants from stormwater runoff. These functions are depicted in **Figure 3** below.

FIGURE 3

Jellyfish Filter Treatment Functions
Pre-Treatment and Membrane Filtration
Section View with Maintenance Access Wall (MAW) Cutaway



Pre-treatment removes coarse sediment (generally > 50 microns), particulate-bound pollutants attached to coarse sediment (nutrients, toxic metals, hydrocarbons), free oil and floatable trash and debris. These pollutants are removed by gravity separation. Large, heavy particles fall to the sump (sedimentation) and low density pollutants rise to the surface (floatation) within the pre-treatment channel.

Pre-treatment begins when influent flow enters the system either through an above-deck inlet pipe (standard) or below-deck inlet pipe (optional). In the above-deck inlet pipe configuration, influent enters the maintenance access wall zone and is channeled through a large-diameter opening in the cartridge deck to the lower chamber. The large surface area of the deck opening and change in flow direction attenuate the influent flow velocity. Due to equalization of hydrostatic pressure and downstream pathway through the opening at the bottom of the separator skirt, influent flow spreads in lateral and downward directions throughout the pre-treatment channel between the vessel wall and the outer perimeter of the separator skirt. In the below-deck inlet pipe configuration, a deflector plate angled across the inlet pipe opening induces directional tangential flow in the pre-treatment channel. In either configuration, flow spreading throughout the pre-treatment channel serves to reduce the average flow velocity and enhance the separation of pollutants.

Pre-treatment for floatables occurs as buoyant pollutants rise toward the surface, with some of the floatables mass trapped beneath the cartridge deck in the pre-treatment channel. Most of the floatables mass accumulating in the maintenance access wall zone at the air-water interface. This feature allows convenient and easy inspection and maintenance for floatable contaminants. The separator skirt protects the filtration tentacles from contamination by oil and floatable debris.

Coarse sediment settles out of the pre-treatment channel to the sump. As water from the pre-treatment channel slowly flows downward and then laterally beneath the separator skirt, the combination of the large opening in the bottom of the separator skirt and a change in direction to an upward downstream flow path serves to further reduce average flow velocity and enhance particle separation. Sediment is stored in the sump until removed by vacuum during a maintenance service.

Membrane filtration treatment removes suspended particulates (generally < 50 microns) and particulate-bound pollutants (nutrients, toxic metals, hydrocarbons, and bacteria). Laboratory and field performance testing of the Jellyfish Filter have demonstrated capture of particulates as small as 2 microns.

Filtration treatment begins when pre-treated influent flows under the separator skirt and into the filtration zone through the large opening defined by the bottom edge of the separator skirt. Uniform hydraulic pressure gradient across the entire membrane surface area causes pre-treated water to penetrate the entire membrane surface area of each filtration tentacle. Water enters the membrane pores radially and deposits fine particulates on the exterior membrane surface. Filtered water flows into the perforated center drain tube of each filtration tentacle and then upward and out the top of each tentacle. Water exiting each of the tentacles of a single cartridge combines at the top of the cartridge under the cartridge lid. The combined flow then vertically exits the cartridge lid orifice with a pulsating fountain effect.

As a layer of sediment builds up on the external membrane surface, membrane pores are partially occluded which serves to reduce the effective pore size. This process, referred to as "filter ripening", significantly improves the removal efficiency of pollutants relative to a brand new or clean membrane of some nominal pore size. Filter ripening accounts for the ability of the JellyfishF ilter to remove particles finer than the nominal pore size rating of the membranes.

Jellyfish Filter operation and maintenance information can be obtained from the Jellyfish Filters Owner's Manual on Imbrium Systems website (www.imbriumsystems.com).

2.5 Jellyfish Filter Operation – Self-Cleaning Functions

The Jellyfish Filter utilizes several self-cleaning processes to remove accumulated sediment from the external surfaces of the filtration membranes, including **automatic passive backwash** of the hi-flo cartridges, **vibrational pulses**, and **gravity**. Combined, these processes significantly extend the cartridge service life, maintenance interval and reduce life-cycle costs.

Automatic passive backwash is performed on the hi-flo cartridge at the end of each runoff event and can also occur multiple times during a single storm event as intensity and driving head varies. During inflow, filtered water exiting the hi-flo cartridges forms a pool above the cartridge deck inside the backwash pool weir. The depth and volume of the backwash pool will vary with the available driving head, ranging from some minimal quantity up to a quantity sufficient to fill and overflow the backwash pool (typical weir height is 6 inches / 150 mm). As the inflow event subsides and forward driving head decreases, water in the backwash pool reverses flow direction and automatically passively backwashes the hi-flo cartridges, removing sediment from the membrane surfaces. Water in the lower chamber (below deck) is displaced through the draindown cartridges.

Vibrational pulses occur as a result of complex and variable pressure and flow direction conditions that arise in the space between the top surface of the cartridge head plate and the underside of the cartridge lid. During forward flow a stream of filtered water exits the top of each filtration tentacle into this space and encounters resistance from the cartridge lid and turbulent pool of water within the space. Water is forced through the cartridge lid flow control orifice with a pulsating fountain effect. The variable localized pressure causes pulses that transmit vibrations to the membranes, thereby dislodging accumulated sediment. The effect appears more pronounced at higher flow rates, and applies to both hi-flo and draindown cartridges.

Gravity continuously applies a force to accumulated sediment on the membranes, both during inflow events and inter-event dry periods. As fine particles agglomerate into larger masses on the membrane surface, adhesion to the membrane surface can lessen, and a peeling effect ensues which ultimately results in agglomerates falling away from the membrane. Complex chemical and biological effects may also play a role in this process.

Chapter 3

3.0 Jellyfish Filter Design Guidelines

The Jellyfish Filter has many flexible design features to accommodate a wide range of specific site requirements and constraints. For design assistance, please contact Imbrium Systems.

3.1 Configurations and Design Capacities

Design flow capacities and pollutant capacities for standard Jellyfish Filter manhole configurations are shown in **Tables 1** and **2**.

The Jellyfish Filter standard model numbers provide information about the manhole inside diameter (expressed in U.S. customary units) and cartridge counts for hi-flo and draindown cartridges. For example, Jellyfish Filter Model Number JF6-4-1 is a 6-ft (1.8 m) diameter manhole with four hi-flo cartridges and one draindown cartridge. Standard model numbers assume the use of 54-inch (1372 mm) long cartridges. Specific designations for non-standard structures or cartridge lengths are noted in the **Jellyfish Filter Owner's Manual**.

Table 1
Design Flow Capacities
Standard Jellyfish Filter Manhole Configurations

Manhole Diameter (ft / m)[1]	Model No.	Hi-Flo Cartridges[2] 54 in / 1372 mm	Draindown Cartridges[2] 54 in / 1372 mm	Design Treatment Flow Rate (gpm / cfs)	Design Treatment Flow Rate (L / S)
4 / 1.2	**JF4-2-1**	**2**	**1**	**200 / 0.45**	**12.6**
6 / 1.8	**JF6-3-1**	**3**	**1**	**280 / 0.62**	**17.7**
	JF6-4-1	4	1	360 / 0.80	22.7
	JF6-5-1	5	1	440 / 0.98	27.8
	JF6-6-1	6	1	520 / 1.16	32.8
8 / 2.4	**JF8-6-2**	**6**	**2**	**560 / 1.25**	**35.3**
	JF8-7-2	7	2	640 / 1.43	40.4
	JF8-8-2	8	2	720 / 1.60	45.0
	JF8-9-2	9	2	800 / 1.78	50.5
	JF8-10-2	10	2	880 / 1.96	55.5
10 / 3.0	**JF10-11-3**	**11**	**3**	**1000 / 2.23**	**63.1**
	JF10-12-3	12	3	1080 / 2.41	68.1
	JF10-12-4	12	4	1120 / 2.50	70.7
	JF10-13-4	13	4	1200 / 2.67	75.7
	JF10-14-4	14	4	1280 / 2.85	80.8
	JF10-15-4	15	4	1360 / 3.03	85.8
	JF10-16-4	16	4	1440 / 3.21	90.8
	JF10-17-4	17	4	1520 / 3.39	95.9
	JF10-18-4	18	4	1600 / 3.56	100.9
	JF10-19-4	19	4	1680 / 3.74	106
12 / 3.6	**JF12-20-5**	**20**	**5**	**1800 / 4.01**	**113.6**
	JF12-21-5	21	5	1880 / 4.19	118.6
	JF12-22-5	22	5	1960 / 4.37	123.7
	JF12-23-5	23	5	2040 / 4.54	128.7
	JF12-24-5	24	5	2120 / 4.72	133.8
	JF12-25-5	25	5	2200 / 4.90	138.8
	JF12-26-5	26	5	2280 / 5.08	143.8
	JF12-27-5	27	5	2360 / 5.26	148.9

[1] Smaller and larger systems may be custom designed
[2] Shorter length cartridge configurations are available

Table 2
Design Pollutant Capacities
Standard Jellyfish Filter Manhole Configurations

Model Diameter (ft / m)	Wet Volume Below Deck (ft^3 / m^3)	Sediment Capacity [1] (ft^3 / m^3)	Oil Capacity [2] (gal / L)
JF4			
4 / 1.2	82 / 2313	12 / 0.34	100 / 379
JF6			
6 / 1.8	184 / 5205	28 / 0.79	224 / 848
JF8			
8 / 2.4	327 / 9252	50 / 1.42	388 / 1469
JF10			
10 / 3.0	511 / 14,456	78 / 2.21	608 / 2302
JF12			
12 / 3.6	735 / 20,820	113 / 3.20	732 / 2771

[1] Assumes 12 inches (305 mm) of sediment depth in sump
Systems may be designed with increased sediment capacity
[2] Assumes 24 inches (610 mm) of pre-treatment channel depth for oil storage

3.2 Inlet and Outlet Pipes

The Jellyfish Filter is available in both the standard **above-deck inlet pipe** configuration and optional **below-deck inlet** pipe configuration. Specific site requirements generally determine the configuration that is most favorable for the site. For both configurations, the invert elevation of the outlet pipe is identical to the cartridge deck elevation. Please refer to **Figures 4** and **5**.

FIGURE 4

Jellyfish Configuration with Below-Deck Inlet Pipe

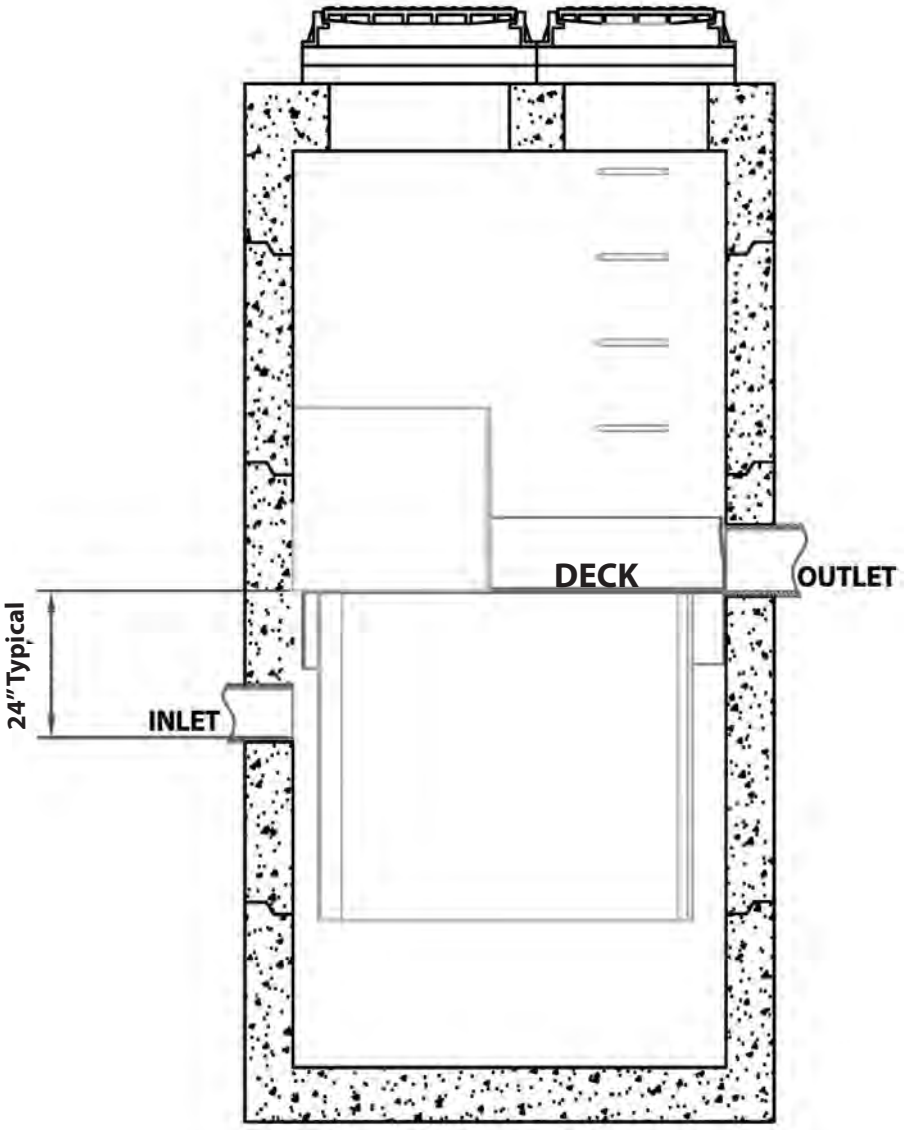
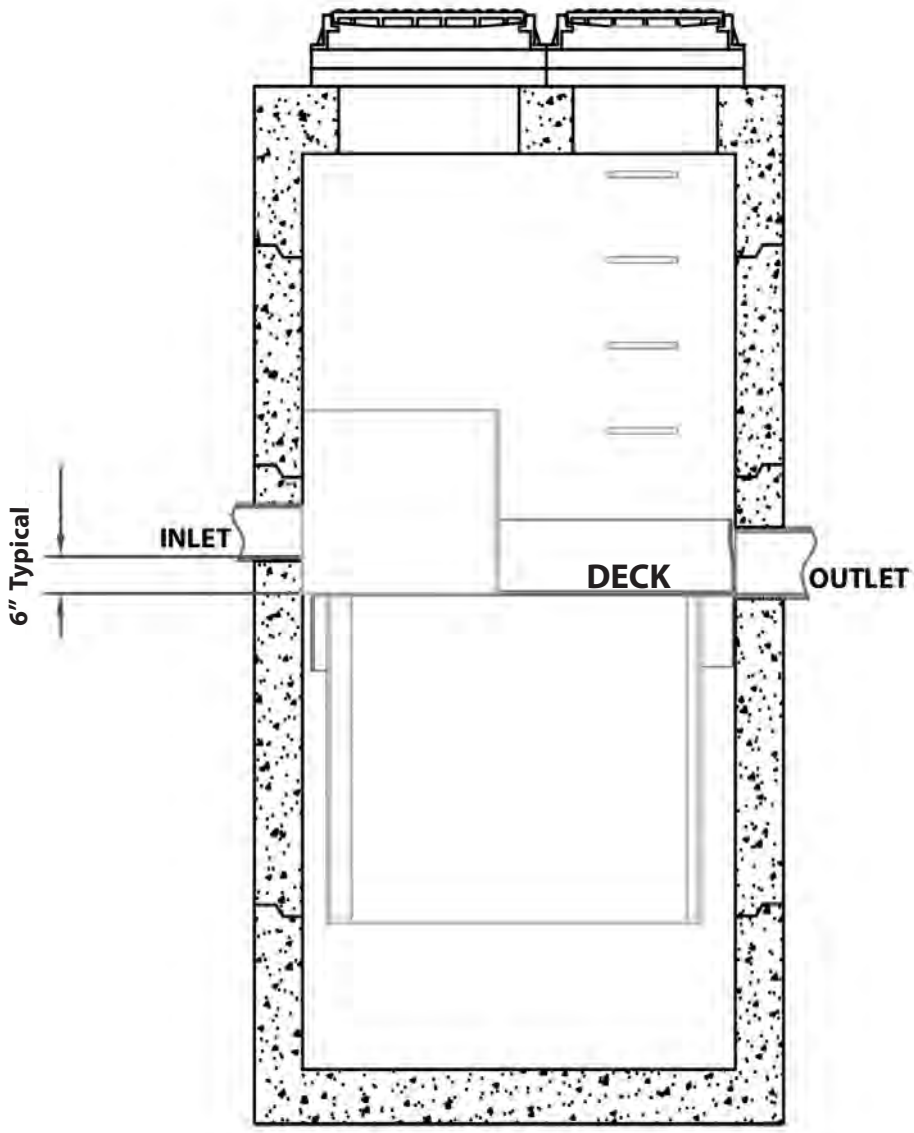


FIGURE 5

Jellyfish Configuration with Above-Deck Inlet Pipe



For the standard above-deck inlet pipe configuration, the invert elevation of the inlet pipe is typically set 6 inches (150 mm) higher than the invert elevation of the outlet pipe. This generally ensures that the inlet pipe will drain completely at the conclusion of each rainfall/runoff event, while providing sufficient volume within the maintenance access wall zone for surface accumulation of floatables below the inlet pipe. The elevation of the inlet pipe can be varied as required.

The Jellyfish Filter can accommodate a wide range of angles between the inlet and outlet pipes. The inlet pipe can be located anywhere about the circumference of the structure. The separation angle relationship of the inlet pipe to the outlet pipe can vary from 0 to 360 degrees to provide maximum design flexibility. Typical off-line layouts (external bypass using an upstream diversion structure) will have an inlet to outlet separation angle of 90 to 120 degrees. See **Table 3** below for the minimum separation angle for standard manhole configurations with an above-deck inlet pipe.

The Jellyfish Filter can accommodate **multiple inlet pipes** within certain restrictions.

The Jellyfish Filter can be built at all depths of cover generally associated with conventional stormwater conveyance systems.

Table 3
Minimum Inlet and Outlet Pipe Separation Angles and Diameters
(Jellyfish Filter Manhole Configurations with Above-Deck Inlet Pipe)

Model Diameter (ft / m)	Minimum Angle[1] Inlet / Outlet Pipes	Minimum Inlet Pipe Diameter (in / mm)	Minimum Outlet Pipe Diameter (in / mm)
JF4			
4 / 1.2	62 °	6 / 152	8 / 203
JF6			
6 / 1.8	59 °	8 / 203	10 / 254
JF8			
8 / 2.4	52 °	10 / 254	12 / 305
JF10			
10 / 3.0	48 °	12 / 305	18 / 457
JF12			
12 / 3.6	40 °	12 / 305	18 / 457

[1] Assumes off-line (external bypass) configuration

3.3 Bypass Design

The Jellyfish Filter can be designed with either an off-line or on-line configuration. All stormwater filter systems will perform for a longer duration between required maintenance services when designed and applied in off-line configurations.

A standard off-line configuration has an external bypass that uses an upstream diversion structure. The elevation difference between the top of the diversion structure weir and the Jellyfish Filter outlet pipe invert establishes the design driving head associated with the design flow rate. Excess flow that overtops the diversion weir bypasses the Jellyfish Filter and proceeds downstream. Drawings that illustrate relative system elevations are available by contacting Imbrium Systems.

For some sites an off-line configuration may not be practical and use of an on-line configuration is advantageous. In these cases, an optional internal bypass pressure relief pipe(s) can be placed in one or multiple cartridge receptacles within the Jellyfish Filter. The pressure relief pipe height and diameter can be varied to accommodate the design peak flow rate and system driving head requirements. For these systems the driving head is calculated as the difference in elevation between the top of the pressure relief pipe and the invert of the outlet pipe. When the internal bypass option is utilized, peak flow rates receive membrane filtration treatment up to the filtration design flow rate, with the balance of the peak flow receiving pre-treatment. Increased sump depth may be required to increase sediment storage capacity and to minimize re-suspension of previously captured sediment at peak flow rates.

Please contact Imbrium Systems for design assistance.

3.4 Shallow or Low Cover Installations

For sites that require minimal depth of cover for the stormwater infrastructure, the Jellyfish Filter can be applied in a shallow application using a hatch cover to provide adequate access to all the cartridges within the unit. The general minimum depth of cover is 36 inches (915 mm) from the Jellyfish outlet pipe invert to the underside of the top slab. Further custom modifications may be possible. A typical drawing is included in **Appendix A**.

3.5 Submerged Installations

When properly designed, the Jellyfish Filter will function effectively under submerged conditions. For systems that may experience submerged or backwater conditions due to dry weather base flow or tidal effects, driving head calculations must account for water elevation during the backwater condition. The Jellyfish Filter treatment functions will continue to operate during forward flow despite backwater conditions. A customized increase to the maintenance access wall height may be required to ensure floatables capture and an increase in the height of the backwash pool weir may be required to ensure function of the automatic passive backwash feature.

3.6 Grated Inlet and Curb Inlet Jellyfish Filters

Existing drainage systems can be retrofitted by replacing conventional storm inlets with a Jellyfish Filter inlet. Imbrium Systems has two standard options, curb inlet and grated inlet configurations. Both configurations utilize

the shorter 27-inch (686 mm) length Jellyfish filter cartridges and require minimal cover. Two typical drawings are included in **Appendix A**. Further custom modifications may be possible.

3.7 Series Jellyfish Filter

For sites with water quality treatment flow rates that exceed the design flow rate of the largest standard Jellyfish Filter model, custom systems can be designed that hydraulically connect multiple Jellyfish Filters in series. Please contact Imbrium Systems for assistance.

3.8 Jellyfish Filter with Sump Drain

The Jellyfish Filter is typically designed to maintain a pool of water in the lower chamber (below deck) between storms. However, certain sites or jurisdictions may require draindown of the sump between storms. To meet these requirements, a sump drain filter can be installed to slowly drain the lower chamber pool to the sub-grade for infiltration or to an alternate point of discharge. A typical drawing is included in **Appendix A**.

Chapter 4

4.0 Jellyfish Filter Sizing Guidelines

The Jellyfish Filter is sized based on considerations of the specified treatment flow rate, anticipated sediment mass load transported from the site and required pollutant storage capacities.

An optional software-based continuous simulation modeling tool, such as **PCSWMM for Stormceptor®**, can be utilized to determine site hydrology from local historical rainfall data and thereby assist in sizing a Jellyfish Filter. In general, such a tool is useful in deriving the water quality treatment flow rate associated with treatment of a high percentage of the average annual runoff volume.

4.1 Sizing for Water Quality Treatment Flow Rate

The Jellyfish Filter can be sized using a specified flow rate (i.e. "water quality flow rate" or "treatment flow rate"). The treatment flow rate is determined by the engineer in accordance with methods approved by the local jurisdiction. The appropriate Jellyfish Filter model number is then selected from **Table 1**. Custom systems can be designed for sites with water quality treatment flow rates that exceed the design flow rate of the largest standard Jellyfish Filter model. Please contact Imbrium Systems for assistance.

4.2 Sizing for Sediment Mass Loading

A second sizing consideration is the anticipated sediment load that will enter the Jellyfish Filter. For a stormwater filter system to have practical application in the field, it is important that the system's sediment mass loading and storage

capacities permit a reasonable interval between successive maintenance clean-outs and filter cartridge service. It is recommended that a system be designed to accommodate a minimum one year interval between maintenance services for pollutant removal and filter cartridge flushing/rinsing.

Laboratory testing using a standard test sediment demonstrated sediment mass loading capacity of 125 pounds (57 kg) of sediment per 54-inch (1372 mm) long hi-flo cartridge at 18 inches (457 mm) of driving head (see **Table 4** below). Specific site conditions will influence the sediment mass loading capacity of the Jellyfish Filter due to the variable nature of sediment characteristics, rainfall intensity, time intervals between runoff events and frequency of automatic passive backwash.

The projected annual sediment load transported from the site should be determined by the engineer. Calculations can be performed for the projected annual runoff volume using an assumed event mean suspended solids concentration (typically 60 mg/L for urban sites). As a guideline, the U.S. EPA has determined typical annual sediment loads per acre for various sites by land use (see **Table 5**). Certain states and local jurisdictions have also established such guidelines.

For some sites the Jellyfish Filter is installed downstream of a detention facility. In these cases, the Jellyfish Filter will typically treat a relatively low flow rate (orifice-controlled release flow rate) from the detention facility compared to flow rates that would be treated if the Jellyfish Filter received the site runoff directly. In such cases, the size of the Jellyfish Filter and number of filter cartridges will typically be determined by the projected annual sediment mass load transported to the Jellyfish Filter, accounting for sediment mass that is expected to settle out in the upstream detention facility.

It is important for the engineer to confirm that the system design has adequate storage capacity for anticipated pollutant loads that will accumulate over the specified maintenance interval. The oil and sediment pollutant capacities for each standard Jellyfish Filter model are shown in **Table 2**.

Table 4
Dry Weight, Treatment Flow Rate, and Sediment Mass Loading Capacity of Various Cartridge Lengths

Cartridge Length (in / mm)	Cartridge Dry Weight (lbs / kg)	Design Treatment Flow Rate [1] (gpm / Lps)	Design Sediment Mass Loading Capacity [1, 2, 3] (lbs / kg)
15 / 381	10 / 4.5	Draindown 11 / 0.7 Hi-Flo 22 / 1.4	Draindown 17 / 8 Hi-Flo 35 / 16
27 / 686	14.5 / 6.6	Draindown 20 / 1.3 Hi-Flo 40 / 2.5	Draindown 31 / 14 Hi-Flo 63 / 28
40 / 1016	19.5 / 8.9	Draindown 30 / 1.9 Hi-Flo 60 / 3.8	Draindown 46 / 21 Hi-Flo 93 / 42
54 / 1372	25 / 11.4	Draindown 40 / 2.5 Hi-Flo 80 / 5.0	Draindown 63 / 28 Hi-Flo 125 / 57

[1] Design flow rates and sediment mass loading capacities based on 18 inches (457 mm) of driving head

[2] Based on laboratory testing using simulated storm events and Sil-Co-Sil® 106 test sediment (d50 = 22 microns) at 40% of maximum cartridge flow rate.

[3] Sediment mass loading capacities expressed as pounds of NJPSD test sediment (1 – 1000 microns, d50 = 67 microns, characterized as 55% sand / 40% silt / 5% clay), using conversion factor of 1.66 from Sil-Co-Sil 106 to NJPSD

Note: Actual sediment mass loading capacity will vary depending on specific site characteristics

Table 5
Annual Total Suspended Solids Load by Land Use
(lbs/acre/year)
(kg/hectare/year)

Commercial	Parking Lot	Residental Density			Highways	Industrials	Shopping Center
		High	Med.	Low			
1000	400	420	250	10	880	500	440
1124	450	472	281	11	989	562	494

Source: U.S. EPA Stormwater Best Management Practice Design Guide Volume 1, Appendix D, Table D-1, Burton and Pitt 2002

4.3 Continuous Simulation Sizing Tool

A software-based continuous simulation modeling tool such as **PCSWMM for Stormceptor®**, can be utilized to determined site hydrology from local historical rainfall data, thereby assist in sizing a Jellyfish Filter. In general, such a tool is useful in deriving the water quality treatment flow rate associated with treatment of a high percentage (typically 80 - 90%) of the average annual runoff volume. The appropriately sized Jellyfish Filter is then selected from **Table 1** based on the derived water quality treatment flow rate. Please contact Imbrium Systems for assistance with optional sizing methodology.

Chapter 5

5.0 Jellyfish Filter Installation

The installation of the precast concrete or fiberglass Jellyfish Filter structure should conform to state highway, provincial or local specifications for the installation of maintenance manholes. Selected sections of a general specification that are applicable are summarized in the following sections.

For more information, please refer to the Jellyfish Filter Performance Specification with document title **Standard Specification – Water Quality Filter Treatment Device**.

Excavation

- Excavation and general site preparation for the installation of the Jellyfish Filter structure should conform to state highway, provincial or local specifications.
- Topsoil removed during the excavation should be stockpiled in designated areas and should not be mixed with subsoil or other materials.
- The Jellyfish Filter structure should not be installed on frozen ground.
- Excavation should extend a minimum of 12 inches (300 mm) from the precast concrete surfaces plus an allowance for shoring and bracing where required.
- If the bottom of the excavation provides an unsuitable foundation additional excavation may be required. In areas with a high water table, continuous dewatering may be required to ensure that the excavation is stable and free of water.

- Level the sub-grade to the proper elevation. Verify the elevation against the structure dimensions, the invert elevations on the approved Jellyfish Filter drawing and the site plans. Adjust the base aggregate if necessary. Verify the soil bearing capacity is adequate for the required load.

Installation of Jellyfish Filter Structure

- Set the base section of the Jellyfish Filter structure on solid sub-grade.
- Verify the level and elevation of the base section before adding any riser sections.
- Add specified watertight seal to the base section. Set riser section(s) on the base section.
- Install the inlet and outlet pipes to the structure.
- Install the top slab and frames and covers.
- Do not install Jellyfish membrane filtration cartridges until the upstream catchment and site have been stabilized.

Installation of Jellyfish Membrane Filtration Cartridges

- After the upstream catchment and site have been stabilized, remove any accumulated sediment and debris from the structure.

- Safely descend to the cartridge deck using the ladder attached to the sidewall of the manhole. Confined space entry procedures are required.

- Carefully lower the Jellyfish membrane filtration cartridges into the cartridge receptacles within the cartridge deck. A filter cartridge should be placed into each of the draindown cartridge receptacles outside the backwash pool weir. Depending on the specific Jellyfish Filter model number, filter cartridges should be placed into most or all of the hi-flo cartridge receptacles within the backwash pool weir. If a membrane joint snags on the receptacle lip, use a slight twisting or sideways motion to clear the snag. Do not force the membranes down into the cartridge receptacle, as this may damage the membranes. Use a slight downward pressure on the cartridge head plate to seat the rim gasket (thick circular gasket on the stainless steel head plate) into the cartridge receptacle.

- Examine the cartridge lids to differentiate lids with a small orifice, a large orifice and no orifice. Lids with a small orifice are to be inserted into the draindown cartridge receptacles. Lids with a large orifice are to be inserted into the hi-flo cartridge receptacles. Lids with no orifice are to be inserted into unoccupied cartridge receptacles within the backwash pool weir.

- To install a cartridge lid, ensure the cartridge lid male threads are aligned properly with the cartridge receptacle female threads. Firmly twist the cartridge lid clockwise to seat the filter cartridge snugly in place.

Chapter 6

6.0 Jellyfish Filter Inspection and Maintenance

For inspection and maintenance information, please refer to the **Jellyfish® Filter Owner's Manual**.

Jellyfish Filter operation and maintenance information can be obtained from the **Jellyfish Filters Owner's Manual** on Imbrium Systems website **(www.imbriumsystems.com)**.

Chapter 7

7.0 Jellyfish Filter Replacement Parts

Replacement parts for the JellyfishFilter can be ordered by contacting Imbrium Systems at:

United States: 888-279-8826 or 301-279-8827
Canada / International: 800-565-4801 / 416-960-9900
www.imbriumsystems.com

Chapter 8

8.0 Jellyfish Filter Performance Specification

The Jellyfish Filter Performance Specification is contained in the document titled **Standard Specification – Water Quality Filter Treatment Device**, shown in **Appendix B** and available on Imbrium Systems website.

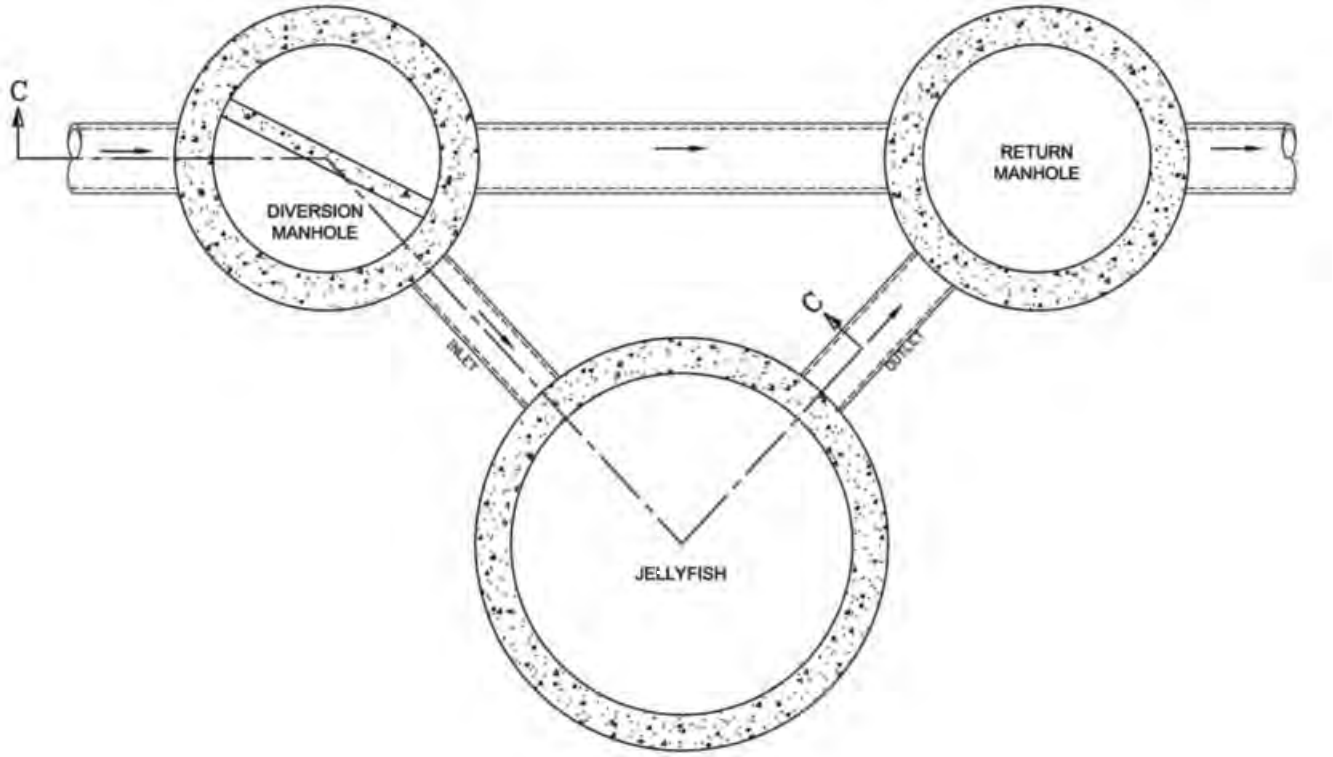
Notes

Appendix A

Jellyfish® Filter Standard Drawings
U.S. Customary Units

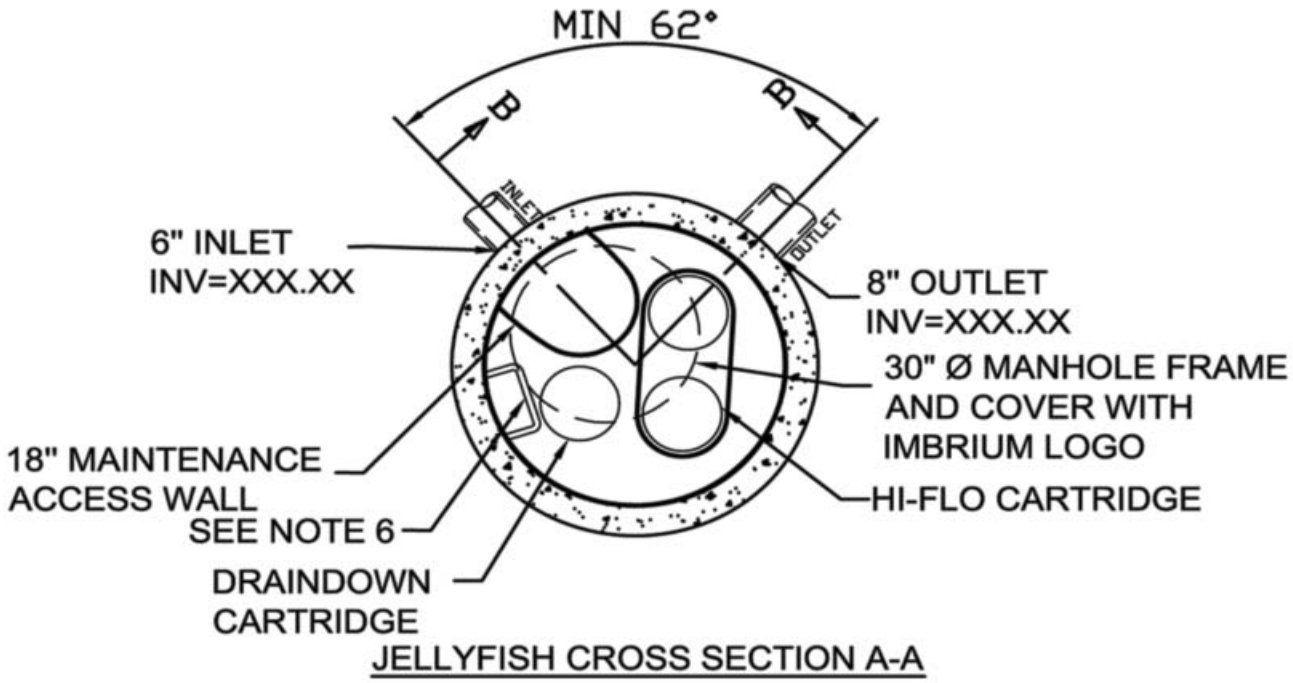
Notes

Jellyfish® Filter
Typical Layout



SITE PLAN

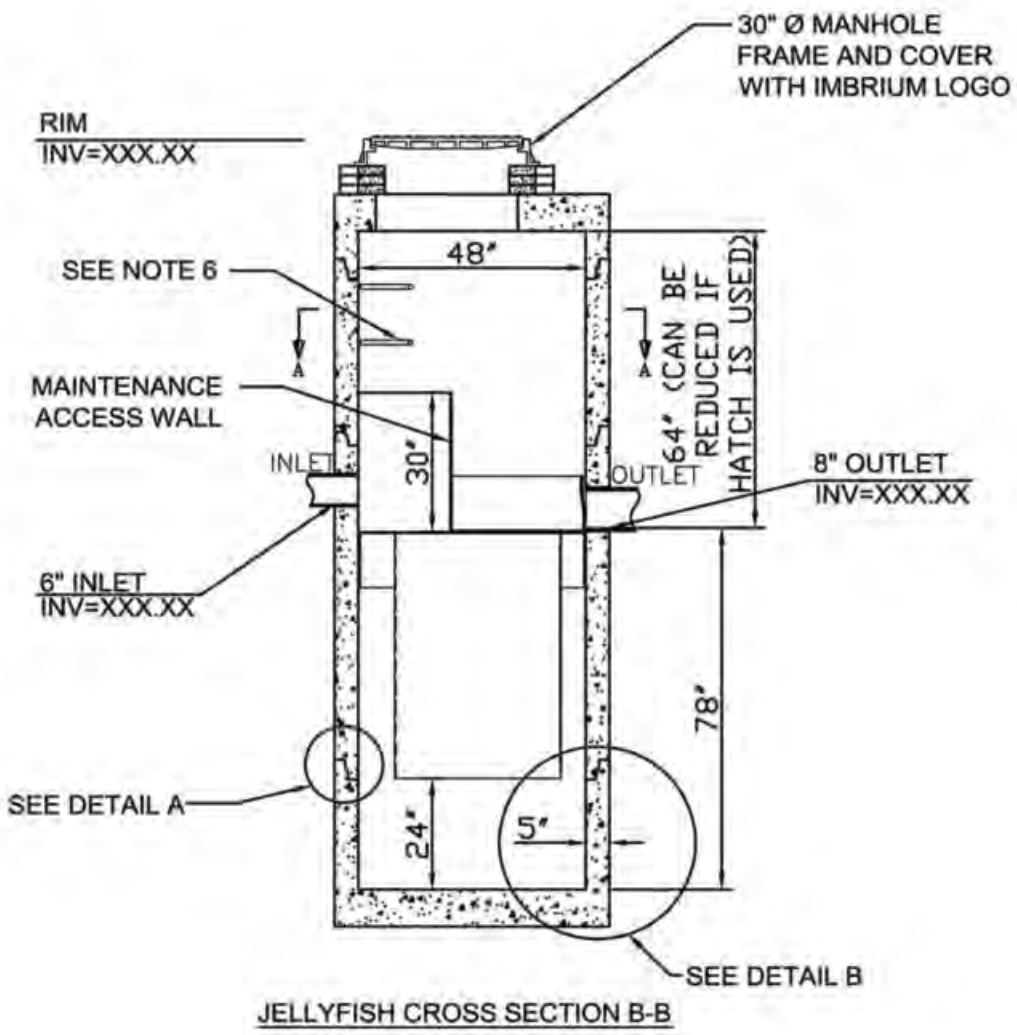
Jellyfish® Filter JF4
Typical Section



Notes:

1. All sections and parts to meet or exceed ASTM C-478, ASTM C-443, and ASTM D-4097 corresponding to AASHTO specifications, and any other site or local standards.
2. Configuration of inlet and outlet can vary to meet site's needs.
3. Cartridge installation shall occur only after site has been stabilized and the Jellyfish unit is clean and free of debris. Cartridges shall be furnished new, at time of final acceptance.
4. The Jellyfish Membrane Filter is protected by the following patents: U.S. Patent No. 8,123,935; Other U.S. Patents Pending; International Patents Pending.
5. For site specific drawings please contact your local Imbrium Systems representative.

Jellyfish® Filter JF4
Typical Section

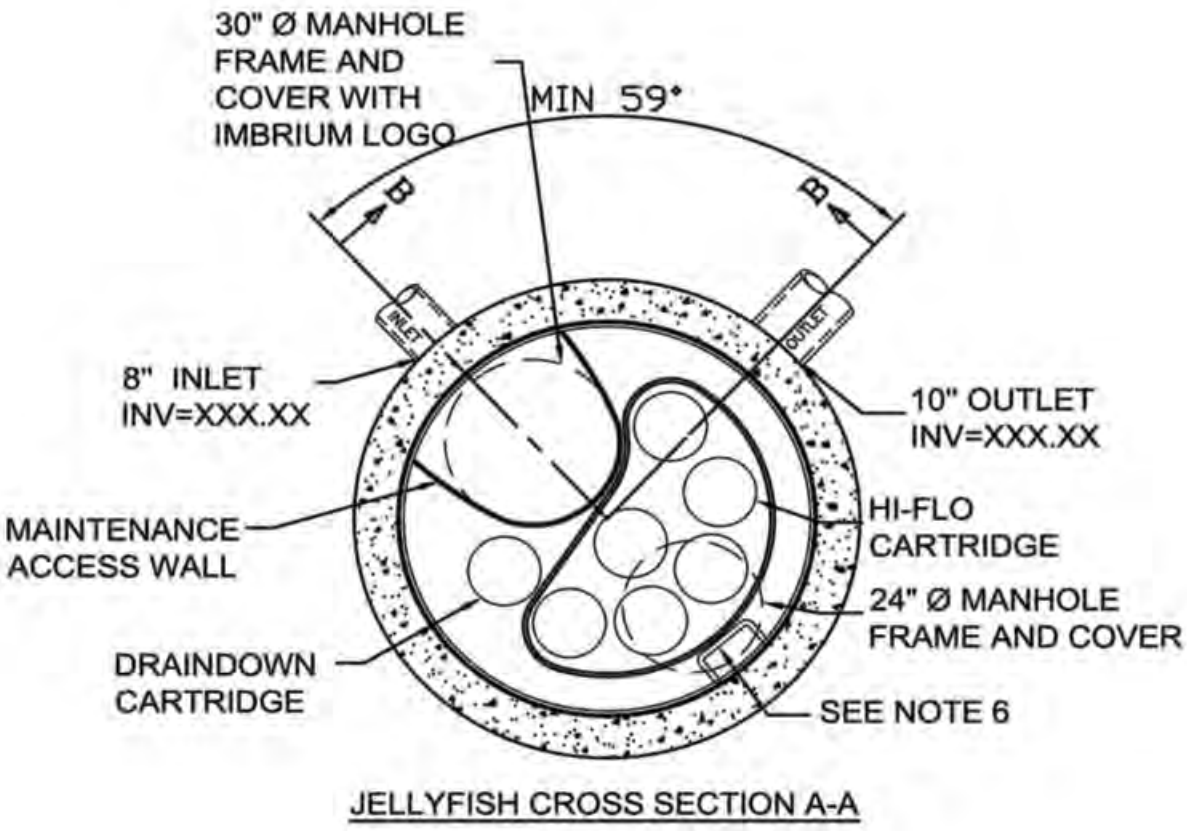


JELLYFISH CROSS SECTION B-B

Notes:

1. All sections and parts to meet or exceed ASTM C-478, ASTM C-443, and ASTM D-4097 corresponding to AASHTO specifications, and any other site or local standards.
2. Configuration of inlet and outlet can vary to meet site's needs.
3. Cartridge installation shall occur only after site has been stabilized and the Jellyfish unit is clean and free of debris. Cartridges shall be furnished new, at time of final acceptance.
4. The Jellyfish Membrane Filter is protected by the following patents: U.S. Patent No. 8,123,935; Other U.S. Patents Pending; International Patents Pending.
5. For site specific drawings please contact your local Imbrium Systems representative.

Jellyfish® Filter JF6
Typical Section

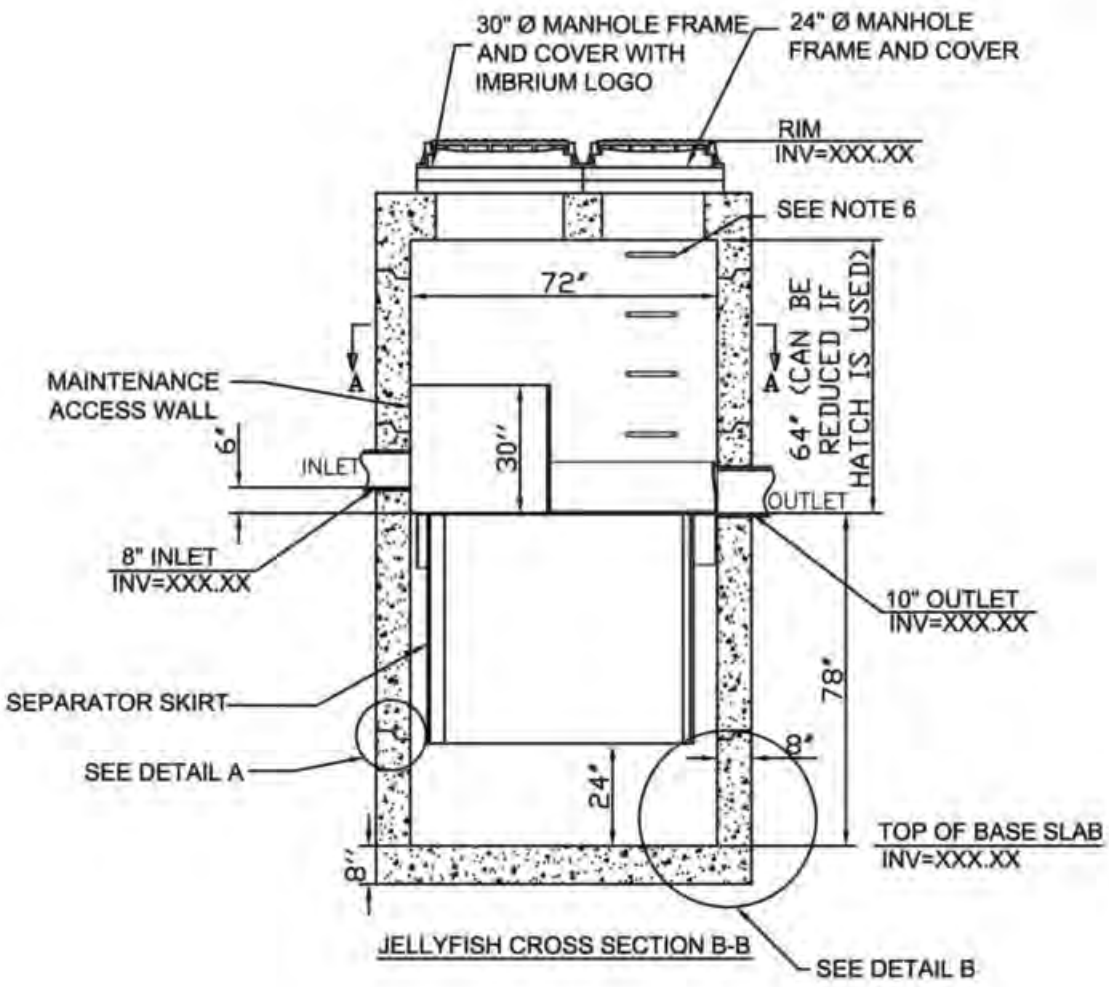


JELLYFISH CROSS SECTION A-A

Notes:

1. All sections and parts to meet or exceed ASTM C-478, ASTM C-443, and ASTM D-4097 corresponding to AASHTO specifications, and any other site or local standards.
2. Configuration of inlet and outlet can vary to meet site's needs.
3. Cartridge installation shall occur only after site has been stabilized and the Jellyfish unit is clean and free of debris. Cartridges shall be furnished new, at time of final acceptance.
4. The Jellyfish Membrane Filter is protected by the following patents: U.S. Patent No. 8,123,935; Other U.S. Patents Pending; International Patents Pending.
5. For site specific drawings please contact your local Imbrium Systems representative.

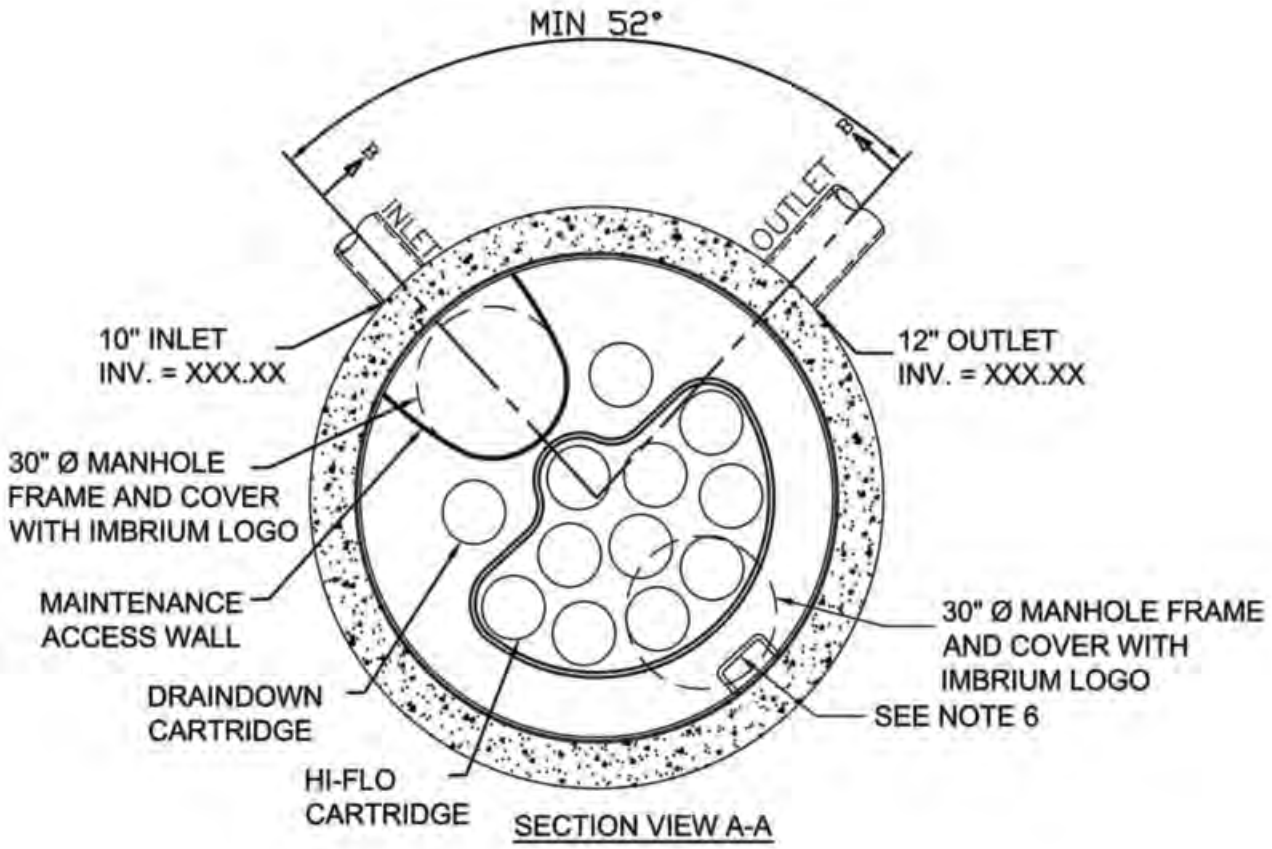
Jellyfish® Filter JF6
Typical Section



Notes:

1. All sections and parts to meet or exceed ASTM C-478, ASTM C-443, and ASTM D-4097 corresponding to AASHTO specifications, and any other site or local standards.
2. Configuration of inlet and outlet can vary to meet site's needs.
3. Cartridge installation shall occur only after site has been stabilized and the Jellyfish unit is clean and free of debris. Cartridges shall be furnished new, at time of final acceptance.
4. The Jellyfish Membrane Filter is protected by the following patents: U.S. Patent No. 8,123,935; Other U.S. Patents Pending; International Patents Pending
5. For site specific drawings please contact your local Imbrium Systems representative.

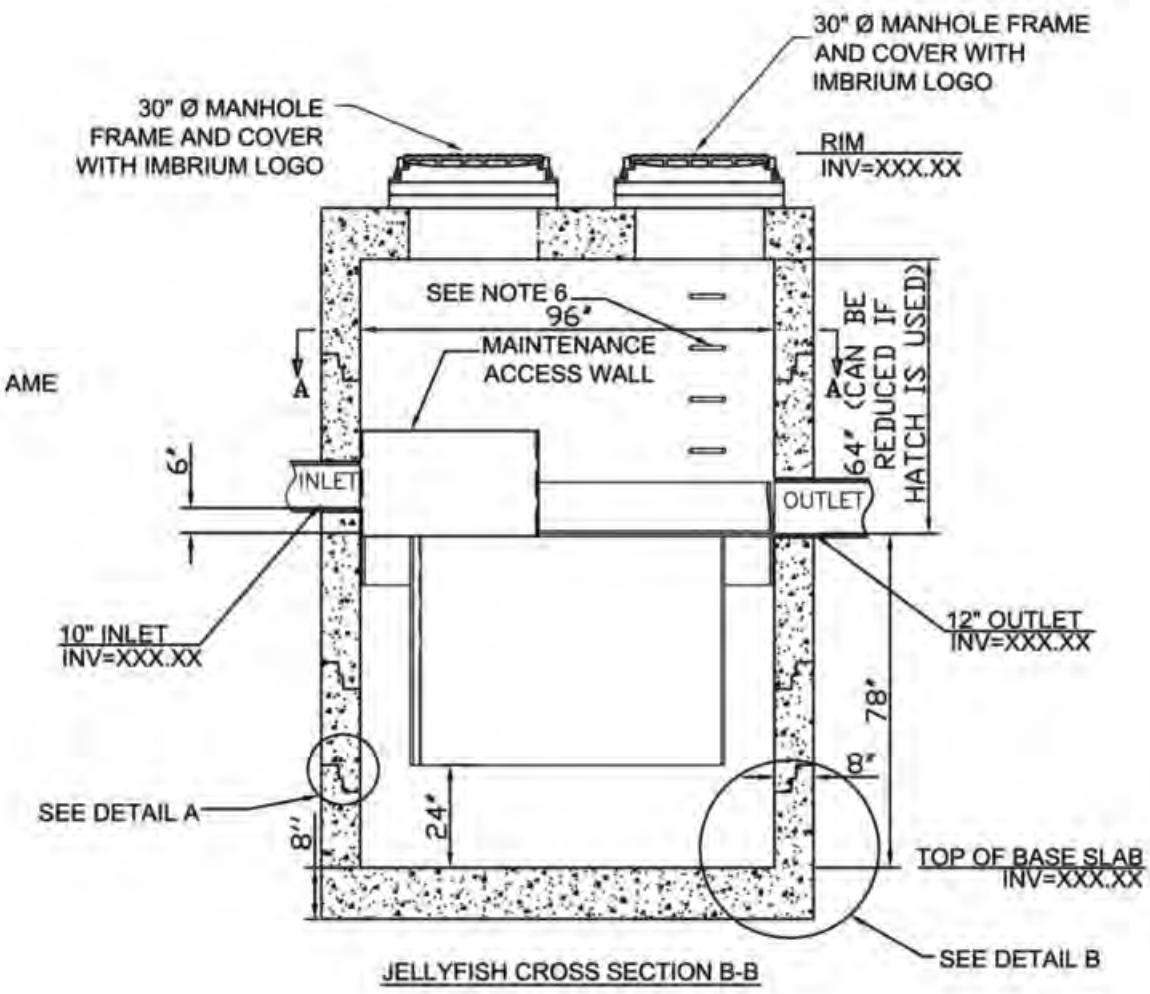
Jellyfish® Filter JF8
Typical Section



Notes:

1. All sections and parts to meet or exceed ASTM C-478, ASTM C-443, and ASTM D-4097 corresponding to AASHTO specifications, and any other site or local standards.
2. Configuration of inlet and outlet can vary to meet site's needs.
3. Cartridge installation shall occur only after site has been stabilized and the Jellyfish unit is clean and free of debris. Cartridges shall be furnished new, at time of final acceptance.
4. The Jellyfish Membrane Filter is protected by the following patents: U.S. Patent No. 8,123,935; Other U.S. Patents Pending; International Patents Pending.
5. For site specific drawings please contact your local Imbrium Systems representative.

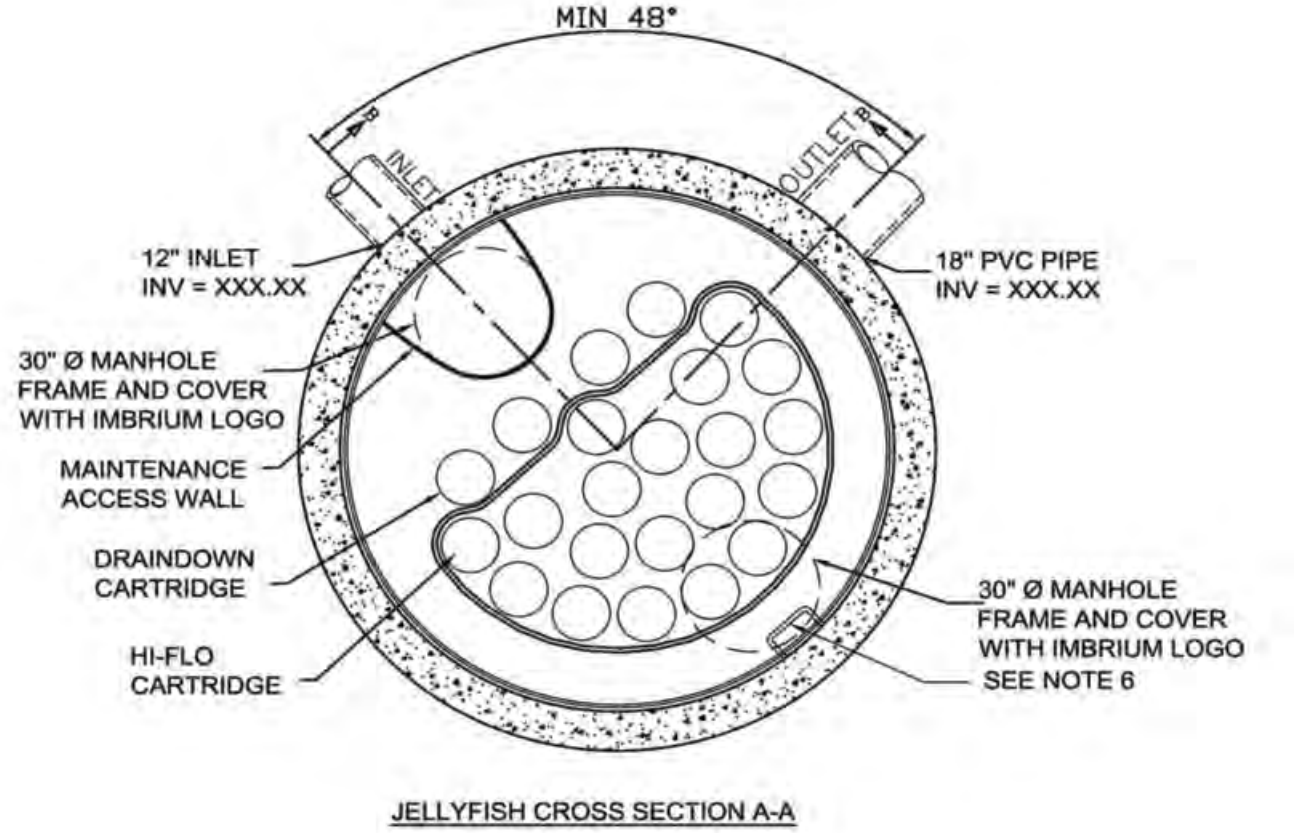
Jellyfish® Filter JF8
Typical Section



Notes:

1. All sections and parts to meet or exceed ASTM C-478, ASTM C-443, and ASTM D-4097 corresponding to AASHTO specifications, and any other site or local standards.
2. Configuration of inlet and outlet can vary to meet site's needs.
3. Cartridge installation shall occur only after site has been stabilized and the Jellyfish unit is clean and free of debris. Cartridges shall be furnished new, at time of final acceptance.
4. The Jellyfish Membrane Filter is protected by the following patents: U.S. Patent No. 8,123,935; Other U.S. Patents Pending; International Patents Pending.
5. For site specific drawings please contact your local Imbrium Systems representative.

Jellyfish® Filter JF10
Typical Section

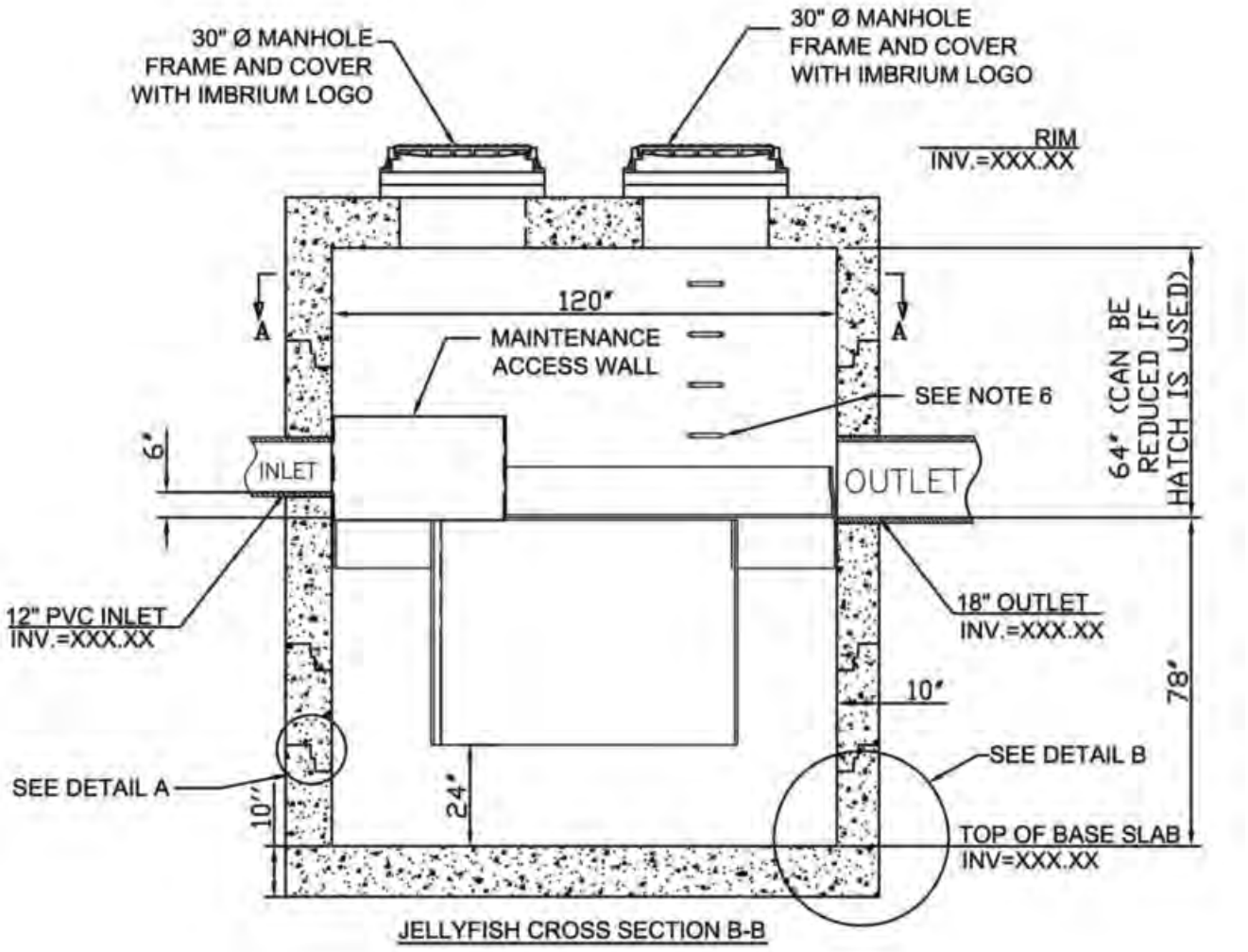


JELLYFISH CROSS SECTION A-A

Notes:

1. All sections and parts to meet or exceed ASTM C-478, ASTM C-443, and ASTM D-4097 corresponding to AASHTO specifications, and any other site or local standards.
2. Configuration of inlet and outlet can vary to meet site's needs.
3. Cartridge installation shall occur only after site has been stabilized and the Jellyfish unit is clean and free of debris. Cartridges shall be furnished new, at time of final acceptance.
4. The Jellyfish Membrane Filter is protected by the following patents: U.S. Patent No. 8,123,935; Other U.S. Patents Pending; International Patents Pending.
5. For site specific drawings please contact your local Imbrium Systems representative.

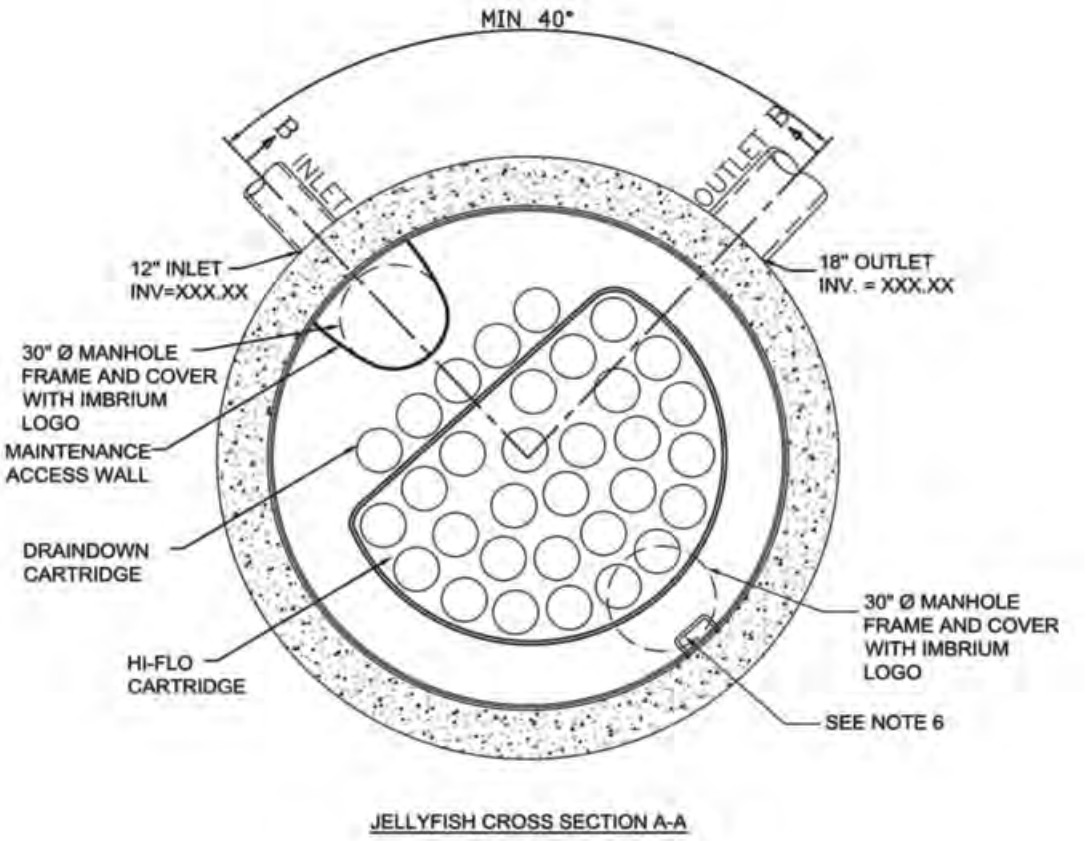
Jellyfish® Filter JF10
Typical Section



Notes:

1. All sections and parts to meet or exceed ASTM C-478, ASTM C-443, and ASTM D-4097 corresponding to AASHTO specifications, and any other site or local standards.
2. Configuration of inlet and outlet can vary to meet site's needs.
3. Cartridge installation shall occur only after site has been stabilized and the Jellyfish unit is clean and free of debris. Cartridges shall be furnished new, at time of final acceptance.
4. The Jellyfish Membrane Filter is protected by the following patents: U.S. Patent No. 8,123,935; Other U.S. Patents Pending; International Patents Pending.
5. For site specific drawings please contact your local Imbrium Systems representative.

Jellyfish® Filter JF12
Typical Section

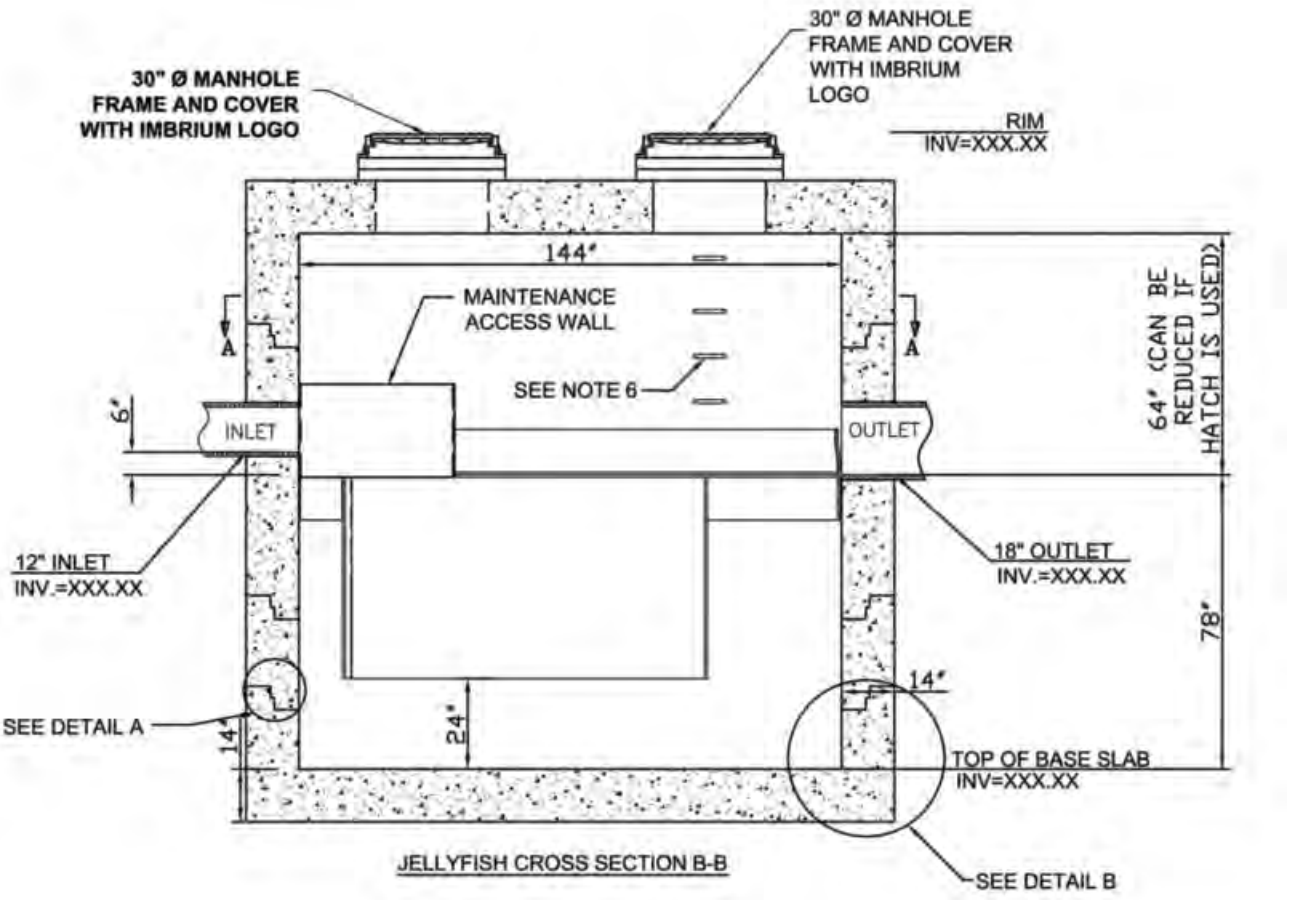


JELLYFISH CROSS SECTION A-A

Notes:

1. All sections and parts to meet or exceed ASTM C-478, ASTM C-443, and ASTM D-4097 corresponding to AASHTO specifications, and any other site or local standards.
2. Configuration of inlet and outlet can vary to meet site's needs.
3. Cartridge installation shall occur only after site has been stabilized and the Jellyfish unit is clean and free of debris. Cartridges shall be furnished new, at time of final acceptance.
4. The Jellyfish Membrane Filter is protected by the following patents: U.S. Patent No. 8,123,935; Other U.S. Patents Pending; International Patents Pending.
5. For site specific drawings please contact your local Imbrium Systems representative.

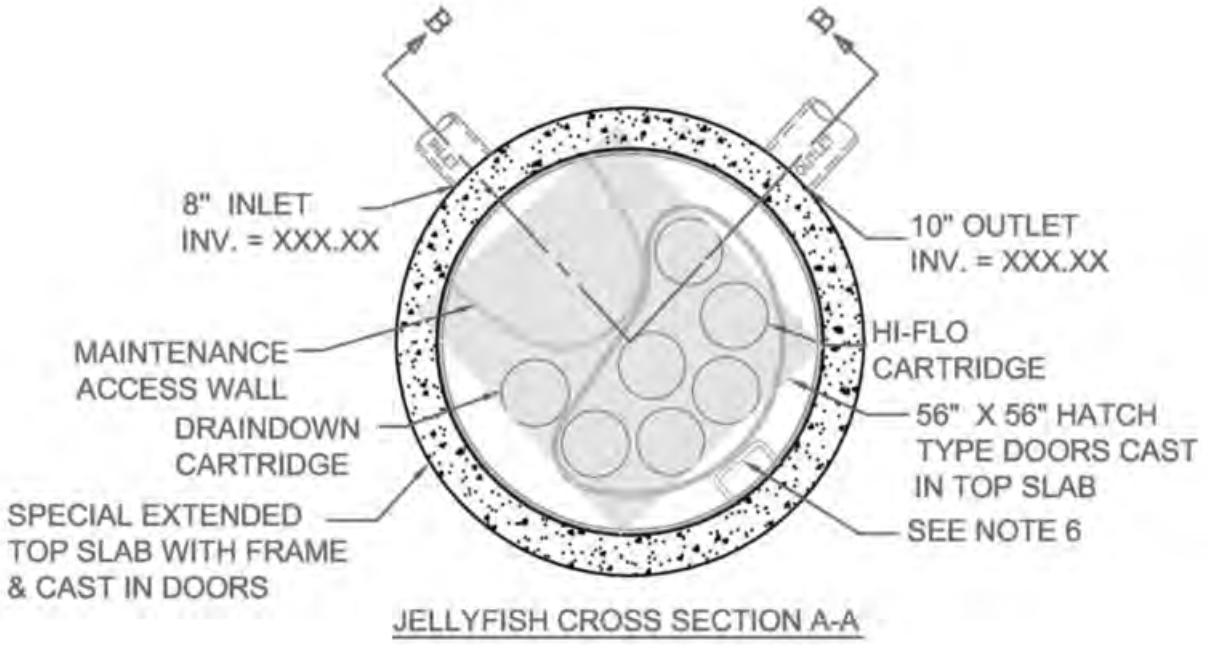
Jellyfish® Filter JF12
Typical Section



Notes:

1. All sections and parts to meet or exceed ASTM C-478, ASTM C-443, and ASTM D-4097 corresponding to AASHTO specifications, and any other site or local standards.
2. Configuration of inlet and outlet can vary to meet site's needs.
3. Cartridge installation shall occur only after site has been stabilized and the Jellyfish unit is clean and free of debris. Cartridges shall be furnished new, at time of final acceptance.
4. The Jellyfish Membrane Filter is protected by the following patents: U.S. Patent No. 8,123,935; Other U.S. Patents Pending; International Patents Pending.
5. For site specific drawings please contact your local Imbrium Systems representative.

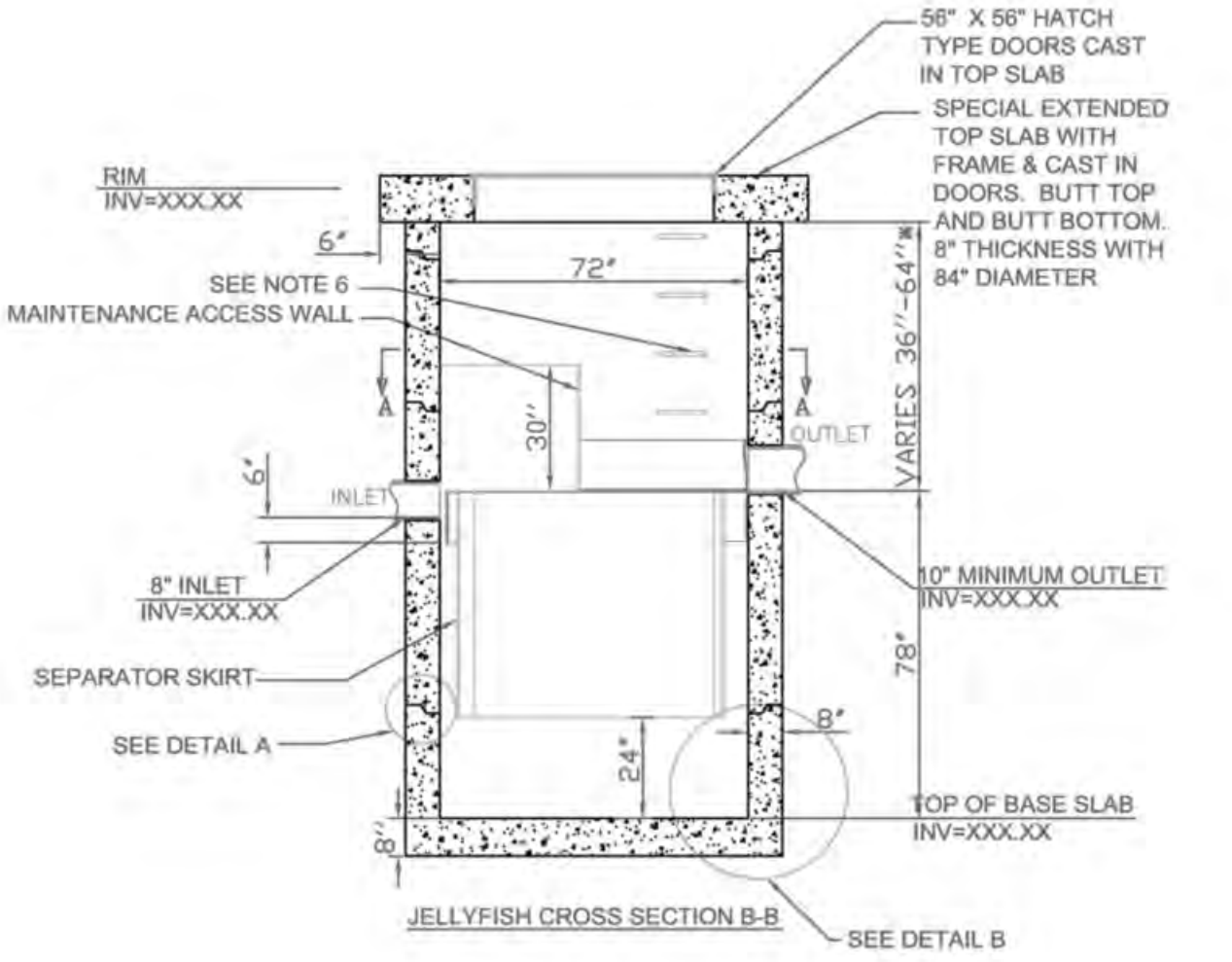
Jellyfish® Filter for Shallow Application (with Hatch) Typical Section



Notes:

1. All sections and parts to meet or exceed ASTM C-478, ASTM C-443, and ASTM D-4097 corresponding to AASHTO specifications, and any other site or local standards.
2. Configuration of inlet and outlet can vary to meet site's needs.
3. Cartridge installation shall occur only after site has been stabilized and the Jellyfish unit is clean and free of debris. Cartridges shall be furnished new, at time of final acceptance.
4. The Jellyfish Membrane Filter is protected by the following patents: Patents Pending.
5. For site specific drawings please contact your local Imbrium Systems representative.

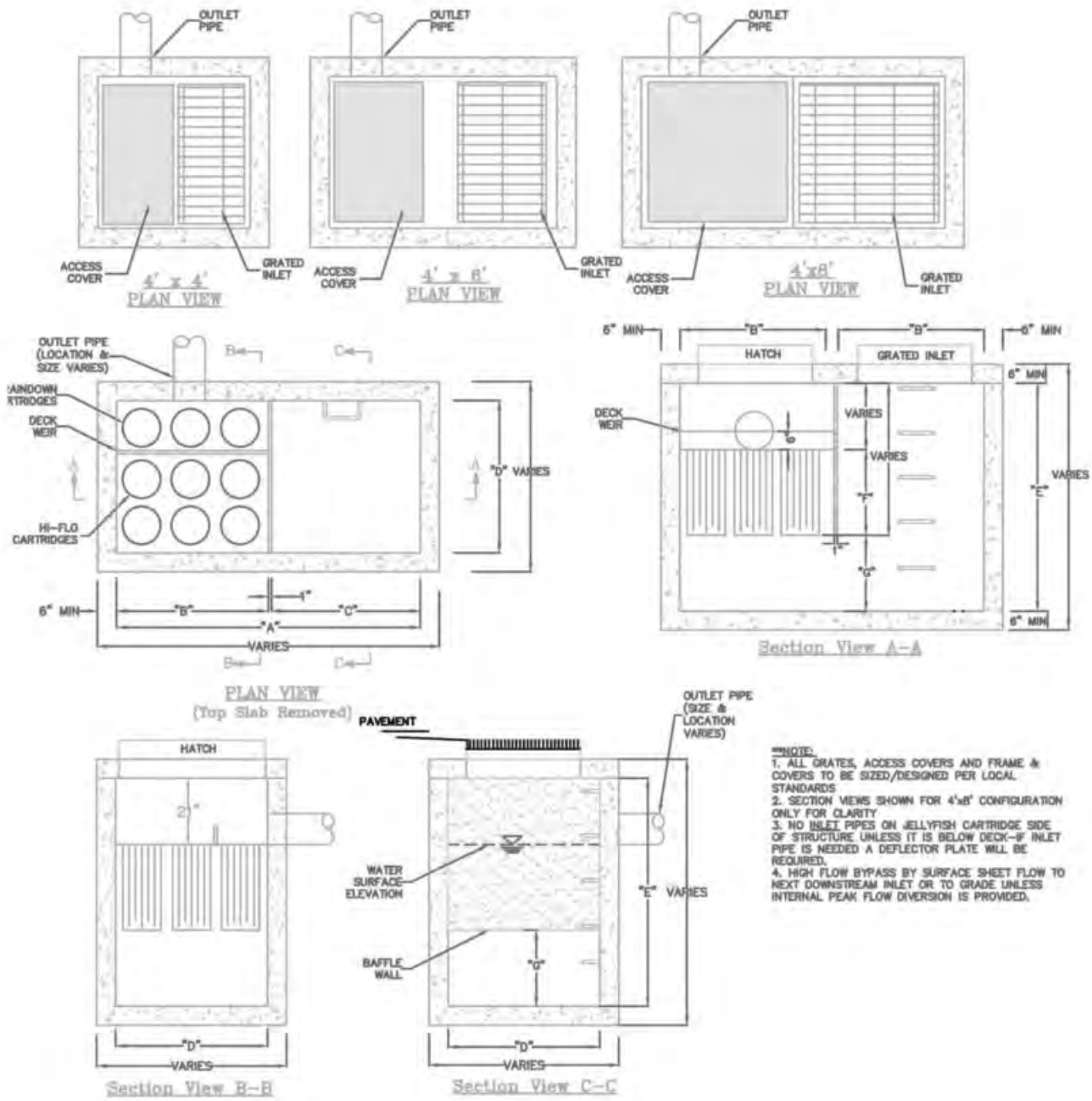
Jellyfish® Filter for Shallow Application (with Hatch) Typical Section



Notes:

1. All sections and parts to meet or exceed ASTM C-478, ASTM C-443, and ASTM D-4097 corresponding to AASHTO specifications, and any other site or local standards.
2. Configuration of inlet and outlet can vary to meet site's needs.
3. Cartridge installation shall occur only after site has been stabilized and the Jellyfish unit is clean and free of debris. Cartridges shall be furnished new, at time of final acceptance.
4. The Jellyfish Membrane Filter is protected by the following patents: Patents Pending.
5. For site specific drawings please contact your local Imbrium Systems representative.

Offline Jellyfish® Filter with Grated Inlet Typical Drawing



Jellyfish Filter Grated Inlet Table

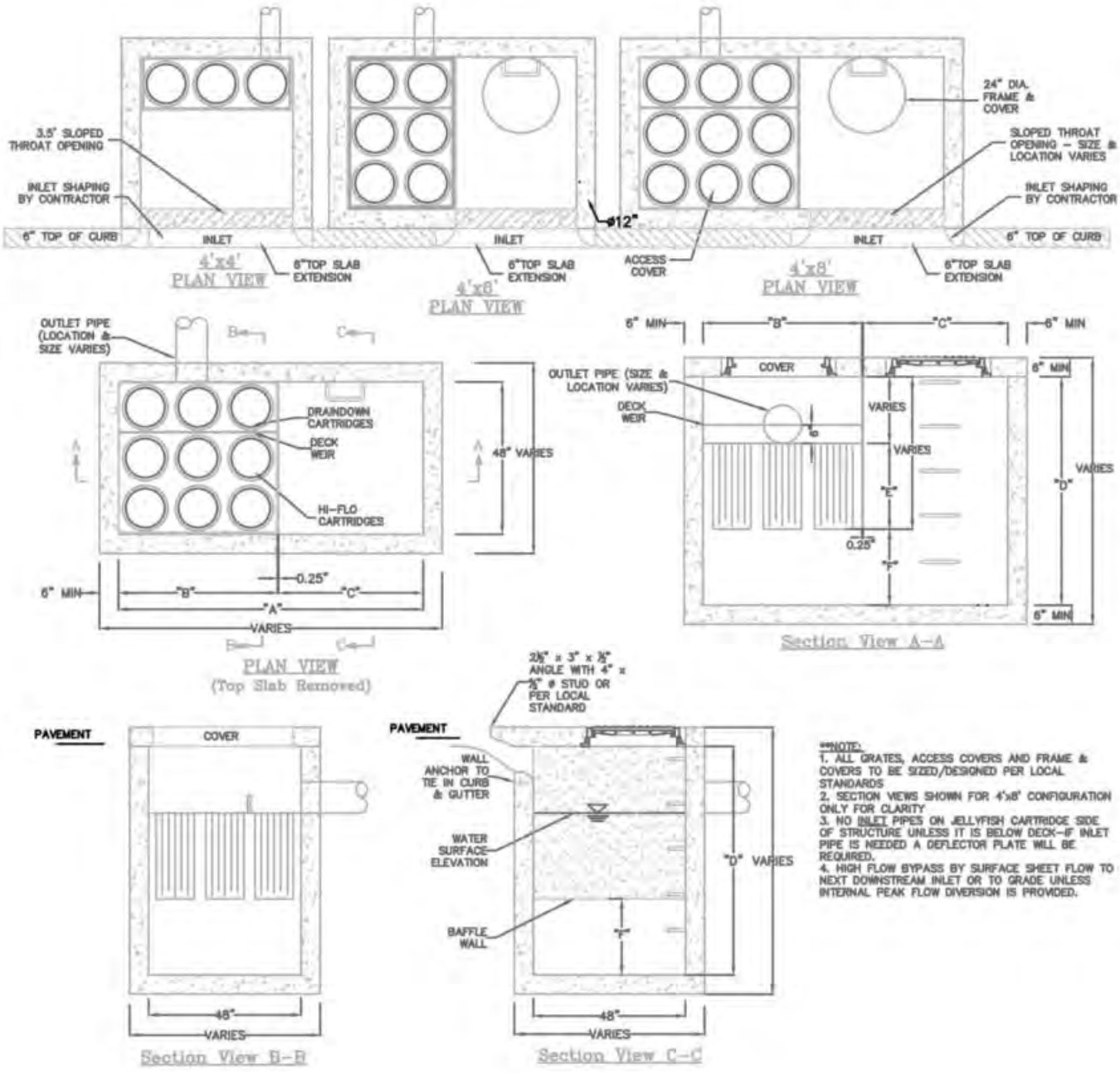
Structure	Cover Dim (Ped or) H-20)	Grate Size	"A" I.D. Length	"B" Deck Width	"C" Inlet Chamber Width	"D" I.D. Width	"E" Min I.D. Height	"F" Cartridge Length	"G" Sump
4′ x 4′	28″ x 44″	24″ Dia.	48″	17.5″	48″	48″	48″	15″	18″
4′ x 4′	28″ x 44″	24″ Dia.	48″	17.5″	48″	48″	72″	27″	24″
4′ x 4′	28″ x 44″	24″ Dia.	48″	17.5″	48″	48″	118″	40″	24″

Structure	Cover Dim (Ped or) H-20)	Grate Size	"A" I.D. Length	"B" Deck Width	"C" Inlet Chamber Width	"D" I.D. Width	"E" Min I.D. Height	"F" Cartridge Length	"G" Sump
4′ x 6′	28″ x 44″	28″ x 44″	72″	33.5″	38″	48″	48″	15″	18″
4′ x 6′	28″ x 44″	28″ x 44″	72″	33.5″	38″	48″	72″	27″	24″
4′ x 6′	28″ x 44″	28″ x 44″	72″	33.5″	38″	48″	118″	40″	24″

Structure	Cover Dim (Ped or) H-20)	Grate Size	"A" I.D. Length	"B" Deck Width	"C" Inlet Chamber Width	"D" I.D. Width	"E" Min I.D. Height	"F" Cartridge Length	"G" Sump
4′ x 8′	44″ x 44″	44″ x 44″	96″	47.5″	48″	48″	48″	15″	18″
4′ x 8′	44″ x 44″	44″ x 44″	96″	47.5″	48″	48″	72″	27″	24″
4′ x 8′	44″ x 44″	44″ x 44″	96″	47.5″	48″	48″	118″	40″	24″

Structure and Model No.	"F" Cartridge Length	Cartridge Type	Design Flow Rate Per Cartridge (gpm)	Max. No of Cartridges	Design Treatment Flow Rate with Max No. of Cartridges (gpm / cfs)
4′ x 4′ JFG4-2-1	15″	Draindown	11	1	55 / 0.12
		Hi-Flo	22	2	
4′ x 4′ JFG4-2-1	27″	Draindown	20	1	100 / 0.22
		Hi-Flo	40	2	
4′ x 4′ JFG4-2-1	40″	Draindown	30	1	150 / 0.33
		Hi-Flo	60	2	
4′ x 6′ JFG6-4-2	15″	Draindown	11	2	110 / 0.25
		Hi-Flo	22	4	
4′ x 6′ JFG6-4-2	27″	Draindown	20	2	200 / 0.45
		Hi-Flo	40	4	
4′ x 6′ JFG6-6-3	40″	Draindown	30	2	300 / 0.67
		Hi-Flo	60	4	
4′ x 8′ JFG8-6-3	15″	Draindown	11	3	165 / 0.37
		Hi-Flo	22	6	
4′ x 8′ JFG8-6-3	27″	Draindown	20	3	300 / 0.67
		Hi-Flo	40	6	
4′ x 8′ JFG8-6-3	40″	Draindown	30	3	450 / 1.00
		Hi-Flo	60	6	

Offline Jellyfish® Filter with Curb Inlet
Typical Drawing



**NOTE:
1. ALL GRATES, ACCESS COVERS AND FRAME & COVERS TO BE SIZED/DESIGNED PER LOCAL STANDARDS
2. SECTION VIEWS SHOWN FOR 4'x8' CONFIGURATION ONLY FOR CLARITY
3. NO INLET PIPES ON JELLYFISH CARTRIDGE SIDE OF STRUCTURE UNLESS IT IS BELOW DECK-IF INLET PIPE IS NEEDED A DEFLECTOR PLATE WILL BE REQUIRED.
4. HIGH FLOW BYPASS BY SURFACE SHEET FLOW TO NEXT DOWNSTREAM INLET OR TO GRADE UNLESS INTERNAL PEAK FLOW DIVERSION IS PROVIDED.

Jellyfish Filter Curb Inlet Table

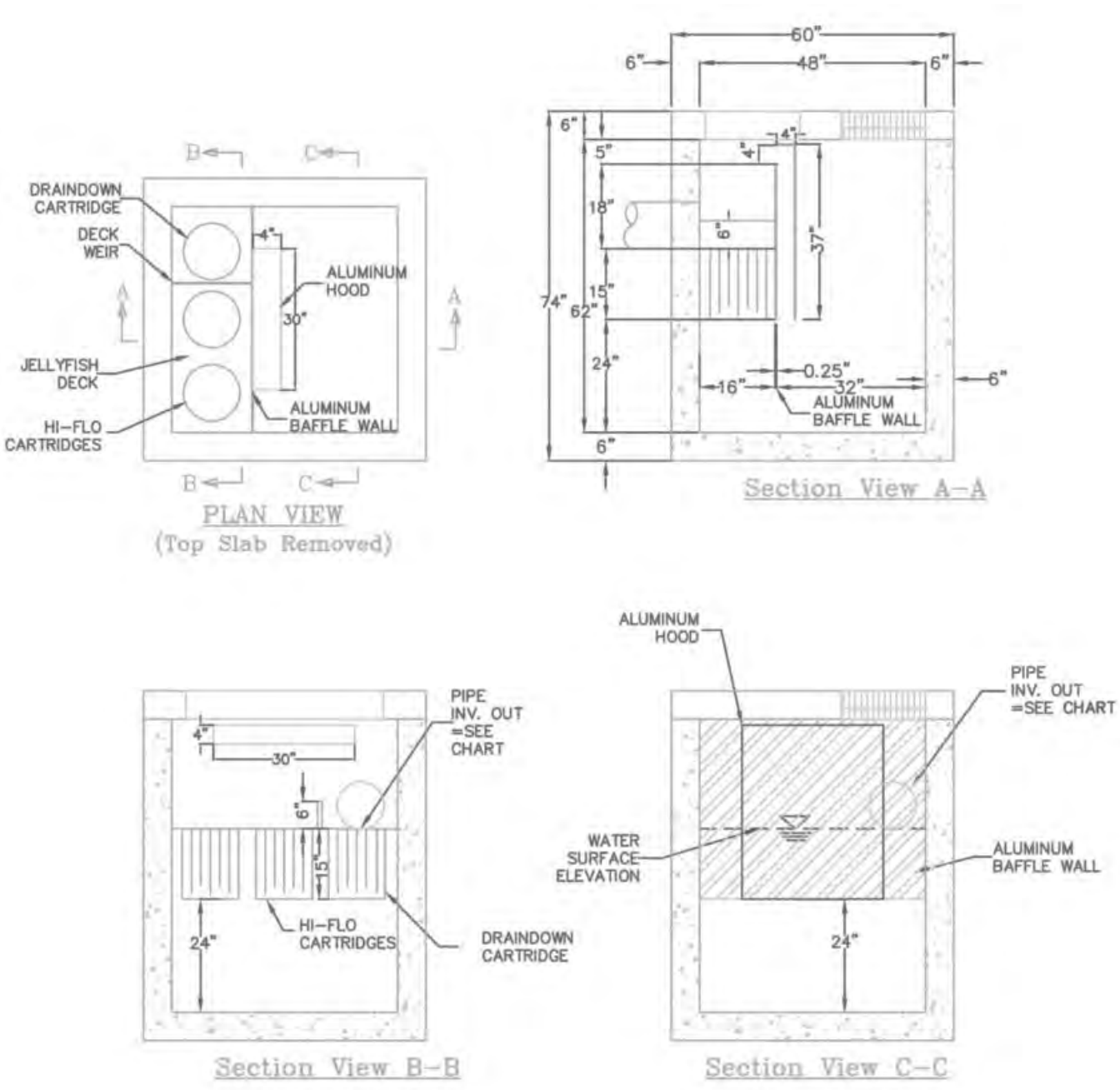
Structure	Cover Dim (Ped Rated)	"A" I.D. Length	"B" Deck Length	"C" Inlet Chamber Length	"D" Min I.D. Height	"E" Cartridge Length	"F" Sump
4′ x 4′	30″ x 48″	48″	47.5″	48″	48″	15″	18″
4′ x 4′	30″ x 48″	48″	47.5″	48″	72″	27″	24″
4′ x 4′	30″ x 48″	48″	47.5″	48″	118″	40″	24″

Structure	Cover Dim (Ped Rated)	Frame and Cover	"A" I.D. Length	"B" Deck Length	"C" Inlet Chamber Length	"D" Min I.D. Height	"E" Cartridge Length	"F" Sump
4′ x 6′	30″ x 48″	24″ Dia.	72″	33.5″	38.25″	48″	15″	18″
4′ x 6′	30″ x 48″	24″ Dia.	72″	33.5″	38.25″	72″	27″	24″
4′ x 6′	30″ x 48″	24″ Dia.	72″	33.5″	38.25″	118″	40″	24″

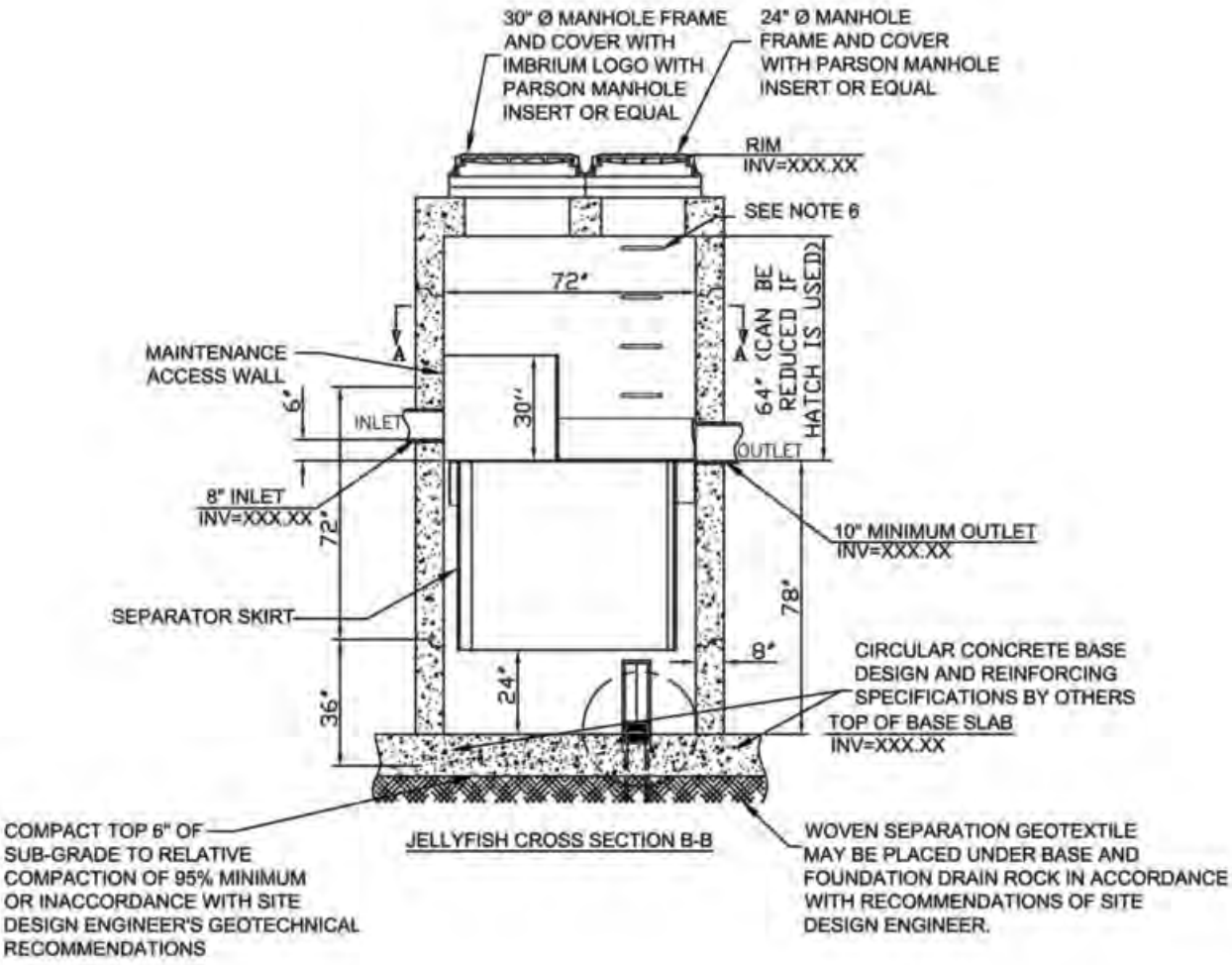
Structure	Cover Dim (Ped Rated)	Frame and Cover	"A" I.D. Length	"B" Deck Length	"C" Inlet Chamber Length	"D" Min I.D. Height	"E" Cartridge Length	"F" Sump
4′ x 8′	44″ x 44″	24″ Dia.	96″	47.5″	48.25″	48″	15″	18″
4′ x 8′	44″ x 44″	24″ Dia.	96″	47.5″	48.25″	72‴	27″	24″
4′ x 8′	44″ x 44″	24″ Dia.	96″	47.5″	48.25″	118″	40″	24″

Structure and Model No.	"F" Cartridge Length	Cartridge Type	Design Flow Rate Per Cartridge (gpm)	Max. No of Cartridges	Design Treatment Flow Rate with Max No. of Cartridges (gpm / cfs)
4′ x 4′ JFC4-2-1	15″	Draindown	11	1	55 / 0 .12
		Hi-Flo	22	2	
4′ x 4′ JFC4-2-1	27″	Draindown	20	1	100 / 0.22
		Hi-Flo	40	2	
4′ x 4′ JFC4-2-1	40″	Draindown	30	1	150 / 0.33
		Hi-Flo	60	2	
4′ x 6′ JFC6-4-2	15″	Draindown	11	2	110 / 0.25
		Hi-Flo	22	4	
4′ x 6′ JFC6-4-2	27″	Draindown	20	2	200 / 0.45
		Hi-Flo	40	4	
4′ x 6′ JFC6-6-3	40″	Draindown	30	2	300 / 0.67
		Hi-Flo	60	4	
4′ x 8′ JFC8-6-3	15″	Draindown	11	3	165 / 0.37
		Hi-Flo	22	6	
4′ x 8′ JFC8-6-3	27″	Draindown	20	3	300 / 0.67
		Hi-Flo	40	6	
4′ x 8′ JFC8-6-3	40″	Draindown	30	3	450 / 1.00
		Hi-Flo	60	6	

Online Jellyfish® Filter with Curb or Grated Inlet Showing Optional Hood



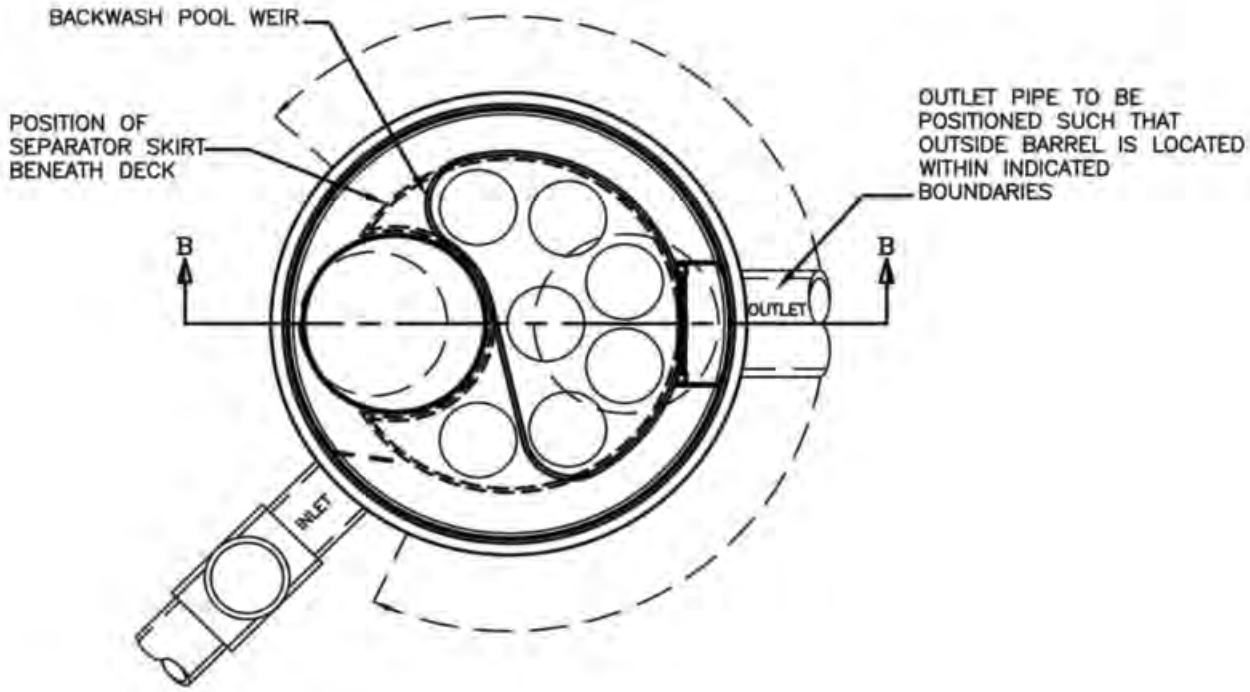
Jellyfish® Filter with Sump Drain Typical Section



NNotes:

1. All sections and parts to meet or exceed ASTM C-478, ASTM C-443, and ASTM D-4097 corresponding to AASHTO specifications, and any other site or local standards.
2. Configuration of inlet and outlet can vary to meet site's needs.
3. Cartridge installation shall occur only after site has been stabilized and the Jellyfish unit is clean and free of debris. Cartridges shall be furnished new, at time of final acceptance.
4. The Jellyfish Membrane Filter is protected by the following patents: U.S. Patent No. 8,123,935; Other U.S. Patents Pending; International Patents Pending.
5. For site specific drawings please contact your local Imbrium Systems representative.

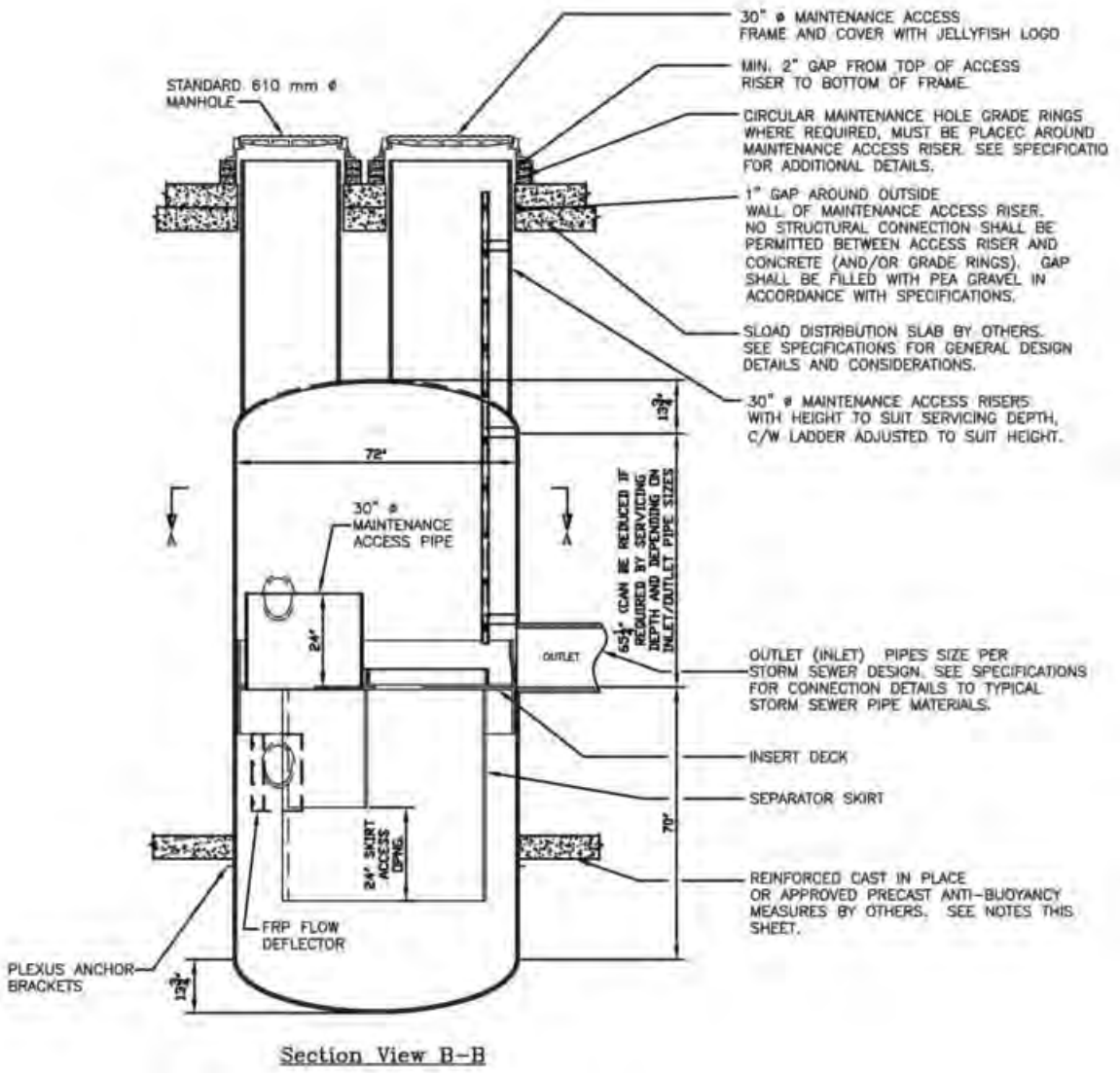
FRP (Fiberglass) Jellyfish® Filter
Typical Section



Notes:

1. All sections and parts to meet or exceed ASTM C-478, ASTM C-443, and ASTM D-4097 corresponding to AASHTO specifications, and any other site or local standards.
2. Configuration of inlet and outlet can vary to meet site's needs.
3. Cartridge installation shall occur only after site has been stabilized and the Jellyfish unit is clean and free of debris. Cartridges shall be furnished new, at time of final acceptance.
4. The Jellyfish Membrane Filter is protected by the following patents: U.S. Patent No. 8,123,935; Other U.S. Patents Pending; International Patents Pending.
5. For site specific drawings please contact your local Imbrium Systems representative.

FRP (Fiberglass) Jellyfish® Filter
Typical Section



Section View B-B

Notes:

1. All sections and parts to meet or exceed ASTM C-478, ASTM C-443, and ASTM D-4097 corresponding to AASHTO specifications, and any other site or local standards.
2. Configuration of inlet and outlet can vary to meet site's needs.
3. Cartridge installation shall occur only after site has been stabilized and the Jellyfish unit is clean and free of debris. Cartridges shall be furnished new, at time of final acceptance.
4. The Jellyfish Membrane Filter is protected by the following patents: U.S. Patent No. 8,123,935; Other U.S. Patents Pending; International Patents Pending.
5. For site specific drawings please contact your local Imbrium Systems representative.

Notes

Appendix B

Jellyfish® Filter Standard Specifications
Water Quality Filter Treatment Device

Notes

Part 1- General

1.1 Work Included

Specifies requirements for construction and performance of an underground stormwater quality filter treatment device that removes pollutants from stormwater runoff through the unit operations of sedimentation, floatation and membrane filtration.

1.2 Reference Standards

ASTM C 891: Specification for Installation of Underground Precast Concrete Utility Structures
ASTM D 4097: Contact Molded Glass Fiber Reinforced Chemical Resistant Tanks
ASTM C 478: Specification for Precast Reinforced Concrete Manhole Sections
ASTM C 443: Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
ASTM D 4101: Specification for Copolymer steps construction

1.3 Shop Drawings

Shop drawings for the structure and performance are to be submitted with each order to the contractor. Contractor shall forward shop drawing submittal to the consulting engineer for approval. Shop drawings are to detail the structure precast concrete and/or fiberglass (FRP) components.

1.4 Handling and Storage

Prevent damage to materials during storage and handling.

Part 2 - Products

2.1 General

2.1.1
The device shall be circular or rectangular and constructed from precast concrete riser and slab components or monolithic precast structure(s), installed to conform to ASTM C 891 and to any required state highway, municipal or local specifications. Alternatively, the device shall be constructed of fiberglass (FRP), installed to conform to applicable sections of state, provincial and municipal building codes, highway, municipal or local specifications for the construction of such devices.

2.1.2 Fiberglass Insert (Cartridge Deck)
The concrete device shall include a fiberglass insert bolted and sealed watertight inside the precast concrete chamber. Alternatively, the fiberglass device shall include a fiberglass insert bolted and/or chemically welded watertight inside the fiberglass chamber. The fiberglass insert shall serve as: (a) a horizontal divider between the lower treatment zone and the upper treated effluent zone; (b) a deck for attachment of filter cartridges such that the membrane filter elements of each cartridge extend into the lower treatment zone; (c) a platform for maintenance workers to service the filter cartridges; (d) a conduit for conveyance of treated water to the effluent pipe.

2.1.3 Membrane Filter Cartridges

Filter cartridges shall be comprised of cylindrical membrane filter elements connected to a perforated head plate. The number of membrane filter elements per cartridge shall be eleven 2.75-inch (70-mm) diameter elements. The length of each filter element shall be a minimum 27 inches (690 mm). Each cartridge shall be fitted into the cartridge deck by insertion into a cartridge receptacle that is permanently mounted into the cartridge deck. Each cartridge shall be secured by a cartridge lid that is threaded onto the receptacle. The maximum treatment flow rate of a filter cartridge shall be controlled by an orifice in the cartridge lid and based on a design flux rate determined by the maximum treatment flow rate per unit of filtration membrane surface area. The maximum flux rate shall be 0.21 gpm/ft2 (0.142 lps/m2).

Each lightweight membrane filter cartridge shall allow for manual installation and removal and shall have a dry installation weight not to exceed the following:

Cartridge Length (in / mm)	Cartridge Dry Weight (lbs / kg)
15 / 381	10 / 4.5
27 / 686	14.5 / 6.6
40 / 1016	19.5 / 8.9
54 / 1372	25 / 11.4

2.1.4 Backwashing Cartridges

The filter device shall have a weir extending above the cartridge deck that encloses the high flow rate filter cartridges when placed in their respective cartridge receptacles within the cartridge deck. The weir shall collect a pool of water during inflow events that subsequently automatically backwashes the hi flo rate cartridges when the inflow event subsides. All filter cartridges shall allow for use of a manual backwashing or filtration membrane rinsing procedure to restore flow capacity and sediment capacity and extend cartridge service life.

2.1.5 Maintenance Access to Captured Pollutants

A Maintenance Access Wall shall enclose an opening in the cartridge deck that has minimum diameter of 18 inches (450 mm) and thereby provide suitable access for removal of accumulated floatable pollutants and sediment.

2.1.6 Bend Structure

The device shall be able to be used as a bend structure with minimum angles between inlet and outlet pipes of 66-degrees or less in the stormwater conveyance system.

2.1.7 Double-Wall Containment of Hydrocarbons

The precast concrete device shall provide double-wall containment for hydrocarbon spill capture by a combined means of an inner wall of fiberglass, to a minimum depth of 12 inches (305 mm) below the cartridge deck and the precast vessel wall. Alternatively, a device constructed of fiberglass (FRP) does not require double-wall containment as fiberglass is resistant to hydrocarbon penetration.

2.1.8 Separator Skirt

The device shall provide a flexible separator skirt that extends from the underside of the cartridge deck to a minimum length equal to the length of the membrane filter elements. The separator skirt shall serve as a baffle to protect the membrane filter elements from contamination by floatables and coarse sediment.

2.1.9 Sump

The device must include a minimum 24 inches (610 mm) of sump below the bottom of the cartridges for sediment accumulation, unless otherwise specified by the design engineer.

2.2 Precast Concrete Sections

All precast concrete components shall be manufactured to a minimum live load of HS-20 truck loading or greater based on local regulatory specifications, unless otherwise modified or specified by the design engineer.

2.3 Gaskets

All gaskets used for the concrete joints shall be manufactured using neoprene or nitrile rubber gaskets to prevent deterioration from presence of captured petroleum hydrocarbons. Mastic sealants or butyl tape are not an acceptable alternative as they are prone to leakage of petroleum hydrocarbons.

2.4 Frame and Cover

Frame and covers must be manufactured from cast-iron and embossed with the name of the device manufacturer or the device brand name.

2.5 Doors and Hatches

If provided shall meet designated loading requirements at a minimum for incidental traffic.

2.5 Concrete

All concrete components shall be manufactured according to local specifications and shall meet the requirements of ASTM C 478.

2.6 Fiberglass

The fiberglass portion of the water treatment device shall be constructed in accordance with the following standard: ASTM D-4097: Contact Molded Glass Fiber Reinforced Chemical Resistant Tanks.

2.7 Steps

Steps shall be constructed according to ASTM D4101 of copolymer polypropylene and be driven into preformed or pre-drilled holes after the concrete has cured, installed to conform to applicable sections of state, provincial and municipal building codes, highway, municipal or local specifications for the construction of such devices.

2.8 Inspections

All precast concrete sections shall be inspected to ensure that dimensions, appearance and quality of the product meet local municipal specifications and ASTM C 478.

Part 3 – Performance

3.1 General

3.1.1 Function
The stormwater quality filter treatment device functions to remove pollutants by the following unit treatment processes; sedimentation, floatation and membrane filtration.

3.1.2 Pollutants
The stormwater quality filter treatment device removes oil, debris, trash, sediment, sediment-bound pollutants, metals and nutrients from stormwater during frequent wet weather events.

3.1.3 Bypass
The stormwater quality filter treatment device typically operates off-line.

3.1.4 Treatment Flux Rate
The stormwater quality filter treatment device shall treat 100% of the required water quality treatment flow based on a maximum treatment flux rate across the membrane filter cartridges of 0.21 gpm/ft^2 (0.142 lps/m^2).

3.2 Field Test Performance

At a minimum, the stormwater quality filter device shall have been field tested with a minimum 25 TARP qualifying storm events and field monitoring conducted according to the TARP or TAPE field test protocol, and have received NJCAT verification.

3.2.1 Suspended Solids Removal
The stormwater quality filter treatment device shall have demonstrated a minimum median TSS removal efficiency of greater than 85%, and a minimum median SSC removal of 95%.

3.2.2 Fine Particle Removal
The stormwater quality filter treatment device shall demonstrate the ability to capture fine particles as indicated by a minimum median removal efficiency of all particles less than 25 microns greater than 75%, an effluent d_{50} of 15 microns or lower for all monitored storm events, and an effluent turbidity of 15 NTUs or lower.

3.2.3 Nutrient (Total Phosphorus & Total Nitrogen) Removal
The stormwater quality filter treatment device shall have demonstrated a minimum median Total Phosphorus removal of 55%, and a minimum median Total Nitrogen removal of 50%.

3.2.4 Metals (Total Zinc & Total Copper) Removal
The stormwater quality filter treatment device shall have demonstrated a minimum median Total Zinc removal of 55%, and a minimum median Total Copper removal of 85%.

3.3 Lab Test Performance

3.3.1 Suspended Solids Removal

The stormwater quality treatment device shall demonstrate the ability to remove a minimum of 85% of Sil-Co-Sil 106 (d_{50} = 22 microns), measured as SSC, with a 95% confidence interval at the system's 100% operating rate with influent sediment concentrations ranging from 100 to 300 mg/L.

3.4 Inspection and Maintenance

The stormwater quality filter device shall have the following features:

3.4.1 The membrane filter elements shall be designed to last three years prior to requiring replacement.

3.4.2 Inspection which includes trash and floatables collection, sediment depth determination, and visible determination of backwash pool depth shall be easily conducted from grade.

3.4.3 Manual backflushing of the filter cartridges shall be possible to restore the flow capacity and sediment capacity of the filter cartridges and therefore extend cartridge service life.

3.4.4 Filter treatment shall have a minimum 12 inches (610 mm) of sediment storage depth.

3.4.5 Sediment removal from the filter treatment device shall be conducted using a standard maintenance truck and vacuum apparatus, and a single point of entry through the cartridge deck that is unobstructed by filter cartridges.

3.4.6 Filter cartridges be easily maintained without the use of additional lifting equipment.

Part 4 – Execution

4.1 Precast & Installation

4.1.1 Precast Device Construction Sequence

The installation of a precast concrete device should conform to ASTM C 891 and to any state highway, municipal or local specifications for the construction of manholes. Selected sections of a general specification that are applicable are summarized below.

4.1.1.1 The precast concrete device is installed in sections in the following sequence:

- aggregate base
- base slab
- treatment chamber and cartridge deck riser section(s)
- bypass section
- connect inlet and outlet pipes
- riser section and/or transition slab (if required)
- maintenance riser section(s) (if required)
- frame and access cover

4.1.1.2 The precast base should be placed level at the specified grade. The entire base should be in contact with the underlying compacted granular material. Subsequent sections, complete with joint seals, should be installed in accordance with the precast concrete manufacturer's recommendations.

4.1.1.3 Adjustment of the stormwater quality treatment device can be performed by lifting the upper sections free of the excavated area, re-leveling the base, and re-installing the sections. Damaged sections and gaskets should be repaired or replaced as necessary. Once the stormwater quality treatment device has been constructed, any lift holes must be plugged watertight with mortar or non-shrink grout.

4.1.4 Inlet and Outlet Pipes

Inlet and outlet pipes should be securely set into the device using approved pipe seals (flexible boot connections, where applicable) so that the structure is watertight.

4.1.5 Frame and Cover Installation

Adjustment units (e.g. grade rings) should be installed to set the frame and cover at the required elevation. The adjustment units should be laid in a full bed of mortar with successive units being joined using sealant recommended by the manufacturer. Frames for the cover should be set in a full bed of mortar at the elevation specified.

4.2.1 Fiberglass (FRP) Installation

The installation of the FRP device should conform to applicable sections of state, provincial and municipal building codes, highway, municipal or local specifications for the construction of such devices. Selected sections of a general specification that are applicable are summarized below. For detailed installation instructions refer to the submitted drawing and installation details.

4.2.1.1 Structural

Proposed installation details shall conform with all federal, provincial, state, municipal or other local specifications as may be applicable, including all building code requirements. Structural - Proposed installation details shall conform with all federal, provincial, state, municipal or other local specifications as may be applicable, including all building code requirements.

4.2.1.2 Water Quality Device Construction Sequence

The water quality FRP device is installed in the following sequence:

- Water quality device as delivered to site placed on prepared bedding or slab using spreader bars and the lifting lugs provided on the structure. Avoid lifting chains or cables from contacting sides of tank. Do not drop, roll or slide vessel.
- Backfill using approved back fill material
- Pour anti-buoyancy slab as required per the drawing
- Connect inlet and outlet pipes
- Riser sections and/or transitions (if required and if shipped separately)
- Frame and access cover

4.2.1.3 Frame and Cover Installation

No direct structural connection shall be permitted to any FRP maintenance access surface riser pipe. No vertical structural connection shall be permitted to any FRP component under any circumstances unless approved by the manufacturer.

A minimum 1-inch (25 mm) gap shall be left around and above any required FRP maintenance access surface risers (i.e. not a buried installation), with this gap filled with pea gravel or approved fill material against the surrounding structure that must support the frame and cover in its entirety.

4.3 Maintenance Access Wall

In some instances the Maintenance Access Wall will require an extension attachment and sealing to the precast wall and cartridge deck at the job site, rather than at the precast facility. In this instance, installation of these components shall be performed according to instructions provided by the manufacturer.

4.4 Filter Cartridge Installation

Filter cartridges shall be installed in the cartridge deck after the construction site is fully stabilized, unless otherwise specified by the design engineer.

Part 5 – Quality Assurance

5.1 Filter Cartridge Installation

Manufacturer shall coordinate delivery of filter cartridges and other internal components with contractor. Filter cartridges shall be delivered and installed after site is stabilized and unit is ready to accept cartridges. Contractor shall take appropriate action to protect the filter cartridge receptacles and filter cartridges from damage during construction. For systems with cartridges installed prior to full site stabilization and prior to system commissioning, the contractor can plug inlet and outlet pipes to prevent stormwater from entering the device. Plugs must be removed after the device has been commissioned.

5.2 Inspection and Maintenance

5.2.1
The manufacturer shall provide an Owner's Manual upon request.

5.2.2
After construction and installation, and during operation, the device shall be inspected and cleaned as necessary based on the manufacturer's recommended inspection and maintenance guidelines.

5.3 Replacement Filter Cartridges

When replacement membrane filter elements and/or other parts are required, only membrane filter elements and parts approved by the manufacturer for use with the stormwater quality filter device shall be installed.

Appendix C

Jellyfish® Filter Design Form

Jellyfish Filter Design Form

Jellyfish®

Project Information

Project Name: _____
Jobsite Address: _____
_____
_____
City/Town: _____
State/Province: _____

Contractor Information

Contact Name: _____
Company: _____
Phone Number: _____
Fax Number: _____
E-Mail: _____

Consultant Information

Contact Name: _____
Company: _____
Phone Number: _____
Fax Number: _____
E-Mail: _____

Owner Information

Contact Name: _____
Company: _____
Phone Number: _____
Fax Number: _____
E-Mail: _____

Design Information

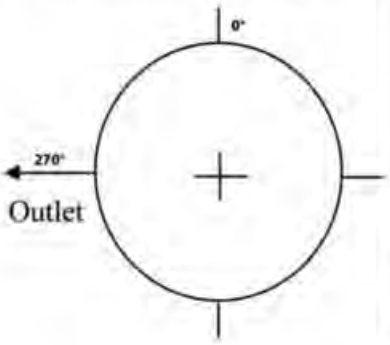
Outlet Pipe Size: _____
Outlet Pipe Material: _____
Upstream Weir Elev: _____
Drainage Area: _____
% Impervious: _____

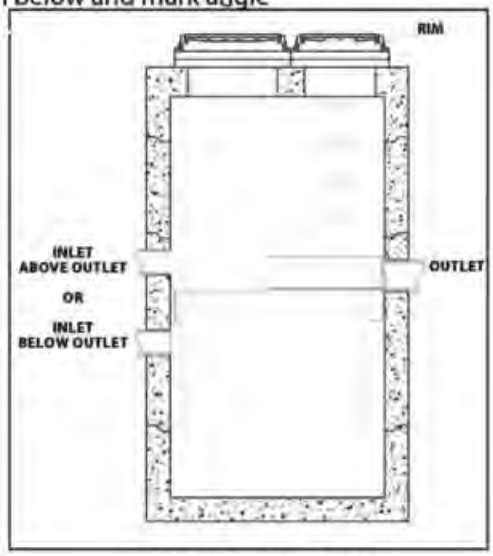
Online* or Offline: _____
If Online:
5 year flow rate: _____
Max Inlet pipe flow rate: _____

*Online available in select markets

Inlet Pipe Size: _____
Inlet Pipe Material: _____
Internal Bypass Required (Y/N): _____
Treatment Flow Rate: _____
Peak Bypass Flow Rate: _____
Detention on site (Y/N): _____
Filter Installed Downstream of Detention (Y/N): _____

Please sketch inlet pipe location below and mark angle





Notes: _____

imbrium®

For Office Use Only

Jellyfish Filter Model: _____
Imbrium Project Number: _____
Quote Number: _____
Submit Form to: Imbrium Systems
USA: 888.279.8826 CAD: 800.565.4801 INT'L: +1.416.960.9900

Notes

Jellyfish® Filter

General Design Notes

Driving Head

- ✓ Typical driving head designed into the system is 18 inches (457 mm)
- ✓ Off-line configuration has an external bypass that uses an upstream diversion structure to provide the 18 inches (457 mm) of driving head

Inlet & Outlet Pipes

- ✓ A wide range of angles can be accommodated
  - The inlet pipe can be located anywhere about the structure circumference
  - The separation angle relationship between the inlet pipe and outlet pipe can vary from 0 to 360 degrees providing maximum design flexibility.

- ✓ Multiple inlet pipes can be accommodated

- ✓ For the standard above-deck configuration, the inlet pipe's invert elevation is typically set 6 inches (150 mm) higher than the invert elevation of the outlet pipe.
  - Alternative invert elevations between the inlet and outlet pipe can easily be accommodated with most all configurations

Minimum Cover

- ✓ Low cover installations generally need a minimum depth of cover of 36 inches (915 mm) from the outlet pipe invert to the underside of the top slab.

Cartridge Details:

- Design flow rates for the 54-inch (1372 mm) length:
  - hi-flo cartridge: 80 gpm (5.0 L/s)
  - draindown cartridge: 40 gpm (2.5 L/s)

- Design membrane filtration flux rate (flow rate per unit surface area) for the 54-inch (1372 mm) length:
  - hi-flo cartridge: 0.21 gpm/ft2 (0.14 Lps/m2)
  - draindown cartridge: 0.11 gpm/ft2 (0.07 Lps/m2)

- Weight for the 54-inch (1372 mm) length:
  - Dry weight < 20 pounds (9 kg)
  - Wet weight < 50 pounds (23 kg)

imbrium®

Engineered Stormwater Treatment

www.imbriumsystems.com

USA

Phone: 301.279.8827

Toll Free: 888.279.8826

Canada / International

Phone: 416.960.9900

Toll Free: 800.565.4801

Int'l: +1.416.960.9900

JFTM_V3-0512- US

APPENDIX I

WATER QUALITY CALCULATIONS

URS

Job TETERBORO AIRPORT TOWER | Project No. | Page ____ of ____
Description STORMWATER MANAGEMENT | Computed by | Sheet ____ of ____
Checked by | Date 11/12/13 | Reference

Date 11/11/13

- AS PER SOUTH HACKENSACK MUNICIPAL STORMWATER MANAGEMENT PLAN:
  EAST RIVER DITCH FW2-NT/SE2

  -NO SPECIAL DISCHARGE OR MANAGEMENT REQUIREMENTS

- ASSUME NO GROUNDWATER RECHARGE - GROUNDWATER IS ASSUMED TO BE NEAR SURFACE AS AREA IS CLASSIFIED AS WETLANDS/SWAMPY AREA

- NJAC 7:8-5.5
  - WATER QUALITY DESIGN STORM 1.25 INCHES OF RAINFALL IN 2 HOURS
  - 80% TSS REMOVAL (NON-CLASSIFIED RIVER)

- FROM DRAWING
  - 2.06 ACRES SITE SIZE, .35 ACRES ACCESS ROAD
  - 100 YEAR RIVERINE 5.7 FT NAVD
  - 100 YEAR TIDAL 8.0 FT NAVD

$Q = CIA$

$I = \frac{1.25\ IN}{2\ HR} = .625\ IN/HR$

$A = 2.06\ AC \rightarrow .96\ AC$ GRASS

$1.10\ AC$ IMPERVIOUS (WITHOUT ACCESS ROAD - WILL BE SEPARATE SYSTEM)

C-SITE

$$\frac{.96(.35) + 1.1(.99)}{2.06}$$

$$\frac{.336 + 1.089}{2.06}$$

$$\frac{1.425}{2.06} = .692$$

C COEFFICIENTS

.99 ASPHALT
.35 GRASS

ROADWAY

$Q = .692(.625)(2.06)$

SITE $Q = .891$ CFS

$Q = .99(.625)(.35)$

ROADWAY $Q = .217$ CFS

URS

Job TETERBORO AIRPORT TOWER | Project No. | Page ____ of ____
Description STORMWATER MANAGEMENT | Computed by | Sheet ____ of ____
Checked by RDW | Date 11/12/13 | Reference

Date 11/11/13

- TO ACHIEVE TSS REMOVAL

SITE - JELLYFISH JF6-5-1 6' DIAMETER MANHOLE BY IMBRIUM SYSTEMS CAP .98CFS
ROAD - JELLYFISH JF4-2-1 4' DIAMETER MANHOLE BY IMBRIUM SYSTEMS CAP .45CFS

- ALL PIPES 15" RCP AS PER NEW JERSEY RESIDENTIAL SITE IMPROVEMENT STANDARDS : NJAC 5:21-7.3

- COVER OF 11" MAINTAINED ON ALL PIPES PER NEW JERSEY RESIDENTIAL SITE IMPROVEMENT STANDARDS : NJAC 5:21-7.3 TABLE 7.4 FOR ASTM CLASS IV RCP

- ALL PIPE CALCULATIONS MADE USING INTERNET BASED- "GRAVITY-FED PIPE FLOW CALCULATOR" - USING HAZEN-WILLIAMS EQUATION WWW.CALCTOOL.ORG
  - ROUGHNESS FACTOR 100 AND VERIFIED USING MANNING'S EQUATION

  - ALL PIPES MINIMUM 3 FPS VELOCITY TO MEET REQUIREMENTS IN NJAC 5:21-7.3

Attachment A4-3-3:
Stormwater Management Report for First Aviation Services Expansion

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STORMWATER MANAGEMENT REPORT

for

First Aviation Services Expansion

Block 76, Lot 1.02

Borough of Moonachie

Bergen County, New Jersey

Prepared For:

Port Authority of New York and New Jersey
Newark Liberty International Airport
Conrad Road, Building #1
Newark, New Jersey 07114

First Aviation Services
d/b/a Signature Flight Support Corporation
Teterboro Airport
Charles Lindberg Drive
Teterboro, New Jersey 07074

Prepared By:

Langan Engineering & Environmental Services, Inc.
21 Penn Plaza
360 W 31st Street, 8th Floor
New York, NY 10001

Marc Gallagher
Professional Engineer NJ License No.24GE04479800

21 January 2016
1642424

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WC-101	Wetland Impact Plan
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CS-503	Site Details 3
CS-504	Site Details 4
CS-505	Site Details 5

INTRODUCTION

This report presents an evaluation of stormwater runoff associated with the proposed development of the First Aviation Services Expansion to be constructed on about 10.5 acres within the south development area of the Port Authority of New York and New Jersey's (PANYNJ) Teterboro Airport. The project proposes the construction of 2 hangars (40,000 SF each) and associated office space, paved apron, access road, and parking lot.

The stormwater analysis performed as part of this study addresses stormwater runoff generated by existing and proposed site conditions during the 2, 10, 25, and 100 year storm events. The stormwater evaluation was conducted using the United States Department of Agriculture (USDA) methodologies presented in Technical Release No. 55 (TR-55). The proposed stormwater conveyance system was designed based on a 25-year storm event using the Rational Method and a six-minute inlet time.

The existing conditions, proposed development, stormwater methodologies, and analytical results are presented herein. All elevations cited in this report are referenced to the National Geodetic Vertical Datum of 1988 (NGVD 88)

PROJECT DESCRIPTION

Existing Site Description

First Aviation Services (FAS) is the currently the leaseholder of 24.82 acres (41.52 proposed) at Teterboro Airport located in the Borough of Moonachie, Bergen County (see Figure 1 – Site Location Map). The site is owned and operated by the Port Authority of New York & New Jersey. First Aviation Services provides private jet services for travel to and from the New York–New Jersey metropolitan area. The existing FAS-leased area contains three airplane maintenance hangars and apron (paved airplane parking area) east of the southern end of Runway 9-24.

The existing topography of the site is relatively flat with elevations ranging from about 1.5 to 3.0 NAVD88. The 100-year floodplain elevation at Teterboro Airport is el. 8 NAVD 88.

The site is tributary to the West Riser Ditch and Berry's Creek. Stormwater currently flows overland to the north and south and through the site via an existing swale along the northwestern portion of the site. The existing on-site soils are fill materials underlain by the natural tidal marshland peat, silt and clay. These underlying soils experience poor drainage due

to flat land surface, low permeability and the tidal fluctuations. The existing site watershed areas are shown on the Existing Drainage Area Map (CG-401). The following summarizes the watershed characteristics of the existing areas shown thereon:

TABLE A
EXISTING WATERSHED AREAS

Drainage Area	Area (acres)	Runoff Coefficient
Sub-Area A	23.73	0.90
Sub-Area B	20.30	0.20
Sub-Area C	12.51	0.20

As noted on the Existing Drainage Area Map, Sub Area A is collected and conveyed through a stormwater system. Sub area B flows north and west via overland flow and an existing swale and is collected by the existing adjacent stormwater system. Area C flows off-site to the south and east of the site and is not included in the study. A relatively high time of concentration was computed in Sub-Area B based on the poor drainage and existing slopes less than 1 percent within the upstream wetland area. The following summarizes the existing peak flow rates for various storm events for the drainage areas within the areas of study (as computed per TR-55):

TABLE B
EXISTING PEAK FLOWS

Drainage Area	2 yr Storm (cfs)	10 yr Storm (cfs)	25 yr Storm (cfs)	100 yr Storm (cfs)
Sub-Area A	55.13	89.20	96.0	126.5
Sub-Area B	1.0	4.16	4.97	9.18

Project Description

First Aviation Services (FAS) is proposing to expand its facilities onto about 10.5 acres within a proposed 16.7-acre lease area. As shown on CS-100, the FAS expansion project includes the construction of two 40,000-square-foot hangars, two 7,500-square-foot offices, 280,000 square feet of apron and 16,600 square feet of vehicle parking (84 spaces). The apron needs to extend to the existing Taxiways "N" and "G" to give planes access to and from the runways. Parking-lot construction will add 84 vehicle spaces for pilots, flight attendants, mechanics, dispatchers, passengers and vendors. A new road is proposed to provide access from existing hangars and parking areas located to the southwest. Construction activities will result in a total disturbance area of about 10.5 acres resulting in 10.25 acres of new impervious.

Fill will be discharged into approximately 8.16 acres of freshwater emergent and scrub-shrub wetlands to increase the site elevation to the 100-year floodplain level of 8.0 feet. To compensate for unavoidable impacts to emergent wetlands, mitigation will be provided at the Kane Wetland Mitigation Bank Site in Carlstadt, New Jersey. Forested/scrub-shrub wetlands impacts will be mitigated for through the purchase of credits at the Oradell Mitigation Bank.

Stormwater runoff generated from the new impervious area will be conveyed to a proposed storm sewer system located beneath the apron, parking lot and access road. The 6.56 acres of stormwater runoff from the apron area north of hangars will be collected and detained in proposed Contech chambers and routed to a proposed Contech Jellyfish treatment unit. The stormwater will then be conveyed to the existing stormwater system located in the adjacent apron. The 4.14 acres of stormwater runoff south of hangers will be collected and conveyed to a proposed Contech Jellyfish treatment unit located in the parking lot prior to being discharged to the southern wetlands through a new outfall and rip rap apron.

STORMWATER MANAGEMENT- RUNOFF QUANTITY

The stormwater runoff for this study was determined in accordance with the United States Natural Resource Conservation Service (NRCS) Technical Release No. 55 (TR-55) manual. The guidelines and methodologies in this manual meet the NJDEP stormwater calculation requirements presented in section 7:8-5.6 of the New Jersey Administrative Code (N.J.A.C).

The existing project site and proposed site conditions were evaluated using the 24-hour, Type III storm distribution for the 2, 10, 25, and 100-year return periods. The time of concentration

was calculated for each watershed and a curve number (CN) of 98 was selected for impervious areas and 58 for pervious areas in accordance with the TR-55 manual. The total rainfall depths for the SCS Type III 24-hour storm events are presented in the table below. (New Jersey 24-hour rainfall data for Bergen County.)

TABLE C
SCS TYPE III, 24-HOUR TOTAL RAINFALL DEPTHS

	2 yr Storm Event	10 yr Storm Event	25 yr Storm Event	100 yr Storm Event
Total Rainfall Depth	3.3 inches	5.1inches	6.3 inches	8.4 inches

The site soils are predominantly TrkAv – Westbrook, Ipswich, and Sandyhook soils with 0 to 2 percent slopes frequently flooded and UdwB- Udorthents with 0 to 8 percent slopes. Hydraulic soil groups are B/D, A/D, and D per the USDA Natural Resources Conservation Service soil survey data. The TrkAv soils are identified as very poorly drained and UdwB soils are identified as moderately well drained.

As per N.J.A.C. 7:8 5.4 (a.3), in tidal flood hazard area, stormwater runoff quantity management shall only be applied if the increased volume of stormwater runoff does not increase flood damages below the point of discharge. The proposed development will not increase flooding downstream of the site as summarized below.

An application to the NJDEP for a Stream Encroachment Permit and Water Quality Certification for the Vincent Place Stormwater Pumping Station and Housing Units was made on 22 March 2004 by Dewberry-Goodkind, Inc. on behalf of the Borough of Teterboro. The proposed project included the removal and replacement of the existing pumping facility and other improvements. The application report included a complete hydrologic and hydraulic analysis of the West Riser Ditch from the existing tide gate at the Berry's Creek confluence to the existing pump station. The First Aviation site is within the study area and was included in the hydrologic and hydraulic study as a developed area, or as an existing condition.

The application summary indicates that the hydrologic and hydraulic calculations to evaluate the upstream and downstream impacts due to the pumping station replacement assumed a fully developed watershed. The watershed studied totaled approximately 1,644 acres, which

included a majority of the Airport and portions of the Borough of Teterboro. It was specifically noted that "hydrologic parameters are based upon a fully developed watershed including implementation of Teterboro Airport improvements as envisioned by the PANYNJ."

As the First Aviation site is only approximately 1.5% of the entire West Riser Ditch drainage area and is located in the extreme lower portion of the watershed, the site development does not impact the peak flow rates or water surface elevations within the West Riser Ditch. The existing peak flows and water surface elevations within the ditch for the 2, 5, 10 and 100 year storm events (which include the impervious coverage proposed by the First Aviation project) are beneath the local roadway levels at the Moonachie Avenue culvert and within the existing channel banks of the ditch and floodplain area of the airport. As such, the increased volume of stormwater runoff from the First Aviation development will not increase flood damages below the point of discharge. Note that the point of discharge is the downstream end of the existing box culvert.

The proposed project's development area peak flows will be controlled by detention and outlet control structures. These structures will be located beneath the proposed apron and are designed to reduce proposed peak flow rates to match the existing rates entering the stormwater system.

The USDA Soil Conservation Service Publication TR-55 "Urban Hydrology for Small Watersheds" was used to compute the peak flows at the point of study for the existing and proposed conditions. TR-55 procedure simulates a watershed as a series of overland flows, channel flows, and inflow and outflow structures for its contribution to runoff. The results are provided for information only as stormwater quantity management is not required for this site due to the tidal conditions.

A value for area, curve number (CN), and time of concentration (Tc) was calculated for each watershed. The CN is a land sensitive coefficient that dictates the relationship between total rainfall depth and direct storm runoff. Based on the coverage of soil groups and land use in the area, an average CN was determined for each watershed for existing and proposed conditions. The time of concentration is defined as the time for runoff to travel from the hydraulically most distant point of the watershed to a point of interest. Values of the time of concentration were determined for existing and proposed conditions based on land cover and slope of the flow path using methods described in TR-55.

The design storm used for the TR-55 study is the 24 hour SCS Type III cumulative rainfall distribution. Twenty-four (24) hour rainfall depths were determined based on the New Jersey

24 hour rainfall estimates compiled by the NJDEP. The computer application Hydroflow Hydrographs extension for AutoCAD Civil 3D 2015 was used to model the watersheds and compute the runoff hydrographs and peak flows.

STORMWATER CONVEYANCE ANALYSIS

The storm sewer system was designed using the Rational Method for estimating peak runoff in conjunction with Hydraflow Storm Sewers extension for Autodesk AutoCAD Civil 3D 2015. A 25 year design storm was used. The Rational Method determines peak runoff rates as follows, Q = C i A where:

Q = flow (cfs) for subject area
C = weighted runoff coefficient for drainage area
i = rainfall intensity (in/hr)
A = drainage area (acres)

The site was divided into sub-areas, each contributing runoff to an individual catch basin inlet or roof drain. A value for area, time of concentration, and a runoff coefficient was calculated for each contributing sub-area. Values for time of concentration were computed based on land cover and slope of the flow path from the hydraulically most distance point in the sub-area to the appropriate inlet. An average runoff coefficient was computed based on the percentage of each type of land cover using the following coefficients:

Land Cover	C
Grass/Landscaping	0.30
Wetlands/Marsh	0.20
Paved/Impervious	0.90

The intensity of rainfall was based on the Intensity-Duration-Frequency (IDF) curves for New Jersey and the 25 year design storm was utilized to design the proposed system. Storm drainage pipes and culverts were sized based on calculated flows using Manning's Equation and were verified by calculating the hydraulic grade line elevation.

A system of catch basins and underground pipes will collect and convey stormwater from the site through the proposed BMPs (see next section) to a new series of reinforced concrete pipes.(see detail sheet CS-504).

The geotechnical and environmental evaluation report prepared by Langan Engineering and dated May 2004 measured groundwater at monitoring wells to be about elevation 2 to

elevation 3.5 NAVD88. Due to the shallow groundwater present at the site, underground piping and detention located beneath the proposed apron may be at or below the groundwater level.

Approximately 6.56 acres of proposed development area will flow through the concrete pipes and connect to an existing piping network on the adjacent apron. This pipe network conveys the site runoff to the West Riser Ditch and Berry's Creek. The existing pipe network currently accepts the undeveloped flow of watershed Area B and was designed to convey greater than the 25 year peak flow from the previously developed site and future development of this upstream area. The existing pipes discharge onto a rip-rap apron sized in accordance with the Soil Erosion and Sediment Control Standards. Proposed pipe sizes vary from upstream to downstream to account for the added flow from the site's storm sewer system.

In order to reduce peak flow rates of the proposed development area to meet allowable limits of the adjacent apron pipe network, a detention system with outlet control structure is planned. A proposed 350-ft x 335-ft of 24-inch diameter corregated metal pipe (CMP) detention system manufactured by Contech Engineered Solutions was sized to provide a total storage of about 127,000 CF to reduce peak flow rates of the developed area to match existing flows for the 2, 10, and 100 year storm events. After being detained, stormwater will be treated by a Jellyfish JF8-10-2 unit manufactured by Contech Engineered Solutions prior to being conveyed to the adjacent piping network and discharged.

The remaining 4.14 acres comprised of roof area, access road, and parking area will be collected and discharged to the wetland area located to the south via concrete headwall outfall and rip rap apron. Stormwater from the access road and parking area will be collected in catch basins and treated by a Contech Jellyfish JF12-23-4 unit prior to being discharged. Runoff from the roof of two hangars is to be conveyed directly by gravity to the outfall without passing through the treatment unit.

The proposed drainage areas were divided as shown on the Proposed Drainage Area Map (Drawing CG-402). An inlet time of concentration of 6 minutes was used to compute the existing runoff hydrographs and estimate peak flow rates 25 year storm events. The entire site will consist of either pavement or roof, so a runoff coefficient of 0.90 or 0.95 was used in the Rational Method modeling. The runoff hydrographs are provided in Appendix B and the stormwater conveyance calculations are provided in Appendix C.

The following summarizes the proposed peak flows for various storm events at the point of discharge from the site compared to the existing flows.

TABLE D

PROJECTED PEAK FLOWS AT POINTS OF DISCHARGE

Drainage Area	2 yr Storm (cfs)	10 yr Storm (cfs)	25 yr Storm (cfs)	100 yr Storm (cfs)
Existing	1.0	4.16	4.97	9.18
Proposed - to existing pipe network	1.0	4.16	4.97	9.18
Proposed to southern wetlands	8.82	10.08	11.01	14.58

STORMWATER RUNOFF QUALITY DESIGN

As per N.J.A.C 7:8-5.5 a land development project that creates 0.25 acres or more of new impervious surface must include stormwater management measures that reduce the average annual total suspended solids (TSS) load in the development site's post-construction runoff by 80 percent.

Construction of open stormwater detention/infiltration basins is discouraged as part of the bird hazard control measures pursuant to the FAA Advisor Circular 150/5200-33: "Hazardous Wildlife Attractants on or Near Airports. The FAA encourages the use of underground stormwater detention/infiltration systems since they are less attractive to wildlife, if soil conditions and other requirements allow.

Manufactured treatment devices offer the best water quality solution for this site. As the entire site is being developed and the site is surrounded on one side by existing wetlands and on three sides by existing apron and taxiways no other BMP solutions are feasible. As such, manufactured treatment devices will be utilized to achieve the water quality requirements for the project areas. Jellyfish Units as designed and manufactured by Contech Engineered Solutions will be used. Jellyfish units are a stormwater treatment technology featuring high flow pretreatment and membrane filtration. Units were sized based on the NJDEP 1.25 inch, 2 hour Stormwater Quality Design Storm in accordance with the manufacturer's requirements to ensure a resulting 80% TSS removal rate. Refer to Appendices D and E for water quality treatment calculations.

Stormwater runoff from roofs may bypass the water quality measures. As such, the runoff from the two hangars is conveyed directly to the southern wetland area via gravity flow to the outflow and rip rap apron.

The following table summarizes the design of the proposed Jellyfish unit.

TABLE E
MANUFACTURED TREATMENT DEVICE SUMMARY

Unit	Drainage Area (acres)	Water Quality Storm Peak Flow (cfs)	Destination
Jellyfish Unit 1: JF8-10-2	6.56 (Detained)	0.40	Existing storm sewer
Jellyfish Unit 2: JF12-23-4	1.7	7.72	Wetland via outfall

Maintenance

As per N.J.A.C. 7:8-5.8 and as recommended by the manufacturer, the maintenance of the proposed Jellyfish units will include periodic visual inspections, vacuum extractions of oil, floatable trash/debris, and sediment from manhole sump, rinsing and re-installing of cartridges,

and replacement of filter cartridge tentacles as needed. Typical replacement is anticipated every 2-5 years. First Aviation Services and PANYNJ, the project developer and future users of the new hangars will be the responsible party for the maintenance of the units. As PANYNJ is a public agency, deed recording is not necessary.

GROUNDWATER RECHARGE

As per N.J.A.C 7:8-5.4 (a.2), a land development project that disturbs at 1 acre of land or creates 0.25 acres or more of new impervious surface must include non-structural and/or structural stormwater management measures to prevent the loss of groundwater recharge at the site. The project must comply with either of the following two groundwater recharge requirements; (1) that 100% of the site's average annual pre-developed groundwater recharge volume be maintained after development; or (2) that 100% of the difference between the site's pre and post development 2 year runoff volumes be infiltrated.

The soil beneath and around the site is tidal marshland composed of silts, clays and peat and the existing annual groundwater recharge through this material is estimated as zero. See Appendix H. As such, no groundwater recharge measures are provided.

SOIL EROSION AND SEDIMENT CONTROL

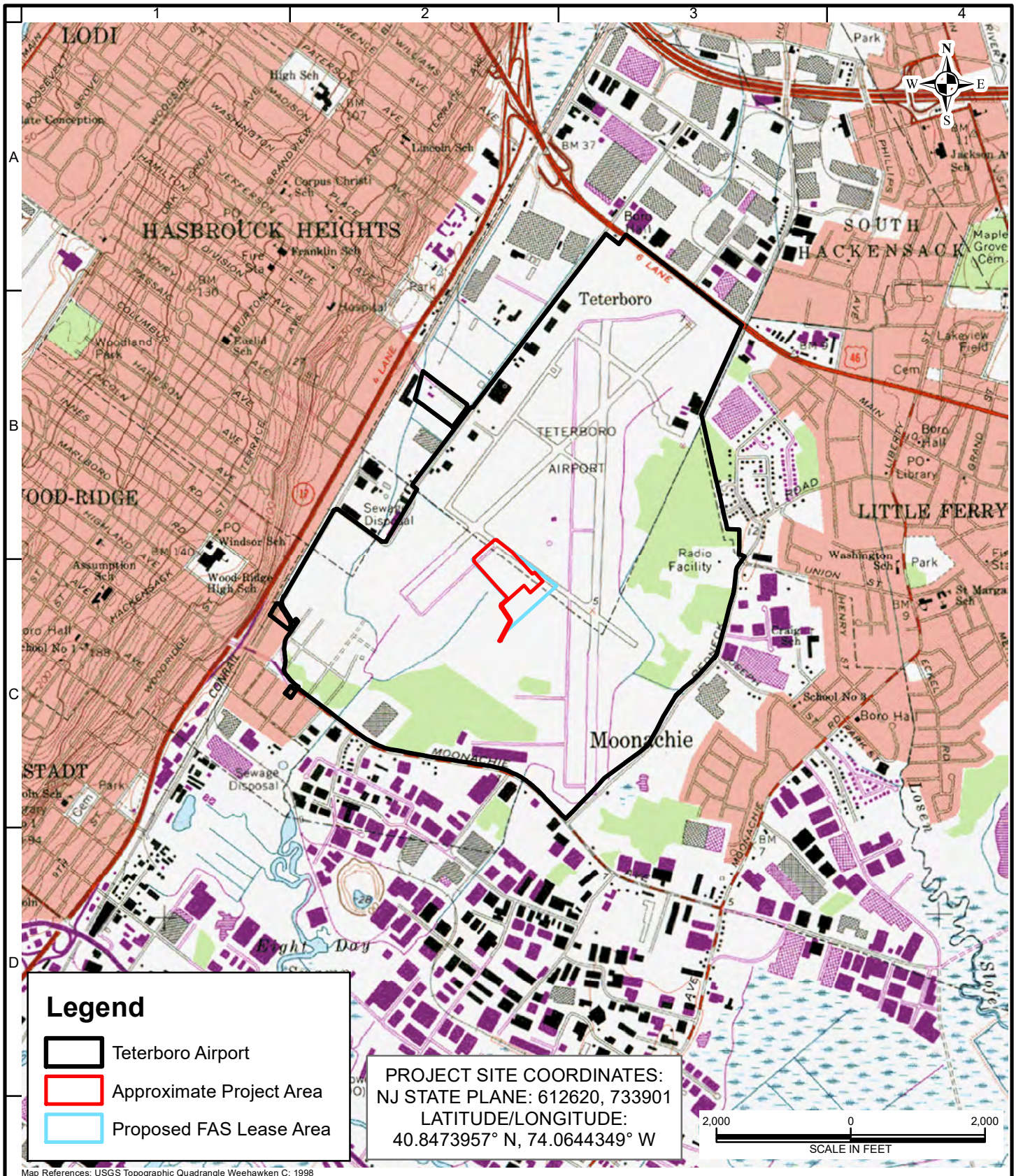
Soil erosion and sediment control measures have been designed and located within the project site to minimize the amount of sediment carried by stormwater runoff, both during and after construction of the project (Drawing CE-101). The SESC design was completed in accordance with the New Jersey Standards for Soil Erosion and Sediment Control.

CONCLUSION

The proposed development and its associated stormwater management facilities are in accordance with N.J.A.C. 7:8 as summarized below:

1. N.J.A.C. 7:8-5.4 (a.1) – The site is designed in accordance with the Soil Erosion and Sediment Control Standards N.J.S.A. 4:24-39 et seq. and implementing rules by providing for both temporary and permanent erosion control measures.

2. N.J.A.C. 7:8-5.4 (a.2) – The site is designed in accordance with the groundwater recharge requirements as due to the existing site conditions the existing annual groundwater recharge is estimated as zero. As such, no recharge measures are proposed.
3. N.J.A.C. 7:8-5.4 (a.3) – The site is designed in accordance with the stormwater quantity requirements as it is within a tidal flood hazard area and the increased volume of stormwater runoff will not increase flood damage below the point of discharge.
4. N.J.A.C. 7:8-5.5 – The site is designed in accordance with the stormwater quality requirements by providing manufactured treatment devices to reduce the post-construction load of total suspended solids in the stormwater runoff generated from the water quality design storm by 80%.
5. N.J.A.C. 8:8 5.7 (5.d) – The proposed treatment units are in accordance with the structural stormwater management measures as the Contech Jellyfish units have NJCAT Interim Certification.
6. The stormwater conveyance system (concrete pipes) provides adequate capacity to pass the 25 year storm event without surcharging the on-site catch basins or manholes. Detention is utilized to reduce peak flows in order to be conveyed by the existing adjacent storm sewer system.
7. N.J.A.C. 7:8-5.8 – A stormwater maintenance plan was prepared and the responsible party identified. See Appendix I.



Map References: USGS Topographic Quadrangle Weehawken C: 1998

LANGAN

300 Kimball Drive
Parsippany, NJ 07054
T: 973.560.4900 F: 973.560.4901 www.langan.com

Langan Engineering & Environmental Services, Inc.
Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C.
Langan International LLC
Collectively known as Langan

NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

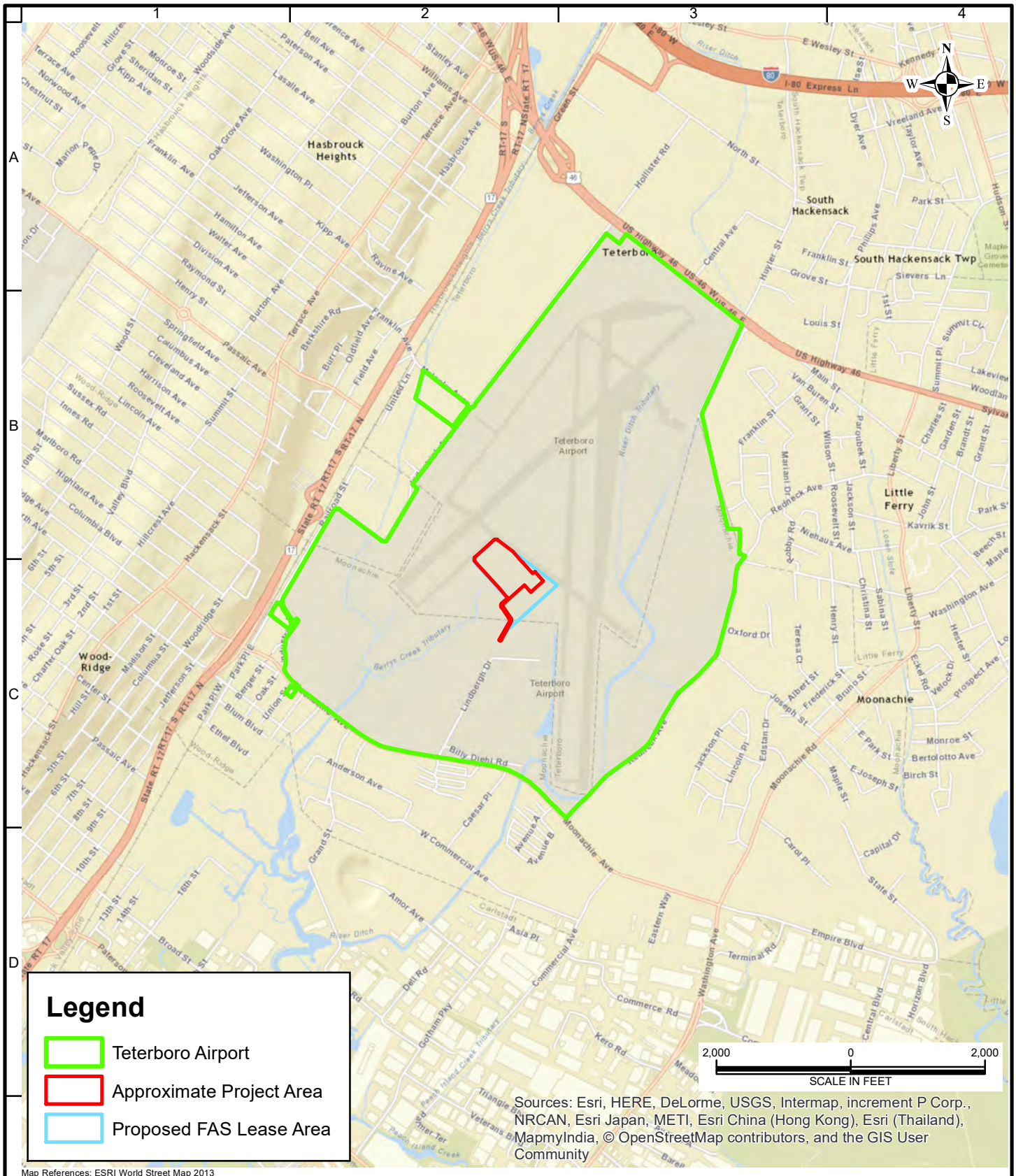
Project
FIRST AVIATION SERVICES EXPANSION
BLOCK 76, LOT 1.02
BOROUGH OF MOONACHIE
& BLOCK 203, LOT 1
BOROUGH OF TETERBORO
BERGEN COUNTY NEW JERSEY

Drawing Title
USGS SITE LOCATION MAP

Project No.	001642424
Date	3/4/2016
Scale	1"= 2,000'
Drawn By	MWen
Figure	1

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Map References: ESRI World Street Map 2013

LANGAN
300 Kimball Drive
Parsippany, NJ 07054
T: 973.560.4900 F: 973.560.4901 www.langan.com

Langan Engineering & Environmental Services, Inc.
Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C.
Langan International LLC
Collectively known as Langan

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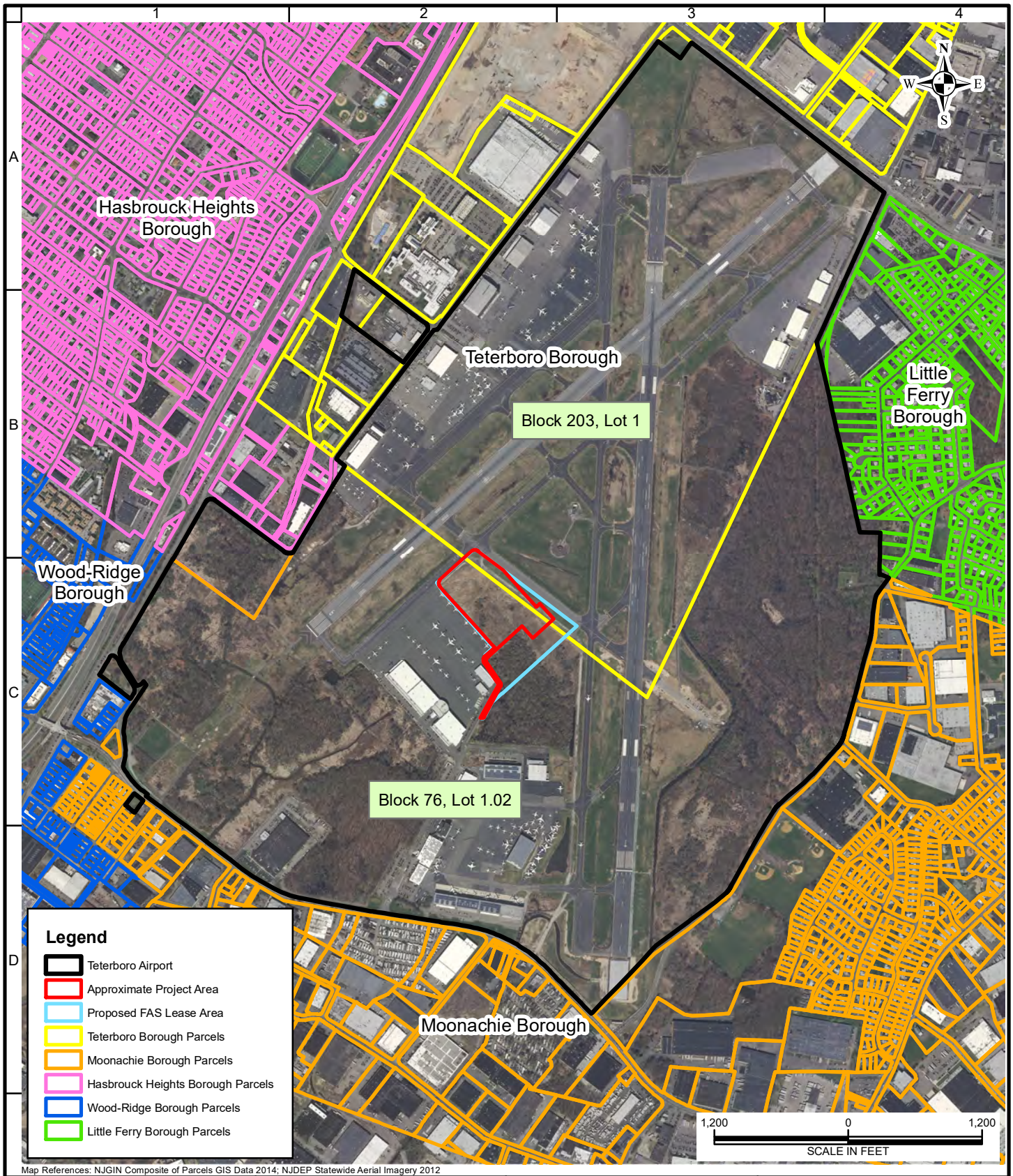
Project
FIRST AVIATION SERVICES EXPANSION
BLOCK 76, LOT 1.02
BOROUGH OF MOONACHIE
& BLOCK 203, LOT 1
BOROUGH OF TETERBORO
BERGEN COUNTY NEW JERSEY

Drawing Title
VICINITY MAP

Project No.	001642424
Date	3/4/2016
Scale	1"= 2,000'
Drawn By	MWen
Figure	2

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Map References: NJGIN Composite of Parcels GIS Data 2014; NJDEP Statewide Aerial Imagery 2012

LANGAN

300 Kimball Drive
Parsippany, NJ 07054
T: 973.560.4900 F: 973.560.4901 www.langan.com

Langan Engineering & Environmental Services, Inc.
Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C.
Langan International LLC
Collectively known as Langan

NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project
FIRST AVIATION SERVICES EXPANSION
BLOCK 76, LOT 1.02
BOROUGH OF MOONACHIE
& BLOCK 203, LOT 1
BOROUGH OF TETERBORO
BERGEN COUNTY NEW JERSEY

Drawing Title
TAX MAP

Project No.	001642424
Date	3/4/2016
Scale	1"= 1,200'
Drawn By	MWen

Figure
3

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Map References: NJDEP Statewide Aerial Imagery 2012

LANGAN
300 Kimball Drive
Parsippany, NJ 07054
T: 973.560.4900 F: 973.560.4901 www.langan.com
Langan Engineering & Environmental Services, Inc.
Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C.
Langan International LLC
Collectively known as Langan
NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project
FIRST AVIATION SERVICES EXPANSION
BLOCK 76, LOT 1.02
BOROUGH OF MOONACHIE
& BLOCK 203, LOT 1
BOROUGH OF TETERBORO
BERGEN COUNTY NEW JERSEY

Drawing Title
AERIAL PHOTOGRAPH

Project No.	001642424
Date	3/4/2016
Scale	1"= 300'
Drawn By	MWen
Figure	4

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Map References: NJDEP Land Use/Land Cover, Hackensack-Passaic Subbasin GIS Data 2012; NJDEP Statewide Aerial Imagery 2012

LANGAN

300 Kimball Drive
Parsippany, NJ 07054
T: 973.560.4900 F: 973.560.4901 www.langan.com

Langan Engineering & Environmental Services, Inc.
Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C.
Langan International LLC
Collectively known as Langan

NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project
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BERGEN COUNTY NEW JERSEY

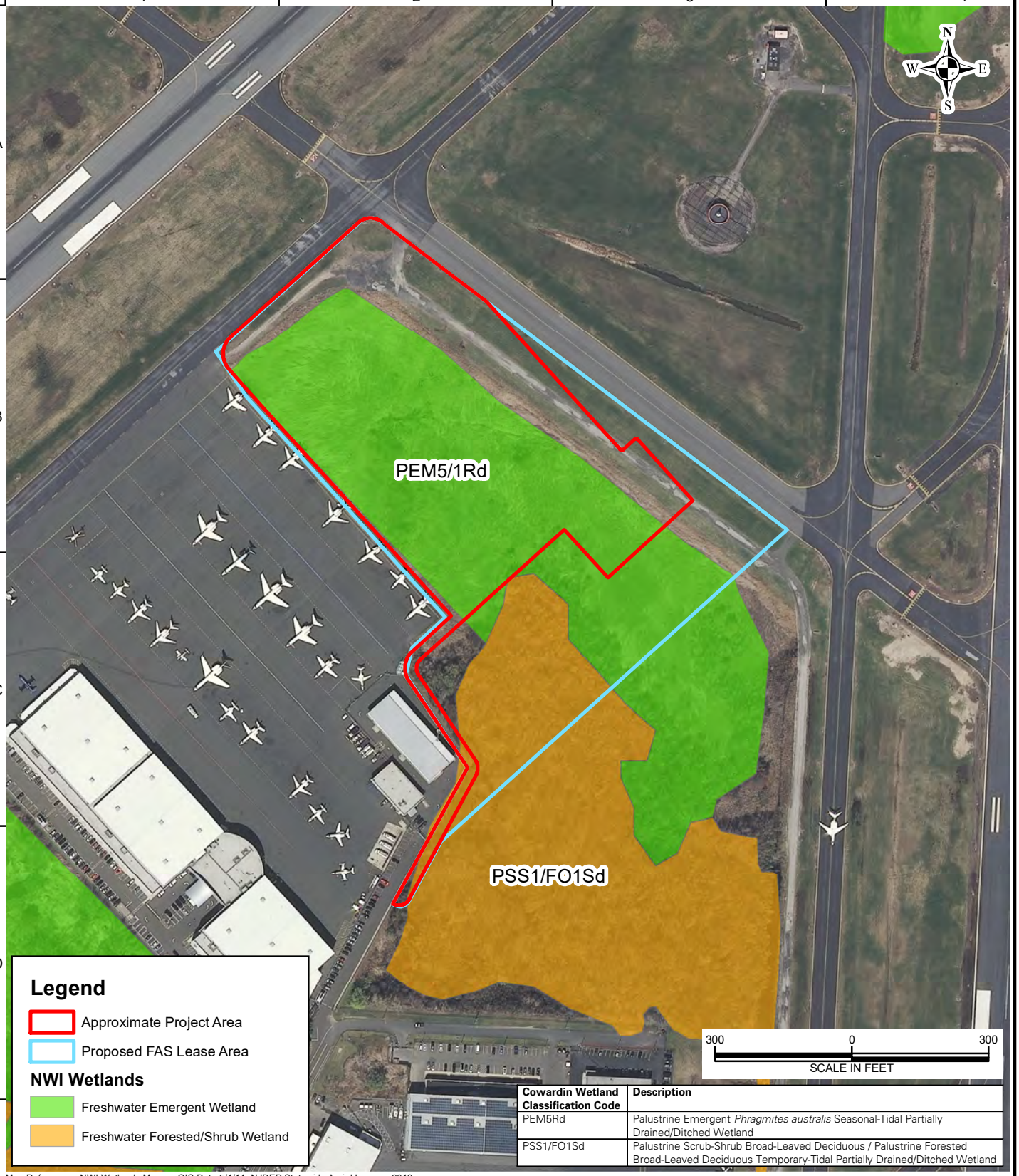
Drawing Title
NJDEP FRESHWATER WETLANDS MAP

Project No.	001642424
Date	3/4/2016
Scale	1"= 300'
Drawn By	MWen

Figure 5

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Path: \\langan.com\data\NY\data4\001642424\ArcGIS\ArcMap_Documents\NJDEP Multi-Permit\Figure 5 - NJDEP Wetlands 2012.mxd



Legend

- Approximate Project Area
- Proposed FAS Lease Area

NWI Wetlands

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland

Cowardin Wetland Classification Code	Description
PEM5Rd	Palustrine Emergent *Phragmites australis* Seasonal-Tidal Partially Drained/Ditched Wetland
PSS1/FO1Sd	Palustrine Scrub-Shrub Broad-Leaved Deciduous / Palustrine Forested Broad-Leaved Deciduous Temporary-Tidal Partially Drained/Ditched Wetland

Map References: NWI Wetlands Mapper GIS Data 5/1/14; NJDEP Statewide Aerial Imagery 2012

LANGAN
300 Kimball Drive
Parsippany, NJ 07054
T: 973.560.4900 F: 973.560.4901 www.langan.com
Langan Engineering & Environmental Services, Inc.
Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C.
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NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project
FIRST AVIATION SERVICES EXPANSION
BLOCK 76, LOT 1.02
BOROUGH OF MOONACHIE
& BLOCK 203, LOT 1
BOROUGH OF TETERBORO
BERGEN COUNTY NEW JERSEY

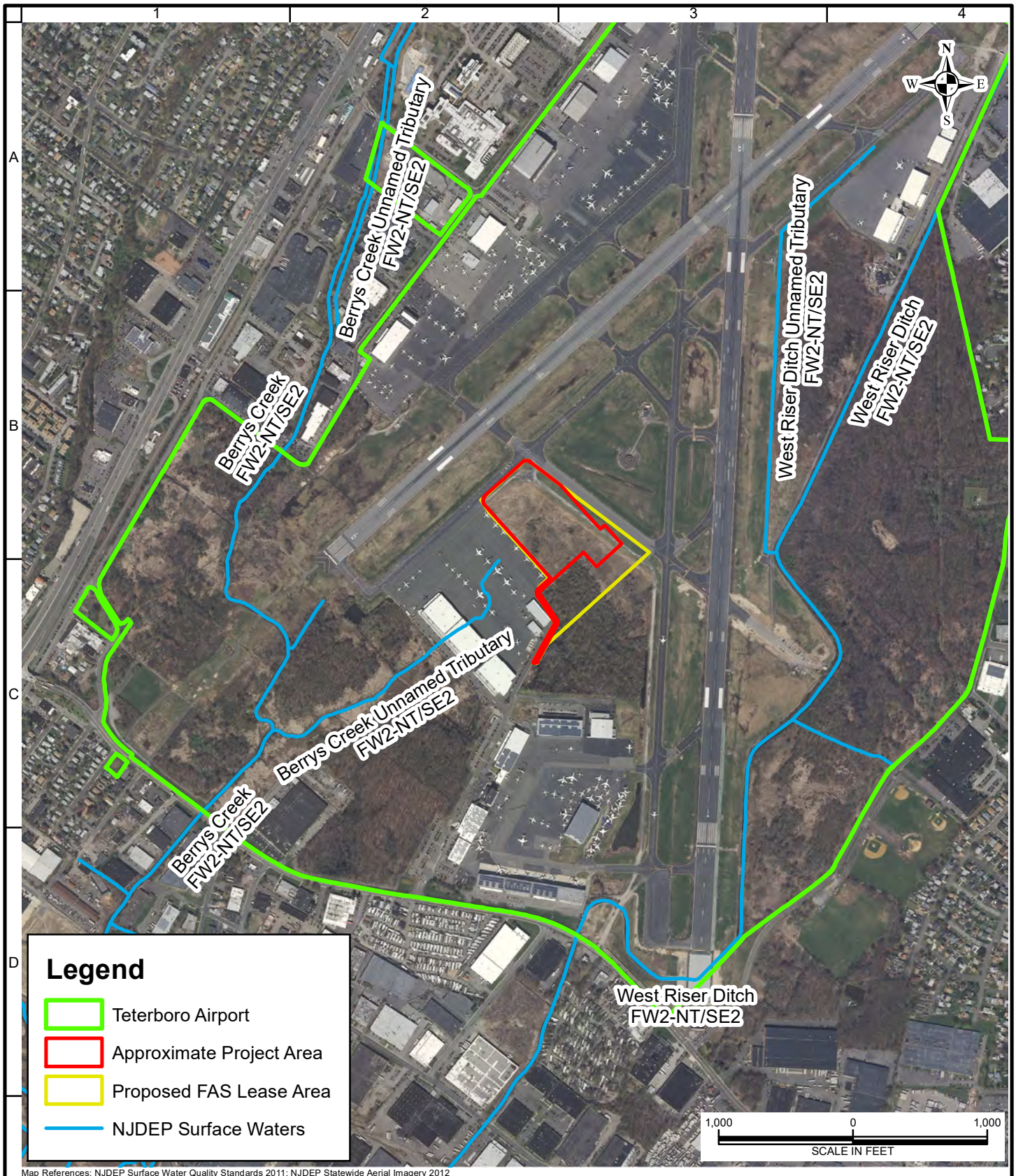
Drawing Title
NATIONAL WETLANDS INVENTORY MAP

Project No.	001642424
Date	3/4/2016
Scale	1"= 300'
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Figure 6

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Map References: NJDEP Surface Water Quality Standards 2011; NJDEP Statewide Aerial Imagery 2012

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300 Kimball Drive
Parsippany, NJ 07054
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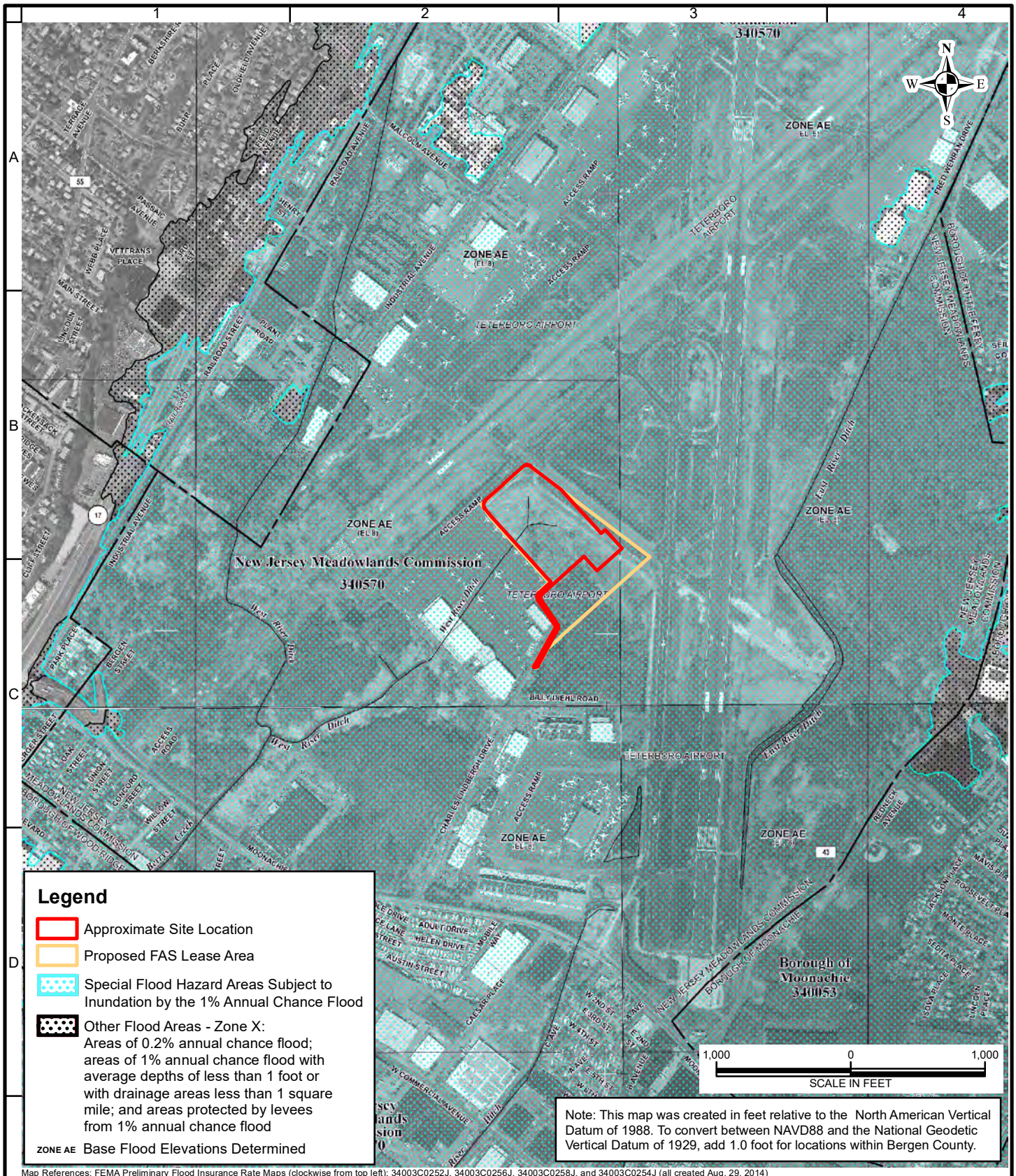
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BERGEN COUNTY NEW JERSEY

Drawing Title
NJDEP SURFACE WATERS MAP

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Scale	1"= 1,000'
Drawn By	MWen
Figure	7

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Legend

- Approximate Site Location
- Proposed FAS Lease Area
- Special Flood Hazard Areas Subject to Inundation by the 1% Annual Chance Flood
- Other Flood Areas - Zone X: Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood
- ZONE AE Base Flood Elevations Determined

Note: This map was created in feet relative to the North American Vertical Datum of 1988. To convert between NAVD88 and the National Geodetic Vertical Datum of 1929, add 1.0 foot for locations within Bergen County.

Map References: FEMA Preliminary Flood Insurance Rate Maps (clockwise from top left): 34003C0252J, 34003C0256J, 34003C0258J, and 34003C0254J (all created Aug. 29, 2014)

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300 Kimball Drive
Parsippany, NJ 07054
T: 973.560.4900 F: 973.560.4901 www.langan.com
Langan Engineering & Environmental Services, Inc.
Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C.
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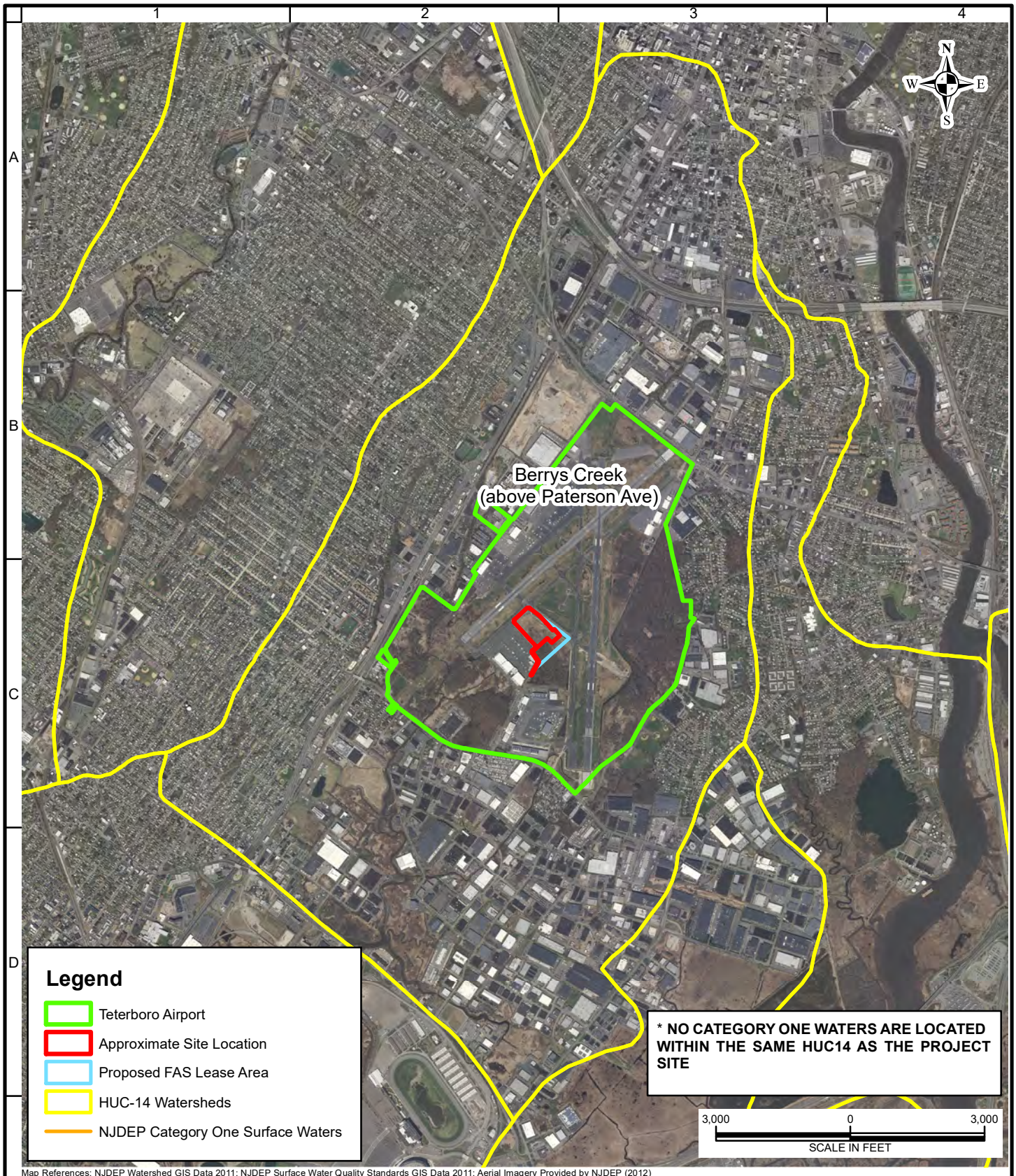
Project
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BOROUGH OF MOONACHIE
& BLOCK 203, LOT 1
BOROUGH OF TETERBORO
BERGEN COUNTY NEW JERSEY

Drawing Title
FEMA PRELIMINARY FIRM MAP

Project No.	001642424
Date	3/4/2016
Scale	1"= 1,000'
Drawn By	MWen
Figure	8

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Map References: NJDEP Watershed GIS Data 2011; NJDEP Surface Water Quality Standards GIS Data 2011; Aerial Imagery Provided by NJDEP (2012)

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300 Kimball Drive
Parsippany, NJ 07054
T: 973.560.4900 F: 973.560.4901 www.langan.com
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Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C.
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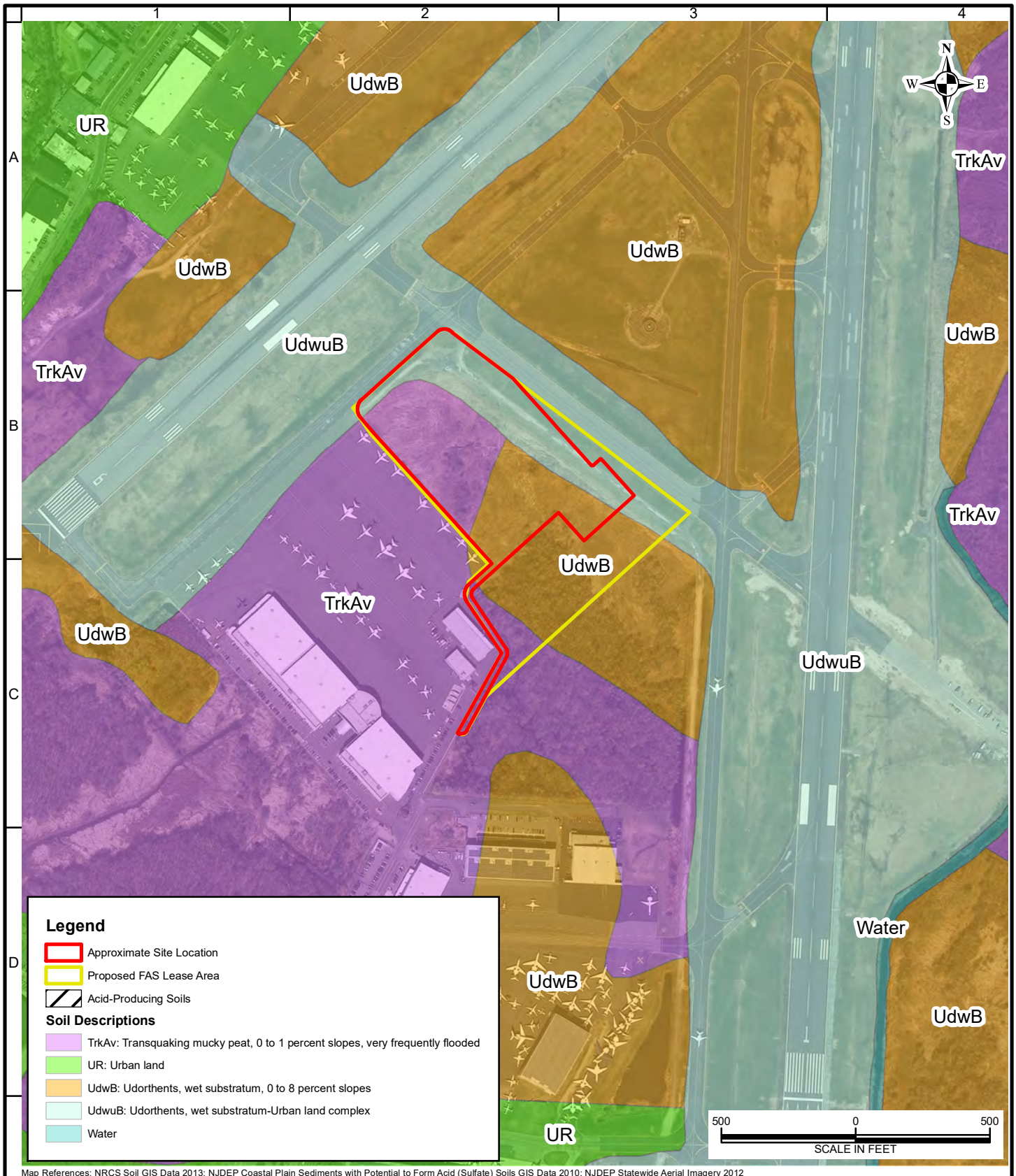
Project
FIRST AVIATION SERVICES EXPANSION
BLOCK 76, LOT 1.02
BOROUGH OF MOONACHIE
& BLOCK 203, LOT 1
BOROUGH OF TETERBORO
BERGEN COUNTY NEW JERSEY

Drawing Title
HUC-14 WATERSHED MAP

Project No.	001642424
Date	3/4/2016
Scale	1" = 3,000'
Drawn By	MWen
Figure	9

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Map References: NRCS Soil GIS Data 2013; NJDEP Coastal Plain Sediments with Potential to Form Acid (Sulfate) Soils GIS Data 2010; NJDEP Statewide Aerial Imagery 2012

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300 Kimball Drive
Parsippany, NJ 07054
T: 973.560.4900 F: 973.560.4901 www.langan.com

Langan Engineering & Environmental Services, Inc.
Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C.
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Project
FIRST AVIATION SERVICES EXPANSION
BOROUGHS OF MOONACHIE & TETERBORO
BERGEN COUNTY NEW JERSEY

Drawing Title
SOILS MAP

Project No.	001642424
Date	3/4/2016
Scale	1"= 500'
Drawn By	MWen
Figure	10

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Map References: NJDEP Historic Fill GIS Data 2009; NJDEP Statewide Aerial Imagery 2012

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300 Kimball Drive
Parsippany, NJ 07054
T: 973.560.4900 F: 973.560.4901 www.langan.com
Langan Engineering & Environmental Services, Inc.
Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C.
Langan International LLC
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BLOCK 76, LOT 1.02
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BERGEN COUNTY NEW JERSEY

Drawing Title
HISTORIC FILL MAP

Project No.	001642424
Date	3/4/2016
Scale	1" = 500'
Drawn By	MWen
Figure	11

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APPENDIX A

EXISTING DISCHARGE HYDROGRAPHS

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

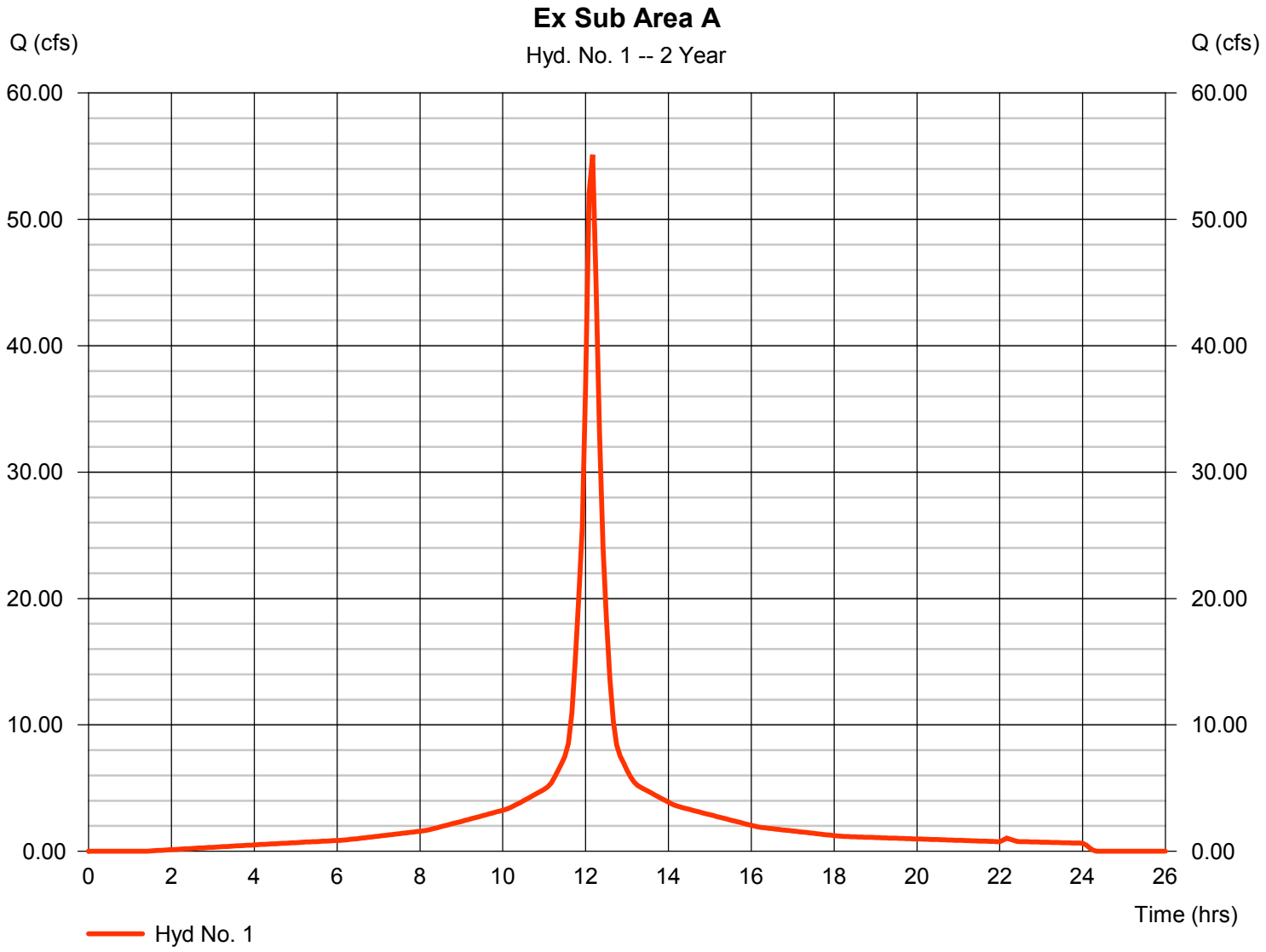
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	55.12	5	730	247,689	------	------	------	Ex Sub Area A
2	SCS Runoff	1.005	5	975	27,657	------	------	------	Ex Sub Area B
3	SCS Runoff	0.689	5	930	17,028	------	------	------	Ex Sub Area C
4	Combine	55.14	5	730	275,346	1, 2,	------	------	Existing Combined at Point of Study (
6	SCS Runoff	18.21	3	726	68,472	------	------	------	Proposed B to Existing Utility
7	SCS Runoff	11.49	3	726	43,213	------	------	------	Proposed B to South Wetland
8	SCS Runoff	0.477	3	975	13,105	------	------	------	Undeveloped B
9	Combine	29.70	3	726	124,789	6, 7, 8	------	------	Total Proposed Sub Area B(Undevelo
11	Reservoir	1.005	3	846	68,355	6	1.58	44,207	Prop B to Util Det

Hydrograph Report

Hyd. No. 1

Ex Sub Area A

Hydrograph type	= SCS Runoff	Peak discharge	= 55.12 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 247,689 cuft
Drainage area	= 23.730 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 16.00 min
Total precip.	= 3.30 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

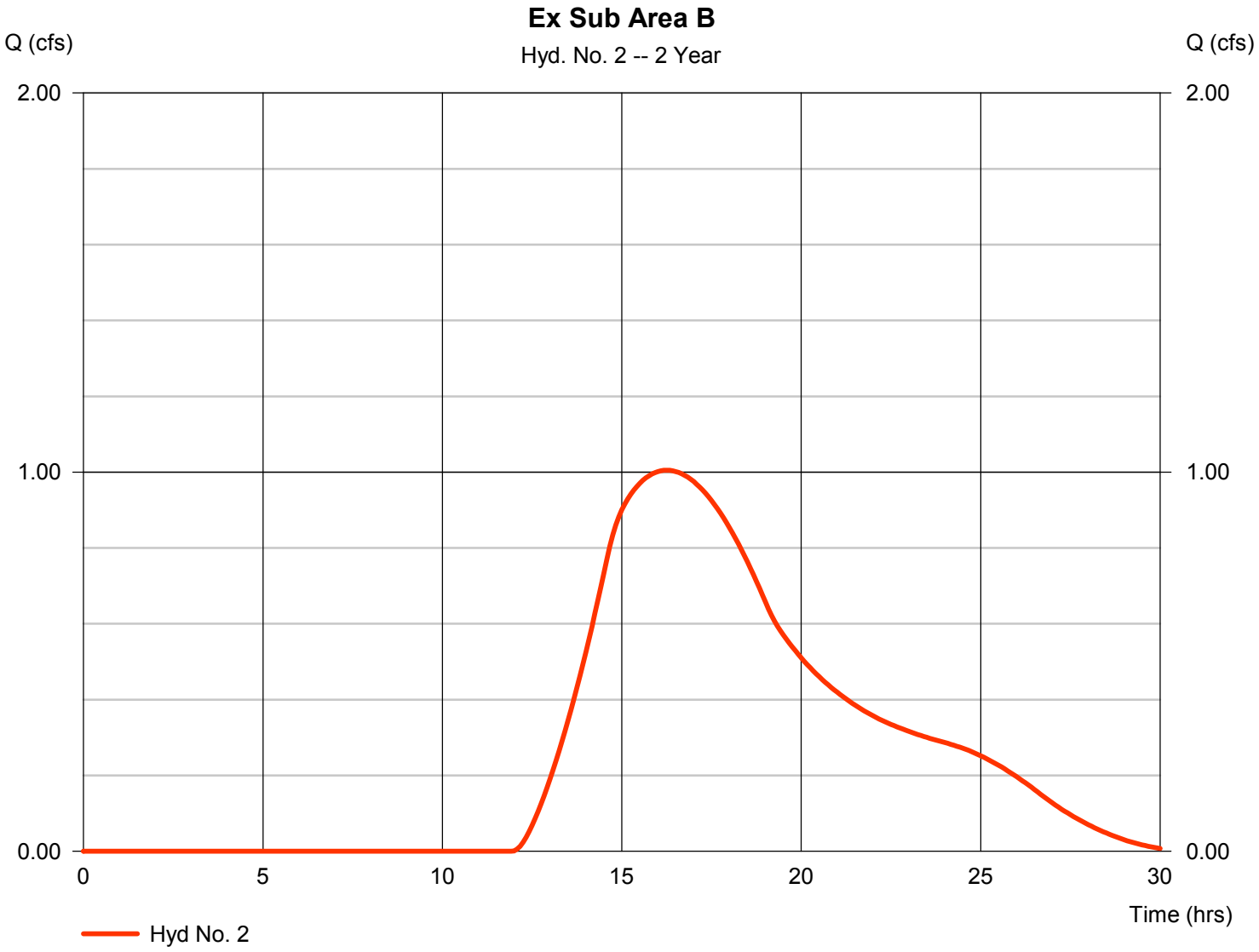


Hydrograph Report

Hyd. No. 2

Ex Sub Area B

Hydrograph type	= SCS Runoff	Peak discharge	= 1.005 cfs
Storm frequency	= 2 yrs	Time to peak	= 16.25 hrs
Time interval	= 5 min	Hyd. volume	= 27,657 cuft
Drainage area	= 20.300 ac	Curve number	= 58
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
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Total precip.	= 3.30 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

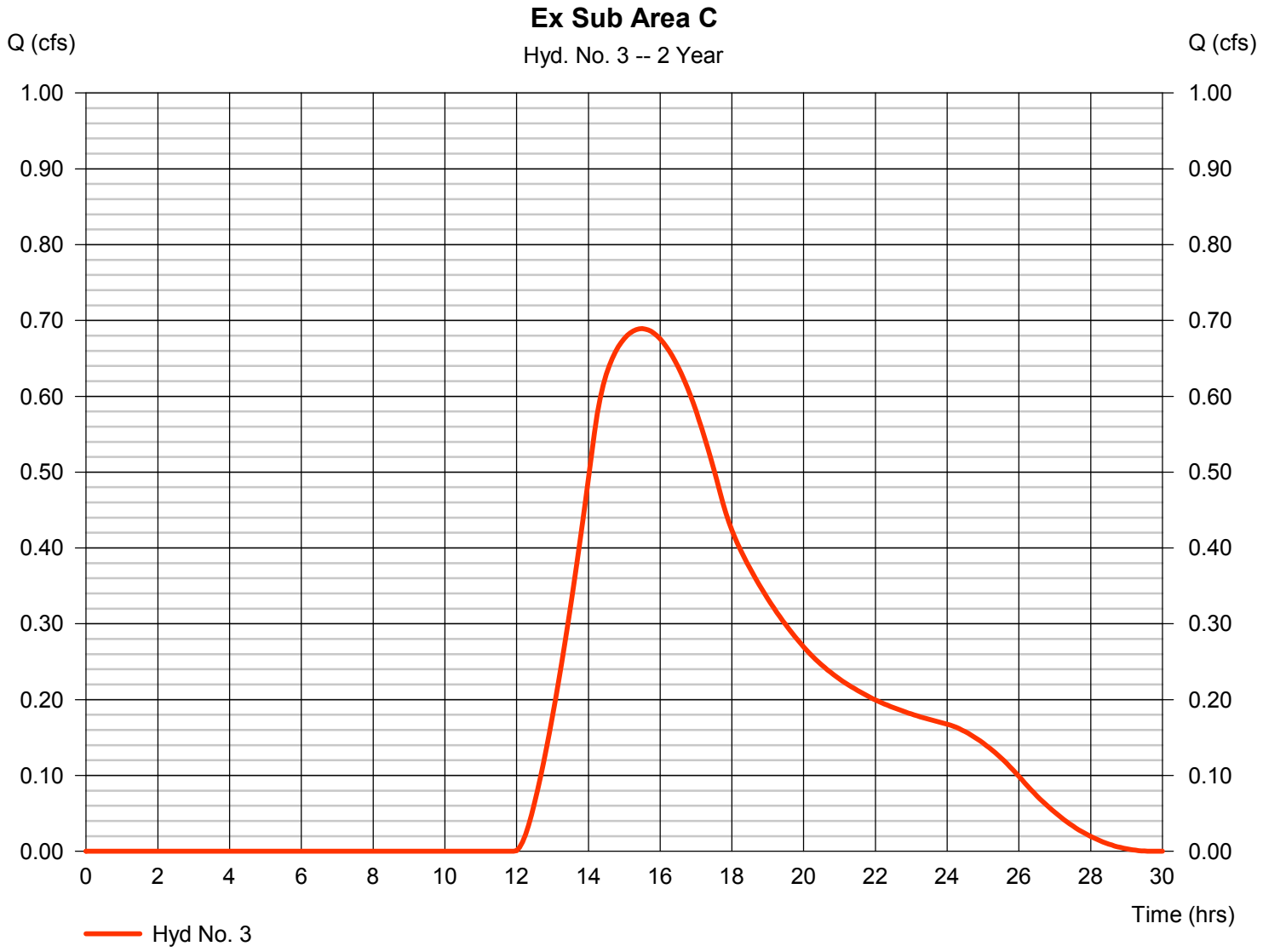


Hydrograph Report

Hyd. No. 3

Ex Sub Area C

Hydrograph type	= SCS Runoff	Peak discharge	= 0.689 cfs
Storm frequency	= 2 yrs	Time to peak	= 15.50 hrs
Time interval	= 5 min	Hyd. volume	= 17,028 cuft
Drainage area	= 12.510 ac	Curve number	= 58
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 218.00 min
Total precip.	= 3.30 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

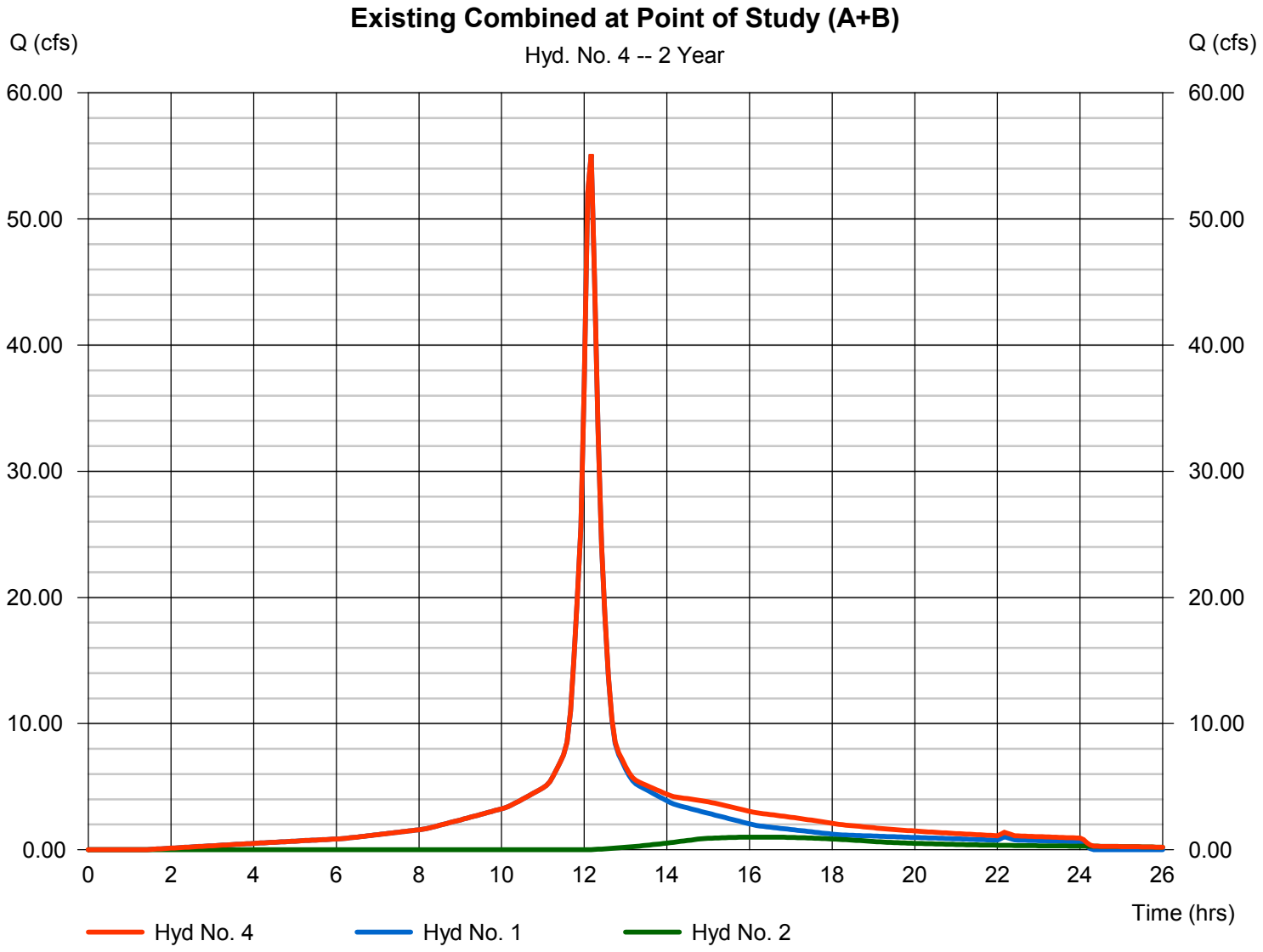


Hydrograph Report

Hyd. No. 4

Existing Combined at Point of Study (A+B)

Hydrograph type	= Combine	Peak discharge	= 55.14 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 275,346 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 44.030 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

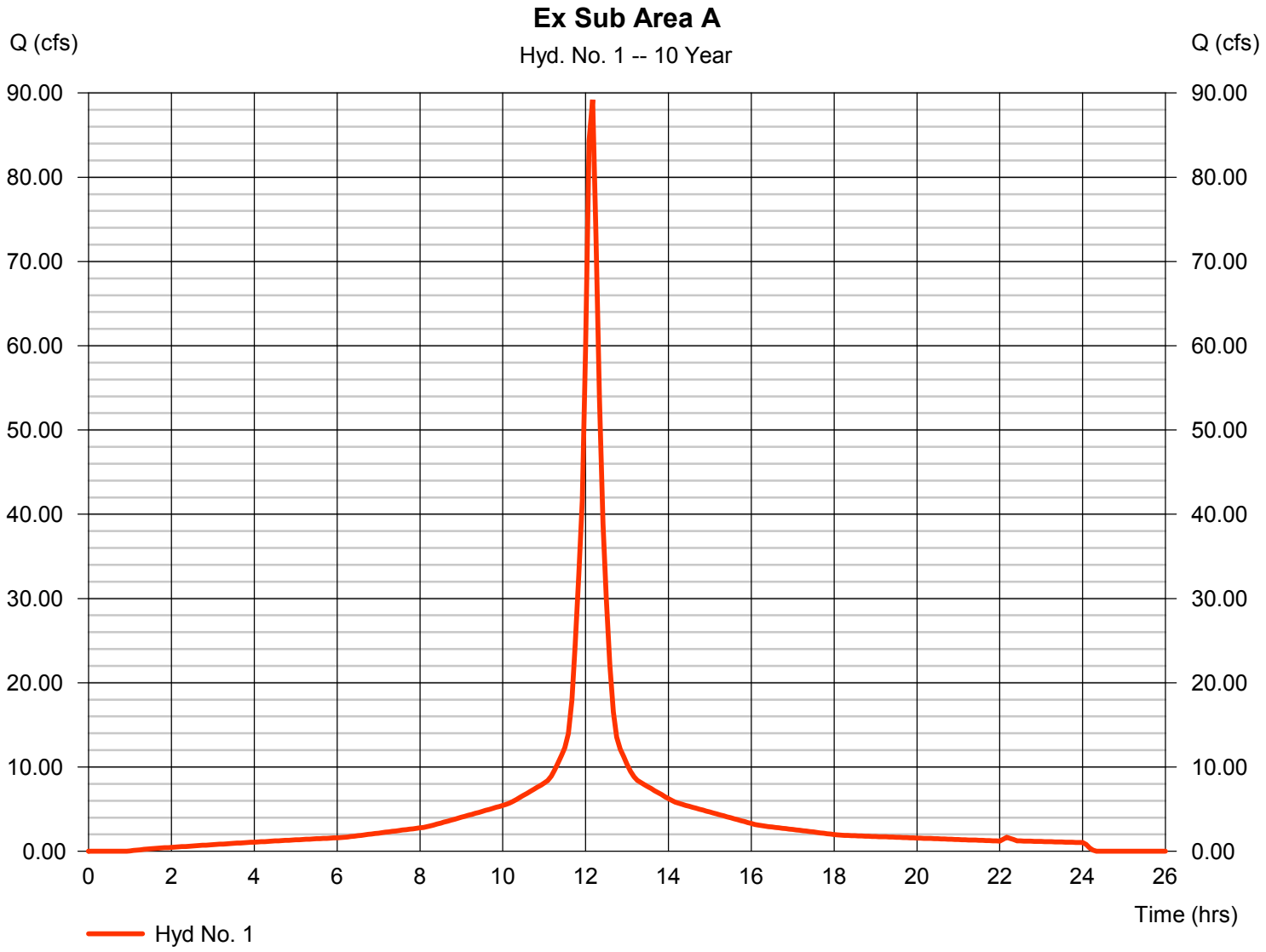
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	89.19	5	730	408,846	------	------	------	Ex Sub Area A
2	SCS Runoff	4.156	5	920	98,165	------	------	------	Ex Sub Area B
3	SCS Runoff	2.949	5	880	60,440	------	------	------	Ex Sub Area C
4	Combine	89.37	5	730	507,010	1, 2,	------	------	Existing Combined at Point of Study (
6	SCS Runoff	29.46	3	726	113,023	------	------	------	Proposed B to Existing Utility
7	SCS Runoff	18.59	3	726	71,328	------	------	------	Proposed B to South Wetland
8	SCS Runoff	1.974	3	921	46,495	------	------	------	Undeveloped B
9	Combine	48.11	3	726	230,846	6, 7, 8	------	------	Total Proposed Sub Area B(Undevelo
11	Reservoir	3.947	3	759	112,906	6	1.96	65,394	Prop B to Util Det

Hydrograph Report

Hyd. No. 1

Ex Sub Area A

Hydrograph type	= SCS Runoff	Peak discharge	= 89.19 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 408,846 cuft
Drainage area	= 23.730 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 16.00 min
Total precip.	= 5.30 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

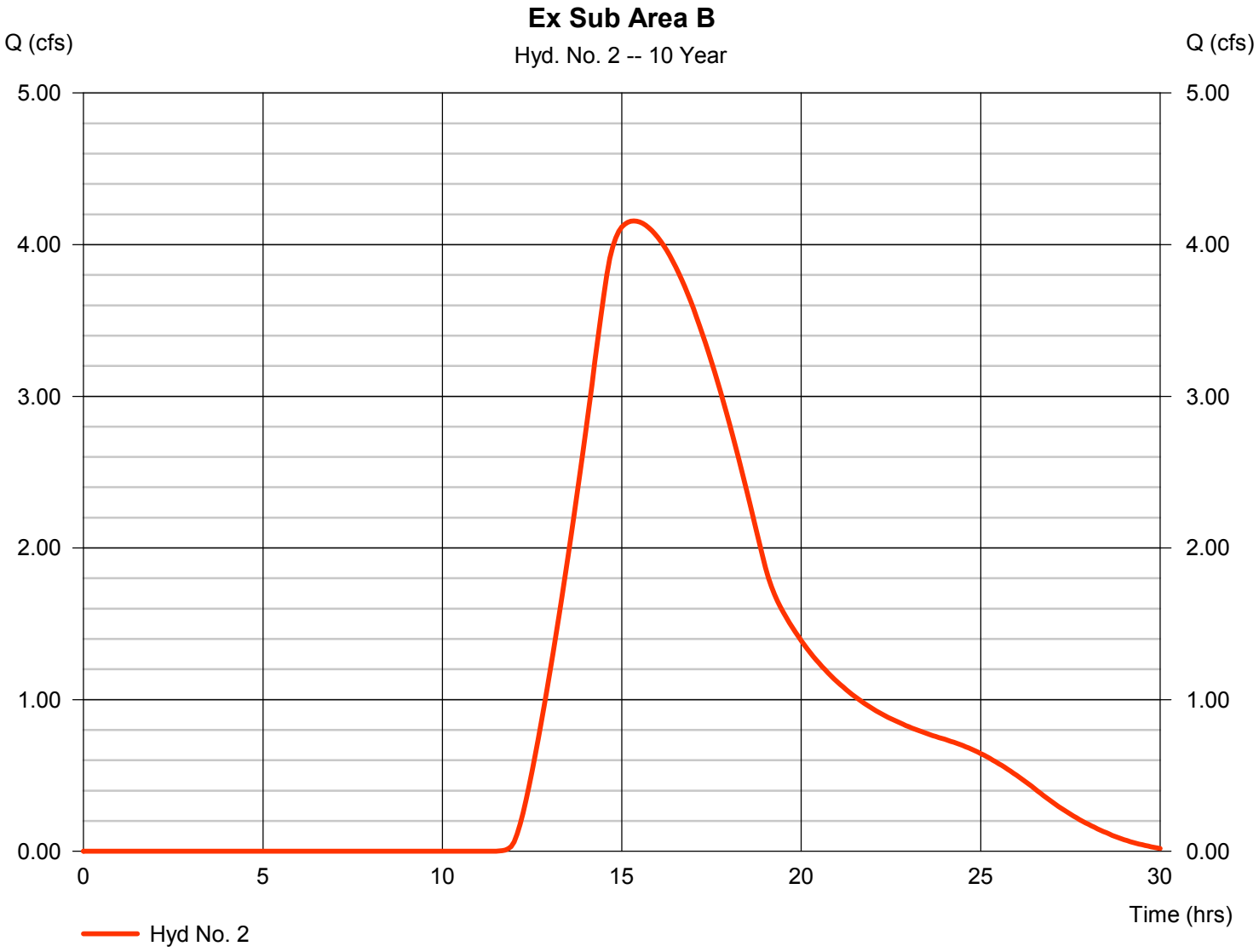


Hydrograph Report

Hyd. No. 2

Ex Sub Area B

Hydrograph type	= SCS Runoff	Peak discharge	= 4.156 cfs
Storm frequency	= 10 yrs	Time to peak	= 15.33 hrs
Time interval	= 5 min	Hyd. volume	= 98,165 cuft
Drainage area	= 20.300 ac	Curve number	= 58
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
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Total precip.	= 5.30 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

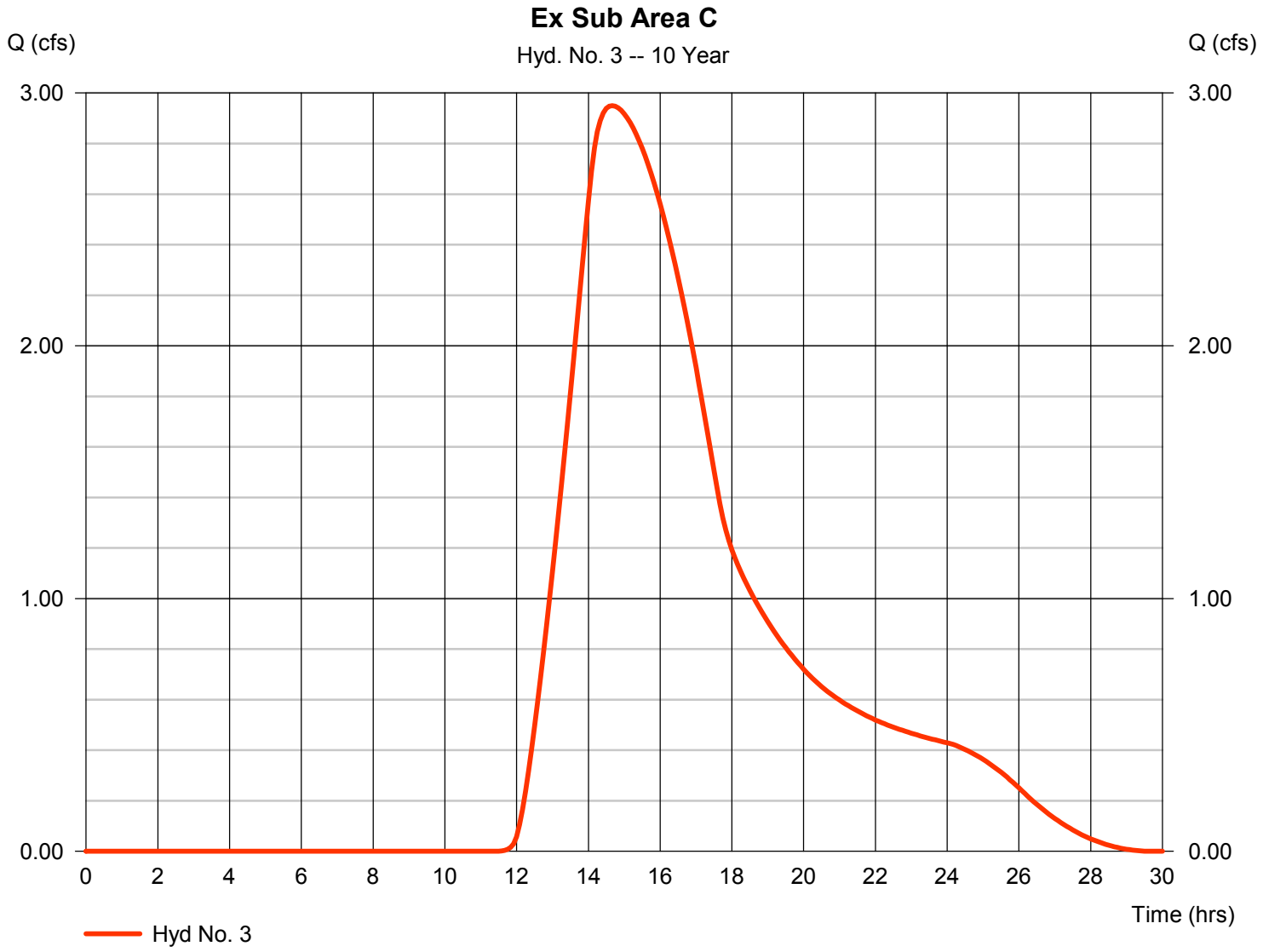


Hydrograph Report

Hyd. No. 3

Ex Sub Area C

Hydrograph type	= SCS Runoff	Peak discharge	= 2.949 cfs
Storm frequency	= 10 yrs	Time to peak	= 14.67 hrs
Time interval	= 5 min	Hyd. volume	= 60,440 cuft
Drainage area	= 12.510 ac	Curve number	= 58
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 218.00 min
Total precip.	= 5.30 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

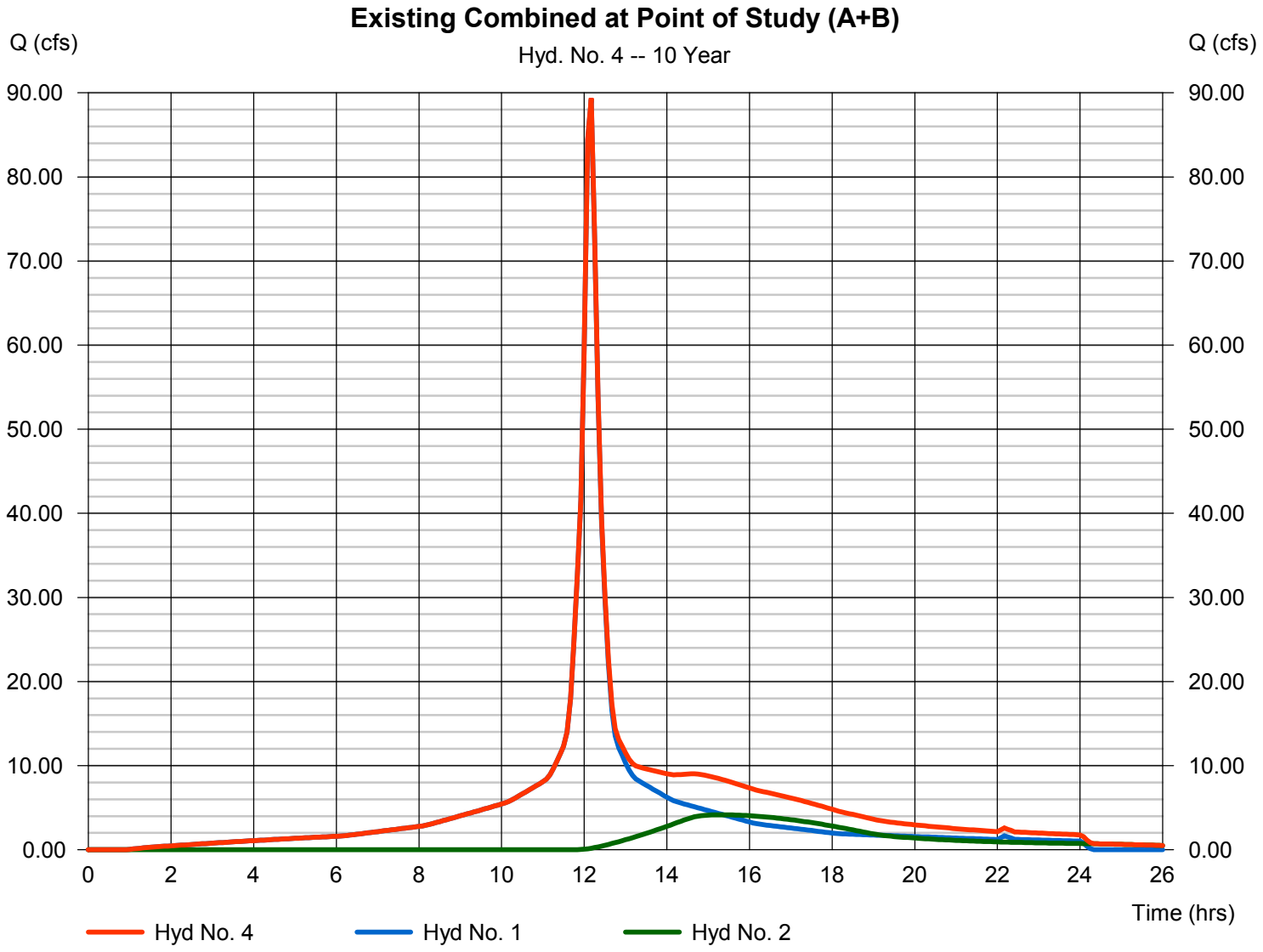


Hydrograph Report

Hyd. No. 4

Existing Combined at Point of Study (A+B)

Hydrograph type	= Combine	Peak discharge	= 89.37 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 507,010 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 44.030 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

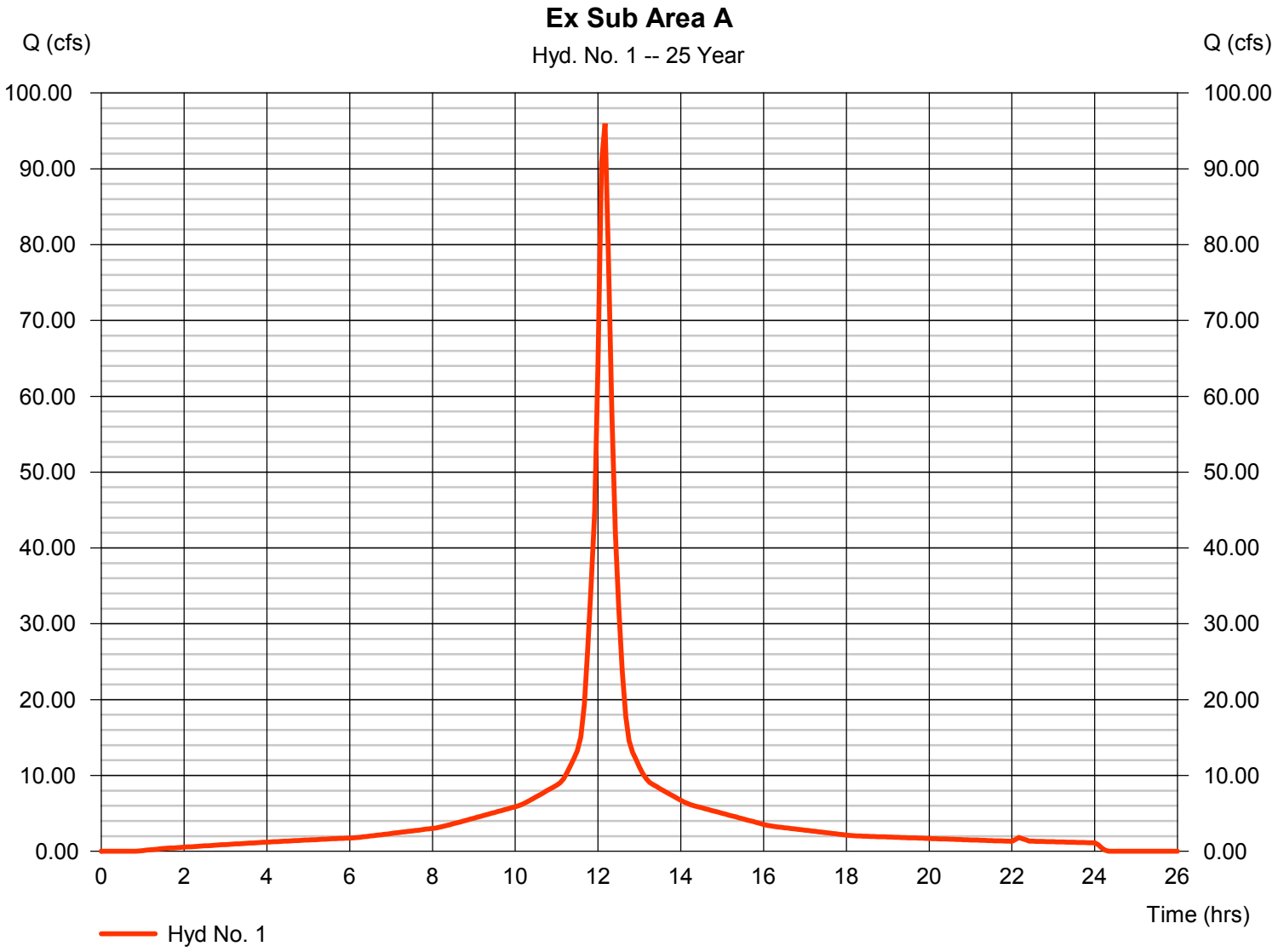
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	95.99	5	730	441,105	------	------	------	Ex Sub Area A
2	SCS Runoff	4.973	5	915	115,449	------	------	------	Ex Sub Area B
3	SCS Runoff	3.540	5	875	71,082	------	------	------	Ex Sub Area C
4	Combine	96.23	5	730	556,554	1, 2,	------	------	Existing Combined at Point of Study (
6	SCS Runoff	31.71	3	726	121,941	------	------	------	Proposed B to Existing Utility
7	SCS Runoff	20.01	3	726	76,957	------	------	------	Proposed B to South Wetland
8	SCS Runoff	2.363	3	915	54,682	------	------	------	Undeveloped B
9	Combine	51.79	3	726	253,580	6, 7, 8	------	------	Total Proposed Sub Area B(Undevelo
11	Reservoir	4.386	3	756	121,824	6	2.05	70,135	Prop B to Util Det

Hydrograph Report

Hyd. No. 1

Ex Sub Area A

Hydrograph type	= SCS Runoff	Peak discharge	= 95.99 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 441,105 cuft
Drainage area	= 23.730 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 16.00 min
Total precip.	= 5.70 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

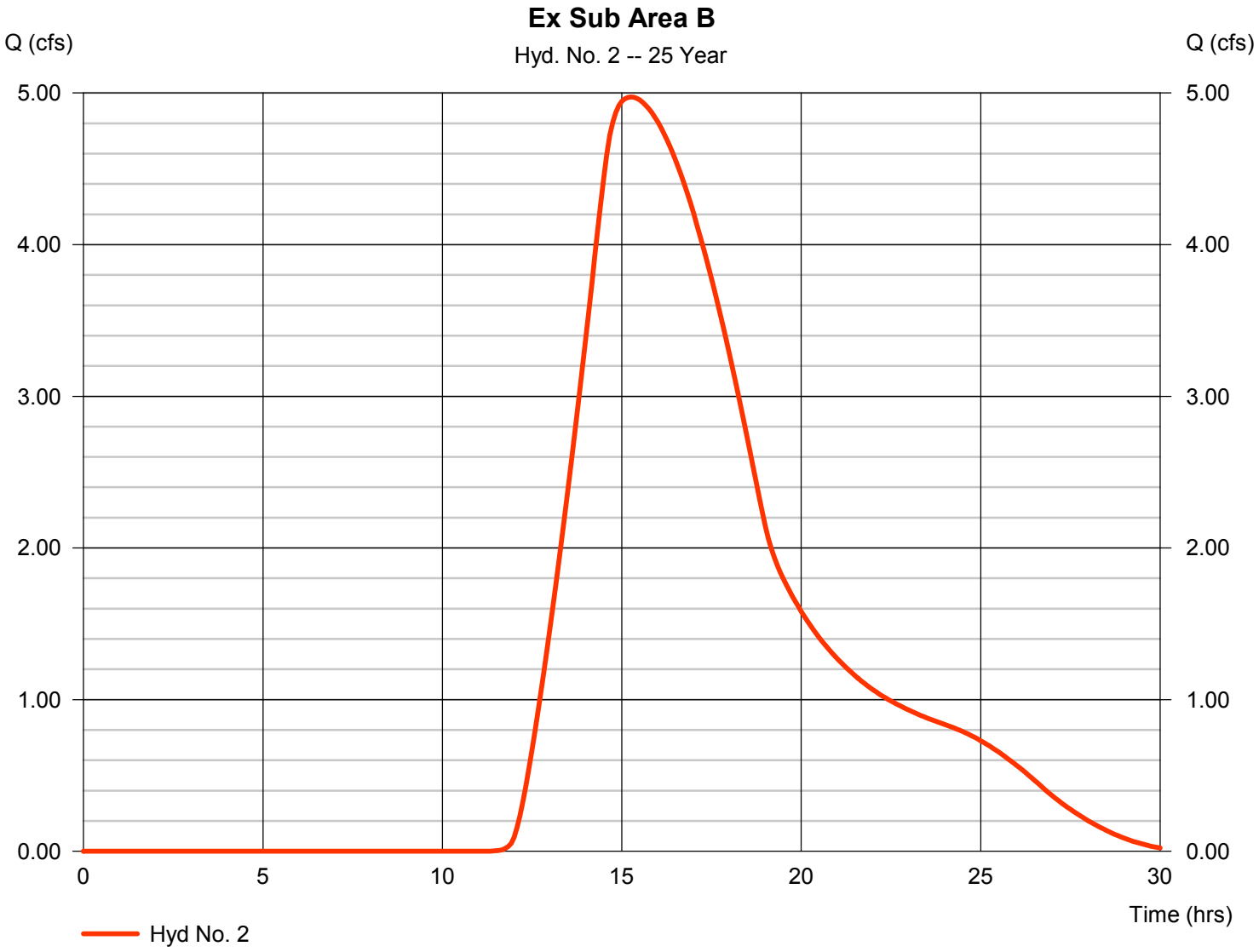


Hydrograph Report

Hyd. No. 2

Ex Sub Area B

Hydrograph type	= SCS Runoff	Peak discharge	= 4.973 cfs
Storm frequency	= 25 yrs	Time to peak	= 15.25 hrs
Time interval	= 5 min	Hyd. volume	= 115,449 cuft
Drainage area	= 20.300 ac	Curve number	= 58
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 266.00 min
Total precip.	= 5.70 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

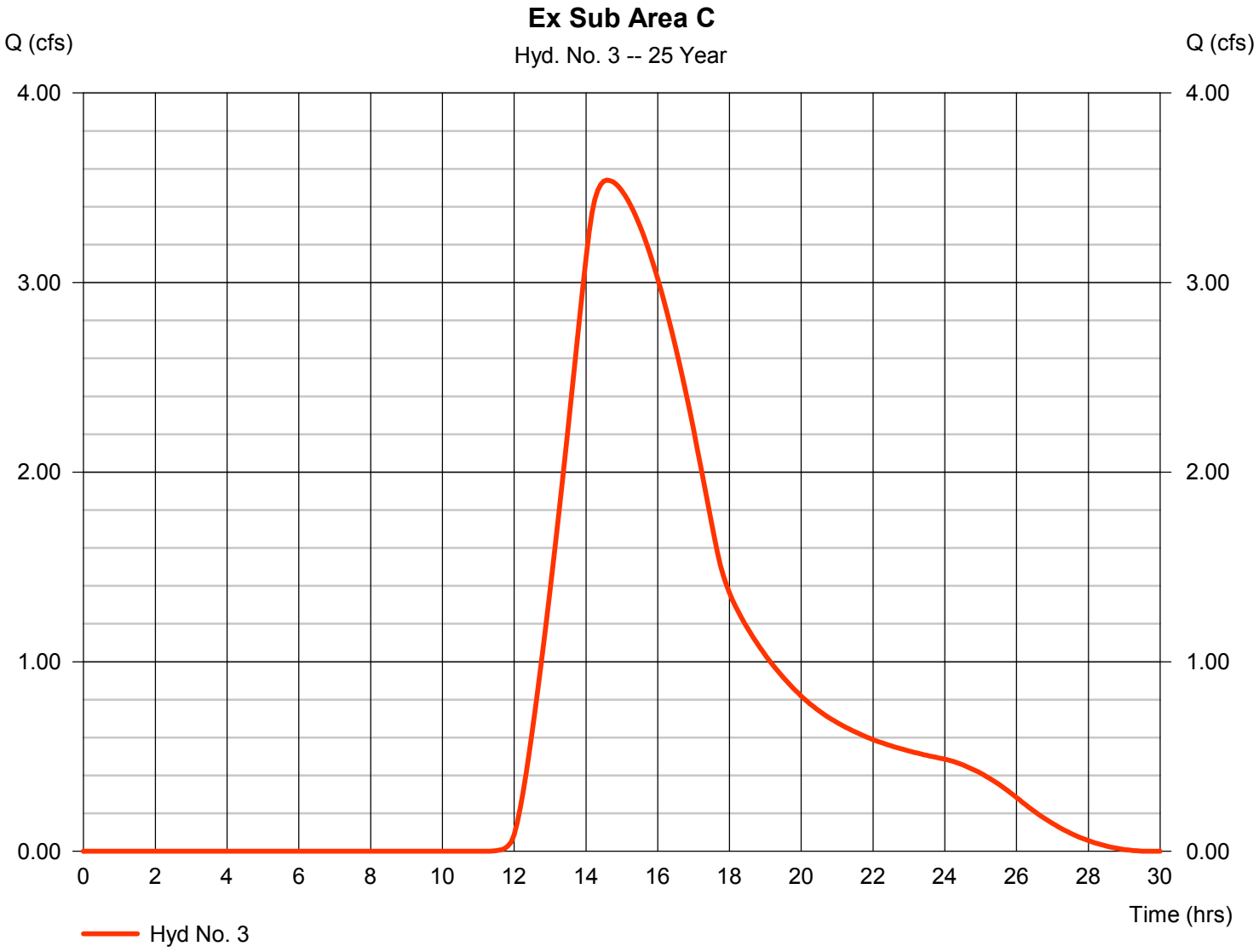


Hydrograph Report

Hyd. No. 3

Ex Sub Area C

Hydrograph type	= SCS Runoff	Peak discharge	= 3.540 cfs
Storm frequency	= 25 yrs	Time to peak	= 14.58 hrs
Time interval	= 5 min	Hyd. volume	= 71,082 cuft
Drainage area	= 12.510 ac	Curve number	= 58
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 218.00 min
Total precip.	= 5.70 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

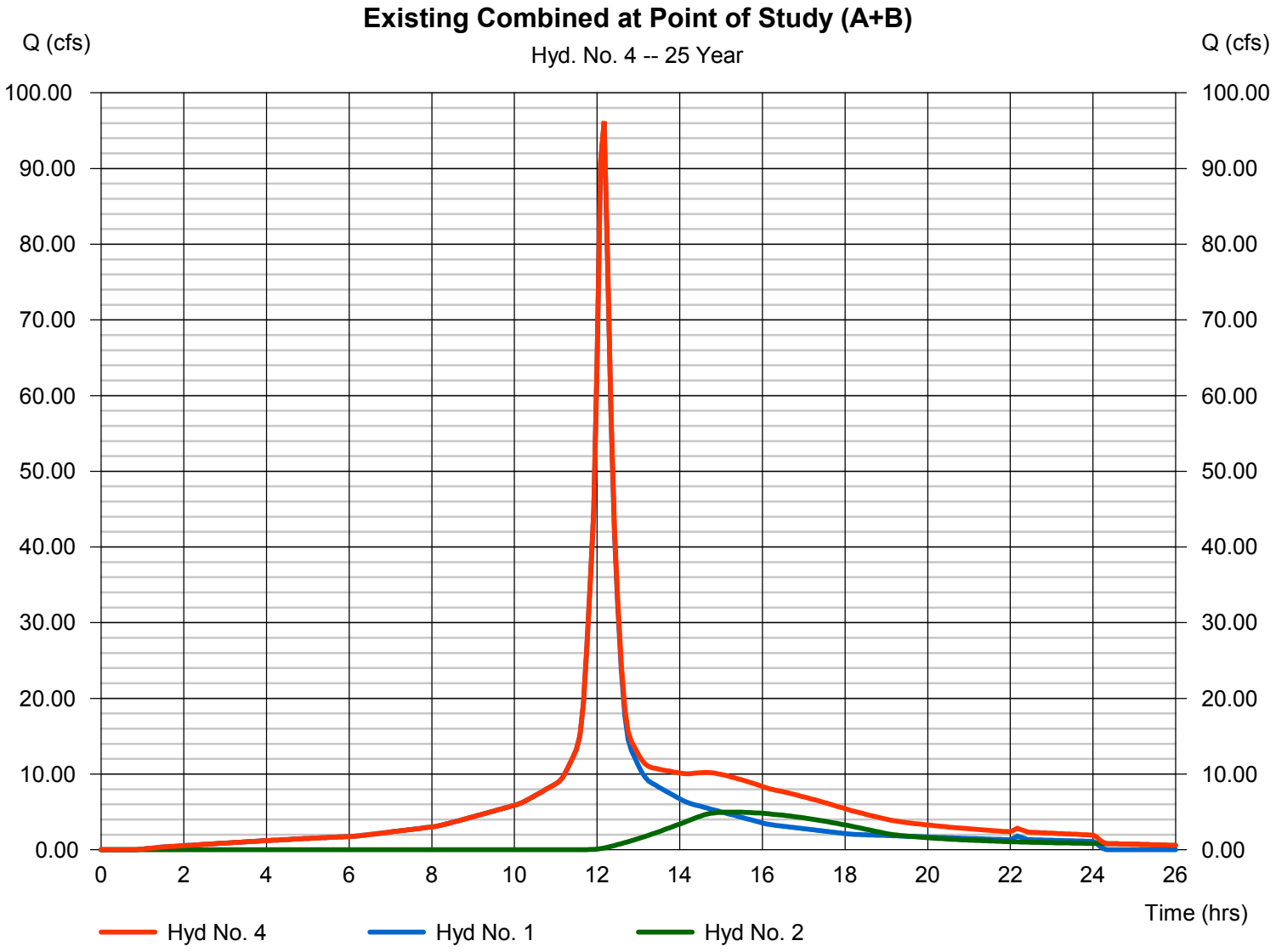


Hydrograph Report

Hyd. No. 4

Existing Combined at Point of Study (A+B)

Hydrograph type	= Combine	Peak discharge	= 96.23 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 556,554 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 44.030 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

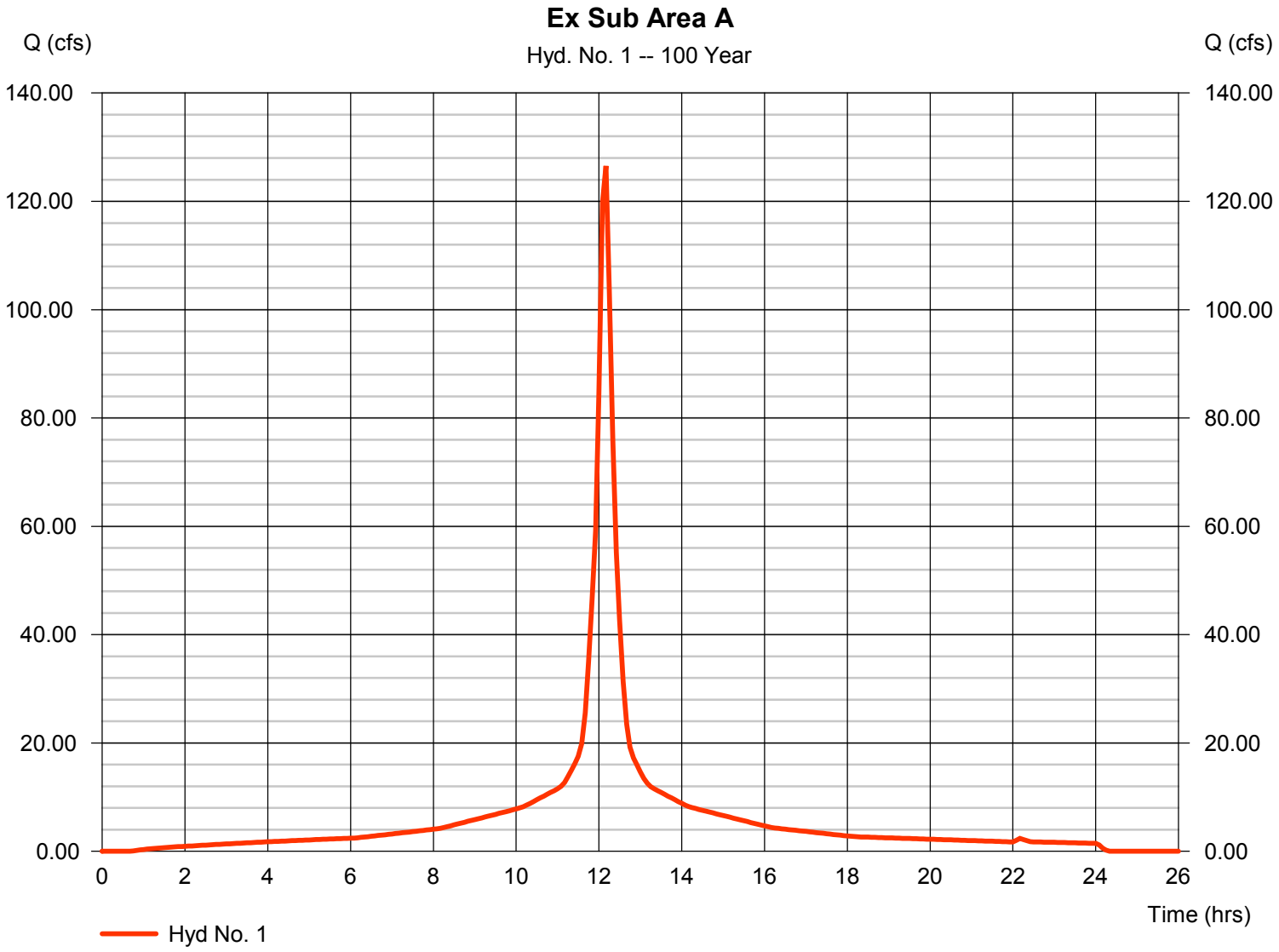
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	126.54	5	730	586,330	------	------	------	Ex Sub Area A
2	SCS Runoff	9.179	5	905	202,225	------	------	------	Ex Sub Area B
3	SCS Runoff	6.576	5	870	124,510	------	------	------	Ex Sub Area C
4	Combine	127.20	5	730	788,555	1, 2,	------	------	Existing Combined at Point of Study (
6	SCS Runoff	41.80	3	726	162,088	------	------	------	Proposed B to Existing Utility
7	SCS Runoff	26.38	3	726	102,293	------	------	------	Proposed B to South Wetland
8	SCS Runoff	4.362	3	903	95,782	------	------	------	Undeveloped B
9	Combine	68.41	3	726	360,163	6, 7, 8	------	------	Total Proposed Sub Area B(Undevelo
11	Reservoir	8.353	3	750	161,971	6	2.70	90,824	Prop B to Util Det

Hydrograph Report

Hyd. No. 1

Ex Sub Area A

Hydrograph type	= SCS Runoff	Peak discharge	= 126.54 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 586,330 cuft
Drainage area	= 23.730 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 16.00 min
Total precip.	= 7.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

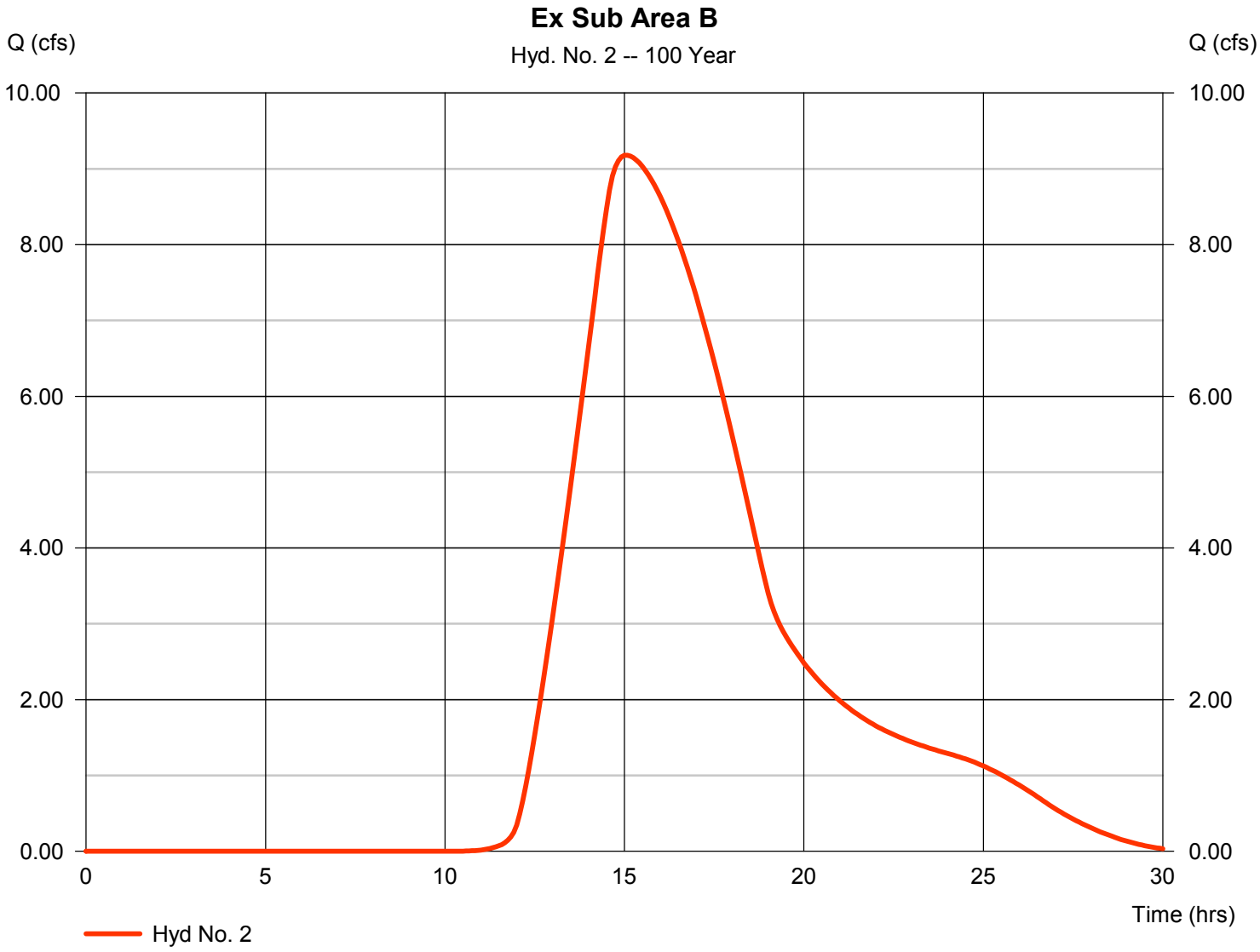


Hydrograph Report

Hyd. No. 2

Ex Sub Area B

Hydrograph type	= SCS Runoff	Peak discharge	= 9.179 cfs
Storm frequency	= 100 yrs	Time to peak	= 15.08 hrs
Time interval	= 5 min	Hyd. volume	= 202,225 cuft
Drainage area	= 20.300 ac	Curve number	= 58
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 266.00 min
Total precip.	= 7.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

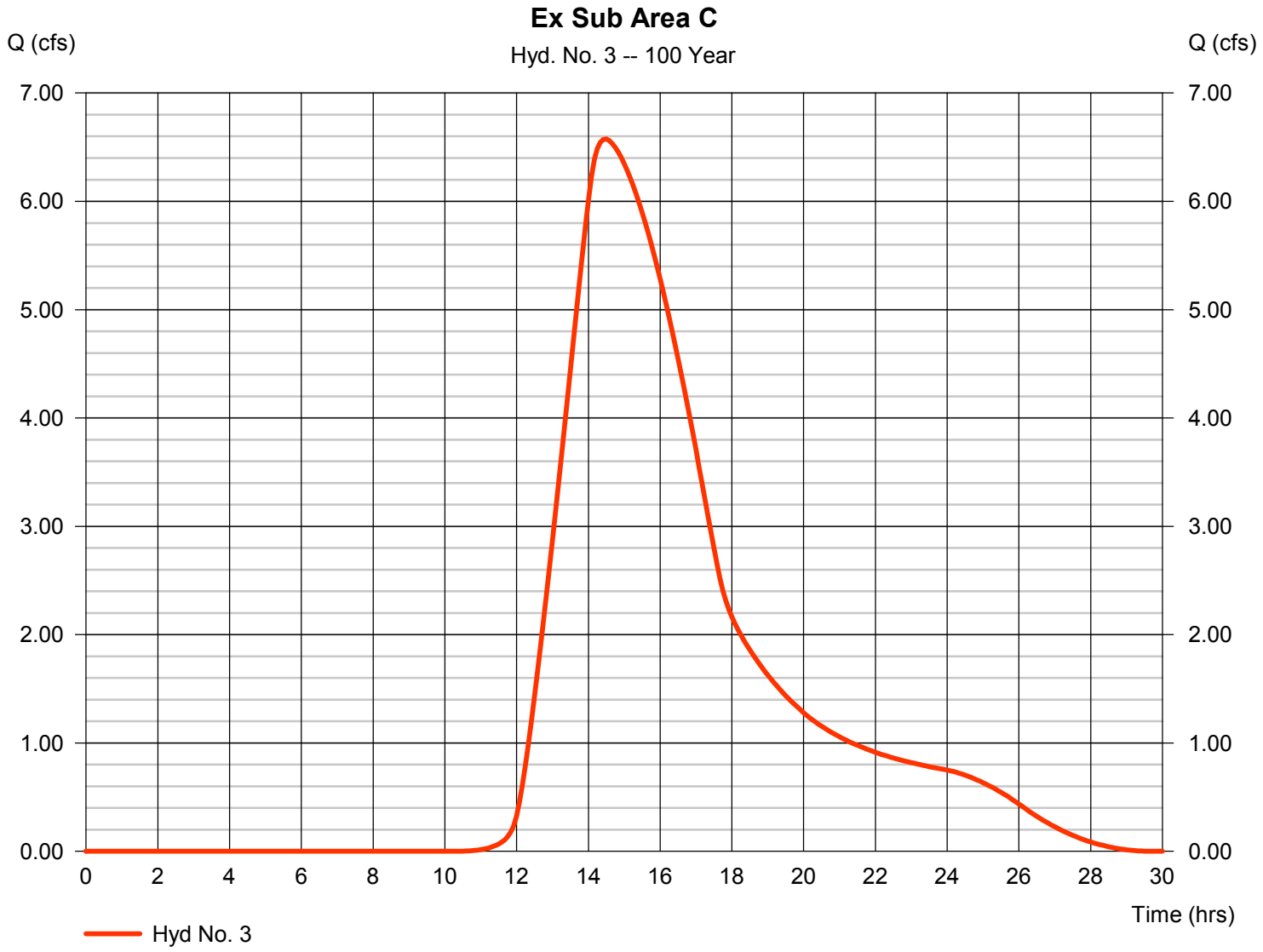


Hydrograph Report

Hyd. No. 3

Ex Sub Area C

Hydrograph type	= SCS Runoff	Peak discharge	= 6.576 cfs
Storm frequency	= 100 yrs	Time to peak	= 14.50 hrs
Time interval	= 5 min	Hyd. volume	= 124,510 cuft
Drainage area	= 12.510 ac	Curve number	= 58
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 218.00 min
Total precip.	= 7.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

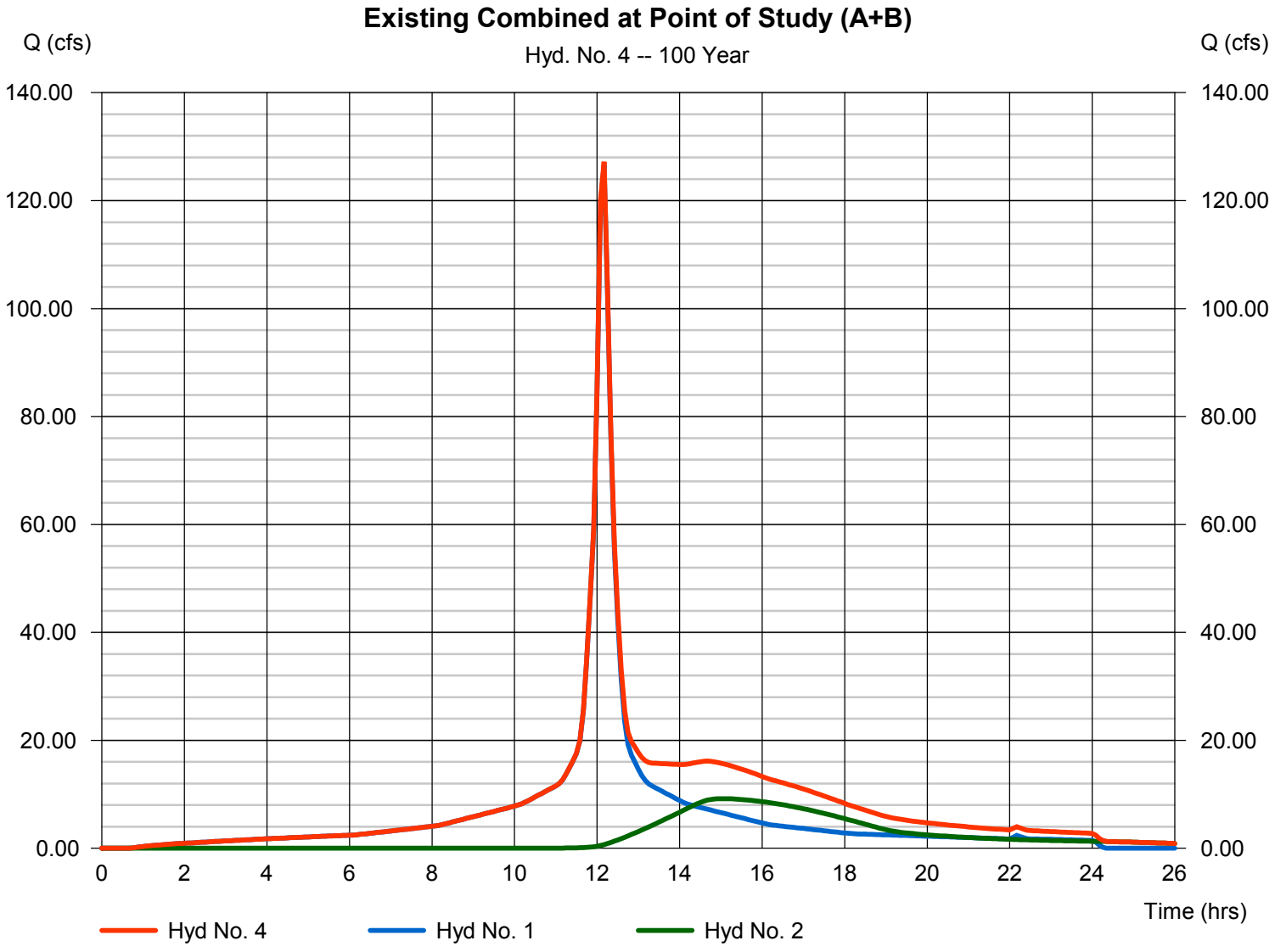


Hydrograph Report

Hyd. No. 4

Existing Combined at Point of Study (A+B)

Hydrograph type	= Combine	Peak discharge	= 127.20 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 788,555 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 44.030 ac



APPENDIX B

PROPOSED DISCHARGE HYDROGRAPHS

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

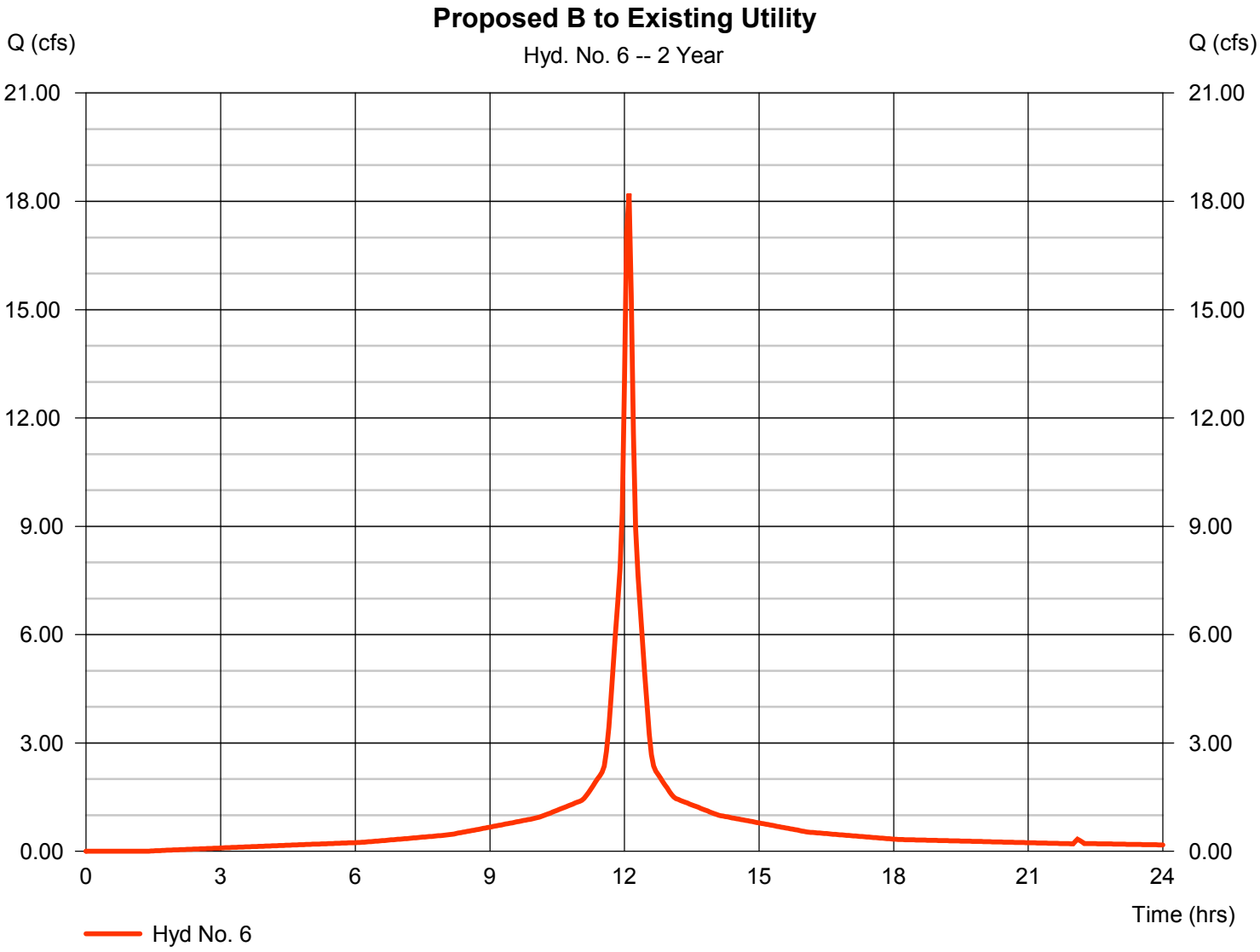
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	55.12	5	730	247,689	------	------	------	Ex Sub Area A
2	SCS Runoff	1.005	5	975	27,657	------	------	------	Ex Sub Area B
3	SCS Runoff	0.689	5	930	17,028	------	------	------	Ex Sub Area C
4	Combine	55.14	5	730	275,346	1, 2,	------	------	Existing Combined at Point of Study (
6	SCS Runoff	18.21	3	726	68,472	------	------	------	Proposed B to Existing Utility
7	SCS Runoff	11.49	3	726	43,213	------	------	------	Proposed B to South Wetland
8	SCS Runoff	0.477	3	975	13,105	------	------	------	Undeveloped B
9	Combine	29.70	3	726	124,789	6, 7, 8	------	------	Total Proposed Sub Area B(Undevelo
11	Reservoir	1.005	3	846	68,355	6	1.58	44,207	Prop B to Util Det

Hydrograph Report

Hyd. No. 6

Proposed B to Existing Utility

Hydrograph type	=	SCS Runoff	Peak discharge	=	18.21 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.10 hrs
Time interval	=	3 min	Hyd. volume	=	68,472 cuft
Drainage area	=	6.560 ac	Curve number	=	98
Basin Slope	=	1.0 %	Hydraulic length	=	550 ft
Tc method	=	LAG	Time of conc. (Tc)	=	9.35 min
Total precip.	=	3.30 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

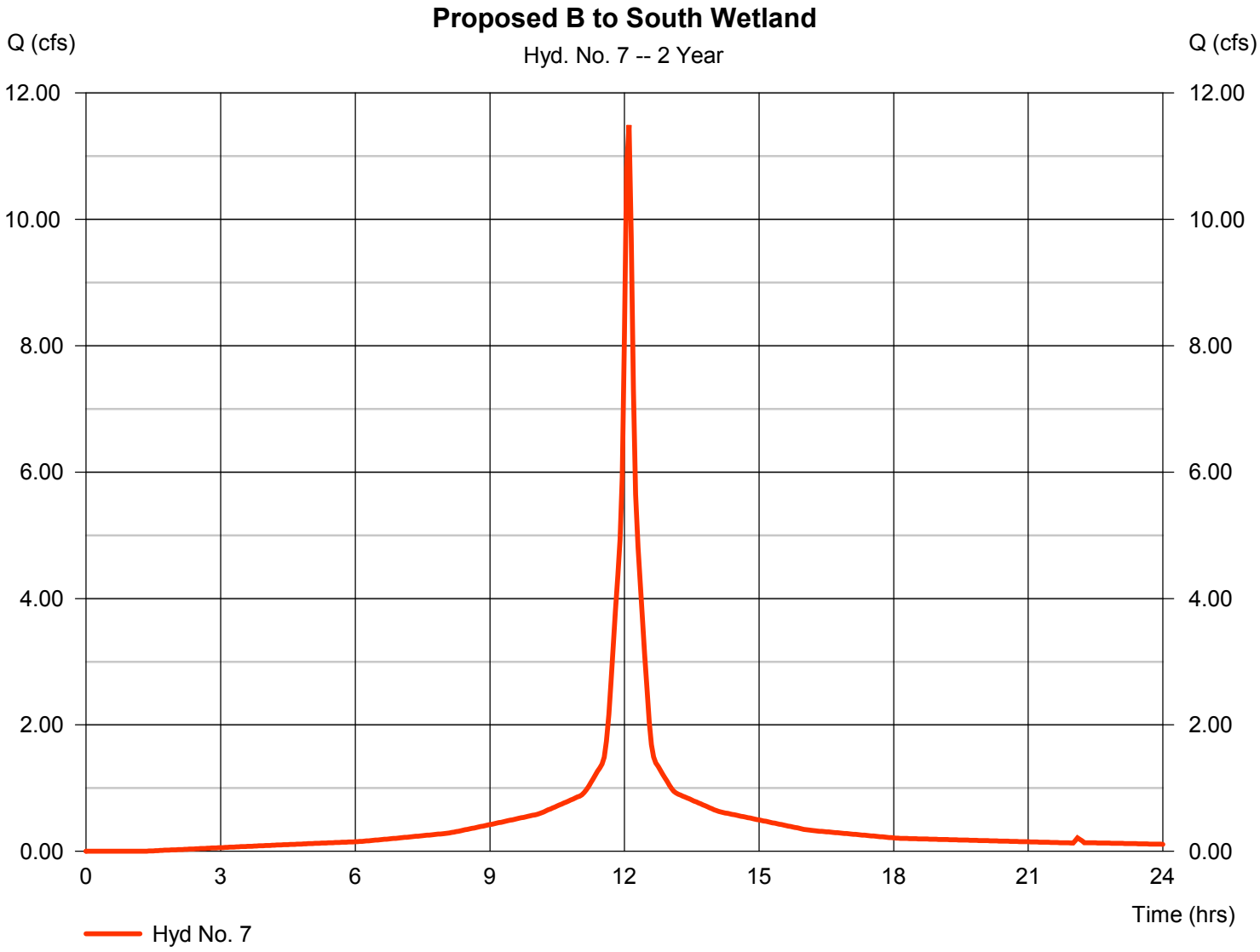


Hydrograph Report

Hyd. No. 7

Proposed B to South Wetland

Hydrograph type	= SCS Runoff	Peak discharge	= 11.49 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.10 hrs
Time interval	= 3 min	Hyd. volume	= 43,213 cuft
Drainage area	= 4.140 ac	Curve number	= 98
Basin Slope	= 1.0 %	Hydraulic length	= 400 ft
Tc method	= LAG	Time of conc. (Tc)	= 7.25 min
Total precip.	= 3.30 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

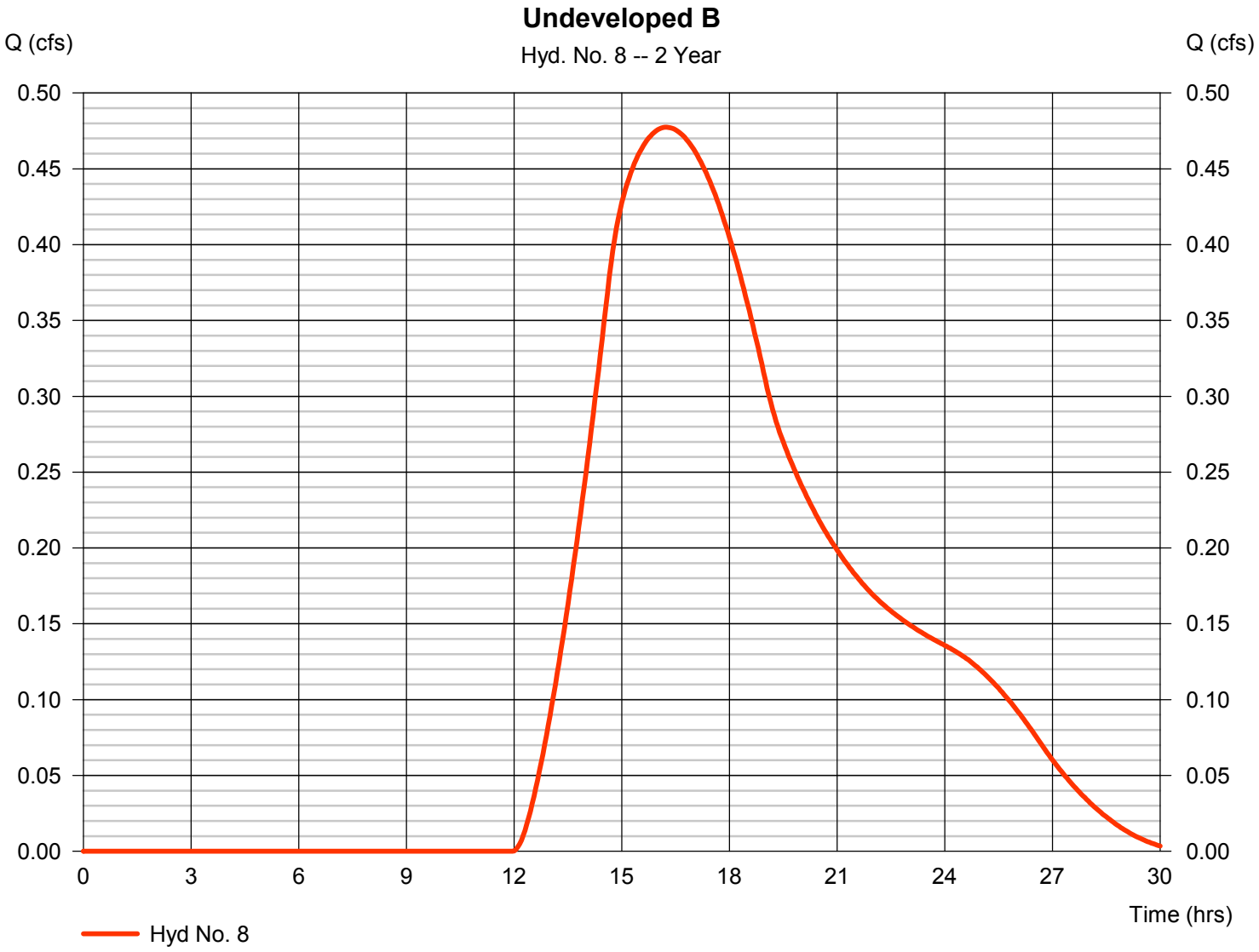


Hydrograph Report

Hyd. No. 8

Undeveloped B

Hydrograph type	= SCS Runoff	Peak discharge	= 0.477 cfs
Storm frequency	= 2 yrs	Time to peak	= 16.25 hrs
Time interval	= 3 min	Hyd. volume	= 13,105 cuft
Drainage area	= 9.600 ac	Curve number	= 58
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 266.00 min
Total precip.	= 3.30 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

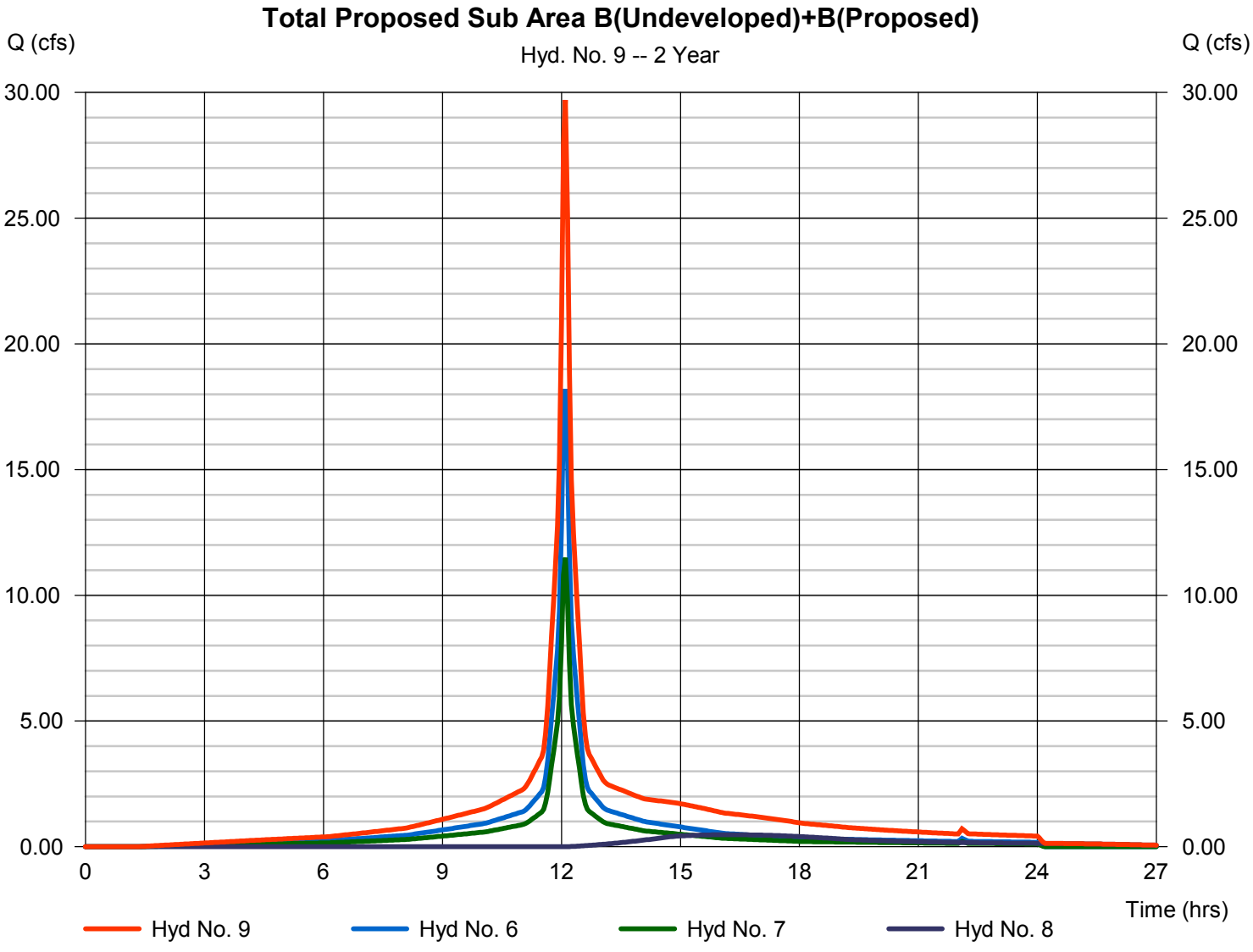


Hydrograph Report

Hyd. No. 9

Total Proposed Sub Area B(Undeveloped)+B(Proposed)

Hydrograph type	= Combine	Peak discharge	= 29.70 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.10 hrs
Time interval	= 3 min	Hyd. volume	= 124,789 cuft
Inflow hyds.	= 6, 7, 8	Contrib. drain. area	= 20.300 ac



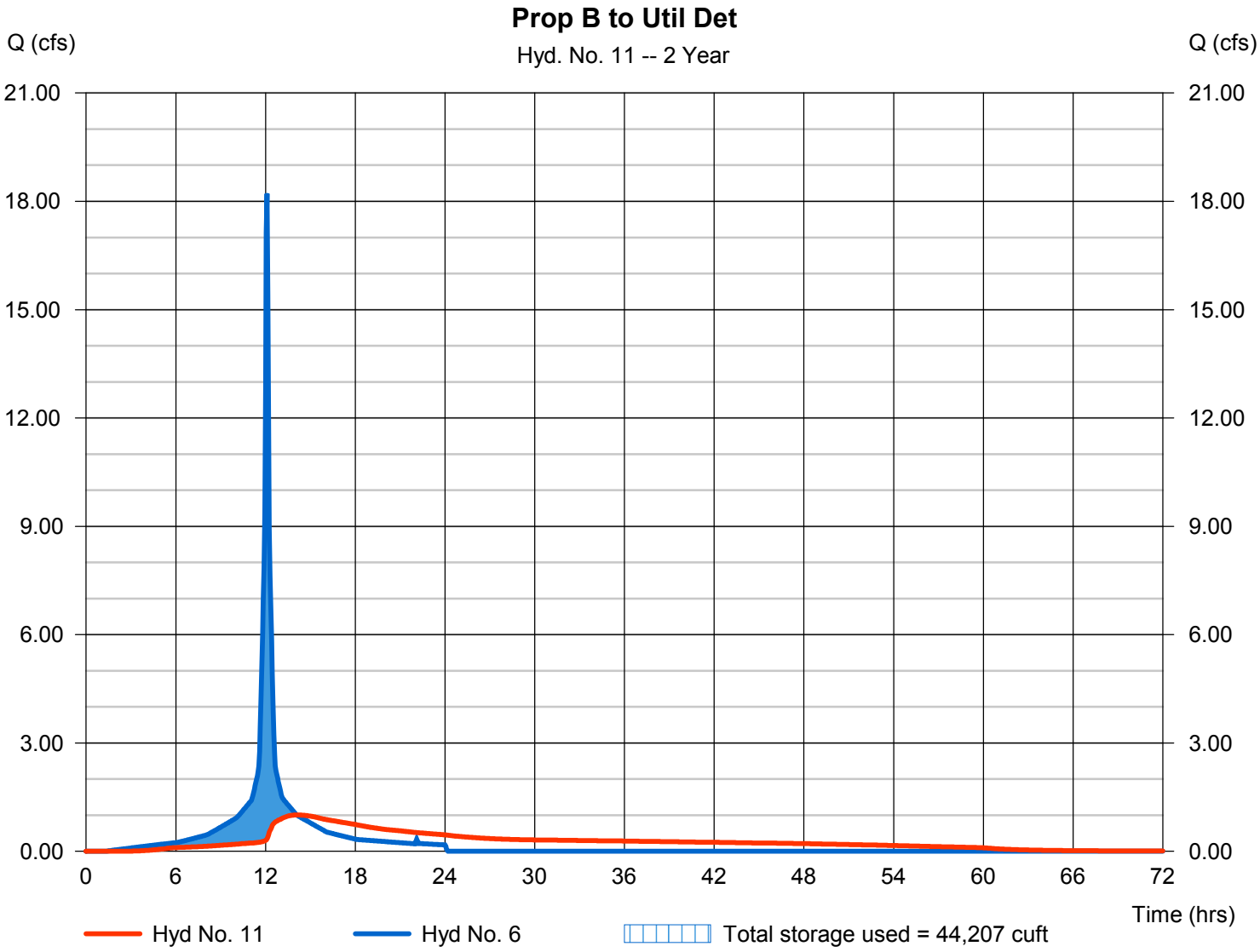
Hydrograph Report

Hyd. No. 11

Prop B to Util Det

Hydrograph type	=	Reservoir	Peak discharge	=	1.005 cfs
Storm frequency	=	2 yrs	Time to peak	=	14.10 hrs
Time interval	=	3 min	Hyd. volume	=	68,355 cuft
Inflow hyd. No.	=	6 - Proposed B to Existing Utility	Max. Elevation	=	1.58 ft
Reservoir name	=	Underground Piping	Max. Storage	=	44,207 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - Underground Piping

Pond Data

UG Chambers -Invert elev. = 0.43 ft, Rise x Span = 2.00 x 2.00 ft, Barrel Len = 355.00 ft, No. Barrels = 82, Slope = 0.10%, Headers = No

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	0.43	n/a	0	0
0.24	0.67	n/a	1,518	1,518
0.47	0.90	n/a	7,139	8,657
0.71	1.14	n/a	10,874	19,531
0.94	1.37	n/a	12,715	32,246
1.18	1.61	n/a	13,500	45,745
1.41	1.84	n/a	13,521	59,266
1.65	2.08	n/a	12,689	71,955
1.88	2.31	n/a	10,868	82,823
2.12	2.55	n/a	7,134	89,957
2.36	2.79	n/a	1,513	91,470

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	4.00	20.00	0.00
Span (in)	= 24.00	4.00	20.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 0.43	0.43	1.25	0.00
Length (ft)	= 38.00	0.50	0.50	0.00
Slope (%)	= 0.25	0.10	0.10	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

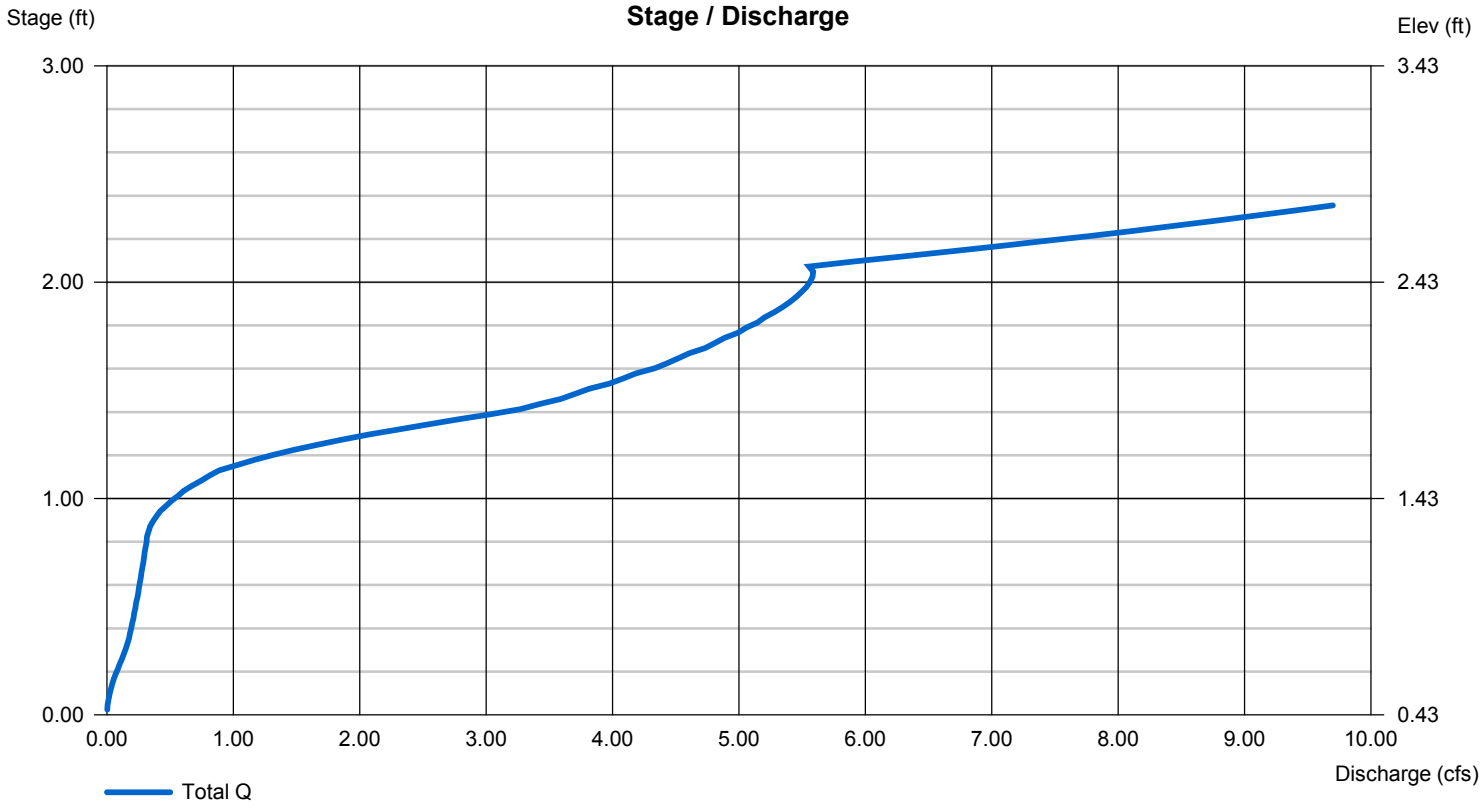
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 2.30	Inactive	Inactive	Inactive
Crest El. (ft)	= 1.55	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	Rect	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

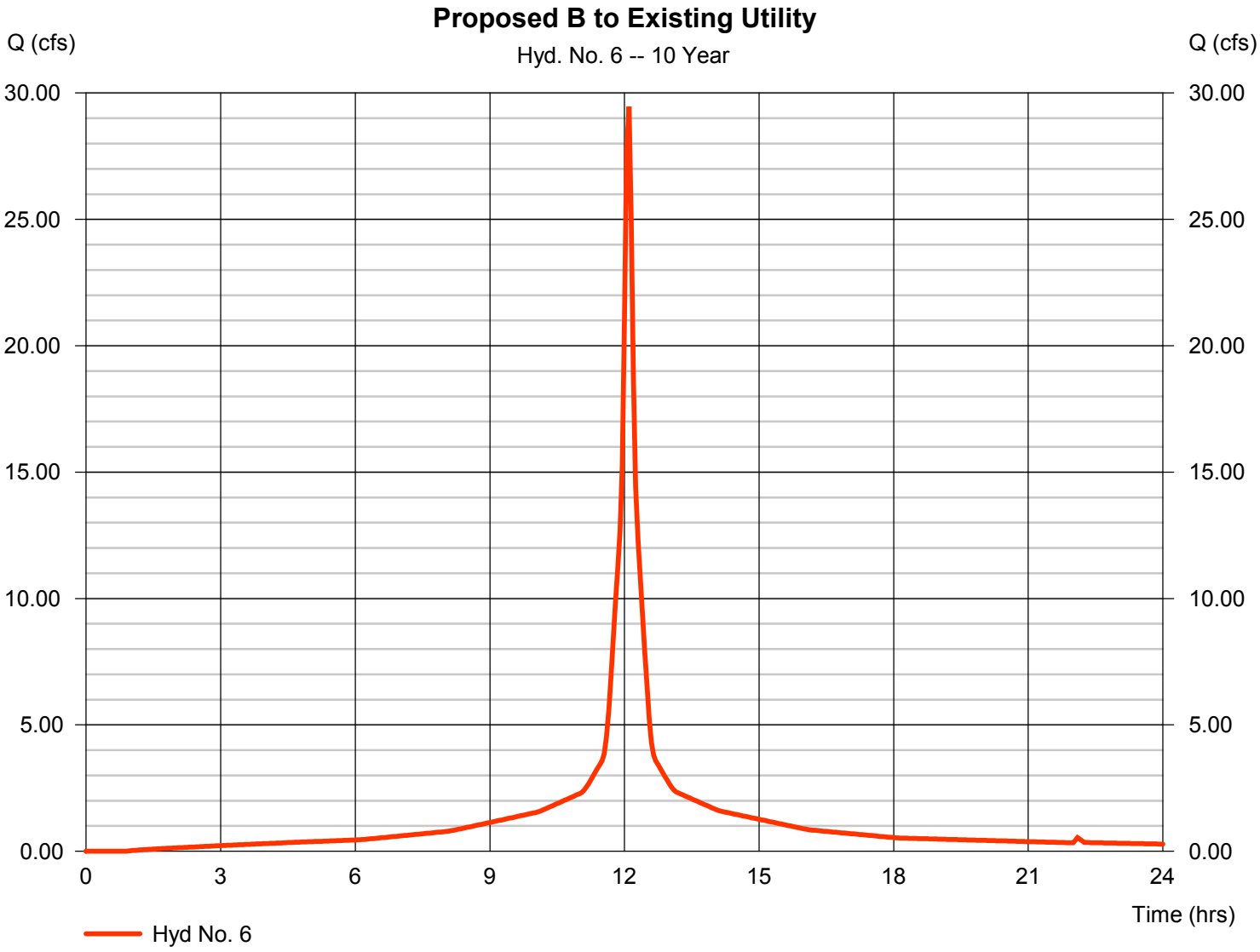
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	89.19	5	730	408,846	------	------	------	Ex Sub Area A
2	SCS Runoff	4.156	5	920	98,165	------	------	------	Ex Sub Area B
3	SCS Runoff	2.949	5	880	60,440	------	------	------	Ex Sub Area C
4	Combine	89.37	5	730	507,010	1, 2,	------	------	Existing Combined at Point of Study (
6	SCS Runoff	29.46	3	726	113,023	------	------	------	Proposed B to Existing Utility
7	SCS Runoff	18.59	3	726	71,328	------	------	------	Proposed B to South Wetland
8	SCS Runoff	1.974	3	921	46,495	------	------	------	Undeveloped B
9	Combine	48.11	3	726	230,846	6, 7, 8	------	------	Total Proposed Sub Area B(Undevelo
11	Reservoir	3.947	3	759	112,906	6	1.96	65,394	Prop B to Util Det

Hydrograph Report

Hyd. No. 6

Proposed B to Existing Utility

Hydrograph type	= SCS Runoff	Peak discharge	= 29.46 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.10 hrs
Time interval	= 3 min	Hyd. volume	= 113,023 cuft
Drainage area	= 6.560 ac	Curve number	= 98
Basin Slope	= 1.0 %	Hydraulic length	= 550 ft
Tc method	= LAG	Time of conc. (Tc)	= 9.35 min
Total precip.	= 5.30 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

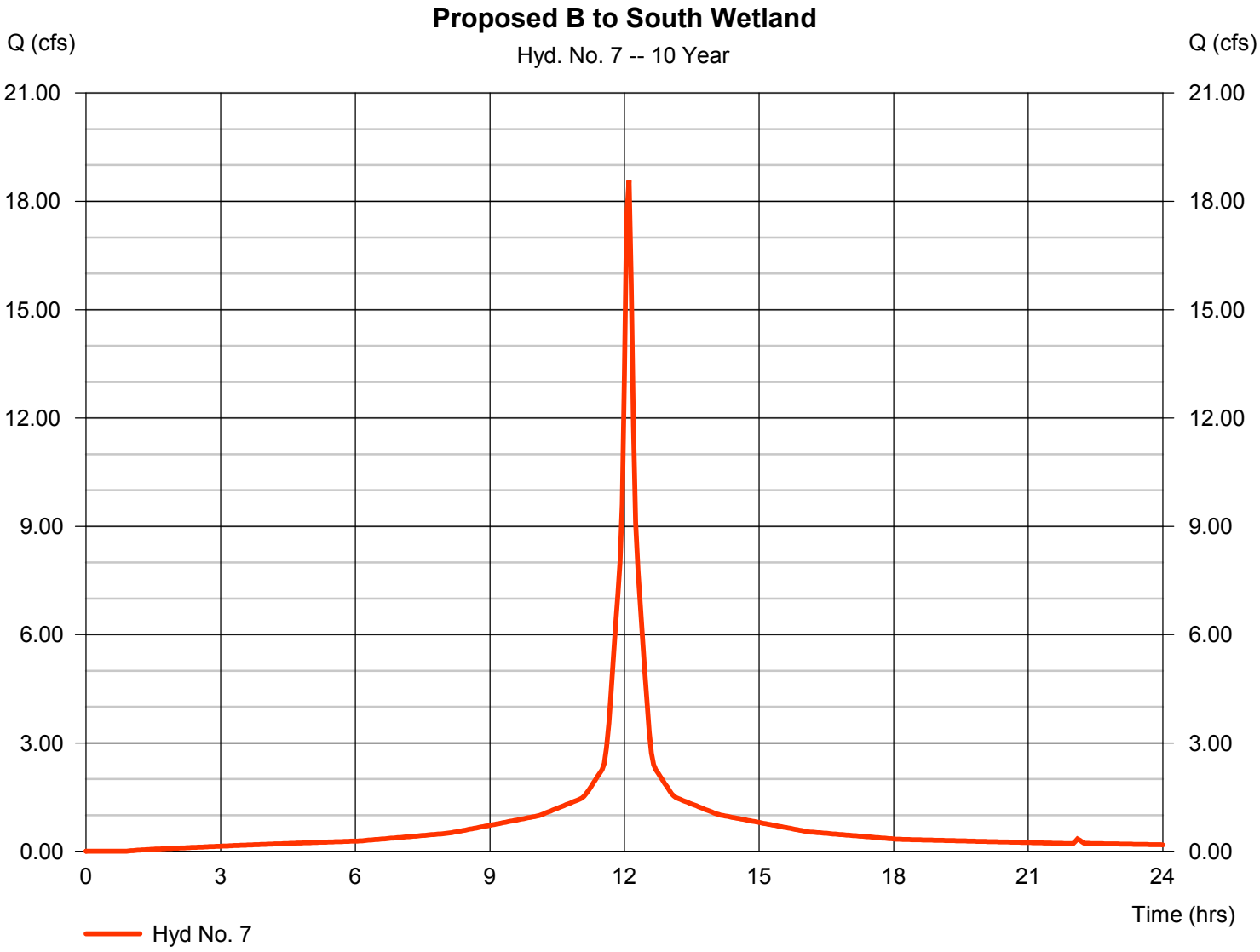


Hydrograph Report

Hyd. No. 7

Proposed B to South Wetland

Hydrograph type	=	SCS Runoff	Peak discharge	=	18.59 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.10 hrs
Time interval	=	3 min	Hyd. volume	=	71,328 cuft
Drainage area	=	4.140 ac	Curve number	=	98
Basin Slope	=	1.0 %	Hydraulic length	=	400 ft
Tc method	=	LAG	Time of conc. (Tc)	=	7.25 min
Total precip.	=	5.30 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

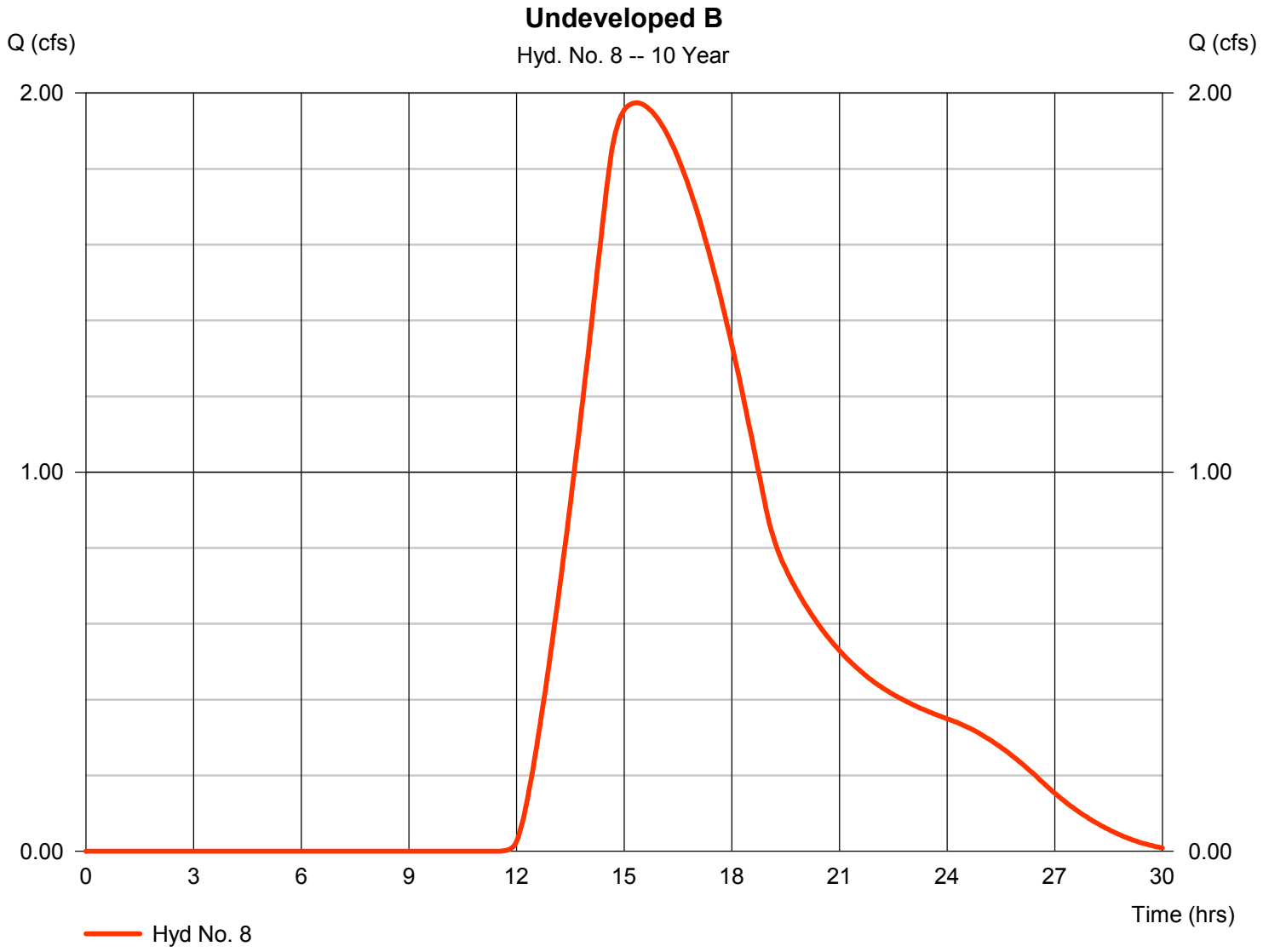


Hydrograph Report

Hyd. No. 8

Undeveloped B

Hydrograph type	= SCS Runoff	Peak discharge	= 1.974 cfs
Storm frequency	= 10 yrs	Time to peak	= 15.35 hrs
Time interval	= 3 min	Hyd. volume	= 46,495 cuft
Drainage area	= 9.600 ac	Curve number	= 58
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 266.00 min
Total precip.	= 5.30 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

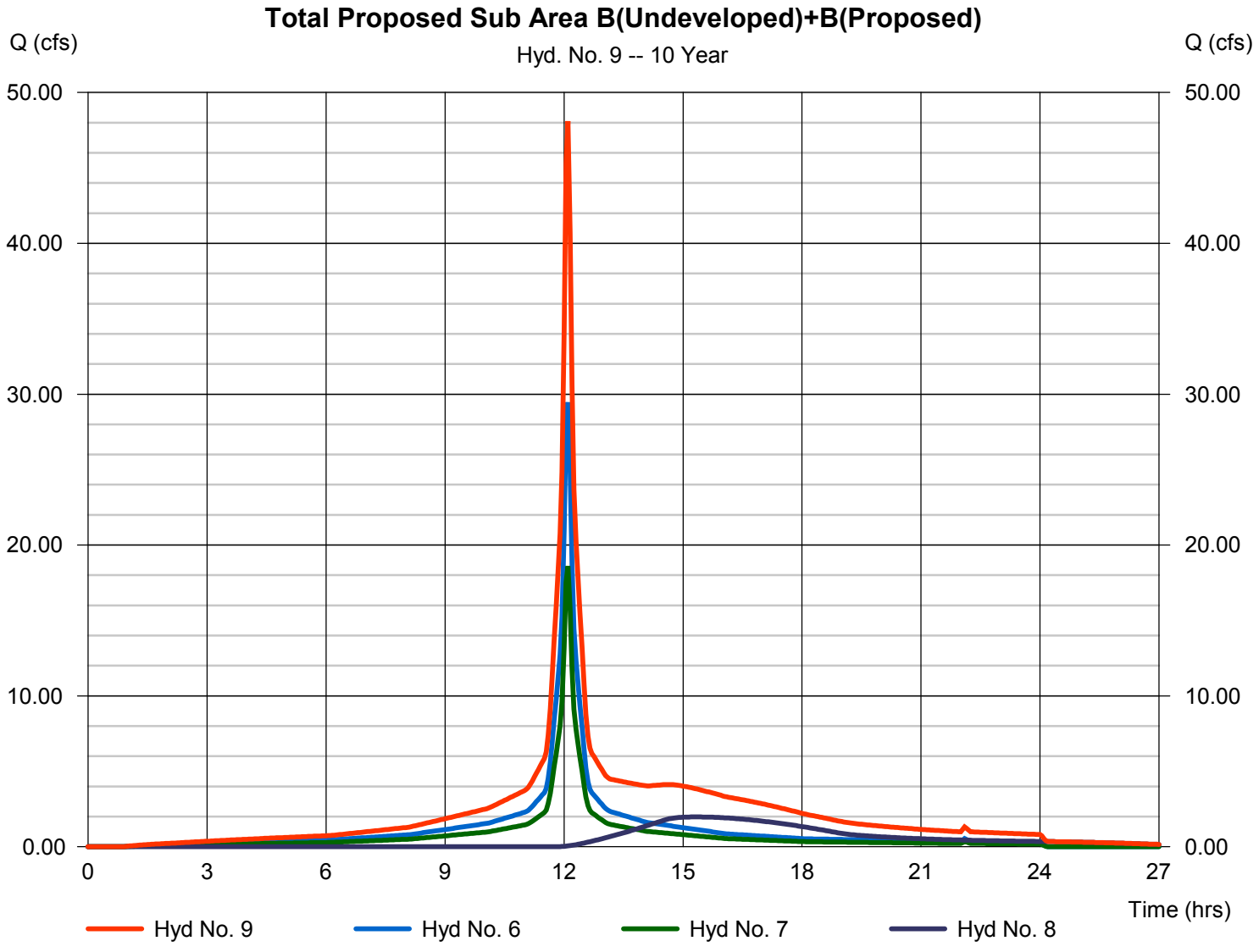


Hydrograph Report

Hyd. No. 9

Total Proposed Sub Area B(Undeveloped)+B(Proposed)

Hydrograph type	= Combine	Peak discharge	= 48.11 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.10 hrs
Time interval	= 3 min	Hyd. volume	= 230,846 cuft
Inflow hyds.	= 6, 7, 8	Contrib. drain. area	= 20.300 ac



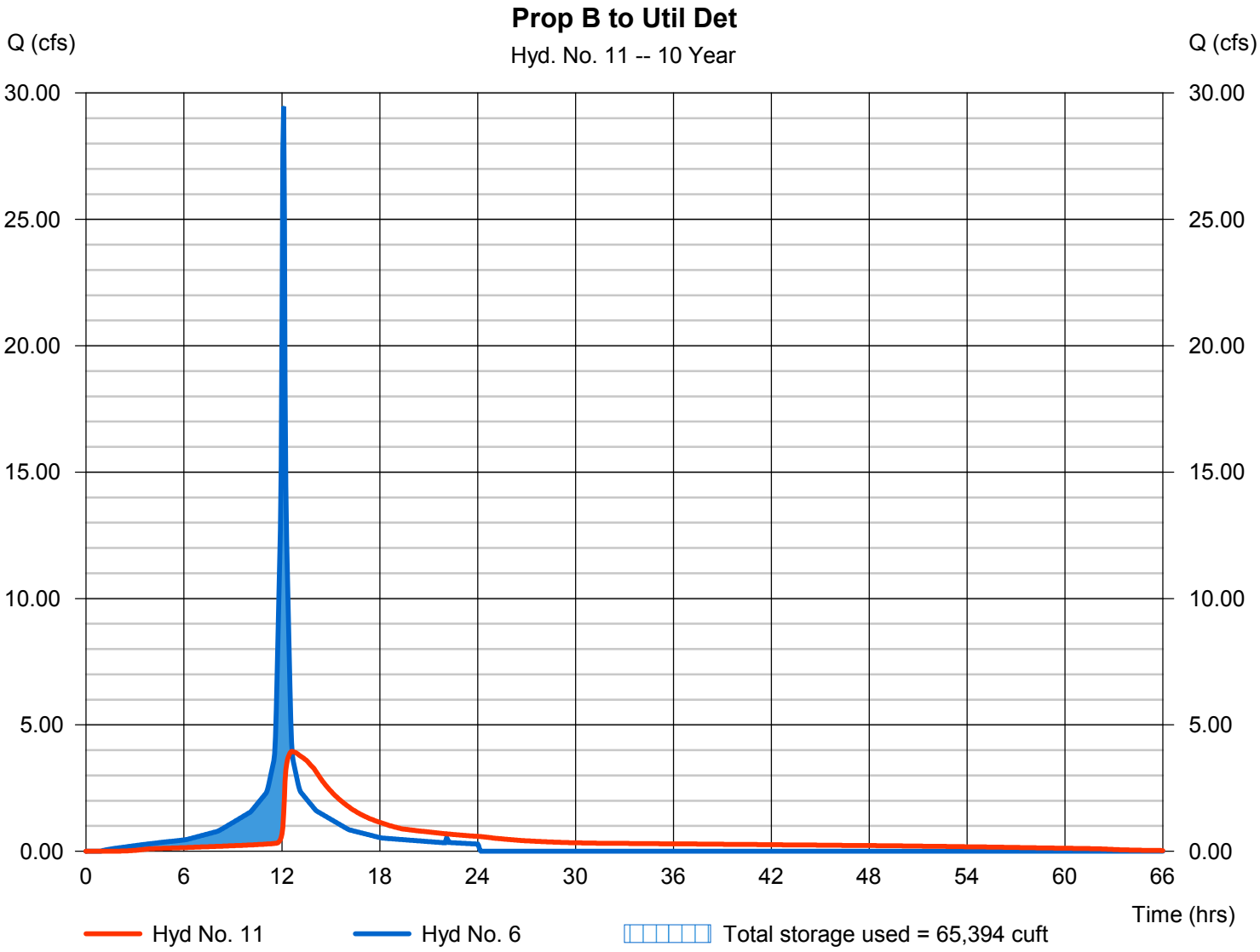
Hydrograph Report

Hyd. No. 11

Prop B to Util Det

Hydrograph type	=	Reservoir	Peak discharge	=	3.947 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.65 hrs
Time interval	=	3 min	Hyd. volume	=	112,906 cuft
Inflow hyd. No.	=	6 - Proposed B to Existing Utility	Max. Elevation	=	1.96 ft
Reservoir name	=	Underground Piping	Max. Storage	=	65,394 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

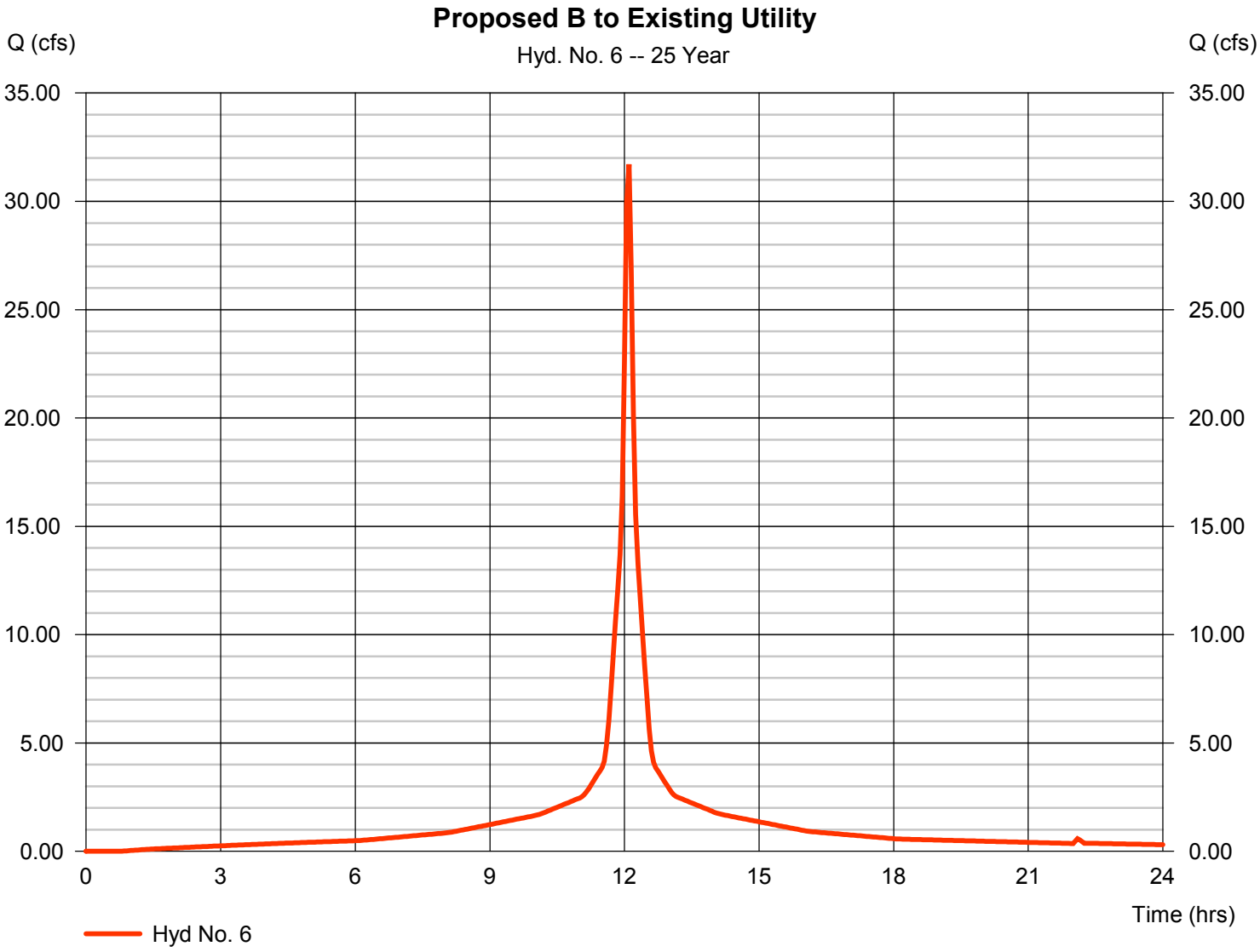
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	95.99	5	730	441,105	------	------	------	Ex Sub Area A
2	SCS Runoff	4.973	5	915	115,449	------	------	------	Ex Sub Area B
3	SCS Runoff	3.540	5	875	71,082	------	------	------	Ex Sub Area C
4	Combine	96.23	5	730	556,554	1, 2,	------	------	Existing Combined at Point of Study (
6	SCS Runoff	31.71	3	726	121,941	------	------	------	Proposed B to Existing Utility
7	SCS Runoff	20.01	3	726	76,957	------	------	------	Proposed B to South Wetland
8	SCS Runoff	2.363	3	915	54,682	------	------	------	Undeveloped B
9	Combine	51.79	3	726	253,580	6, 7, 8	------	------	Total Proposed Sub Area B(Undevelo
11	Reservoir	4.386	3	756	121,824	6	2.05	70,135	Prop B to Util Det

Hydrograph Report

Hyd. No. 6

Proposed B to Existing Utility

Hydrograph type	= SCS Runoff	Peak discharge	= 31.71 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.10 hrs
Time interval	= 3 min	Hyd. volume	= 121,941 cuft
Drainage area	= 6.560 ac	Curve number	= 98
Basin Slope	= 1.0 %	Hydraulic length	= 550 ft
Tc method	= LAG	Time of conc. (Tc)	= 9.35 min
Total precip.	= 5.70 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

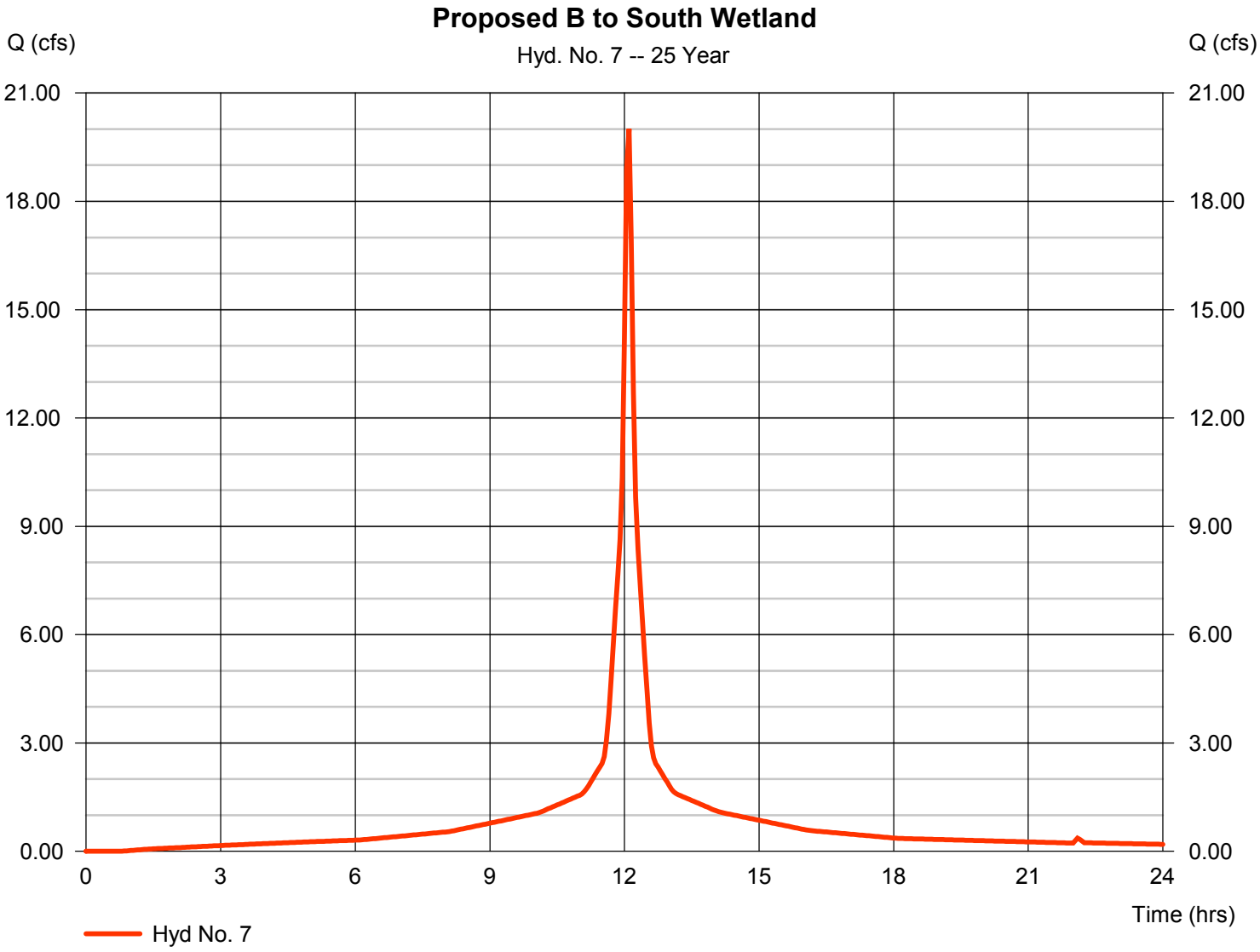


Hydrograph Report

Hyd. No. 7

Proposed B to South Wetland

Hydrograph type	= SCS Runoff	Peak discharge	= 20.01 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.10 hrs
Time interval	= 3 min	Hyd. volume	= 76,957 cuft
Drainage area	= 4.140 ac	Curve number	= 98
Basin Slope	= 1.0 %	Hydraulic length	= 400 ft
Tc method	= LAG	Time of conc. (Tc)	= 7.25 min
Total precip.	= 5.70 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

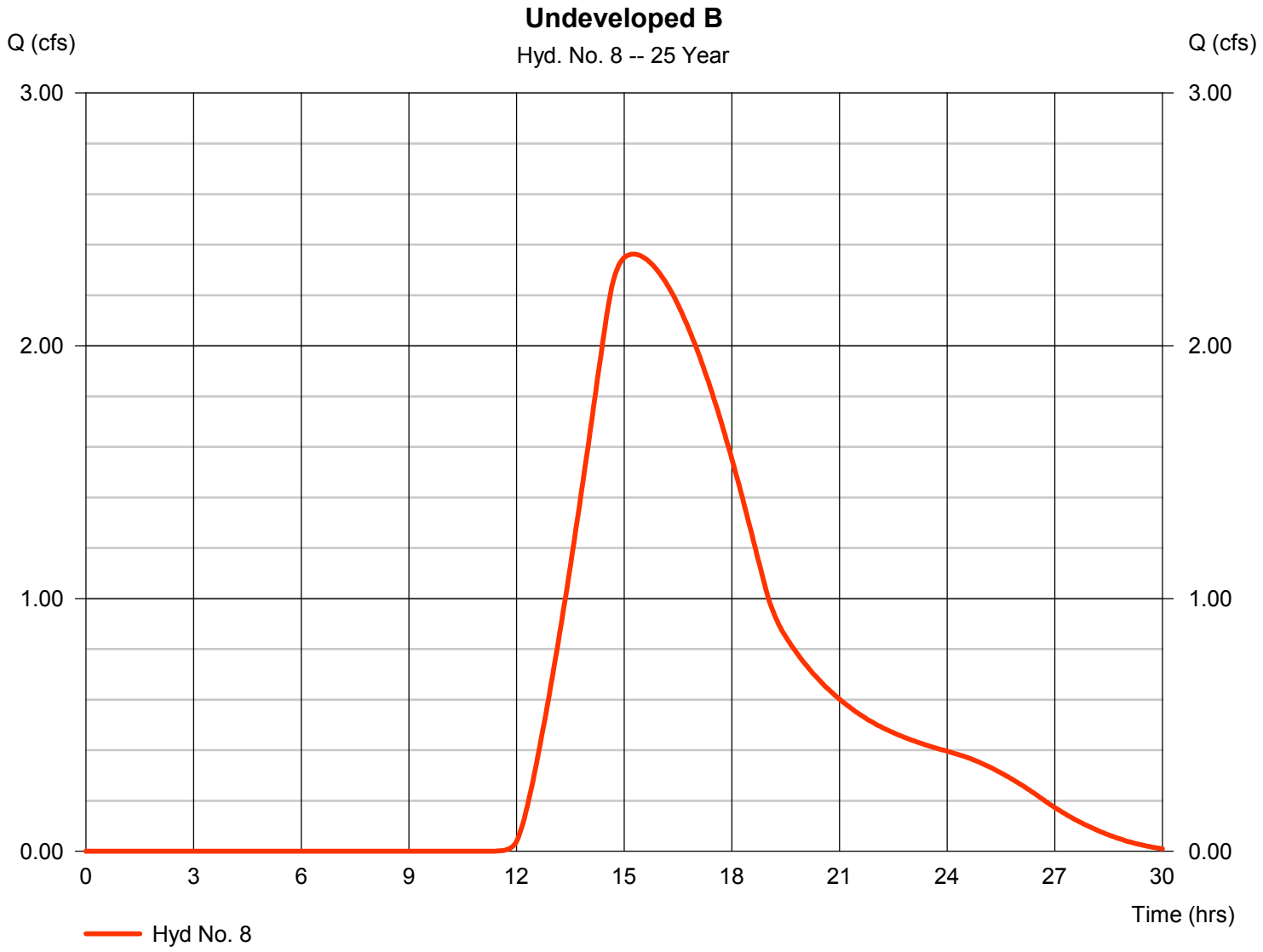


Hydrograph Report

Hyd. No. 8

Undeveloped B

Hydrograph type	= SCS Runoff	Peak discharge	= 2.363 cfs
Storm frequency	= 25 yrs	Time to peak	= 15.25 hrs
Time interval	= 3 min	Hyd. volume	= 54,682 cuft
Drainage area	= 9.600 ac	Curve number	= 58
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 266.00 min
Total precip.	= 5.70 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

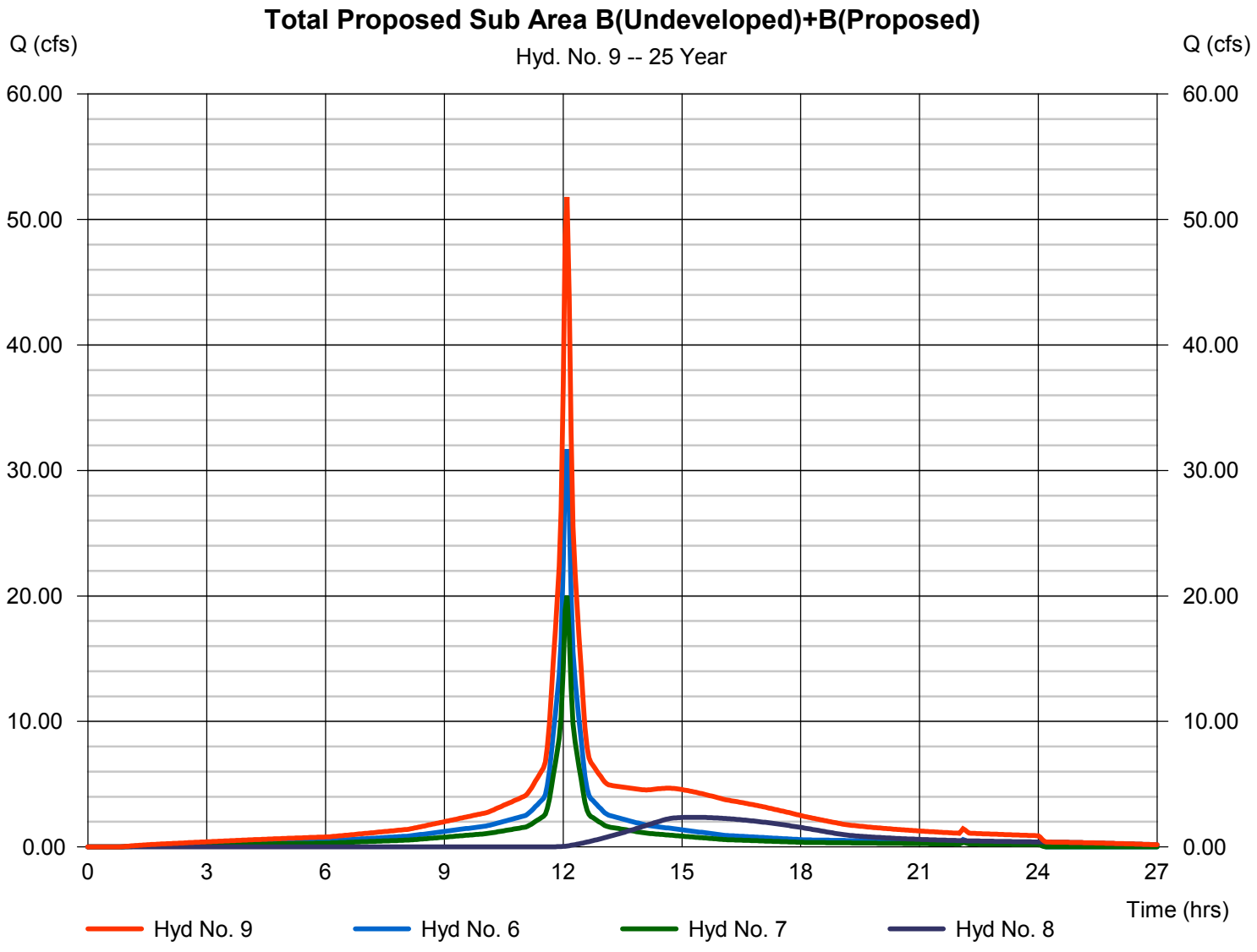


Hydrograph Report

Hyd. No. 9

Total Proposed Sub Area B(Undeveloped)+B(Proposed)

Hydrograph type	= Combine	Peak discharge	= 51.79 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.10 hrs
Time interval	= 3 min	Hyd. volume	= 253,580 cuft
Inflow hyds.	= 6, 7, 8	Contrib. drain. area	= 20.300 ac



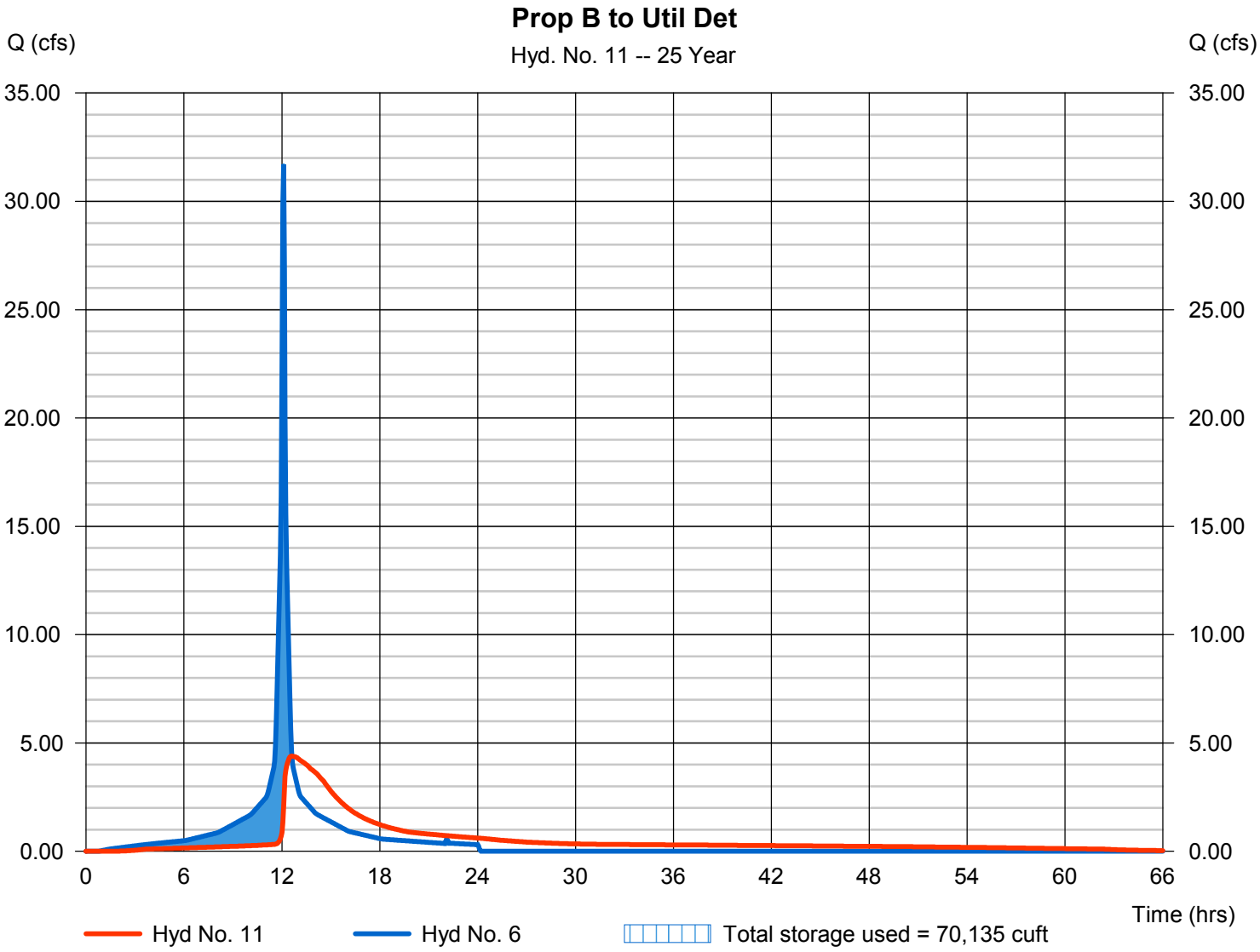
Hydrograph Report

Hyd. No. 11

Prop B to Util Det

Hydrograph type	=	Reservoir	Peak discharge	=	4.386 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.60 hrs
Time interval	=	3 min	Hyd. volume	=	121,824 cuft
Inflow hyd. No.	=	6 - Proposed B to Existing Utility	Max. Elevation	=	2.05 ft
Reservoir name	=	Underground Piping	Max. Storage	=	70,135 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

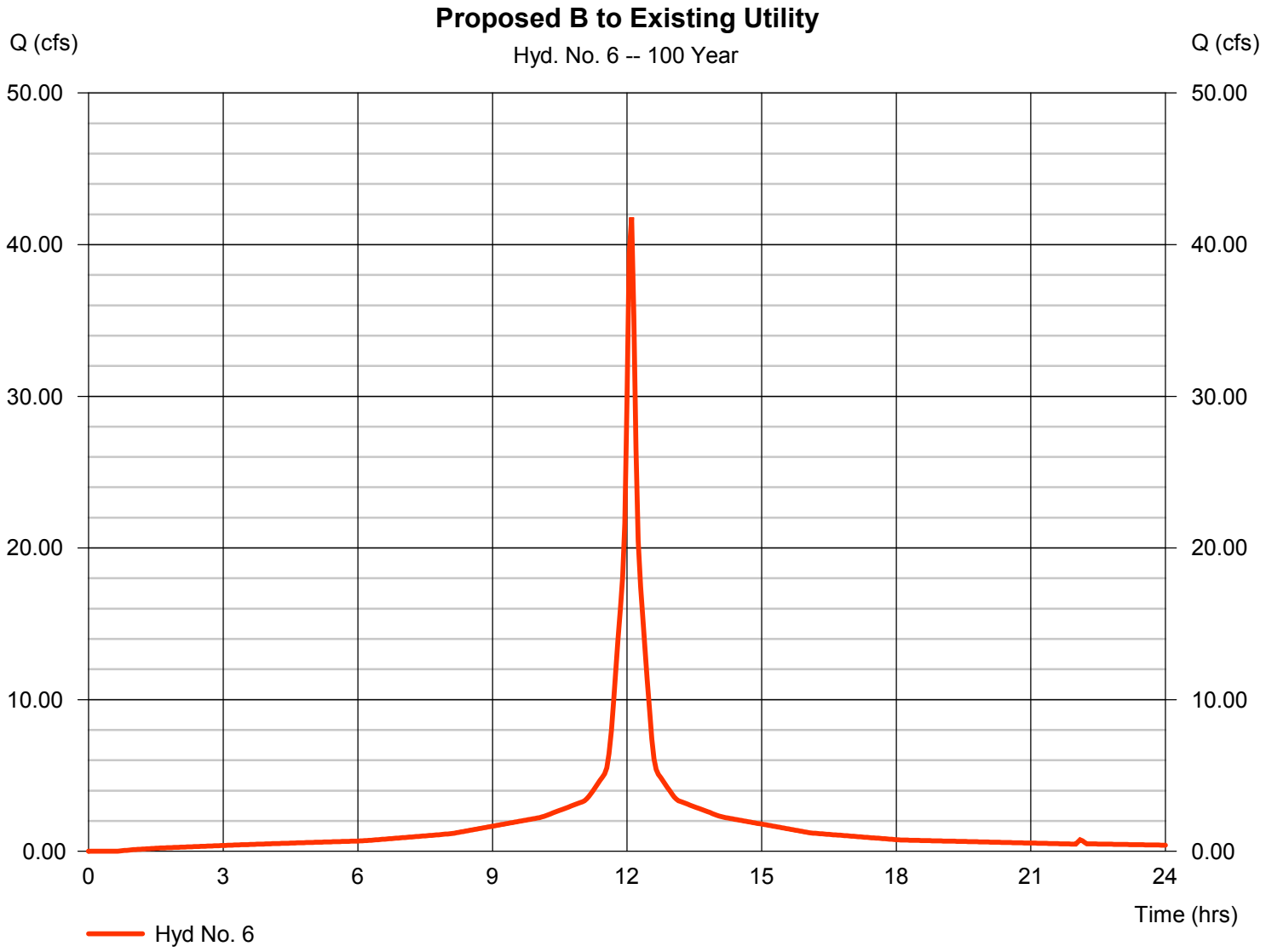
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	126.54	5	730	586,330	------	------	------	Ex Sub Area A
2	SCS Runoff	9.179	5	905	202,225	------	------	------	Ex Sub Area B
3	SCS Runoff	6.576	5	870	124,510	------	------	------	Ex Sub Area C
4	Combine	127.20	5	730	788,555	1, 2,	------	------	Existing Combined at Point of Study (
6	SCS Runoff	41.80	3	726	162,088	------	------	------	Proposed B to Existing Utility
7	SCS Runoff	26.38	3	726	102,293	------	------	------	Proposed B to South Wetland
8	SCS Runoff	4.362	3	903	95,782	------	------	------	Undeveloped B
9	Combine	68.41	3	726	360,163	6, 7, 8	------	------	Total Proposed Sub Area B(Undevelo
11	Reservoir	8.353	3	750	161,971	6	2.70	90,824	Prop B to Util Det

Hydrograph Report

Hyd. No. 6

Proposed B to Existing Utility

Hydrograph type	= SCS Runoff	Peak discharge	= 41.80 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.10 hrs
Time interval	= 3 min	Hyd. volume	= 162,088 cuft
Drainage area	= 6.560 ac	Curve number	= 98
Basin Slope	= 1.0 %	Hydraulic length	= 550 ft
Tc method	= LAG	Time of conc. (Tc)	= 9.35 min
Total precip.	= 7.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

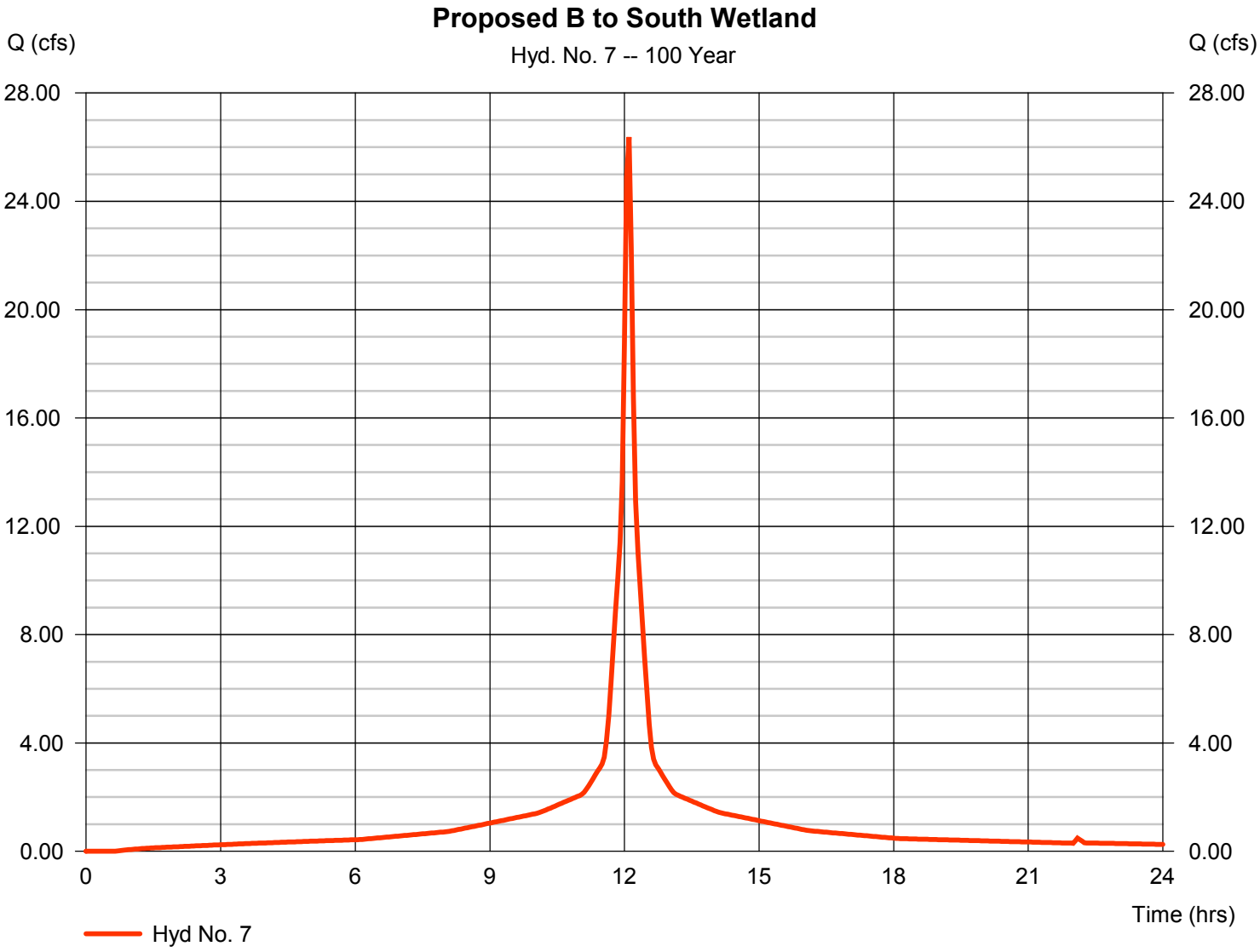


Hydrograph Report

Hyd. No. 7

Proposed B to South Wetland

Hydrograph type	=	SCS Runoff	Peak discharge	=	26.38 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.10 hrs
Time interval	=	3 min	Hyd. volume	=	102,293 cuft
Drainage area	=	4.140 ac	Curve number	=	98
Basin Slope	=	1.0 %	Hydraulic length	=	400 ft
Tc method	=	LAG	Time of conc. (Tc)	=	7.25 min
Total precip.	=	7.50 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

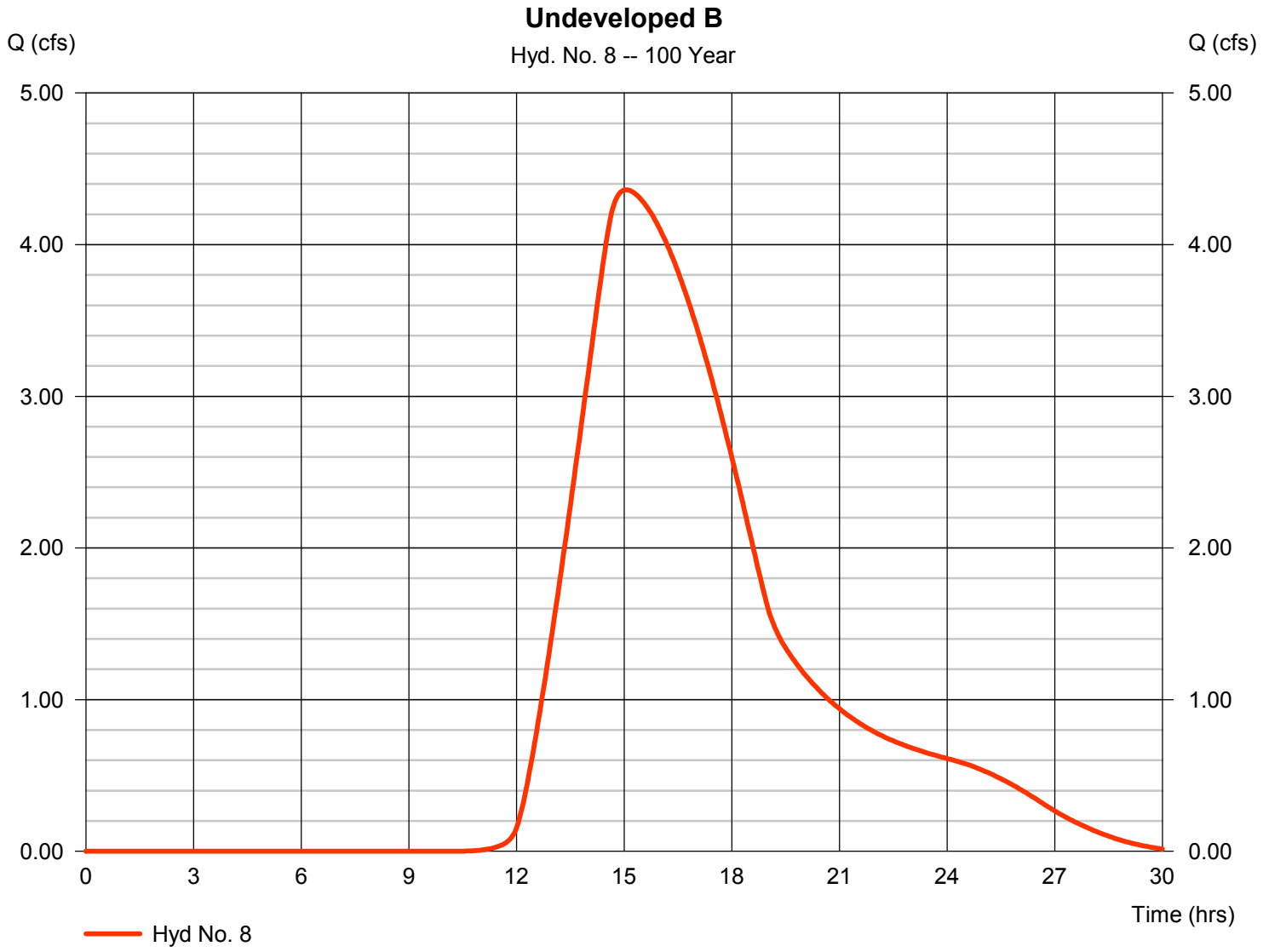


Hydrograph Report

Hyd. No. 8

Undeveloped B

Hydrograph type	= SCS Runoff	Peak discharge	= 4.362 cfs
Storm frequency	= 100 yrs	Time to peak	= 15.05 hrs
Time interval	= 3 min	Hyd. volume	= 95,782 cuft
Drainage area	= 9.600 ac	Curve number	= 58
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 266.00 min
Total precip.	= 7.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

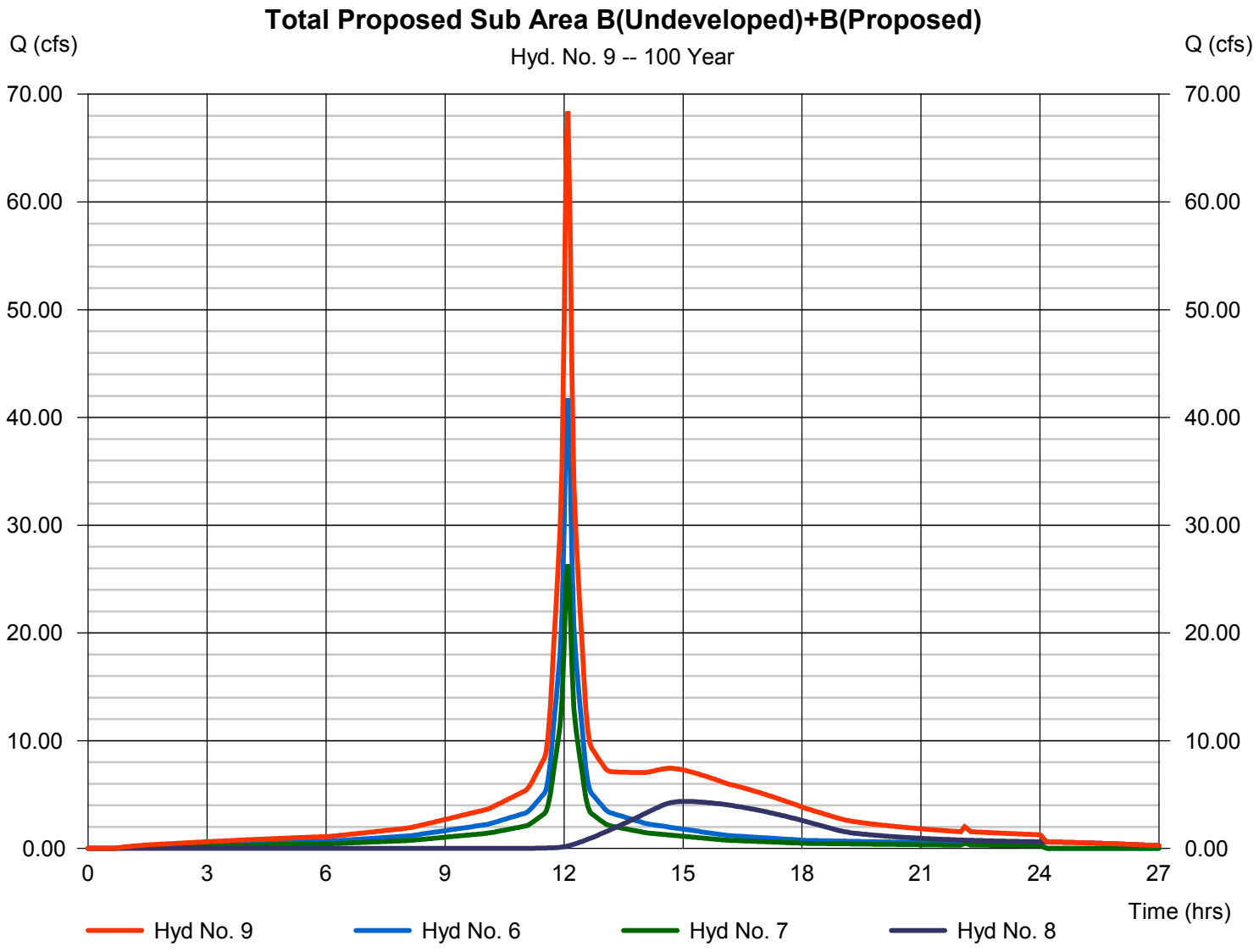


Hydrograph Report

Hyd. No. 9

Total Proposed Sub Area B(Undeveloped)+B(Proposed)

Hydrograph type	= Combine	Peak discharge	= 68.41 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.10 hrs
Time interval	= 3 min	Hyd. volume	= 360,163 cuft
Inflow hyds.	= 6, 7, 8	Contrib. drain. area	= 20.300 ac



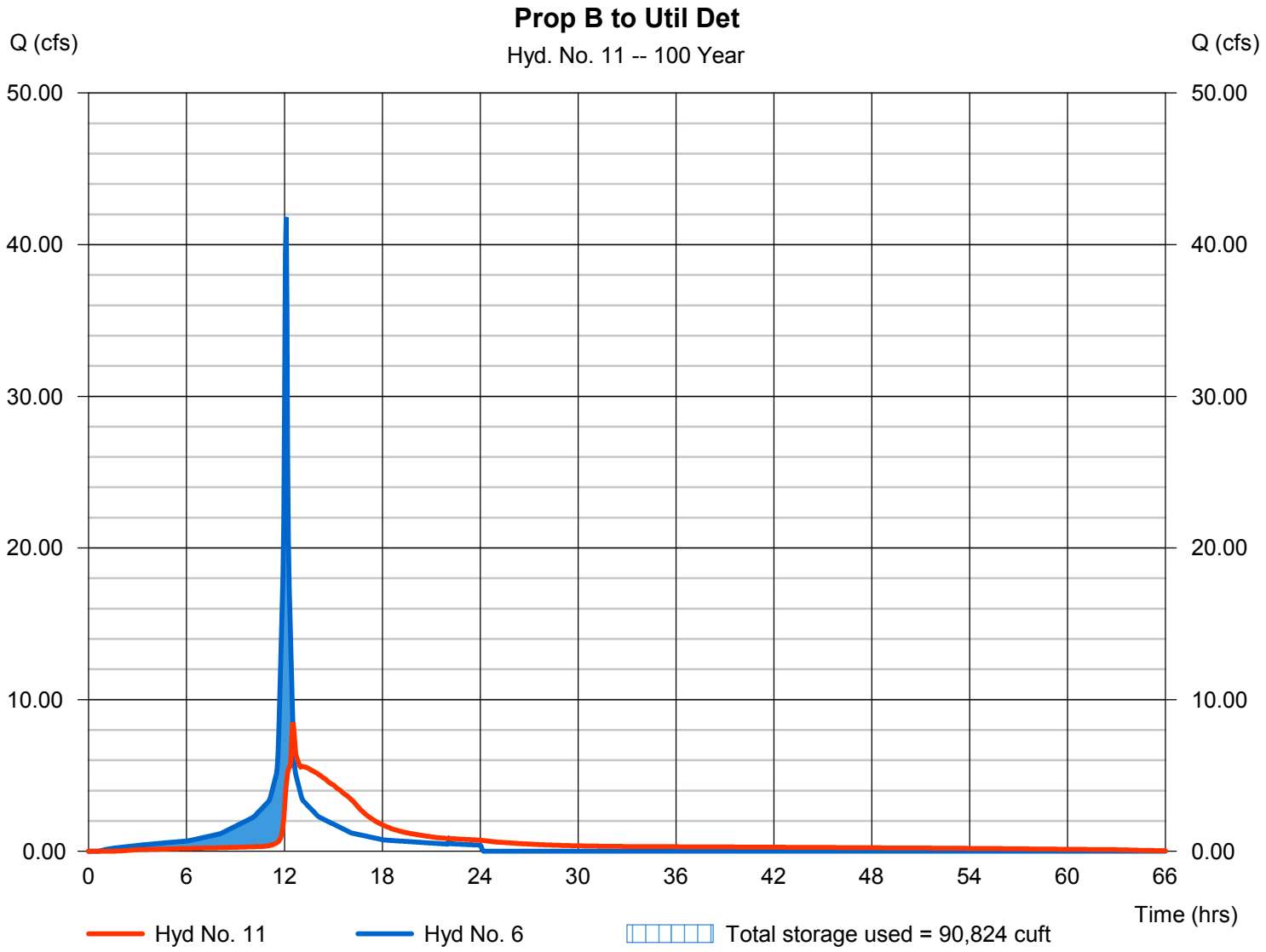
Hydrograph Report

Hyd. No. 11

Prop B to Util Det

Hydrograph type	=	Reservoir	Peak discharge	=	8.353 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.50 hrs
Time interval	=	3 min	Hyd. volume	=	161,971 cuft
Inflow hyd. No.	=	6 - Proposed B to Existing Utility	Max. Elevation	=	2.70 ft
Reservoir name	=	Underground Piping	Max. Storage	=	90,824 cuft

Storage Indication method used.



APPENDIX C

PROPOSED STORMWATER CONVEYANCE

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	MH4 to HW	11.71	24	Cir	11.843	2.06	2.12	0.507	3.70	3.35	0.52	3.35	End	Manhole
2	RL to MH4	5.44	18	Cir	185.754	2.62	3.88	0.678	3.44	4.78	n/a	4.78	1	Manhole
3	CB5 to MH4	6.35	24	Cir	63.879	2.12	2.28	0.250	3.35	3.42	0.28	3.69	1	Generic
4	MH3 to CB5	3.56	18	Cir	24.752	2.28	2.35	0.283	3.69	3.71	0.07	3.78	3	Manhole
5	MH2 to MH3	2.42	15	Cir	128.363	2.60	2.93	0.257	3.78	3.91	0.09	3.99	4	Manhole
6	CB3 to MH2	2.61	15	Cir	362.421	2.93	3.89	0.265	3.99	4.66	0.08	4.74	5	Generic
7	MH1 to CB3	0.94	12	Cir	40.159	3.89	4.00	0.274	4.74	4.76	0.03	4.80	6	Manhole
8	CB2 to MH1	0.96	12	Cir	34.985	4.00	4.09	0.257	4.80	4.81	0.02	4.83	7	Generic
9	CB1 to CB2	0.58	12	Cir	225.088	4.09	4.51	0.187	4.83	4.97	0.04	5.01	8	Generic
10	CB4 to MH3	1.67	12	Cir	22.101	2.85	2.95	0.452	3.78	3.81	0.08	3.89	4	Generic

Project File: Proposed Sewer to Outfall.stm | Number of lines: 10 | Run Date: 1/22/2016

NOTES: Return period = 25 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	11.843	0.00	1.22	0.00	0.00	1.20	0.0	16.0	5.2	11.71	17.44	5.02	24	0.51	2.06	2.12	3.70	3.35	4.85	6.21	MH4 to HW
2	1	185.754	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	5.44	9.37	5.21	18	0.68	2.62	3.88	3.44	4.78	6.21	6.91	RL to MH4
3	1	63.879	0.54	1.22	0.98	0.53	1.20	6.0	15.5	5.3	6.35	12.26	3.29	24	0.25	2.12	2.28	3.35	3.42	6.21	5.80	CB5 to MH4
4	3	24.752	0.00	0.68	0.00	0.00	0.67	0.0	15.3	5.3	3.56	6.05	2.09	18	0.28	2.28	2.35	3.69	3.71	5.80	6.16	MH3 to CB5
5	4	128.363	0.00	0.45	0.00	0.00	0.44	0.0	14.4	5.5	2.42	3.55	2.18	15	0.26	2.60	2.93	3.78	3.91	6.16	8.18	MH2 to MH3
6	5	362.421	0.29	0.45	0.98	0.28	0.44	6.0	12.0	5.9	2.61	3.60	2.82	15	0.26	2.93	3.89	3.99	4.66	8.18	6.84	CB3 to MH2
7	6	40.159	0.00	0.16	0.00	0.00	0.16	0.0	11.5	6.0	0.94	2.02	1.39	12	0.27	3.89	4.00	4.74	4.76	6.84	6.75	MH1 to CB3
8	7	34.985	0.08	0.16	0.98	0.08	0.16	6.0	11.1	6.1	0.96	1.96	1.50	12	0.26	4.00	4.09	4.80	4.81	6.75	6.94	CB2 to MH1
9	8	225.088	0.08	0.08	0.98	0.08	0.08	6.0	6.0	7.4	0.58	1.67	1.28	12	0.19	4.09	4.51	4.83	4.97	6.94	7.01	CB1 to CB2
10	4	22.101	0.23	0.23	0.98	0.23	0.23	6.0	6.0	7.4	1.67	2.60	2.26	12	0.45	2.85	2.95	3.78	3.81	6.16	6.31	CB4 to MH3

Project File: Proposed Sewer to Outfall.stm

Number of lines: 10

Run Date: 1/22/2016

NOTES:Intensity = 77.05 / (Inlet time + 12.60) ^ 0.80 ; Return period =Yrs. 25 ; c = cir e = ellip b = box

APPENDIX D

WATER QUALITY VOLUME HYDROGRAPH

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

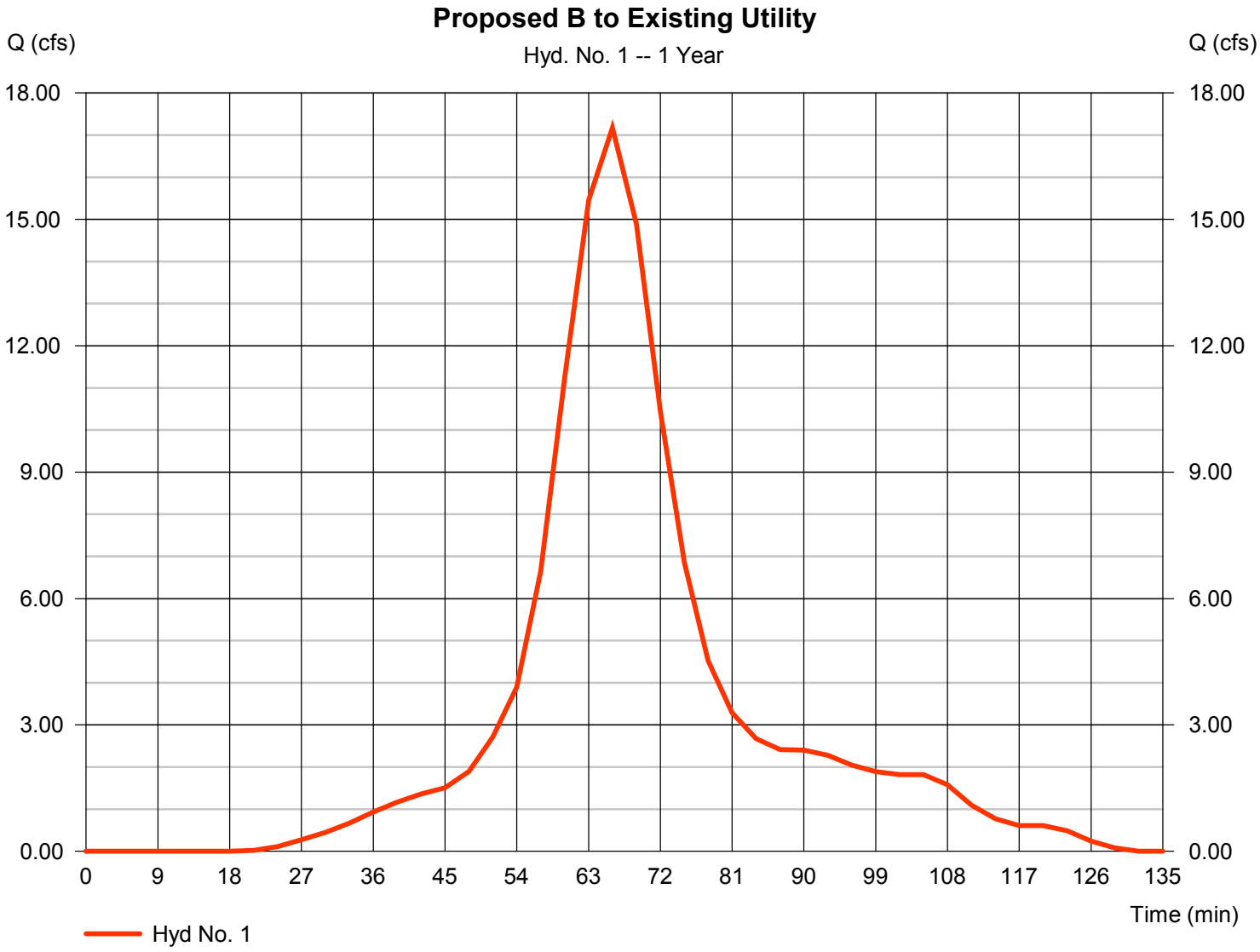
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	17.18	3	66	23,096	------	------	------	Proposed B to Existing Utility
2	SCS Runoff	10.84	3	66	14,576	------	------	------	Proposed B to South Wetland
4	Reservoir	0.297	3	126	22,979	1	1.18	21,855	Prop B to Util Det

Hydrograph Report

Hyd. No. 1

Proposed B to Existing Utility

Hydrograph type	=	SCS Runoff	Peak discharge	=	17.18 cfs
Storm frequency	=	1 yrs	Time to peak	=	66 min
Time interval	=	3 min	Hyd. volume	=	23,096 cuft
Drainage area	=	6.560 ac	Curve number	=	98
Basin Slope	=	1.0 %	Hydraulic length	=	550 ft
Tc method	=	LAG	Time of conc. (Tc)	=	9.35 min
Total precip.	=	1.25 in	Distribution	=	Custom
Storm duration	=	\\langan.com\data\NY\data4\063424\Engineering Data\Site\Hydrographs\NJD			

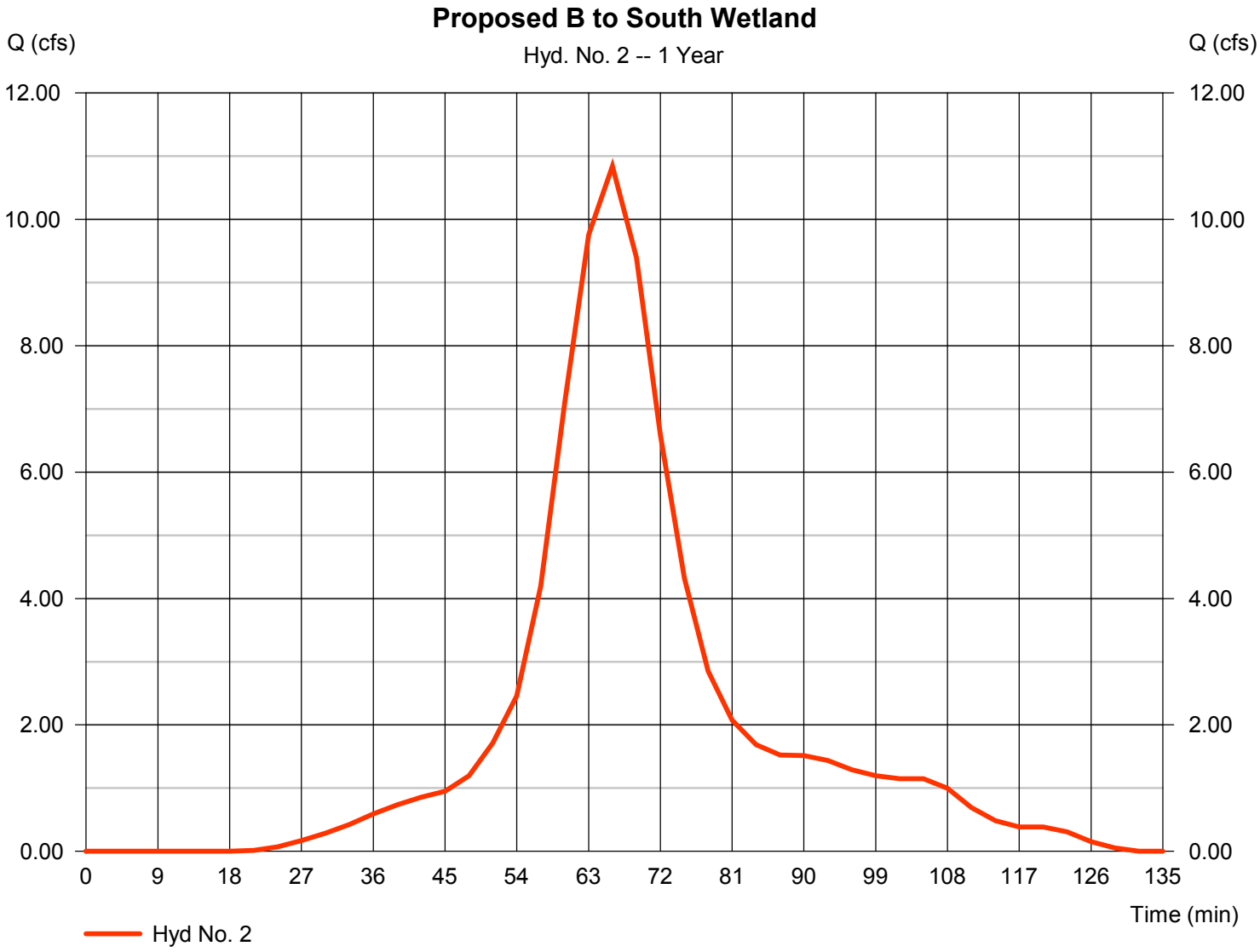


Hydrograph Report

Hyd. No. 2

Proposed B to South Wetland

Hydrograph type	=	SCS Runoff	Peak discharge	=	10.84 cfs
Storm frequency	=	1 yrs	Time to peak	=	66 min
Time interval	=	3 min	Hyd. volume	=	14,576 cuft
Drainage area	=	4.140 ac	Curve number	=	98
Basin Slope	=	1.0 %	Hydraulic length	=	400 ft
Tc method	=	LAG	Time of conc. (Tc)	=	7.25 min
Total precip.	=	1.25 in	Distribution	=	Custom
Storm duration	=	\\langan.com\data\NY\data4\0[illegible]\Engineering Data\Site\Hydrographs\NJD			



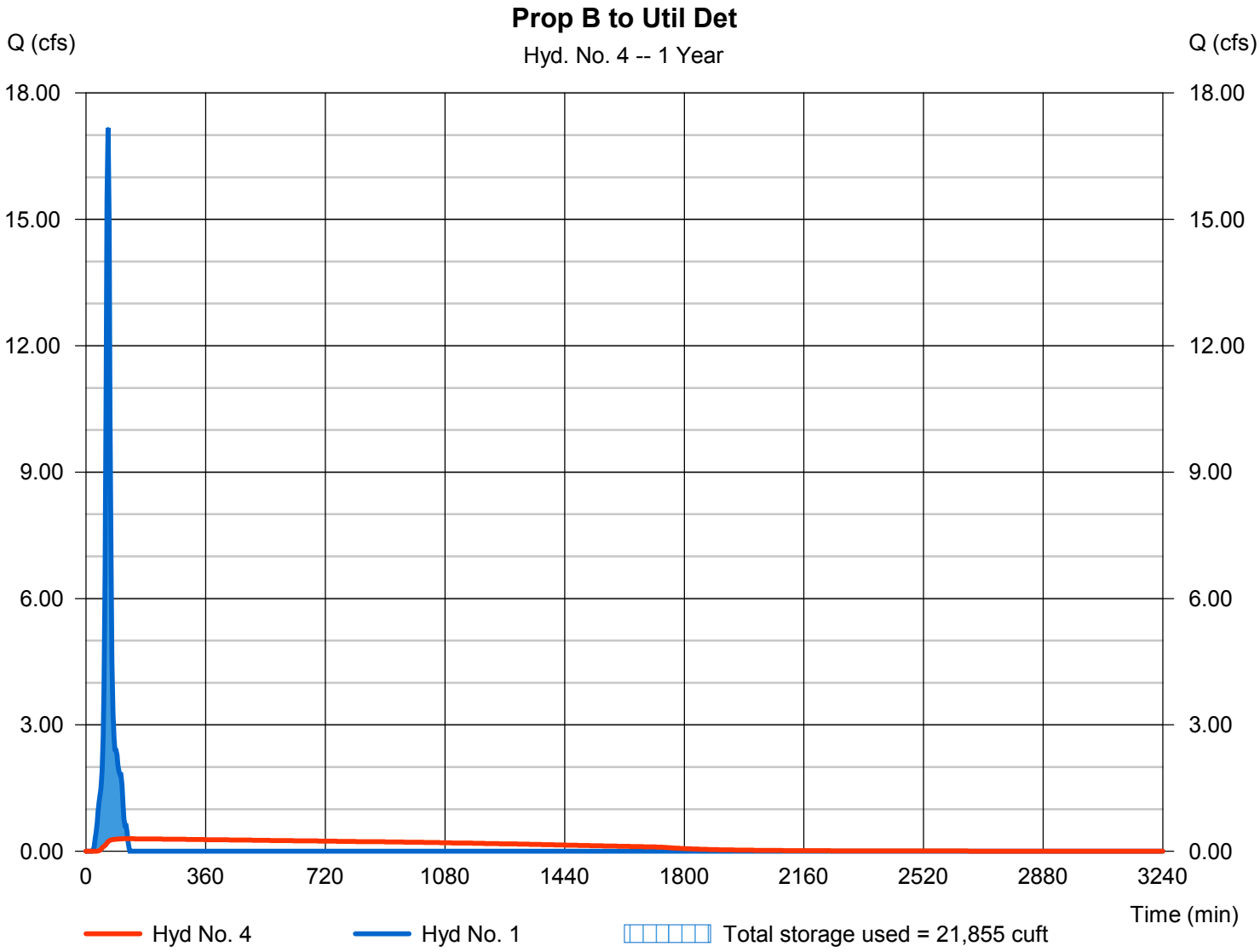
Hydrograph Report

Hyd. No. 4

Prop B to Util Det

Hydrograph type	=	Reservoir	Peak discharge	=	0.297 cfs
Storm frequency	=	1 yrs	Time to peak	=	126 min
Time interval	=	3 min	Hyd. volume	=	22,979 cuft
Inflow hyd. No.	=	1 - Proposed B to Existing Utility	Max. Elevation	=	1.18 ft
Reservoir name	=	Underground Piping	Max. Storage	=	21,855 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - Underground Piping

Pond Data

UG Chambers -Invert elev. = 0.43 ft, Rise x Span = 2.00 x 2.00 ft, Barrel Len = 355.00 ft, No. Barrels = 82, Slope = 0.10%, Headers = No

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	0.43	n/a	0	0
0.24	0.67	n/a	1,518	1,518
0.47	0.90	n/a	7,139	8,657
0.71	1.14	n/a	10,874	19,531
0.94	1.37	n/a	12,715	32,246
1.18	1.61	n/a	13,500	45,745
1.41	1.84	n/a	13,521	59,266
1.65	2.08	n/a	12,689	71,955
1.88	2.31	n/a	10,868	82,823
2.12	2.55	n/a	7,134	89,957
2.36	2.79	n/a	1,513	91,470

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	4.00	20.00	0.00
Span (in)	= 24.00	4.00	20.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 0.43	0.43	1.25	0.00
Length (ft)	= 38.00	0.50	0.50	0.00
Slope (%)	= 0.25	0.10	0.10	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

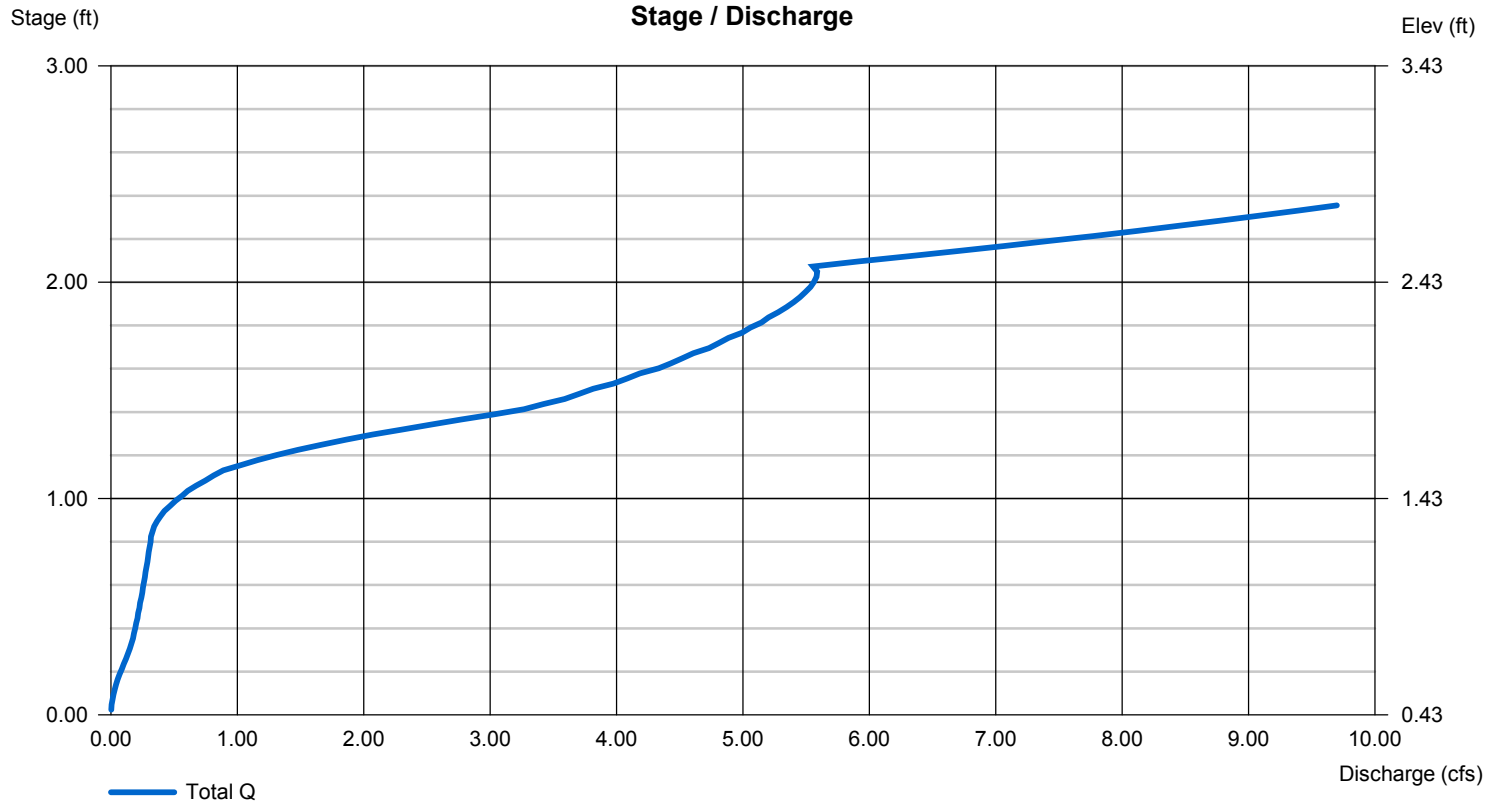
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 2.30	Inactive	Inactive	Inactive
Crest El. (ft)	= 1.55	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	Rect	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



APPENDIX E

CONTECH JELLYFISH CERTIFICATION

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION
Bureau of Nonpoint Pollution Control
Division of Water Quality
401-02B
Post Office Box 420
Trenton, New Jersey 08625-0420
609-633-7021 Fax: 609-777-0432
http://www.state.nj.us/dep/dwq/bnpc_home.htm

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

BOB MARTIN
Commissioner

May 14, 2012

Joel Garbon
Product Manager
7564 Standish Place
Suite 112
Rockville, MD 20855

Re: Final Certification
Jellyfish® Filter by Imbrium Systems

Expiration Date: December 1, 2016
TSS Removal Rate: 80%

Dear Mr. Garbon:

The Stormwater Management rules under N.J.A.C. 7:8-5.5(b) and 5.7(c) allow the use of manufactured treatment devices (MTDs) for compliance with the design and performance standards at N.J.A.C. 7:8-5 if the pollutant removal rates have been verified by the New Jersey Corporation for Advanced Technology (NJCAT) and have been certified by the New Jersey Department of Environmental Protection (NJDEP). Imbrium Systems. has requested a Final Certification for the Jellyfish® Filter.

This project falls under the "Transition for Manufactured Treatment Devices July 15, 2011". The Jellyfish Filter by Imbrium Systems qualified for Category C. Manufactured Treatment Devices Seeking Final Certifications - In Process which are MTDs that have commenced field testing on or before August 1, 2011.

NJDEP received the required information from signed statement sby the NJCAT Technical Director and the manufacturer listing the indicating that the requirements of the 2009 NJDEP Field Testing Protocols have been met or exceeded. NJDEP also received a signed statement from the third party testing entity, University of Florida, indicating that the testing requirements have been met or exceeded. The NJCAT letter also includes a recommended certification TSS removal rate and the required maintenance plan.

The NJDEP certifies the use of the Jellyfish Filter by Imbrium Systems at TSS removal rate of 80%, subject to the following conditions:

1. The Jellyfish Filter is designed according to the NJ Water Quality Design Storm in N.J.A.C. 7:8-5.5.
2. The peak inflow of the water quality design storm is limited to the following:

For each hi-flow cartridge, the maximum inflow is 1.48 gpm and a maximum inflow drainage area is 0.012 impervious acres, for each inch of cartridge length.

For each draindown cartridge, the maximum inflow 0.74 gpm and the maximum inflow drainage area is 0.006 impervious acres for each inch of cartridge length.

Example: For a 54-inch hi-flo cartridge length, the maximum inflow is 80 gpm and the maximum inflow drainage area is 0.65 impervious acres.

Maximum treatment flow rates for typical Jellyfish Filter models are provided in Table 1.

Maximum treatment flow rates and maximum inflow drainage areas for various cartridge lengths are provided in Table 2.

3. The bottom of the Jellyfish tentacles is a minimum of 2 feet above the bottom of the vault. The sedimentation area in the vault shall be a minimum of 4 ft^2 per cartridge.
4. The Jellyfish Filter is certified as an off-line system only.
5. The Jellyfish Filter cannot be used in series with a settling chamber (such as a hydrodynamic separator) or a media filter (such as a sand filter), to achieve an enhanced removal rate for total suspended solids (TSS) removal under N.J.A.C. 7:8-5.5.
6. The maintenance plan for sites using this device shall incorporate, at a minimum, the maintenance requirements for the Jellyfish Filter shown in Appendix A below.

In addition to the attached, any project with a Stormwater BMP subject to the Stormwater Management Rules, N.J.A.C. 7:8, must include a detailed maintenance plan. The detailed maintenance plan must include all of the items identified in Stormwater Management Rules, N.J.A.C. 7:8-5.8. Such items include, but are not limited to, the list of inspection and maintenance equipment and tools, specific corrective and preventative maintenance tasks, indication of problems in the system, and training of maintenance personnel. Additional information can be found in Chapter 8: Maintenance of the New Jersey Stormwater Best Management Manual.

NJDEP anticipates proposing further adjustments to this process through the readoption of the Stormwater Management Rules. Additional information regarding the implementation of the Stormwater Management Rules, N.J.A.C. 7:8, are available at www.njstormwater.org. If you have any questions regarding the above information, please contact Ms. Sandra Blick of my office at (609) 633-7021.

Sincerely,



Ed Frankel, P.P., Section Chief
Bureau of Nonpoint Pollution Control

C: Chron File
Richard Magee, NJCAT
Mark Pedersen, DLUR
Elizabeth Dragon, BNPC

APPENDIX F

RIP RAP APRON

Based on "Standards for Soil Erosion and Sediment Control in New Jersey," dated 1999

TABLE 12-1 ALLOWABLE VELOCITIES FOR VARIOUS SOILS

SOIL TEXTURE	ALLOWABLE VELOCITY (ft./sec.)
1. Sand	1.8
2. Sandy Loam	2.5
3. Silt loam (also high lime clay), loam	3.0
4. Sandy clay loam	3.5
5. Clay loam	4.0
6. Clay, fine gravel, gradded loam to gravel	5.0
7. Cobbles	5.5
8. Shale (non-weathered)	6.0

Soil type where outfall is located = 1 (Note: Select number designating soil texture above)
allowable velocity = 1.8 ft/sec
v (velocity) = 6.91 ft/sec from Storm Sewer Conveyance
Rip Rap Apron required? yes (1 = yes, 0 = no)

Given:

D_o (max inside height) = 2 feet
W_o (max inside width) = 2 feet
Q (discharge) = 12.38 cfs (25-year Storm) from 25-yr basin outfall hydrograph
*q (unit discharge, = Q/W_o) = 6.2 cfs / foot
** T_w (tail water) = 0.20 feet

* for the conduit design storm or the 25 year storm, whichever is greater
** for areas where T_w cannot be computed, use $T_w = 0.2\ D_o$. For discharge into detention basins, Tw shall equal the 2 year storm elevation in the basin.

Riprap Apron Dimensions

I. The length of the apron, L (in feet), shall be determined from the formula:

$$L_a = (1.8\frac{q}{D_o^{1/2}}) + 7D_o$$

$T_w < ½\ D_o$ **L_a = 22 feet**

$$L_a = 3\frac{q}{D_o^{1/2}}$$

$T_w > ½\ D_o$ L_a = 0 feet

II. Where there is no well-defined channel immediately downstream of the apron, the width, W, of the outlet end of the apron shall be as follows:

For tailwater elevation greater than or equal to the elevation of the center of the pipe,

$$W = 3W_o + 0.4L_a$$

W = 0 feet

For tailwater elevation less than the elevation of the center of the pipe,

$$W = 3W_o + L_a$$

W = 28 feet

Where L_a is the length of the apron determined from the formula and W_o is the culvert width.

LANGAN ENGINEERING & ENVIRONMENTAL SERVICES
River Drive Center 1 Elmwood Park, NJ
P: 201.794.6900 F: 201.794.0366
NJ Certificate of Authorization No: 24GA27996400

Project: **Outlet Protection 8 (Headwall-1)**
RIP-RAP APRON DESIGN CALCULATIONS
PROJECT X
ROBBINSVILLE TOWNSHIP, MERCER COUNTY, NEW JERSEY

Project No.	Date:	By:	Ckd:	Sheet. No.
100335101	10/11/2013	MRG		1 of 2

Riprap Median Stone Diameter

The median stone diameter $D_{50} = \frac{0.016}{T_w} q^{1.33}$ ermined from the formula:

Where $q = Q/D_o$

For Horizontal Apron:

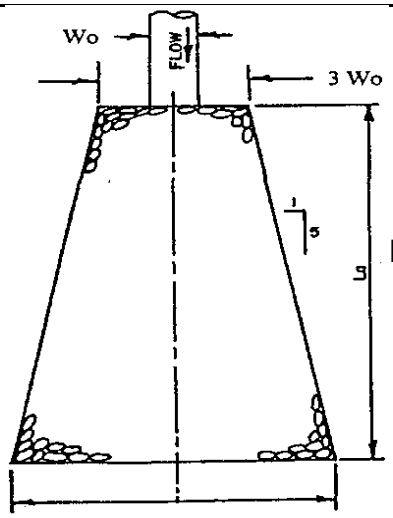
D_{50} = 0.90 feet *OR* **D_{50} = 10.8 inches**

Note: For discharge into Detention Basins, analyze the hydraulic characteristics of the basin for the design storm to determine the combination of conduit discharge and tailwater that results in the largest required D50 stone size. 3 inch minimum.

Riprap Lining Thickness

The thickness of riprap lining shall meet at least one of the following criteria:

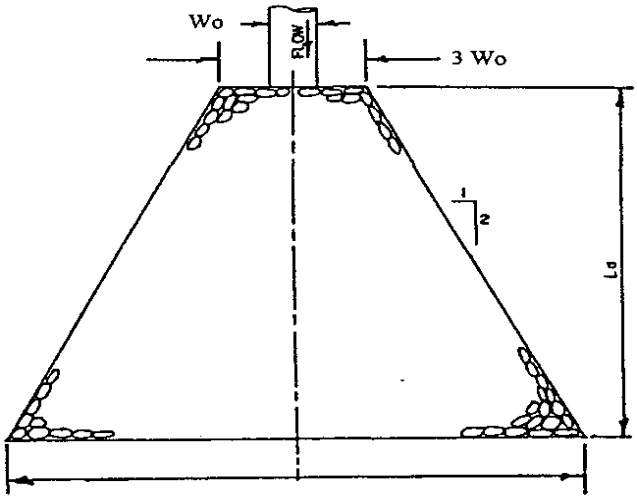
1. A thickness of at least three times the D_{50} size if a filter layer is not used. t = 32.5 inches
2. A thickness of at least two times the D_{50} size if a filter layer is used. **t = 22.0 inches**



For tailwater elevation greater than or equal to the elevation of the center of the pipe

L_a = 0 feet

W= 0 feet



For tailwater elevation less than the elevation of the center of the pipe

L_a = 22

W= 28

LANGAN
ENGINEERING & ENVIRONMENTAL SERVICES
River Drive Center 1 Elmwood Park, NJ
P: 201.794.6900 F: 201.794.0366
NJ Certificate of Authorization No: 24GA27996400

Project: **Outlet Protection 8 (Headwall-1)**

RIP-RAP APRON DESIGN CALCULATIONS

PROJECT X

ROBBINSVILLE TOWNSHIP, MERCER COUNTY, NEW JERSEY

Project No.	Date:	By:	Ckd:	Sheet. No.
100335101	10/11/2013	MRG	0	2 of 2

APPENDIX G

GROUNDWATER RECHARGE

New Jersey Groundwater Recharge Spreadsheet
Version 2.0
November 2003

Annual Groundwater Recharge Analysis (based on GSR-32)

Select Township ↓	Average Annual P (in)	Climatic Factor
BERGEN CO., MOONACHIE BORO	42.9	1.39

Project Name:	**First Aviation Service Expansion**
Description:	**Recharge Assessment**
Analysis Date:	**09/05/15**

Pre-Developed Conditions

Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	10.7	Open space	Udorthents	0.0	-
2	0				
3	0				
4	0				
5	0				
6	0				
7	0				
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	10.7			Total Annual Recharge (in)	Total Annual Recharge (cu-ft)
				0.0	-

Post-Developed Conditions

Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	10.7	Impervious areas	Urban Land*	0.0	-
2	0				
3	0				
4	0				
5	0				
6	0				
7	0				
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	10.7			Total Annual Recharge (in)	Total Annual Recharge (cu.ft)
				0.0	-

Annual Recharge Requirements Calculation ↓

% of Pre-Developed Annual Recharge to Preserve =	100%	Total Impervious Area (sq.ft)	466,092
Post-Development Annual Recharge Deficit=	*0*	(cubic feet)	

Recharge Efficiency Parameters Calculations (area averages)

RWC=	0.00	(in)	DRWC=	0.00	(in)
ERWC =	0.00	(in)	EDRWC=	0.00	(in)

Procedure to fill the Pre-Development and Post-Development Conditions Tables

For each land segment, first enter the area, then select TR-55 Land Cover, then select Soil. Start from the top of the table and proceed downward. Don't leave blank rows (with A=0) in between your segment entries. Rows with A=0 will not be displayed or used in calculations. For impervious areas outside of standard lots select "Impervious Areas" as the Land Cover. Soil type for impervious areas are only required if an infiltration facility will be built within these areas.

APPENDIX H

STORMWATER MAINTENANCE REPORT

STORMWATER MAINTENANCE REPORT

for

First Aviation Services, Expansion Project

Block 76, Lot 1.02
Borough of Moonachie
Bergen County, New Jersey

Prepared For:

Port Authority of New York and New Jersey
Newark Liberty International Airport
Conrad Road, Building #1
Newark, New Jersey 07114

First Aviation Services
d/b/a Signature Flight Support Corporation
Teterboro Airport
101 Charles Lindberg Drive
Teterboro, New Jersey 07074

Prepared By:

Langan Engineering & Environmental Services, Inc.
21 Penn Plaza
360 W 31st Street, 8th Floor
New York, NY 10001

21 January 2016
1642424

LANGAN

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Appendix B	Jellyfish Filter Owner's Manual

INTRODUCTION

This manual addresses the operation and maintenance components of the stormwater management facilities for the First Aviation Services Expansion, Borough of Moonachie, New Jersey, to ensure their effective, efficient, and enduring service. This plan contains preventative and corrective maintenance tasks and procedures.

The party responsible for the preventative and corrective maintenance of the stormwater measures described herein is:

First Aviation Services
d/b/a Signature Flight Support Corporation
Teterboro Airport
Charles Lindberg Drive
Teterboro, New Jersey 07074

PROJECT DESCRIPTION

First Aviation Services (FAS) is proposing to expand its facilities onto about 10.5 acres within a proposed 16.7-acre lease area. The project includes the construction of two 40,000-square-foot hangars, two 7,500-square-foot offices, 280,000 square feet of apron and 16,600 square feet of vehicle parking (84 spaces). The apron needs to extend to the existing Taxiways "N" and "G" to give planes access to and from the runways. Parking-lot construction will add 84 vehicle spaces for pilots, flight attendants, mechanics, dispatchers, passengers and vendors. A new road is proposed to provide access from existing hangars and parking areas located to the southwest.

Stormwater runoff generated from the new impervious area will be conveyed to a proposed storm sewer system located beneath the apron, parking lot and access road. The 6.56 acres of stormwater runoff from the apron area north of hangars will be collected and detained in proposed Contech chambers and routed to a proposed Contech Jellyfish treatment unit. The stormwater will then be conveyed to the existing stormwater system located in the adjacent apron. The 4.14 acres of stormwater runoff south of hangers will be collected and conveyed to a proposed Contech Jellyfish treatment unit located in the parking lot prior to being discharged to the southern wetlands through a new outfall and rip rap apron.

STORMWATER MAINTENANCE OBJECTIVE

This maintenance plan has been prepared to ensure that the stormwater management facilities in place are operating efficiently and reliably. The responsible party shall ensure the long-term/perpetual operation, maintenance, repair, and safety of the stormwater management facilities.

Maintenance procedures are required to maintain safe operation of the stormwater management facility by reducing the occurrence of problems and malfunctions. To be effective, maintenance shall be performed on a regular basis and include such routine procedures as training of staff, periodic inspections, silt and debris removal, and review of maintenance and inspection work to identify where the maintenance program could be more effective.

Repair procedures may be required to correct problems or malfunctions of stormwater management facilities and to restore the intended means of operation and safe condition of the facilities. Based upon the severity of the problem, repairs shall be performed on an as-needed or emergency basis which may include procedures such as structural repairs, mosquito control, removal of debris, sediment and trash which threaten discharge capacity, erosion repair, snow and ice removal, and restoration of vegetation.

In the event that the stormwater management facility becomes a danger to public safety or public health, or if it is in need of maintenance, the municipality may notify the responsible party in writing. Upon receipt of that notice, the responsible person shall have fourteen (14) days to initiate maintenance and repair of the facility in a manner that is approved by the Municipal Engineer or their designee. If the responsible party fails or refuses to perform such maintenance and repair, the municipality may immediately proceed to do so and shall invoice the cost thereof to the responsible party.

MAINTENANCE OF CONVEYANCE SYSTEMS AND UNDERGROUND DETENTION

Conveyance systems, including inlets and pipes, are expected to receive and/or accumulate debris and sediment. These systems must be inspected for clogging and excessive debris and sediment accumulation at least annually, as well as after every storm exceeding 1-inch of rainfall. Sediment removal should take place when all runoff has drained from the conveyance network and the systems are reasonably dry. Disposal of debris, trash, sediment, and other waste material shall be done at suitable disposal/recycling sites and in compliance with all applicable local, county, state and federal waste regulations.

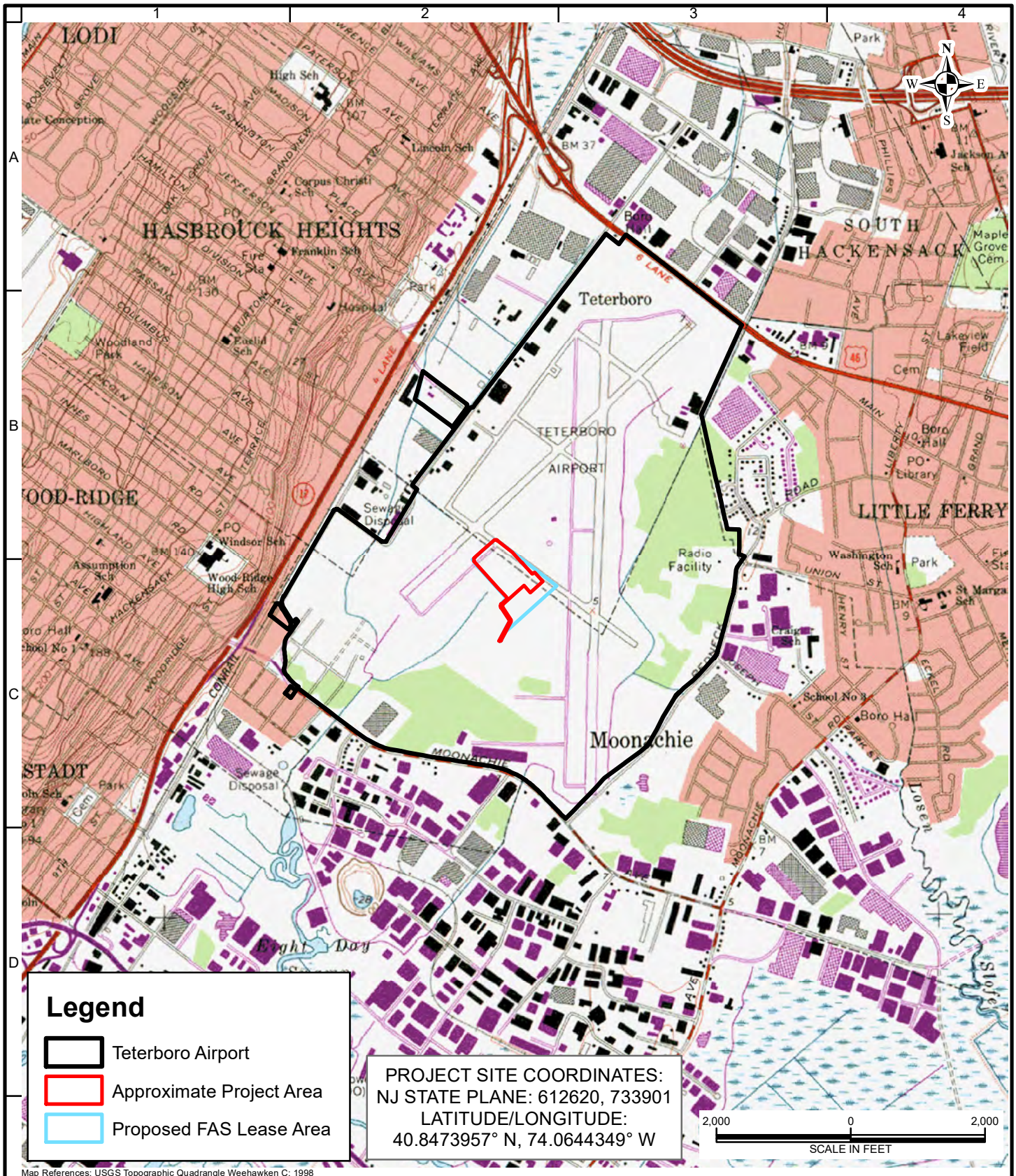
All structural components must be inspected for cracking, subsidence, breaching, wearing, and deterioration at least annually. The condition of surrounding above ground areas shall be inspected for evidence of potential failures or deterioration of buried stormwater facilities.

The routine equipment expected to be utilized for the maintenance tasks include a jet vacuum vehicle, shovels, lighting equipment, and a wheel barrow or truck for the hauling of debris. Water and concrete repair materials may also be required depending on the condition of the structures. Instructions or user manuals for these components were not available from the manufacturer. The cost to perform routine maintenance tasks including inspection of the facilities and removal of debris, sediment and trash is estimated to be $2,000 per year.

Detention outlet structures and headwalls shall be inspected for cracking, subsidence, breaching, wearing, and deterioration at least annually. The integrity of all outlet structure hardware including grates, nut and bolt connections, hinges and locks shall be inspected. The condition of the ground surface above the outlet pipe shall be inspected for evidence of potential failures or deterioration of the pipe. Structural damage to the outlet structure, trash racks, and headwalls shall be repaired promptly. The analysis of structural damage and the design and performance of structural repairs should only be undertaken by qualified personnel.

MAINTENANCE OF JELLYFISH UNIT

Please refer to Appendix B for the Jellyfish maintenance and inspection procedures.



Map References: USGS Topographic Quadrangle Weehawken C: 1998

LANGAN

300 Kimball Drive
Parsippany, NJ 07054
T: 973.560.4900 F: 973.560.4901 www.langan.com

Langan Engineering & Environmental Services, Inc.
Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C.
Langan International LLC
Collectively known as Langan

NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project
FIRST AVIATION SERVICES EXPANSION
BLOCK 76, LOT 1.02
BOROUGH OF MOONACHIE
& BLOCK 203, LOT 1
BOROUGH OF TETERBORO
BERGEN COUNTY NEW JERSEY

Drawing Title
USGS SITE LOCATION MAP

Project No.	001642424
Date	3/4/2016
Scale	1"= 2,000'
Drawn By	MWen
Figure	1

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Path: \\langan.com\data\NY\data4\001642424\ArcGIS\ArcMap_Documents\NJDEP Multi-Permit\Figure 1 - USGS.mxd

First Aviation Services Expansion, Borough of Moonachie, New Jersey
Block 76, Lot 1.02
Figure 2- Stormwater Maintenance Schedule
1642424
22-Jan-2016

Facility	What to Inspect For	Frequency of Inspections
Conveyance Systems (Inlets and Pipes)	Clogging, excessive debris, and sediment accumulation; cracking, subsidence, breaching, wearing, and deterioration of structural components	Annually and after every storm exceeding 1-inch of rainfall when the systems are dry
Jellyfish Unit	Clogging, excessive debris, oil/grease and sediment accumulation within the system; cracking, subsidence, breaching, wearing, and deterioration of structural components; dirty or damaged cartridges;overall condition, flow bypass, odors outside facility	Annually, after major storm events, and after a chemical spill; assess cartridges during a storm; filter cartridges should be replaced every 3 years

APPENDIX A

Conveyance and Detention Systems Maintenance and Inspection Logs

MAINTENANCE LOG
FOR CONVEYANCE AND DETENTION SYSTEMS

FIRST AVIATION SERVICES EXPANSION
MOONACHIE, NEW JERSEY

INSTRUCTIONS:
THIS LOG SHALL BE UPDATED TO INCLUDE ALL MAINTENANCE PERFORMED AT A SPECIFIC STORMWATER MEASURE.

DATE	PERSON CONDUCTING MAINTENANCE	AREA OF MAINTENANCE	PROBLEM(S) FOUND	ACTION(S) TAKEN

MAINTENANCE INSPECTION FOR CONVEYANCE AND DETENTION SYSTEMS

FIRST AVIATION SERVICES EXPANSION MOONACHIE, NEW JERSEY

NOTE: INSPECTIONS TO BE PERFORMED DURING A PERIOD OF DRY WEATHER.

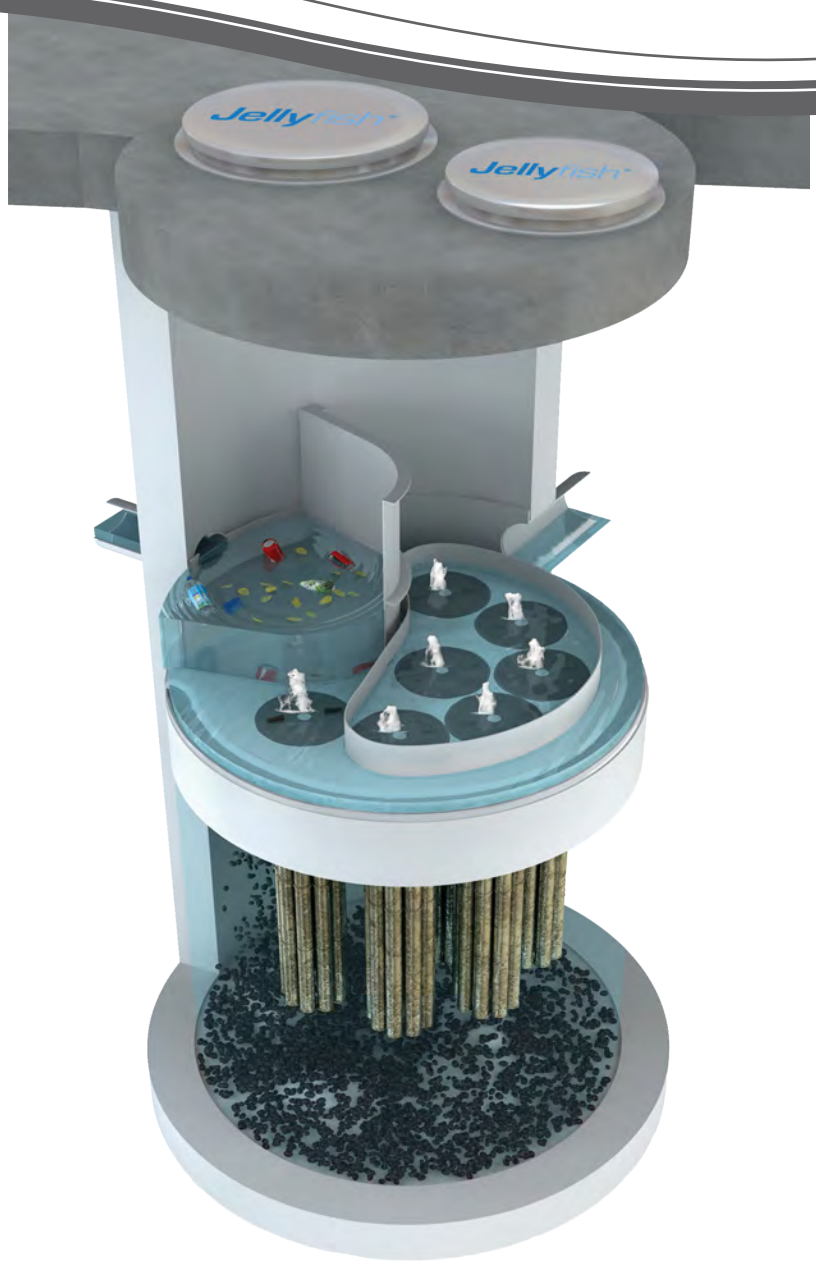
Yes	No	Maintenance Evaluation	Action(s) Required if Answer "Yes"
❑	❑	Is there a buildup of sediment (in excess of 3 inches), trash, debris or any other stormwater pollution?	Remove sediment and evaluate on-site upstream systems. Dispose debris in accordance with local, county, state and federal requirements.
❑	❑	Is there standing water?	Evaluate downstream systems for clogging or trash sediment buildup.
❑	❑	Is there any structural failure?	Consult engineer to determine safety and/or stability of the system.
❑	❑	Are there visible signs of cracking, subsidence, erosion or deterioration of any of the storm conveyance systems?	Consult engineer to determine safety and/or stability of the system.
❑	❑	Are there any root intrusions or any other vegetation within catch basins?	Remove roots and dispose vegetation in accordance with local, county, state and federal requirements.
❑	❑	Are ladder rungs in catch basins or manholes damaged, missing or misaligned?	Repair or replace.
❑	❑	Are grates or covers missing, damaged or only partially in place at any catch basin or manhole?	Repair or replace.
❑	❑	Does the existing maintenance program need to be amended to provide a more effective maintenance program?	Address suggested changes to the responsible party for the stormwater maintenance facility.
❑	❑		
❑	❑		

APPENDIX B

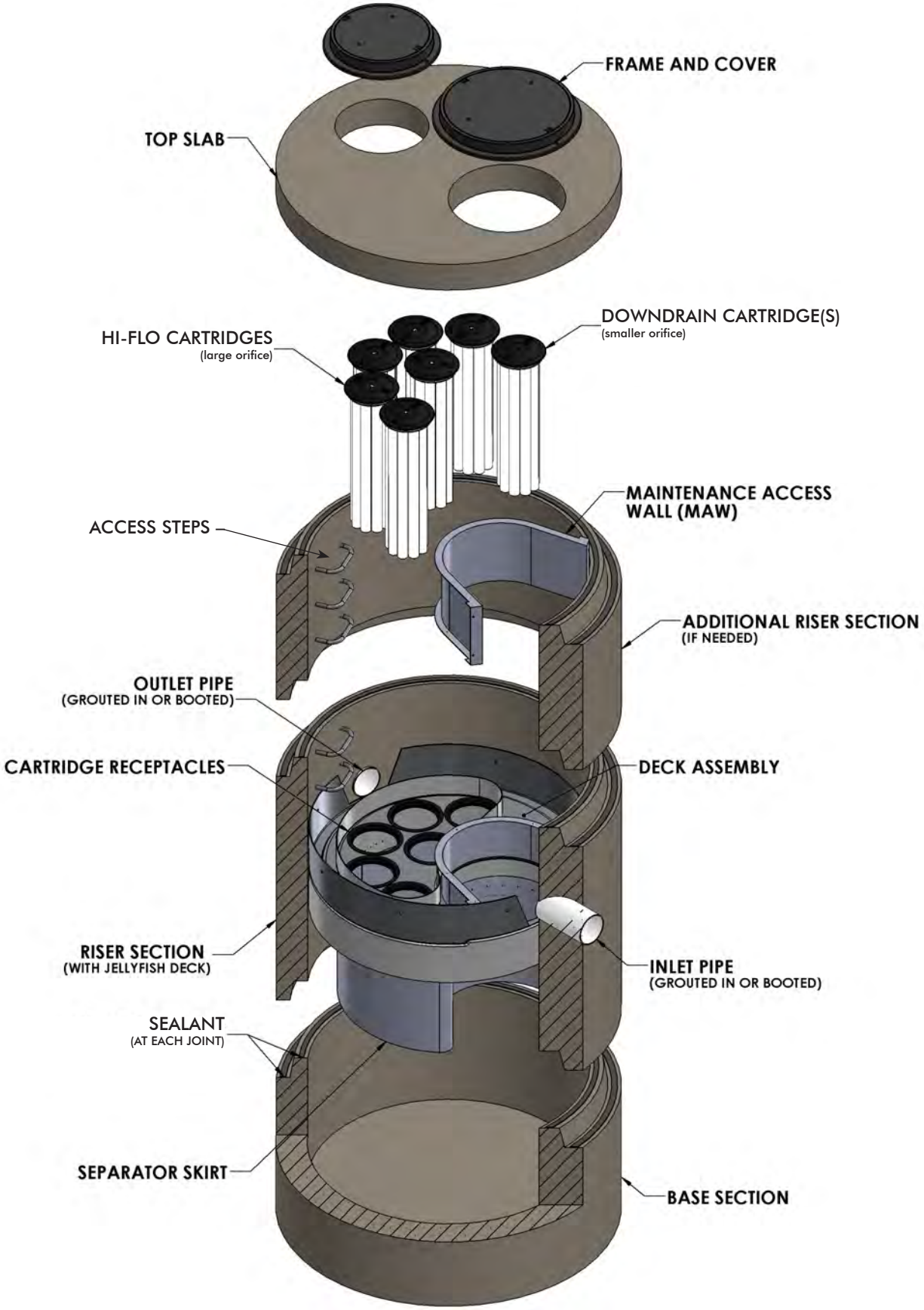
Contech Jellyfish Inspection and Maintenance Procedures

Jellyfish® Filter

Jellyfish® Filter Owner's Manual



CONTECH®
ENGINEERED SOLUTIONS


FRAME AND COVER
TOP SLAB
DOWNDRAIN CARTRIDGE(S)
(smaller orifice)
HI-FLO CARTRIDGES
(large orifice)
MAINTENANCE ACCESS
WALL (MAW)
ACCESS STEPS
ADDITIONAL RISER SECTION
(IF NEEDED)
OUTLET PIPE
(GROUTED IN OR BOOTED)
CARTRIDGE RECEPTACLES
DECK ASSEMBLY
RISER SECTION
(WITH JELLYFISH DECK)
INLET PIPE
(GROUTED IN OR BOOTED)
SEALANT
(AT EACH JOINT)
SEPARATOR SKIRT
BASE SECTION

WARNINGS / CAUTION

1. FALL PROTECTION may be required.
2. WATCH YOUR STEP
   Attentive care must be taken while standing on the deck.
3. SLIPPERY WHEN WET.
4. If the Top Slab, Covers or Hatches have not yet been installed, or are removed for any reason, great care must be taken to NOT DROP ANYTHING ONTO THE JELLYFISH FILTER DECK.
   Cartridge Receptacle Rings can be damaged under high impact loads. *This type of activity voids all warranties. All damaged items to be replaced at owner's expense*.
5. Maximum deck load 2 persons, total weight 225 lbs. per person.

Safety Notice

Jobsite safety is a topic and practice addressed comprehensively by others. The inclusions here are intended to be reminders to whole areas of Safety Practice that are the responsibility of the Owner(s), Manager(s) and Contractor(s). OSHA and Canadian OSH, and Federal, State/Provincial, and Local Jurisdiction Safety Standards apply on any given site or project. The knowledge and applicability of those responsibilities is the Contractor's responsibility and outside the scope of Contech Engineered Solutions.

Secure all equipment and perform all training to meet applicable local and OSHA
space entry. It is the Contractor's or entry personnel's responsibility to proceed safely at all times.

Personal Safety Equipment

Contractor is responsible to provide and wear appropriate personal protection equipment as needed including, , gloves and fall protection equipment as necessary. Make sure all equipment is , and all equipment is checked for proper operation and safety features prior to use.

- Fall protection equipment
- Eye protection
- Safety boots
- Ear protection
- Gloves
- Ventilation and respiratory protection
- Hard hat
-

Thank Y **® Filter!**

s

ongoing, high levels of stormwater pollutant removal.

If you have any questions, please feel free to call us or e-mail us at info@conteches.com.com.

Contech Engineered Solutions
9025 Centre Pointe Drive, Suite 400
West Chester, OH 45069
Phone: 800-338-1122
www.ContechES.com

U.S. Patent No. 8,123,935; U.S. Patent No. 8,287,726; U.S. Patent No. 8,221,618
Australia Patent No. 2008,286,748
Canadian Patent No. 2,696,482
Korean Patent No. 10-1287539
New Zealand Patent No. 583,461; New Zealand Patent No. 604,227
South African Patent No. 2010,01068
**other patents pending*

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easily inspect, maintain and order parts for your system.

Owner Name:	
Phone Number:	
Site Address:	
Site GPS Coordinates/unit location:	
Unit Location Description:	
Cartridge Installation Date:	
No. of Hi-Flo Cartridges	
Length of Hi-Flo Cartridges:	
No. of Draindown Cartridges:	
Length of Draindown Cartridges:	
No. of Blank Cartridge Lids:	
Online System (Yes/No):	
es/No):	

Notes:

.

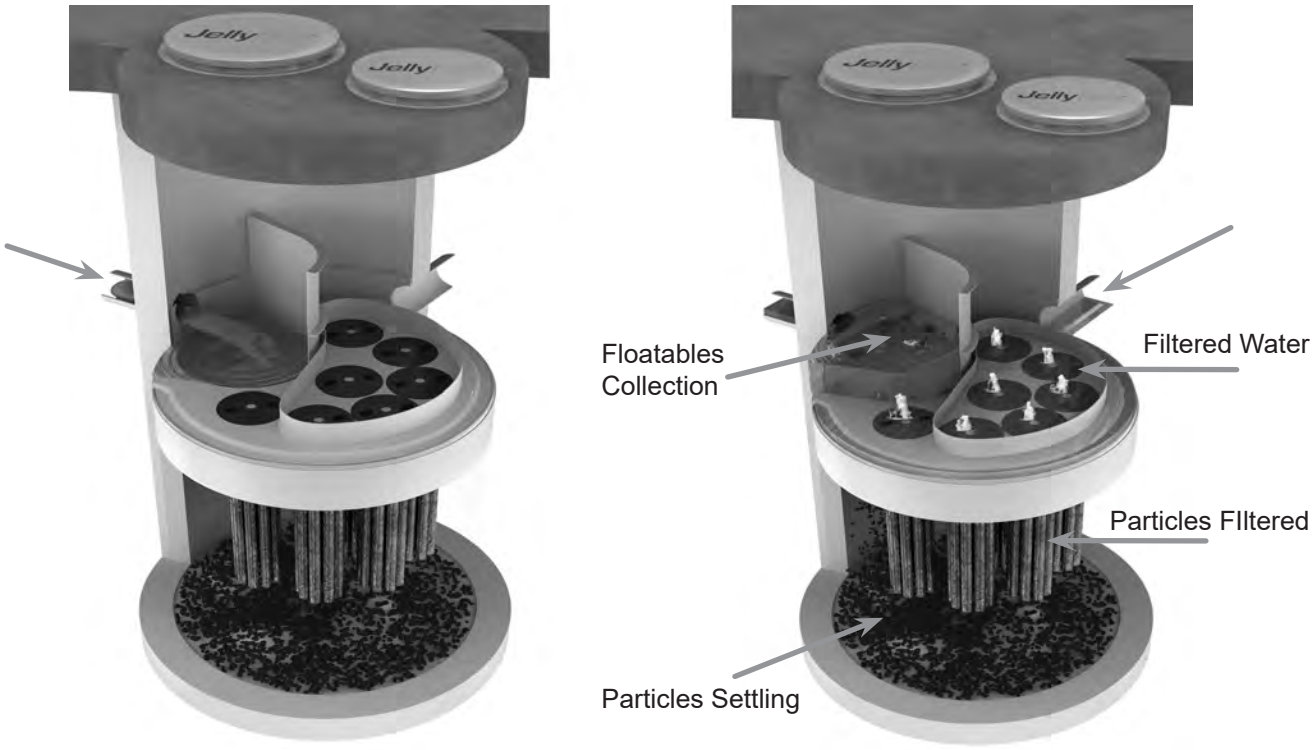
Figure 1 below.

FIGURE 1

reatment Functions

Membrane Filtration

Section View with Maintenance Access Wall (MAW) Cutaway

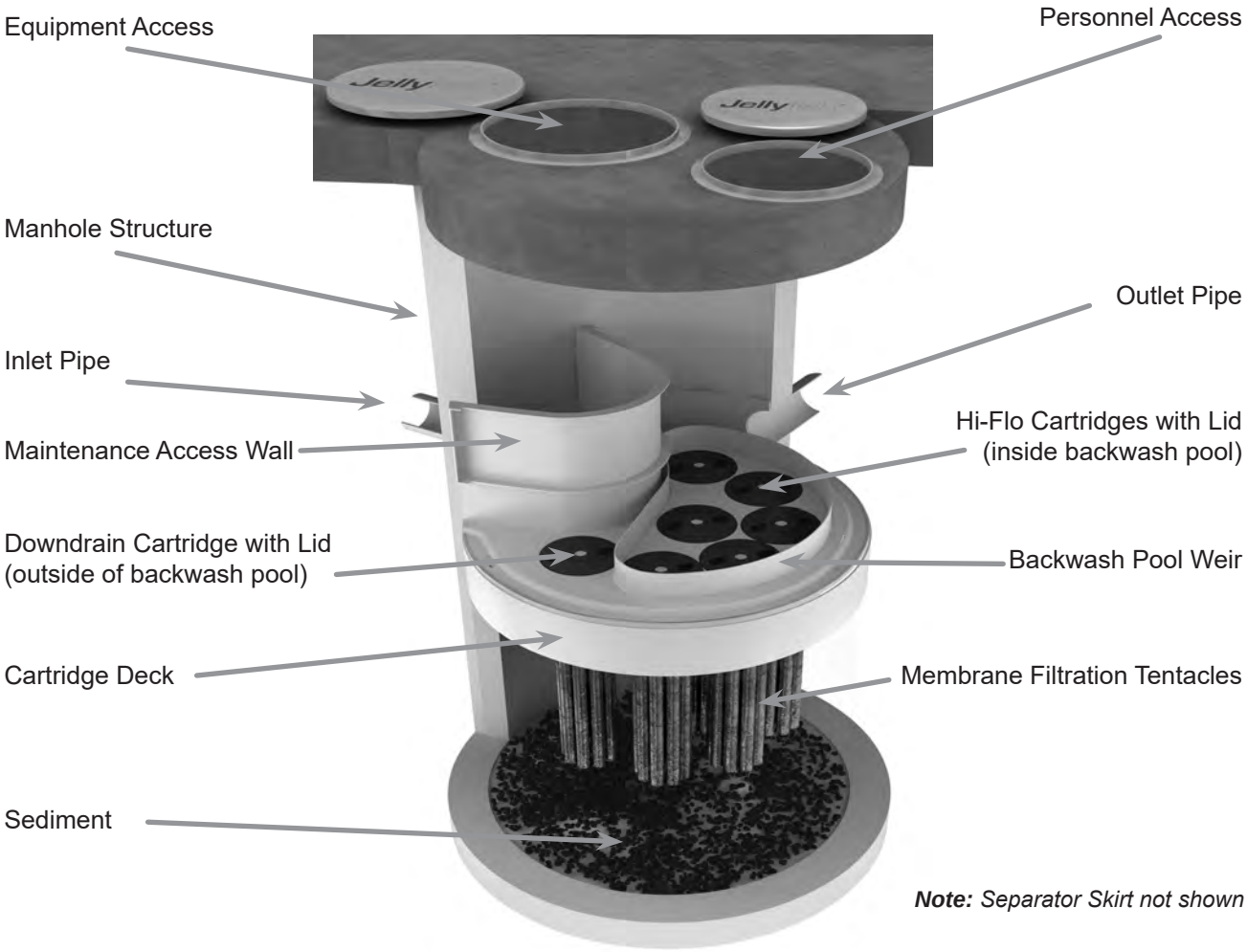


the membranes. This backwash process extends the service life of the cartridges and increases the time between maintenance events.

on our website at www.ContechES.com.

2.1 – Components and Cartridges

FIGURE 2



Note: *Separator Skirt not shown*

Tentacles are available in various lengths as depicted in Table 1 below.

Table 1 – Cartridge Lengths / W

Cartridge Lengths	Dry Weight	Diameter	Diameter
15 inches (381 mm)	10 lbs (4.5 kg)	35 mm	20 mm
27 inches (686 mm)	14.5 lbs (6.6 kg)	45 mm	25 mm
40 inches (1,016 mm)	19.5 lbs (8.9 kg)	55 mm	30 mm
54 inches (1,372 mm)	25 lbs (11.4 kg)	70 mm	35 mm

A .

FIGURE 3



Assembly

To attach, insert the top pipe nipples with the o-ring through the head plate holes and secure with locking nuts. Locking nuts to be hand tighten and checked with a wrench as shown below.

- After the upstream catchment and site have stabilized, remove any accumulated sediment and debris from the

  (if applicable). Failure to address this step completely will reduce the time between required maintenance.
- Descend to the cartridge deck (see Safety Notice and page 3).
-

  cartridge receptacles within the cartridge deck. A cartridge should be placed into each of the draindown cartridge receptacles outside the backwash pool weir. It is

  cartridge. In that case, a blank headplate and blank cartridge



Cartridge Assembly

A
cartridges into the cartridge receptacles. Use a gentle twisting or sideways motion to clear any potential snag. Do not force the tentacles down into the cartridge receptacle, as this may damage the membranes. Apply downward pressure on the cartridge head plate to seat the rim gasket (thick circular gasket surrounding the circumference of the head plate) into the cartridge receptacle.

- Examine the cartridge lids to dif
  - Lids with a _____ are to be inserted into the draindown cartridge receptacles, outside of the backwash pool weir.
  - Lids with a _____ are to be inserted into the _____ within the backwash pool weir.
  - Lids with _____ (blank cartridge lids) and a blank headplate are to be inserted into unoccupied cartridge receptacles.
- **To install a cartridge lid, align the cartridge lid male threads with the cartridge receptacle female threads. Firmly twist the cartridge lid clockwise a minimum 1 proper watertight seal.**

Chapter 3

3.0 – Inspection and Maintenance Overview

f. As with any
’s maximum treatment performance.
Regular inspection and maintenance are required to insure proper functioning of the system.

activities may be required in the event of an upstream chemical spill or due to excessive sediment loading from site erosion or extreme runoff events. It is a good practice to inspect the system after major storm events.

Inspection activities are typically conducted from surface observations and include:

- Observe if standing water is present
- Observe if there is any physical damage to the deck or cartridge lids
- Observe the amount of debris in the Maintenance Access Wall (MAW)

Maintenance activities typically include:

-
- Removal of collected sediments from manhole sump
-
-

with experience in stormwater maintenance and disposal services. Maintenance procedures may require manned

procedures should enter the vessel. Procedures, safety and damage prevention precautions, and other information, included in these guidelines, should be reviewed and observed prior to all inspection and maintenance activities.

3.1 – Inspection

3.1.1 – Timing

, and to develop a history of the site’s pollutant loading characteristics. In general, inspections should be performed at the times indicated below; *or per the approved project stormwater quality documents (if applicable), whichever is more frequent.*

- All construction debris or construction-related sediment within the device must be removed, and any damage to system components repaired.
- A
accumulation, and to ensure proper functioning of the system.

- Inspection frequency in subsequent years is based on the inspection and maintenance plan developed in the .
- Inspection is recommended after each major storm event.
- Immediately after an upstream oil, fuel or other chemical spill.

3.1.2 – Inspection Tools and Equipment

- Access cover lifting tool
- Sediment probe (clear hollow tube with check valve)
- Tape measure
- Flashlight
- Camera
- Inspection and maintenance log documentation
- Safety cones and caution tape
- Hard hat, safety shoes, safety glasses, and chemical-resistant gloves

3.1.3 – Inspection Procedure

The following procedure is recommended when performing inspections:

- .
- Inspect the MA
  oil sheen.
- Measure oil and sediment depth by lowering a sediment probe through the MA
  structure. Retrieve the probe, record sediment depth, and presences of any oil layers and repeat in multiple locations within the MAW opening. **Sediment depth of 12 inches or greater indicates maintenance is required**.
- Inspect cartridge lids. Missing or damaged cartridge lids to be replaced.
- Inspect the MAW, cartridge deck, and backwash pool weir for cracks or broken components. If damaged, repair is required.
- **Dry weather inspections:** inspect the cartridge deck for standing water.
  - No standing water under normal operating condition.
  - Standing water **inside** the backwash pool, but not outside the

    need to be rinsed.
  - Standing water **outside** the backwash pool may indicate a backwater condition caused by high water elevation in the receiving water body, or possibly a blockage in downstream infrastructure.
- **Wet weather inspections:** observe the rate and movement of water in the unit. Note the depth of water above deck elevation within the MAW.
  - **Less than 6 inches**
    cartridges located outside the backwash pool).
  - **Greater than 6 inches**

    .
  - **18 inches or greater**



The depth of sediment and oil can be measured from the surface by using a sediment probe or dipstick tube equipped with a ball check valve and 's maintenance access wall opening. The large opening provides convenient access for inspection and vacuum removal of water and pollutants.

3.2 – Maintenance

3.2.1 – Maintenance Requirements

maintenance requires some combination of the following:

- **Sediment removal for depths reaching 12 inches or greater, or within 3 years of the most recent sediment cleaning, whichever occurs sooner.**
- Floatable trash, debris, and oil must be removed.
- Filter cartridges rinsed and re-installed as required by the most recent inspection results, or within 12 months of
- damaged or missing. It is recommended that tentacles should remain in service no longer than 5 years before replacement.
- Damaged or missing cartridge deck components must be repaired or replaced as indicated by results of the most recent inspection.
- spill. Filter cartridge tentacles should be replaced if damaged by the spill.

3.2.2 – Maintenance Tools and Equipment

- Vacuum truck
- Ladder
- Garden hose and low pressure sprayer
-
-
-
- Access cover lifting tool
- Sediment probe (clear hollow tube with check valve)
- Tape measure
- Flashlight
- Camera
- Inspection and maintenance log documentation
- Safety cones and caution tape
- Hard hats, safety shoes, safety glasses, chemical-resistant gloves, and hearing protection for service providers
-
-

3.2.3 – Maintenance Procedure

- .
- procedures.
- **Caution:** Dropping objects onto the cartridge deck may cause damage.
- Perform **Inspection Procedure** prior to maintenance activity.
- T
  Caution: Do not step onto the maintenance access wall (MAW) or backwash pool weir, as damage may result. Note that the cartridge deck may be slippery.

3.2.4 – Filter Cartridge Rinsing Procedure

- Remove a cartridge lid.
- Remove the cartridge from the receptacle using the lifting loops in the cartridge head plate. **Caution:** Should

a snag occur, do not force the cartridge upward as damage to the tentacles may result. Rotate the cartridge with a slight sideways motion to clear the snag and continue removing the cartridge.

- Thread a rope or cord through the lifting loops and lift the cartridge from the cartridge deck to the top surface outside the structure.
- **Caution:** Immediately replace and secure the lid on the exposed empty receptacle as a safety precaution. Never expose more than one empty cartridge receptacle.
- are located at the top surface outside the structure.
- counter-clockwise. Remove the tentacles from the cartridge head plate.
- Position a receptacle in a plastic tub or garbage can such that the rinse water is captured. Using a low-pressure garden hose sprayer, direct a wide-angle water spray at a downward 45° angle onto the tentacle membrane, sweeping from top to bottom along the length of the tentacle. Rinse until all sediment is removed from the membrane. **Caution:** Do not use a high pressure sprayer or focused stream of water on the membrane. Excessive water pressure may damage the membrane. Turn membrane upside down and pour out any residual rinsewater to ensure center of tentacle is clear of any sediment.



low-pressure garden hose sprayer, and using a plastic garbage container to capture rinse water.

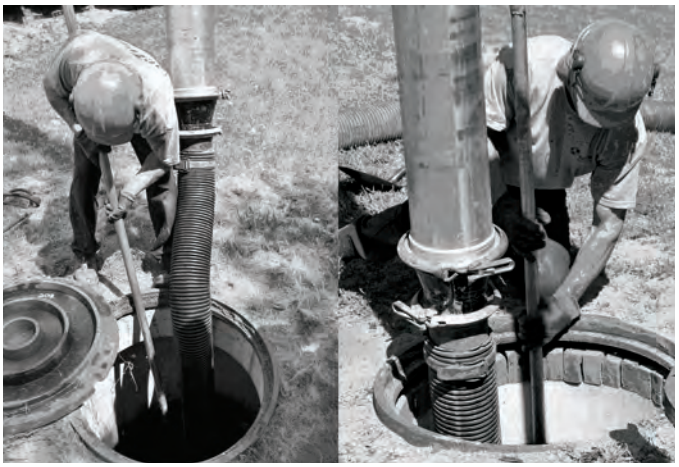
- Remove rinse water from rinse tub or garbage can using a vacuum hose as needed.
- Slip the o-ring over the tentacle nipple and reassemble onto the cartridge head plate; hand-tighten.
- If rinsing is ineffective in removing sediment from the tentacles, or if tentacles are damaged, provisions must be made to replace the spent or damaged tentacles with new tentacles. Contact Contech to order replacement tentacles.
- receptacle. **Caution:** Should a snag occur when lowering the cartridge into the receptacle, do not force the cartridge downward; damage may occur. Rotate the cartridge with a slight sideways motion to clear the snag and complete the installation.
- Replace the cartridge lid on the exposed receptacle. Rinse away any accumulated grit from the receptacle **Align the cartridge lid male threads with the cartridge receptacle female threads. Firmly twist the cartridge lid clockwise a minimum 1 snugly in place, with a proper watertight seal**.
- Repeat cartridge installation until all cartridges are installed.

3.2.5 – Vacuum Cleaning Procedure

- **Caution:**
  system. Access the lower chamber for vacuum cleaning **only through the maintenance access wall (MAW) opening**
  deck. **Do not lower the vacuum wand through a cartridge receptacle**, as damage to the receptacle will result.
  - T W opening and vacuum f the surface of the water. Alternatively skimmer.
  - Using a vacuum hose, remove the water from the lower chamber to the sanitary sewer, if permitted by the local regulating authority, or into a separate containment tank.
  - Remove the sediment from the bottom of the unit through the MAW opening.
  - facilitated by removing a cartridge lid from an empty receptacle and inserting a jetting wand (not a vacuum wand) through the receptacle. Use the sprayer to rinse loosened sediment toward the vacuum hose in the MAW opening, being careful not to damage the receptacle..
  -
  - requirements.

3.2.6 – Chemical Spills

- **Caution** , do not attempt maintenance. Immediately contact the local hazard response agency.





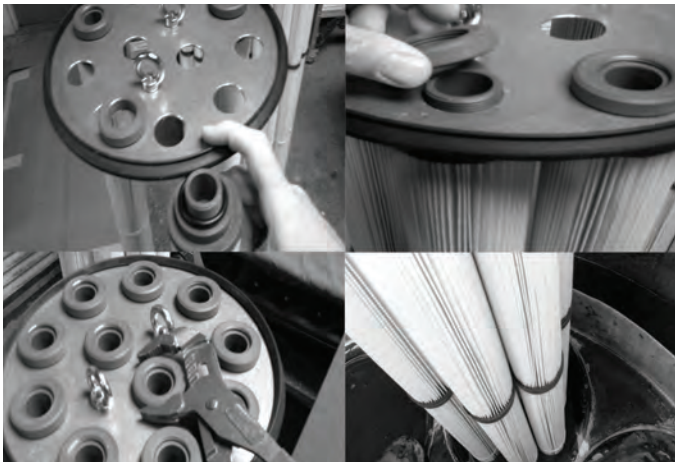
A maintenance worker stationed on the surface uses a vacuum hose to evacuate water





A

opening (right image).





3.3 – Disposal Procedures

, such as oil and fuels, should be removed and disposed of by a licensed waste management company.

W. A rainbow or sheen can be visible at oil concentrations of less than 10 mg/L (ppm).

Chapter 4

4 – Recommended Safety Procedures

Jobsite safety is a topic and a practice addressed comprehensively by others. The inclusions here are merely reminders to whole areas of Safety Practice that are the responsibility of the Owner(s), Manager(s) and Contractor(s). OSHA and Canadian OSH, and Federal, State/Provincial, and Local Jurisdiction Safety Standards apply.

arning and Cautions

Please see reference on Page 3.

Chapter 5

by contacting Contech Engineered Solutions at:

Phone: 800-338-1122
Email: info@conteches.com
Website: www.ContechES.com

• 15 Inch (381 mm) • 27 Inch (686 mm) • 40 Inch (1,016 mm) • 54 Inch (1,372 mm)

- tentacles, eleven (11) o-rings, and eleven (11) locking nuts
- Standard Head plate
- Blank head plate
- Rim gasket (for head plate)
- Locking nuts (for tentacles)
- O-rings (for tentacles)
-
- Maintenance Access Wall (MAW) extension (18-inch segment)

** Nothing in this catalog should be construed as an expressed warranty or implied warranties, including the warranties of merchantability and of*

Location: _____ GPS Coordinates: _____

Land Use: Commercial:_____ Industrial: _____ Service Station:_____

Road/Highway:____ Airport: _____ Residential: _____ Parking Lot:_____

Date/Time:						
Inspector:						
Maintenance Contractor:						
Visible Oil Present: (Y/N)						
Oil Quantity Removed						
Floatable Debris Present: (Y/N)						
Floatable Debris removed: (Y/N)						
Water Depth in Backwash Pool						
Draindown Cartridges externally rinsed and re-commissioned: (Y/N)						
New tentacles put on Cartridges: (Y/N)						
Hi-Flo cartridges externally rinsed and recommissioned (Y/N):						
New tentacles put on Hi-Flo Cartridges: (Y/N)						
Sediment Depth Measured: (Y/N)						
Sediment Depth (inches or mm):						
Sediment Removed: (Y/N)						
Cartridge Lids intact: (Y/N)						
Observed Damage:						
Comments:						

CONTECH
ENGINEERED SOLUTIONS

Jellyfish® Filter Manhole Installations
Inspection and Maintenance Manual



CONTECH Engineered Solutions
1-800-548-4667

Inspection and Maintenance Overview

The primary purpose of the Jellyfish® Filter is to capture and remove pollutants from stormwater runoff. As with any filtration system, these pollutants must be removed to maintain the filter's maximum treatment performance. Regular inspection and maintenance are required to insure proper functioning of the system.

Maintenance frequencies and requirements are site specific and vary depending on pollutant loading. Maintenance activities may be required in the event of an upstream chemical spill or due to excessive sediment loading from site erosion or extreme runoff events. It is a good practice to inspect the system after major storm events.

Inspection activities are typically conducted form surface observations and include:

- Observe if standing water is present
- Observe if there is any physical damage to the deck or cartridge lids
- Observe the amount of debris in the Maintenance Access Wall (MAW)

Maintenance activities typically include:

- Removal of oil, floatable trash and debris
- Removal of collected sediments
- Rinsing and re-installing the filter cartridges
- Replace filter cartridge tentacles, as needed.

It is recommended that Jellyfish Filter inspection and maintenance be performed by professionally trained individuals, with experience in stormwater maintenance and disposal services. Maintenance procedures may require manned entry into the Jellyfish structure. Only professional maintenance service providers trained in confined space entry procedures should enter the vessel. Procedures, safety and damage prevention precautions, and other information, included in these guidelines, should be reviewed and observed prior to all inspection and maintenance activities.

Inspection Timing

Inspection of the Jellyfish Filter is key in determining the maintenance requirements for, and to develop a history of the site's pollutant loading characteristics. In general, inspections should be performed at the times indicated below; *or per the approved project stormwater quality documents (if applicable), whichever is more frequent.*

- Post-construction inspection is required prior to putting the Jellyfish Filter into service. All construction debris or construction-related sediment within the device must be removed, and any damage to system components repaired.
- A minimum of two inspections during the first year of operation to assess the sediment and floatable pollutant accumulation, and to ensure proper functioning of the system.
- Inspection frequency in subsequent years is based on the inspection and maintenance plan developed in the first year of operation. Minimum frequency should be once per year.
- Inspection is recommended after each major storm event.
- Immediately after an upstream oil, fuel or other chemical spill.

Inspection Tools and Equipment

The following equipment and tools are typically required when performing a Jellyfish Filter inspection:

- Access cover lifting tool
- Sediment probe (clear hollow tube with check valve)
- Tape measure
- Flashlight
- Camera
- Inspection and maintenance log documentation
- Safety cones and caution tape
- Hard hat, safety shoes, safety glasses, and chemical-resistant gloves

Inspection Procedure

The following procedure is recommended when performing inspections:

- Provide traffic control measures as necessary.
- Inspect the MAW for floatable pollutants such as trash, debris, and oil sheen.
- Measure oil and sediment depth by lowering a sediment probe through the MAW opening until contact is made with the floor of the structure. Retrieve the probe, record sediment depth, and presences of any oil layers and repeat in multiple locations within the MAW opening. *Sediment depth of 12 inches or greater indicates maintenance is required.*
- Inspect cartridge lids. Missing or damaged cartridge lids to be replaced.
- Inspect the MAW, cartridge deck, and backwash pool weir, for cracks or broken components. If damaged, repair is required.
- **Dry weather inspections:** inspect the cartridge deck for standing water.
    - No standing water under normal operating condition.
    - Standing water **inside** the backwash pool, but not outside the backwash pool, this condition indicates that the filter cartridges need to be rinsed.
    - Standing water **outside** the backwash pool may indicate a backwater condition caused by high water elevation in the receiving water body, or possibly a blockage in downstream infrastructure.
- **Wet weather inspections:** observe the rate and movement of water in the unit. Note the depth of water above deck elevation within the MAW.
    - **Less than 6 inches**, flow should be exiting the cartridge lids of each of the draindown cartridges (i.e. cartridges located outside the backwash pool).
    - **Greater than 6 inches**, flow should be exiting the cartridge lids of each of the draindown cartridges and each of the hi-flo cartridges (i.e. cartridges located inside the backwash pool), and water should be overflowing the backwash pool weir.
    - **18 inches or greater** and relatively little flow is exiting the cartridge lids and outlet pipe, this condition indicates that the filter cartridges are occluded with sediment and need to be rinsed.

Maintenance Requirements

Required maintenance for the Jellyfish Filter is based upon results of the most recent inspection, historical maintenance records, or the site specific water quality management plan; whichever is more frequent. In general, maintenance requires some combination of the following:

- Sediment removal for depths reaching 12 inches or greater, or within 3 years of the most recent sediment cleaning, whichever occurs sooner.

- Floatable trash, debris, and oil must be removal.
- Filter cartridges rinsed and re-installed as required by the most recent inspection results, or within 12 months of the most recent filter rinsing, whichever occurs sooner.
- Replace filter cartridge if rinsing does not remove accumulated sediment from the tentacles, or if tentacles are damaged or missing. It is recommended that tentacles should remain in service no longer than 5 years before replacement.
- Damaged or missing cartridge deck components must be repaired or replaced as indicated by results of the most recent inspection.
- The unit must be cleaned out and filter cartridges inspected immediately after an upstream oil, fuel, or chemical spill. Filter cartridge tentacles should be replaced if damaged by the spill.

Maintenance Tools and Equipment

The following equipment and tools are typically required when performing Jellyfish Filter maintenance:

- Vacuum truck
- Ladder
- Garden hose and low pressure sprayer
- Rope or cord to lift filter cartridges from the cartridge deck to the surface
- Adjustable pliers for removing filter cartridge tentacles from cartridge head plate
- Plastic tub or garbage can for collecting effluent from rinsed filter cartridge tentacles
- Access cover lifting tool
- Sediment probe (clear hollow tube with check valve)
- Tape measure
- Flashlight
- Camera
- Inspection and maintenance log documentation
- Safety cones and caution tape
- Hard hats, safety shoes, safety glasses, chemical-resistant gloves, and hearing protection for service providers
- Proper safety equipment for confined space entry
- Replacement filter cartridge tentacles if required

Maintenance Procedure

The following procedures are recommended when maintaining the Jellyfish Filter:

- Provide traffic control measures as necessary.
- Open all covers and hatches. Use ventilation equipment as required, according to confined space entry procedures.
- **Caution:** Dropping objects onto the cartridge deck may cause damage.
- Perform **Inspection Procedure** prior to maintenance activity.
- To access the cartridge deck for filter cartridge service, descend the ladder and step directly onto the deck. **Caution:** Do not step onto the maintenance access wall (MAW) or backwash pool weir, as damage may result. Note that the cartridge deck may be slippery.
- **Filter Cartridge Rinsing Procedure**
    - Remove a cartridge lid.
    - Remove the cartridge from the receptacle using the lifting loops in the cartridge head plate. **Caution:** Should a snag occur, do not force the cartridge upward as damage to the tentacles may result. Rotate the cartridge with a slight sideways motion to clear the snag and continue removing the cartridge.

- Thread a rope or cord through the lifting loops and lift the filter cartridge from the cartridge deck to the top surface outside the structure.
- **Caution:** Immediately replace and secure the lid on the exposed empty receptacle as a safety precaution. Never expose more than one empty cartridge receptacle.
- Repeat the filter cartridge removal procedure until all of the cartridges are located at the top surface outside the structure.
- Disassemble the tentacles from each filter cartridge by rotating counter-clockwise. Remove the tentacles from the cartridge head plate.
- Position a receptacle in a plastic tub or garbage can such that the rinse water is captured. Using a low-pressure garden hose sprayer, direct a wide-angle water spray at a downward 45° angle onto the tentacle membrane, sweeping from top to bottom along the length of the tentacle. Rinse until all sediment is removed from the membrane. **Caution:** Do not use a high pressure sprayer or focused stream of water on the membrane. Excessive water pressure may damage the membrane.
- Remove rinse water from rinse tub or garbage can using a vacuum hose as needed.
- Slip the O-ring over the pipe nipple on the top end of the tentacle and reassemble onto the cartridge head plate; hand tighten.
- If rinsing is ineffective in removing sediment from the tentacles, or if tentacles are damaged, provisions must be made to replace the spent or damaged tentacles with new tentacles. Contact Contech to order replacement tentacles.
- Lower a rinsed filter cartridge to the cartridge deck. Remove the cartridge lid on a receptacle and carefully lower the filter cartridge into the receptacle until the head plate gasket is seated squarely on the lip of the receptacle. **Caution:** Should a snag occur when lowering the cartridge into the receptacle, do not force the cartridge downward; damage may occur. Rotate the cartridge with a slight sideways motion to clear the snag and complete the installation.
- Replace the cartridge lid on the exposed receptacle. Check the fit before completing rotation to a firm hand-tight attachment. Rinse away any accumulated grit from the receptacle threads if needed to get a proper fit.
- Repeat cartridge installation until all cartridges are installed.

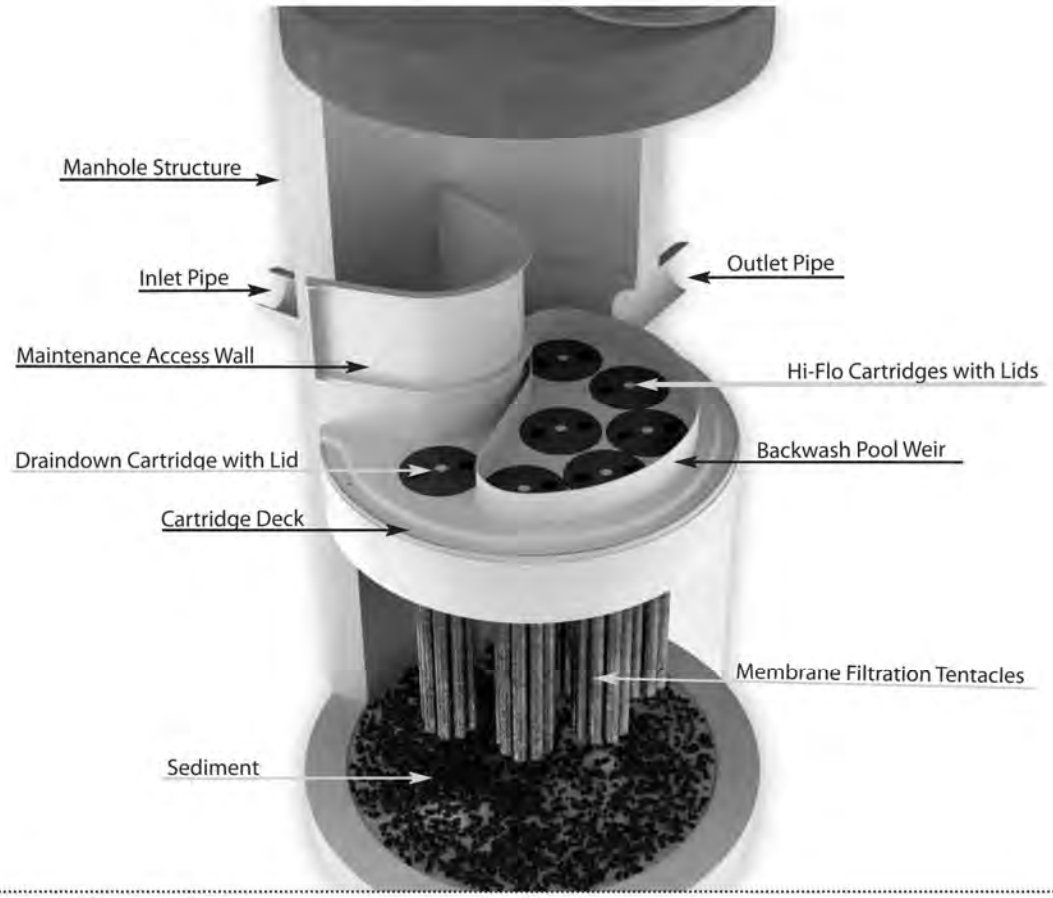
- **Vacuum Cleaning Procedure**
  - **Caution:** Perform vacuum cleaning of the Jellyfish Filter only after filter cartridges have been removed from the system. Access the lower chamber for vacuum cleaning **only through the maintenance access wall (MAW) opening**, being careful not to damage the flexible plastic separator skirt that is attached to the underside of the deck. The separator skirt surrounds the filter cartridge zone, and could be torn if contacted by the wand. **Do not lower the vacuum wand through a cartridge receptacle**, as damage to the receptacle will result.
  - To remove floatable trash, debris, and oil, lower the vacuum hose into the MAW opening and vacuum floatable pollutants off the surface of the water. Alternatively, floatable solids may be removed by a net or skimmer.
  - Using a vacuum hose, remove the water from the lower chamber to the sanitary sewer, if permitted by the local regulating authority, or into a separate containment tank.
  - Remove the sediment from the bottom of the unit through the MAW opening.
  - For larger diameter Jellyfish Filter manholes (8-ft, 10-ft, 12-ft diameter), complete sediment removal may be facilitated by removing a cartridge lid from an empty receptacle and inserting a jetting wand (not a vacuum wand) through the receptacle. Use the sprayer to rinse loosened sediment toward the vacuum hose in the MAW opening, being careful not to damage the receptacle..
  - After the unit is clean, re-fill the lower chamber with water if required by the local jurisdiction, and re-install filter cartridges.
  - Dispose of sediment, floatable trash and debris, oil, spent tentacles, and water according to local regulatory requirements.

- **Chemical Spills**
  - **Caution:** If a chemical spill has been captured by the Jellyfish Filter, do not attempt maintenance. Immediately contact the local hazard response agency, and contact Contech Engineered Services.

Below is a cut-away schematic of the Jellyfish Filter manhole with key components identified (6-ft diameter manhole is depicted).

FIGURE 1

Jellyfish Filter and Components

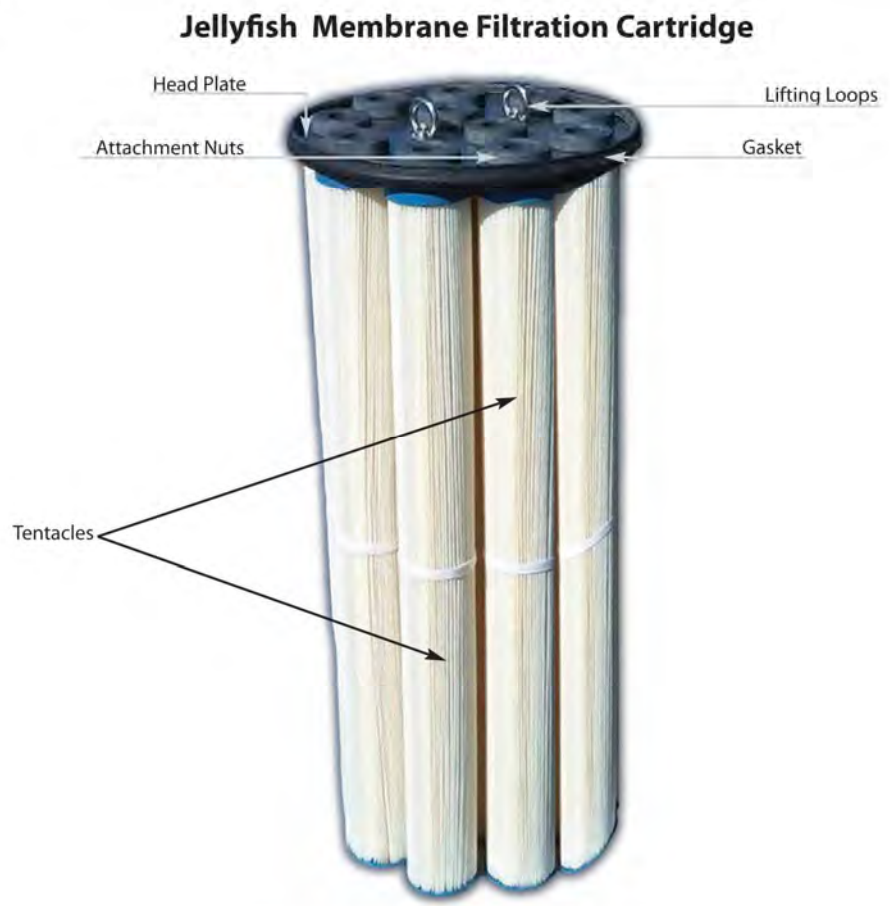


Note: Separator Skirt Not Shown

The Jellyfish Filter has no moving parts to wear out and therefore maintenance activities are generally focused on pollutant removal and filter cartridge service.

Below is a schematic of a Jellyfish Filter membrane filtration cartridge. Tentacles can be easily removed from the head plate and rinsed or replaced as needed.

FIGURE 2





The depth of sediment and oil can be measured from the surface by using a sediment probe or dipstick tube equipped with a ball check valve and inserted through the Jellyfish Filter's maintenance access wall opening. The large opening provides convenient access for inspection and vacuum removal of water and pollutants.



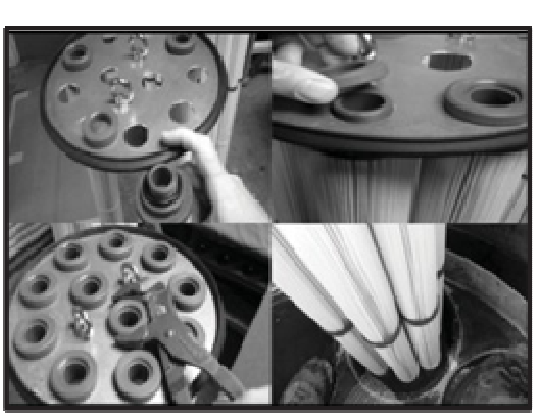


A maintenance worker stationed on the surface uses a vacuum hose to evacuate water, sediment, and floatables from the Jellyfish Filter by inserting the vacuum wand through the maintenance access wall opening.





A view of a Jellyfish Filter cartridge deck from the surface showing all the cartridge lids intact and no standing water on the deck (left image), and inspection of the flexible separator skirt from inside the maintenance access wall opening (right image).





Assembly of a Jellyfish Filter cartridge (left) and installation of a filter cartridge into a cartridge receptacle in the deck (right).



Rinsing of dirty filter cartridge tentacles with a low-pressure garden hose sprayer, and using a plastic garbage container to capture rinse water.

The benefits of regular inspection and maintenance are many – from ensuring maximum operation efficiency, to keeping maintenance costs low, to the continued protection of natural waterways – and provide the key to the Jellyfish Filter's long and effective service life.

Ordering Replacement Parts

Jellyfish Filter cartridges, replacement tentacles, cartridge lids, and other system components can be ordered by contacting: **Contech Engineered Solutions, 1-800-548-4667**

APPENDIX I

LOW IMPACT DEVELOPMENT CHECKLIST

New Jersey Stormwater Best Management Practices Manual

February 2004

APPENDIX A

Low Impact Development Checklist

A checklist for identifying nonstructural stormwater management strategies incorporated into proposed land development

According to the NJDEP Stormwater Management Rules at N.J.A.C. 7:8, the groundwater recharge, stormwater quality, and stormwater quantity standards established by the Rules for major land development projects must be met by incorporating nine specific nonstructural stormwater management strategies into the project's design to the maximum extent practicable.

To accomplish this, the Rules require an applicant seeking land development approval from a regulatory board or agency to identify those nonstructural strategies that have been incorporated into the project's design. In addition, if an applicant contends that it is not feasible to incorporate any of the specific strategies into the project's design, particularly for engineering, environmental, or safety reasons, the Rules further require that the applicant provide a basis for that contention.

This checklist has been prepared to assist applicants, site designers, and regulatory boards and agencies in ensuring that the nonstructural stormwater management requirements of the Rules are met. It provides an applicant with a means to identify both the nonstructural strategies incorporated into the development's design and the specific low impact development BMPs (LID-BMPs) that have been used to do so. It can also help an applicant explain the engineering, environmental, and/or safety reasons that a specific nonstructural strategy could not be incorporated into the development's design.

The checklist can also assist municipalities and other land development review agencies in the development of specific requirements for both nonstructural strategies and LID-BMPs in zoning and/or land use ordinances and regulations. As such, where requirements consistent with the Rules have been adopted, they may supersede this checklist.

Finally, the checklist can be used during a pre-design meeting between an applicant and pertinent review personnel to discuss local nonstructural strategies and LID-BMPs requirements in order to optimize the development's nonstructural stormwater management design.

Since this checklist is intended to promote the use of nonstructural stormwater management strategies and provide guidance in their incorporation in land development projects, municipalities are permitted to revise it as necessary to meet the goals and objectives of their specific stormwater management program and plan within the limits of N.J.A.C. 7:8.

Low Impact Development Checklist

A checklist for identifying nonstructural stormwater management strategies incorporated into proposed land development

Municipality: Teterboro/Moonachie

County: Bergen Date: 11 September 2015

Review board or agency: N/A

Proposed land development name: First Aviation Services Expansion

Lot(s): 1.02 Block(s): 76

Project or application number: _____

Applicant's name: First Aviation Services d/b/a Signature Flight Support Corporation

Applicant's address: 101 Charles Lindberg Drive, Teterboro NJ 07470

_____

Telephone: 407-206-5246 Fax: _____

Email address: neil.terwilliger@signatureflight.com

Designer's name: Langan Engineering, Environmental, Surveying and Landscape Architecture D.P.C.

Designer's address: 360 West 31st Street, 8th Floor, New York, NY 10001

mgallagher@langan.com

Telephone: 212-479-5400 Fax: 212-479-5444

Email address: _____

Part 2: Review of Local Stormwater Management Regulations

Title and date of stormwater management regulations used in development design:

NJMC § 19:4-8.6, N.J.A.C. 7:8, N.J.A.C. 7:13, Standards for Soil Erosion and Sediment Control

Do regulations include nonstructural requirements? Yes: x No: _____

If yes, briefly describe: The Regulations are modeled after NJDEP regulations

List LID-BMPs prohibited by local regulations: None Noted

Pre-design meeting held? Yes: x Date: 10/15/2014 No: _____

Meeting held with: Meetings held with NJDEP on 7/18/14 and 10/22/15. Addition meetings held with US Army Corps of Engineers, NJDEP, NOAA Fisheries, USEPA, NJMC, First Aviation and Langan Engineering

Pre-design site walk held? Yes: _____ Date: _____ No: x

Site walk held with: _____

Other agencies with stormwater review jurisdiction:

Name: NJDEP

Required approval: Flood Hazard Verification

Name: _____

Required approval: _____

Name: _____

Required approval: _____

Part 1: Description of Nonstructural Approach to Site Design

In narrative form, provide an overall description of the nonstructural stormwater management approach and strategies incorporated into the proposed site's design. Attach additional pages as necessary. Details of each nonstructural strategy are provided in Part 3 below.

1. Minimize land disturbance including clearing and grading: The limit of disturbance is minimized to the maximum extent practical given the applicatant's requirements and the natural constraints of the site. Retaining walls utilized to reduce the amount of site disturbance.

2. Maximize the protection of national drainage features and vegetation: The disturbance of wetlands was minimized and the remaining wetlands surrounding the site will be maintained and protected during construction. A silt fence is provided to protect wetland vegetation from construction activities.

Part 3: Nonstructural Strategies and LID-BMPs in Design

3.1 Vegetation and Landscaping

Effective management of both existing and proposed site vegetation can reduce a development's adverse impacts on groundwater recharges and runoff quality and quantity. This section of the checklist helps identify the vegetation and landscaping strategies and nonstructural LID-BMPs that have been incorporated into the proposed development's design to help maintain existing recharge rates and/or minimize or prevent increases in runoff quantity and pollutant loading.

A. Has an inventory of existing site vegetation been performed? Yes: _____X_____ No: _____

If yes, was this inventory a factor in the site's layout and design? Yes: _____X_____ No: _____

B. Does the site design utilize any of the following nonstructural LID-BMPs?

Preservation of natural areas? Yes: ____X____ No: _____ If yes, specify % of site: _____

Native ground cover? Yes: _____ No: _____X_____ If yes, specify % of site: _____

Vegetated buffers? Yes: _____ No: _____X_____ If yes, specify % of site: _____

C. Do the land development regulations require these nonstructural LID-BMPs?

Preservation of natural areas? Yes: _____ No: _____X_____ If yes, specify % of site: _____

Native ground cover? Yes: _____ No: _____X_____ If yes, specify % of site: _____

Vegetated buffers? Yes: _____ No: _____X_____ If yes, specify % of site: _____

D. If vegetated filter strips or buffers are utilized, specify their functions:

Reduce runoff volume increases through lower runoff coefficient: Yes: _____ No: _____

Reduce runoff pollutant loads through runoff treatment: Yes: _____ No: _____

Maintain groundwater recharge by preserving natural areas: Yes: _____ No: _____

3.2 Minimize Land Disturbance

Minimizing land disturbance is a nonstructural LID-BMP that can be applied during both the development's construction and post-construction phases. This section of the checklist helps identify those land disturbance strategies and nonstructural LID-BMPs that have been incorporated into the proposed development's design to minimize land disturbance and the resultant change in the site's hydrologic character.

A. Have inventories of existing site soils and slopes been performed? Yes: x No: _____

If yes, were these inventories factors in the site's layout and design? Yes: x No: _____

B. Does the development's design utilize any of the following nonstructural LID-BMPs?

Restrict permanent site disturbance by land owners? Yes: x No: _____

If yes, how: Preservation of existing vegetation and wetlands where applicable

Restrict temporary site disturbance during construction? Yes: x No: _____

If yes, how: The construction limit of disturbance is about xx acres based on the soil erosion and sediment control plan.

Consider soils and slopes in selecting disturbance limits? Yes: x No: _____

If yes, how: Retaining wall utilized to reduce extent of disturbance and wetland impact.

C. Specify percentage of site to be cleared: 100% Regraded: 100%

D. Specify percentage of cleared areas done so for buildings: 21%

For driveways and parking: 73% For roadways: 6%

E. What design criteria and/or site changes would be required to reduce the percentages in C and D above?

The footprint of the apron and building, and amount of car parking spaces would have to be reduced in order to reduce the percentages in C and D. These cannot be reduced because of regulatory and development requirements.

F. Specify site's hydrologic soil group (HSG) percentages:

HSG A: _____ HSG B: _____ HSG C: _____ HSG D: 100%

G. Specify percentage of each HSG that will be permanently disturbed:

HSG A: _____ HSG B: _____ HSG C: _____ HSG D: 100%

H. Locating site disturbance within areas with less permeable soils (HSG C and D) and minimizing disturbance within areas with greater permeable soils (HSG A and B) can help maintain groundwater recharge rates and reduce runoff volume increases. In light of the HSG percentages in F and G above, what other practical measures if any can be taken to achieve this?

The site is located within hydraulic soil group D.

I. Does the site include Karst topography? Yes: _____ No: x

If yes, discuss measures taken to limit Karst impacts:

N/A

3.3 Impervious Area Management

New impervious surfaces at a development site can have the greatest adverse effect on groundwater recharge and stormwater quality and quantity. This section of the checklist helps identify those nonstructural strategies and LID-BMPs that have been incorporated into a proposed development's design to comprehensively manage the extent and impacts of new impervious surfaces.

A. Specify impervious cover at site: Existing: 0% Proposed: 100%

B. Specify maximum site impervious coverage allowed by regulations: _____

C. Compare proposed street cartway widths with those required by regulations:

Type of Street	Proposed Cartway Width (feet)	Required Cartway Width (feet)
Residential access – low intensity		
Residential access – medium intensity		
Residential access – high intensity with parking		
Residential access – high intensity without parking		
Neighborhood		
Minor collector – low intensity without parking		
Minor collector – with one parking lane		
Minor collector – with two parking lanes		
Minor collector – without parking		
Major collector		

D. Compare proposed parking space dimensions with those required by regulations:

Proposed: 9.5' x 18'x Regulations: 8.5' x 18'

E. Compare proposed number of parking spaces with those required by regulations:

Proposed: 84 Regulations: 84

F. Specify percentage of total site impervious cover created by buildings: 21%

By driveways and parking: 73% By roadways: 6%

G. What design criteria and/or site changes would be required to reduce the percentages in F above?

The footprint of the apron and building, and amount of car parking spaces would have to be reduced in order to reduce the percentages in F. These cannot be reduced because of regulatory and development requirements.

H. Specify percentage of total impervious area that will be unconnected:

Total site: 0 Buildings: _____ Driveways and parking: _____ Roads: _____

I. Specify percentage of total impervious area that will be porous:

Total site: 0% Buildings: _____ Driveways and parking: _____ Roads: _____

J. Specify percentage of total building roof area that will be vegetated: 0%

K. Specify percentage of total parking area located beneath buildings: 0%

L. Specify percentage of total parking located within multi-level parking deck: 0%

3.4 Time of Concentration Modifications

Decreasing a site's time of concentration (Tc) can lead directly to increased site runoff rates which, in turn, can create new and/or aggravate existing erosion and flooding problems downstream. This section of the checklist helps identify those nonstructural strategies and LID-BMPs that have been incorporated into the proposed development's design to effectively minimize such Tc decreases.

When reviewing Tc modification strategies, it is important to remember that a drainage area's Tc should reflect the general conditions throughout the area. As a result, Tc modifications must generally be applied throughout a drainage area, not just along a specific Tc route.

A. Specify percentage of site's total stormwater conveyance system length that will be:

Storm sewer: 70% Vegetated swale: _____ Natural channel: _____

Stormwater management facility: Detention System: 30% Other: _____

Note: the total length of the stormwater conveyance system should be measured from the site's downstream property line to the downstream limit of sheet flow at the system's headwaters.

B. What design criteria and/or site changes would be required to reduce the storm sewer percentages and increase the vegetated swale and natural channel percentages in A above?

The footprint of the apron and building, and amount of car parking spaces would have to be reduced in order to reduce the storm sewer percentages. These cannot be reduced because of regulatory and development requirements.

C. In conveyance system subareas that have overland or sheet flow over impervious surfaces or turf grass, what practical and effective site changes can be made to:

Decrease overland flow slope: Overland slopes in paved areas are minimized which results in longer time of concentrations.

Increase overland flow roughness: _____

3.5 Preventative Source Controls

The most effective way to address water quality concerns is by pollution prevention. This section of the checklist helps identify those nonstructural strategies and LID-BMPs that have been incorporated into the proposed development's design to reduce the exposure of pollutants to prevent their release into the stormwater runoff.

A. Trash Receptacles

Specify the number of trash receptacles provided: TBD

Specify the spacing between the trash receptacles: TBD

Compare trash receptacles proposed with those required by regulations:

Proposed: N/A Regulations: N/A

B. Pet Waste Stations

Specify the number of pet waste stations provided: 0

Specify the spacing between the pet waste stations: N/A

Compare pet waste stations proposed with those required by regulations:

Proposed: N/A Regulations: N/A

C. Inlets, Trash Racks, and Other Devices that Prevent Discharge of Large Trash and Debris

Specify percentage of total inlets that comply with the NJPDES storm drain inlet criteria: _____

D. Maintenance

Specify the frequency of the following maintenance activities:

Street sweeping: Proposed: 0 Regulations: N/A

Litter collection: Proposed: 0 Regulations: N/A

Identify other stormwater management measures on the site that prevent discharge of large trash and debris:

N/A

E. Prevention and Containment of Spills

Identify locations where pollutants are located on the site, and the features that prevent these pollutants from being exposed to stormwater runoff:

Pollutant: N/A Location: _____

Feature utilized to prevent pollutant exposure, harmful accumulation, or contain spills:

Pollutant: N/A Location: _____

Feature utilized to prevent pollutant exposure, harmful accumulation, or contain spills:

Pollutant: N/A Location: _____

Feature utilized to prevent pollutant exposure, harmful accumulation, or contain spills:

Pollutant: N/A Location: _____

Feature utilized to prevent pollutant exposure, harmful accumulation, or contain spills:

Pollutant: N/A Location: _____

Part 4: Compliance with Nonstructural Requirements of NJDEP Stormwater Management Rules

1. Based upon the checklist responses above, indicate which nonstructural strategies have been incorporated into the proposed development's design in accordance with N.J.A.C. 7:8-5.3(b):

No.	Nonstructural Strategy	Yes	No
1.	Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss.	X	
2.	Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces.		X
3.	Maximize the protection of natural drainage features and vegetation.	X	
4.	Minimize the decrease in the pre-construction time of concentration.	X	
5.	Minimize land disturbance including clearing and grading.	X	
6.	Minimize soil compaction.		X
7.	Provide low maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers, and pesticides.		X
8.	Provide vegetated open-channel conveyance systems discharge into and through stable vegetated areas.		X
9.	Provide preventative source controls.	X	

2. For those strategies that have not been incorporated into the proposed development's design, provide engineering, environmental, and/or safety reasons. Attached additional pages as necessary.

The development (airport) prohibits the breakup of impervious surfaces.

Soil compaction is not minimized due to the soil compaction requirements.

The development does not include landscaped areas.

The development must use storm sewers for stormwater conveyance.

FAA Advisory Circular restrictions on Hazardous Wildlife Attractants on or Near Airports