NEW BRITAIN – HARTFORD BUSWAY

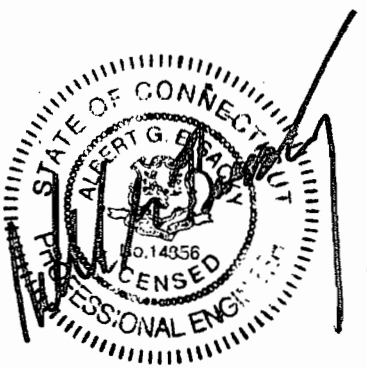
WEST HARTFORD, CT

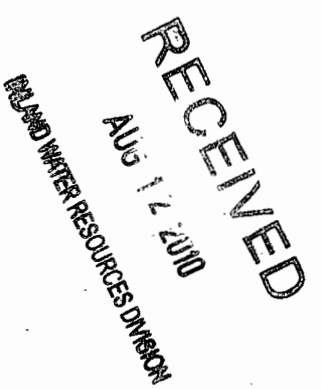
PERMITTING SUBMISSION

OCTOBER 30, 2009

FLATBUSH AVENUE STATION

State Project No. 88-H039





S E A

S E A CONSULTANTS INC.
Scientists/Engineers/Architects

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1. Introduction

1.0. Project Description

This project involves the design of eleven transit stations along an exclusive bus rapid transit (BRT) line. The BRT alignment and stations are within New Britain, Newington, West Hartford, and Hartford, Connecticut. Each site involves the design and construction of pedestrian and vehicular facilities for the busway operation. The site locations are typically urban sites that have been previously developed.

1.1. Purpose of Report

This report presents the preliminary drainage design for the BRT station sites. It provides information regarding the coordination with the proposed mainline drainage systems and data for use in preparing permitting applications.

1.2. Data Collection

In accordance with the Connecticut Department of Transportation Drainage Manual, the communities were solicited for input on existing drainage issues and concerns about the station drainage designs. Letters were sent to the Department of Public Works Directors and Town/City engineers in New Britain, Newington, West Hartford, and Hartford.

The Acting Town Engineer for West Hartford, David Kraus, responded via letter on October 30, 2008. Mr. Kraus requested drainage at Flatbush Station be installed to relieve the flooding condition on New Park Avenue. He also noted that the storm drainage system within New Britain Avenue is congested and recommended that the station drainage be directed northerly to Trout Brook.

2. Analysis Methodology

2.0. Design Criteria

The drainage design of the station sites was prepared in accordance with the 2000 Connecticut Department of Transportation Drainage Manual. Additional criteria of the Connecticut Department of Environmental Protection 2004 Stormwater Quality Manual along with the 2002 Connecticut Guidelines for Soil Erosion and Sediment Control was also considered.

The storm drainage systems were designed for the 10-year storm event. The rational method was used to calculate peak flows within the station sites. The hydraulic grade lines (HGLs) and pipe capacities were analyzed with StormCAD software. The Intensity/Duration/Frequency (IDF) curves used in the hydrologic analyses was from the Connecticut Department of Transportation Drainage Manual (Table B-2.1).

The inlets within the station sites were designed in accordance with the above mentioned manuals. A clogging factor of 50 percent was assumed for all basins located within sag. Similarly, an assumed clogging factor of 75 was applied to all yard drains and area drains

The CTDOT Drainage Manual specifies a minimum pipe velocity of 3 feet per second. When feasible, this velocity was achieved. However, given the nature of the site designs and the desire to eliminate nuisance flows to reduce icing conditions, not all pipes were able to be designed to meet this criterion. In general, this condition only exists in the upper reaches of the drainage systems.

The station site drainage system will be discharged into a system designed by others. Drainage reports and calculations were provided to S E A Consultants by URS for use in the station design. References to these designs are included herein.

2.1. Design Methodology

StormCAD V8 XM software by Bentley was utilized to conduct the drainage calculations for this report. In addition, the rational method was used to compare the existing drainage at and surrounding the site to the proposed drainage design. Design points were selected around the site to accurately represent the change in flow from existing to proposed. Weighted C values were chosen to represent surface types.

2.2. Assumptions

Drainage areas were delineated using project area mapping provided by the Department.

Runoff coefficients were determined based on land cover. Two types were identified within the station limits, paved and grassed areas. The runoff coefficients were determined as 0.9 and 0.3, respectively. Due to the small size of the station sites and small proposed drainage collection areas, the time of concentration of all on-site drainage sub-areas was assumed to be five minutes.

3. Station Analysis

3.0. Flatbush Station

3.0.1. Existing Condition

The site is almost entirely paved and was previously used as a car dealership. The site, including the shopping center driveway, is approximately 92.3% impervious and generally drains to New Park Avenue on the west and Flatbush Avenue on the east. The existing 15-inch storm drain pipe within New Park Avenue connects to the 15-inch reinforced concrete pipe in Flatbush Avenue. This system travels to the east on Flatbush Avenue.

A catch basin on New Park Avenue collects stormwater from a portion of the parking lot in addition to a section of the road (See Exhibit 3.6-A). The tributary area to this catch basin is approximately 0.84 acres. The discharge to this basin, Design Point A, is summarized, as follows:

Storm Frequency	Q_{PRE} (cfs)
2-year	2.82
10-year	3.68
25-year	4.11
100-year	4.78

A set of catch basins on Flatbush Avenue located near the rail crossing, captures surface runoff and is Design Point B. These catch basins collect stormwater from a portion of Flatbush Avenue and some of the existing parking lot. The discharge to these catch basins is summarized, as follows:

Storm Frequency	Q_{PRE} (cfs)
2-year	0.96
10-year	1.25
25-year	1.40
100-year	1.63

The majority of the site, 1.35 acres, drains to an existing swale that conveys the stormwater to the north to an existing 8-inch corrugated metal pipe. This is Design Point C. The discharge is summarized, as follows:

Storm Frequency	Q_{PRE} (cfs)
2-year	5.40
10-year	7.05
25-year	7.87
100-year	9.16

A portion of the site drains to existing catch basins in the neighboring shopping center (Appletree Market). The southern corner of the site drains to Appletree's loading dock. The drainage to this catch basin is Design Point D and is summarized as follows:

Storm Frequency	Q_{PRE} (cfs)
2-year	2.01
10-year	2.61
25-year	2.93
100-year	3.41

Discharge to a catch basin located within the existing driveway of Appletree Market is Design Point E and is summarized, as follows:

Storm Frequency	Q_{PRE} (cfs)
2-year	0.53
10-year	0.69
25-year	0.77
100-year	0.90

3.0.2. Proposed Condition

The proposed site consists of a parking area, plaza area, and some green space. It is approximately 68.2% impervious. The stormwater from the site will be collected in a series of yard drains and catch basins that will connect to the proposed mainline busway drainage system (Contract No. 155-H030, System No. 2) and ultimately tie into the existing system in Flatbush Avenue.

A yard drain located in the northwest corner of the site on New Park Avenue will connect to the proposed Flatbush Avenue Drainage (Contract No. 155-H030).

The northbound and southbound platforms are proposed to drain toward the mainline busway system drainage system. The 100% Drainage Design Submission drainage report prepared by URS and VN Engineers, Inc. revised October 2009 was used to determine the connection points and hydraulic controls at the site.

The area of the site that will be collected into the station drainage system totals approximately 1.74 acres. The area tributary to each inlet is shown in Exhibit 3.6-B. At the most downstream catch basin proposed, CB-1, the system intensity is 5.35 inches per hour for the 10 year storm.

The site discharge tributary to the mainline system connection is summarized, as follows:

Storm Frequency	Q_{POST} (cfs)
2-year	4.17
10-year	5.30
25-year	5.46
100-year	6.24

No peak flow attenuation is proposed prior to discharge into the mainline drainage system.

The yard drain (YD-4), described above, will connect to a proposed catch basin on New Park Avenue. This yard drain will capture nuisance flows to prevent flow over the proposed walkways and stairs. The discharge to this catch basin is summarized, as follows:

Storm Frequency	Q_{POST} (cfs)
2-year	0.02
10-year	0.02
25-year	0.03
100-year	0.03

The tailwater for the station system and the yard drain was determined by using the 100% Drainage Design Submission drainage report for the busway mainline drainage system. The site connection to the mainline occurs at Conduit 46 located at Station 350+57.7. The *Storm Sewer Summary Report* provides an invert elevation of 62.57 feet and a hydraulic grade line elevation of 64.10 feet at this location.

The yard drain connection to New Park Avenue occurs at Conduit 43 located at Station 104+70 Right. The *Storm Sewer Summary Report* provides an invert elevation of 72.52 feet and a hydraulic grade line elevation of 72.84 feet at this point.

The drainage and grading design for the site reduces the tributary areas for existing catch basins surrounding the site as described below (See Exhibit 3.6-B).

The catch basin on New Park Avenue will collect stormwater mainly from the road. The proposed flow to this catch basin, Design Point A, is summarized, as follows:

Storm Frequency	Q_{PRE} (cfs)	Q_{POST} (cfs)	ΔQ (cfs)
2-year	2.82	1.32	-1.50
10-year	3.68	1.73	-1.95
25-year	4.11	1.93	-2.18
100-year	4.78	2.25	-2.54

No stormwater is proposed to flow to the catch basins on Flatbush Avenue, Design Point B. This catch basin is within the limits of Contract No. 155-H025.

The existing swale, Design Point C, will be removed with the construction of the busway mainline (Contract No. 155-H025). No site contribution to the existing CMP is proposed.

The southern corner of the site will continue to drain to Appletree's loading dock. The drainage to this catch basin, Design Point D, is summarized as follows:

Storm Frequency	Q_{PRE} (cfs)	Q_{POST} (cfs)	ΔQ (cfs)
2-year	2.01	0.96	-1.05
10-year	2.61	1.25	-1.37
25-year	2.93	1.40	-1.53
100-year	3.41	1.63	-1.78

Discharge to the catch basin located within the existing driveway of Appletree Market, Design Point E, is summarized, as follows:

Storm Frequency	Q_{PRE} (cfs)	Q_{POST} (cfs)	ΔQ (cfs)
2-year	0.53	0.12	-0.41
10-year	0.69	0.16	-0.53
25-year	0.77	0.18	-0.59
100-year	0.90	0.21	-0.69

3.0.3. Environmental Issues and Stormwater Treatment

No Department flagged wetland areas are located within the station site boundaries. However, a flagged wetland area, identified on Exhibit 3.6-C, is located within the alignment of the mainline busway near the Flatbush Avenue Station. This area will be impacted by the Hartford South Contract (No. 155-H025).

The station site drainage design includes provisions for the installation of a hydrodynamic separator (HDS). The device is proposed within the station plaza area to facilitate access and minimize and vehicular conflicts during maintenance. The device will be an off-line type and specified in accordance with the Department requirements.

A diversion manhole has been included in the hydraulic model of the station drainage system (MH-1). This structure has been designed to divert the water quality flow to the unit for treatment and allow bypass of peak flow events.

The water quality flow was calculated in accordance with CTDEP standard practices and equals 1.1 cfs for the station site. See calculations in Appendix C.

3.0.4. Soil Erosion and Sediment Control

The soil erosion and sedimentation control design complies with the Department of Environmental Protection 2002 Connecticut Guidelines for Soil Erosion and Sediment Control. The design contains provisions for silt fences along with inlet protection.

4. Appendix A: Design Checklist

Project No.	88-H039
Roadway	FLATBUSH STATION
Town	WEST HARTFORD
Date	10/29/2009
Designed By	S E A CONSULTANTS
Signature of Engineer	EAS

Drainage Design Checklist (Plans 50% Complete)

Allow a 6-8 week review time

See ***Note*** below.

Semi-Final Design Checklist (Plans 60% to 70% Complete)

Allow a 5-6 week review time

Note: A separate, earlier drainage submission (at approximately 50% completion) may be required if the drainage design is particularly complicated, requires significant right of way and/or otherwise might jeopardize the schedule of the project. **This checklist MUST accompany both of these submissions.**

Indicate which submission this checklist is for and include the following information:

☐ *Drainage Design Submission* ☒ *Semi-Final Design Submission*

a. Draft Drainage Report

1. Disposition of Preliminary Design/Drainage Design Submission comments with written responses justifying comments not incorporated.
   ☒ Included ☐ Not Included ☐ Not Applicable
2. A condition survey of the existing drainage pipes and structures that are to remain in use should be investigated for structural adequacy and documented. (See Section 3.6.3.)
   ☐ Included ☐ Not Included ☒ Not Applicable
3. The condition of existing ditches that are to remain in use should be field inspected, analyzed and results documented to verify their stability and the need for cleaning and reshaping.
   ☐ Included ☐ Not Included ☒ Not Applicable
4. The condition of the outlet at the existing discharge points should be investigated and documented to ensure no erosion or sediment problems exist. If outlet protection is required, it should be incorporated into the project and computations submitted.
   ☐ Included ☐ Not Included ☒ Not Applicable

5. A condition survey report including items 2, 3, and 4 above. (See Appendix A and B, Chapter 4)
   ☐ Included ☐ Not Included ☒ Not Applicable
6. Drainage design computations should include gutter flow analysis, storm sewer design, and hydraulic gradeline (HGL). The hydraulic gradeline should be analyzed to ensure 0.3m (1 ft) freeboard is maintained at drainage structures. This analysis should consider all friction, entrance, junction, exit and bend losses. Designer to verify that the proposed drainage will not adversely impact the existing downstream storm system or property owners. (See Chapter 11, Storm Drainage Systems.)
   ☒ Included ☐ Not Included ☐ Not Applicable
7. Drainage computations should identify structures by station and offset rather than by a numerical identifier. If station and offset is not feasible for the computations then include an index with the location of the structure corresponding to its numerical identifier. The watershed map should be prepared accordingly.
   ☒ Included ☐ Not Included ☐ Not Applicable
8. Existing drainage systems shall be analyzed for hydraulic adequacy to meet the proposed conditions and, if found inadequate, an upgrade will be designed in conformance with the criteria established in the Drainage Manual.
   ☐ Included ☐ Not Included ☒ Not Applicable
9. All roadway drainage systems should be brought to a suitable outlet.
   ☒ Included ☐ Not Included ☐ Not Applicable
10. If upgrading of pipes downstream of the project is necessary, then additional rights may need to be acquired.
    ☐ Included ☐ Not Included ☒ Not Applicable
11. The need for temporary drainage should be addressed. Temporary drainage computations should be prepared in accordance with criteria in the Drainage Manual. (See Section 3.6.11.)
    ☐ Included ☐ Not Included ☒ Not Applicable
12. Proposed swales, ditches and channels should be designed in accordance with HEC-15 for discharges 1.42 m^3/s (50 ft^3/s) and less or HEC-11 for discharges in excess of 1.42 m^3/s (50 ft^3/s). (See Chapter 7, Channels.)
    ☐ Included ☐ Not Included ☒ Not Applicable
13. Minor and small cross culvert design computations with culvert data sheet. (See Chapter 8, Culverts.)
    ☐ Included ☐ Not Included ☒ Not Applicable
14. Topographic mapping with watershed area delineated for each inlet and/or cross culverts as required to perform the drainage calculations. The flow path used in the time of concentration calculation and coefficient of imperviousness should be shown for each area. (See Chapter 6, Hydrology.)
    ☒ Included ☐ Not Included ☐ Not Applicable
15. Diversion identified.
    ☐ Included ☐ Not Included ☒ Not Applicable
16. All plans, computations and reports identify the responsible engineers who prepared and checked the work.
    ☒ Included ☐ Not Included ☐ Not Applicable

b. Plans, Profiles and Cross Sections

1. The existing and proposed storm drainage shown to their outlets.
   ☒ Included ☐ Not Included ☐ Not Applicable
2. Size and type of existing drainage pipes/structures and disposition of pipes/structures to be abandoned.
   ☐ Included ☐ Not Included ☒ Not Applicable
3. Properties affected by diversions should be shown on the plans so that proper rights can be acquired.
   ☐ Included ☐ Not Included ☒ Not Applicable
4. Drainage Rights and Easements.
   ☐ Included ☐ Not Included ☒ Not Applicable
5. Outlet Protection shown on plans and details provided.
   ☐ Included ☐ Not Included ☒ Not Applicable
6. Intersection grading plans to ensure inlets are located at the low points to alleviate ponding/icing conditions. Top of frame elevation should be shown.
   ☐ Included ☒ Not Included ☐ Not Applicable
7. In areas where cross culverts are being extended, replaced, or where outlet protection is proposed a profile or cross section of the natural ground should be provided to show how the inverts will tie into the existing topography.
   ☐ Included ☐ Not Included ☒ Not Applicable
8. The top of frame and invert elevations for each storm drainage structure shown. Proposed drainage structures shall be identified by station and offset on cross sections.
   ☒ Included ☐ Not Included ☐ Not Applicable
9. Existing and proposed drainage patterns (flow arrows) of pipes, ditches, channel and swales.
   ☒ Included ☐ Not Included ☐ Not Applicable
10. Details for any special drainage structures not found in the Standard Drawings.
    ☐ Included ☐ Not Included ☒ Not Applicable
11. The direction of flow should be shown by arrows to 61m (200 ft.) beyond any drainage outlet, or shown to terminate by dissipation or entrance into a watercourse or body of water.
    ☐ Included ☐ Not Included ☒ Not Applicable

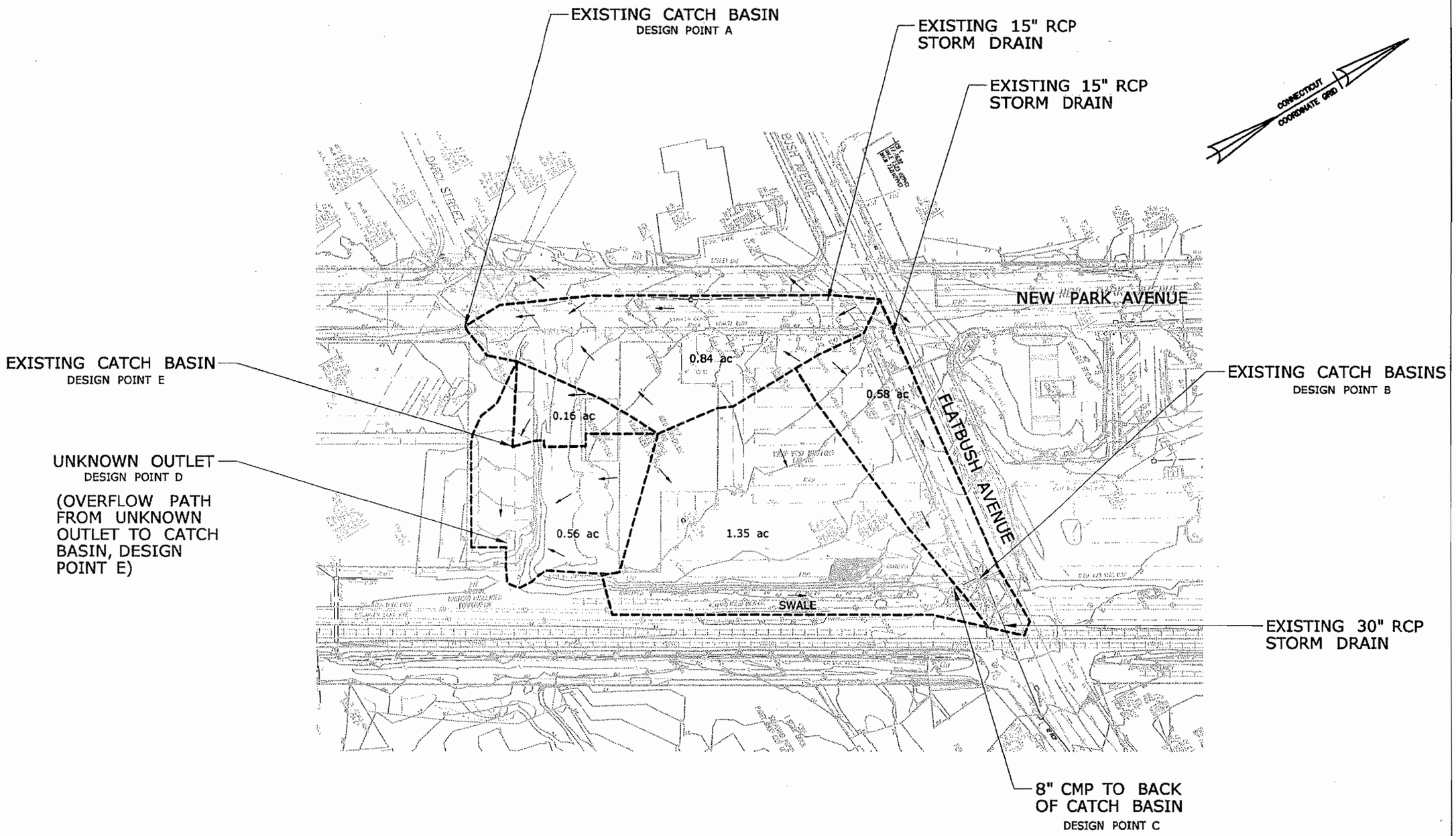
c. Structures with drainage areas > 2.59 km^2 (1 mi^2)

1. Draft hydraulic design report.
   ☐ Included ☐ Not Included ☒ Not Applicable
2. Draft scour report when the proposed structure spans the waterway.
   ☐ Included ☐ Not Included ☒ Not Applicable
3. Draft floodway report.
   ☐ Included ☐ Not Included ☒ Not Applicable
4. Draft SCEL report.
   ☐ Included ☐ Not Included ☒ Not Applicable
5. Draft scour report if required.
   ☐ Included ☐ Not Included ☒ Not Applicable

Provide justification for items **Not Included**. Justification should correspond to letter and number.

b.6. INTERSECTION GRADING PLANS TO BE PREPARED DURING FINAL DESIGN.

5. Appendix B: Watershed Mapping and Exhibits



EXISTING CONDITIONS

SCALE 1" = 100'

200 100 0 200

STATE PROJECT NO.: 88-H039 COUNTY: HARTFORD CITY/TOWN: WEST HARTFORD	APPLICATION BY: STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING SCALE 1=100	DATE: OCTOBER 2009 SITE: FLATBUSH AVENUE STATION EXHIBIT: 3.6-A

EXISTING CATCH BASINS
DESIGN POINT A

CONNECT TO PROPOSED
DRAINAGE DESIGN
CONTRACT NO. 155-H030

CONNECTICUT
COORDINATE GRID

NEW PARK AVENUE

PROPOSED 12" RCP
STORMDRAIN
(BY OTHERS)

0.32 ac

CB-13
0.09 ac

CB-3
0.24 ac

YD-2
0.01 ac

EXISTING CATCH BASIN
DESIGN POINT E

0.03 ac

CB-4
0.26 ac

YD-1
0.07 ac

YD-3
0.07 ac

FLATBUSH AVENUE

CB-6
0.19 ac

CB-7

CB-5
0.14 ac

UNKNOWN OUTLET
DESIGN POINT D

0.29 ac

CB-2
0.11 ac

CB-1
0.15 ac

346+00

347+00

348+00

349+00

350+00

351+00

351+00

CONNECT TO PROPOSED
DRAINAGE DESIGN
STA. 350+57.70
CONTRACT NO. 155-H025

PROPOSED 30" RCP
STORMDRAIN
(BY OTHERS)

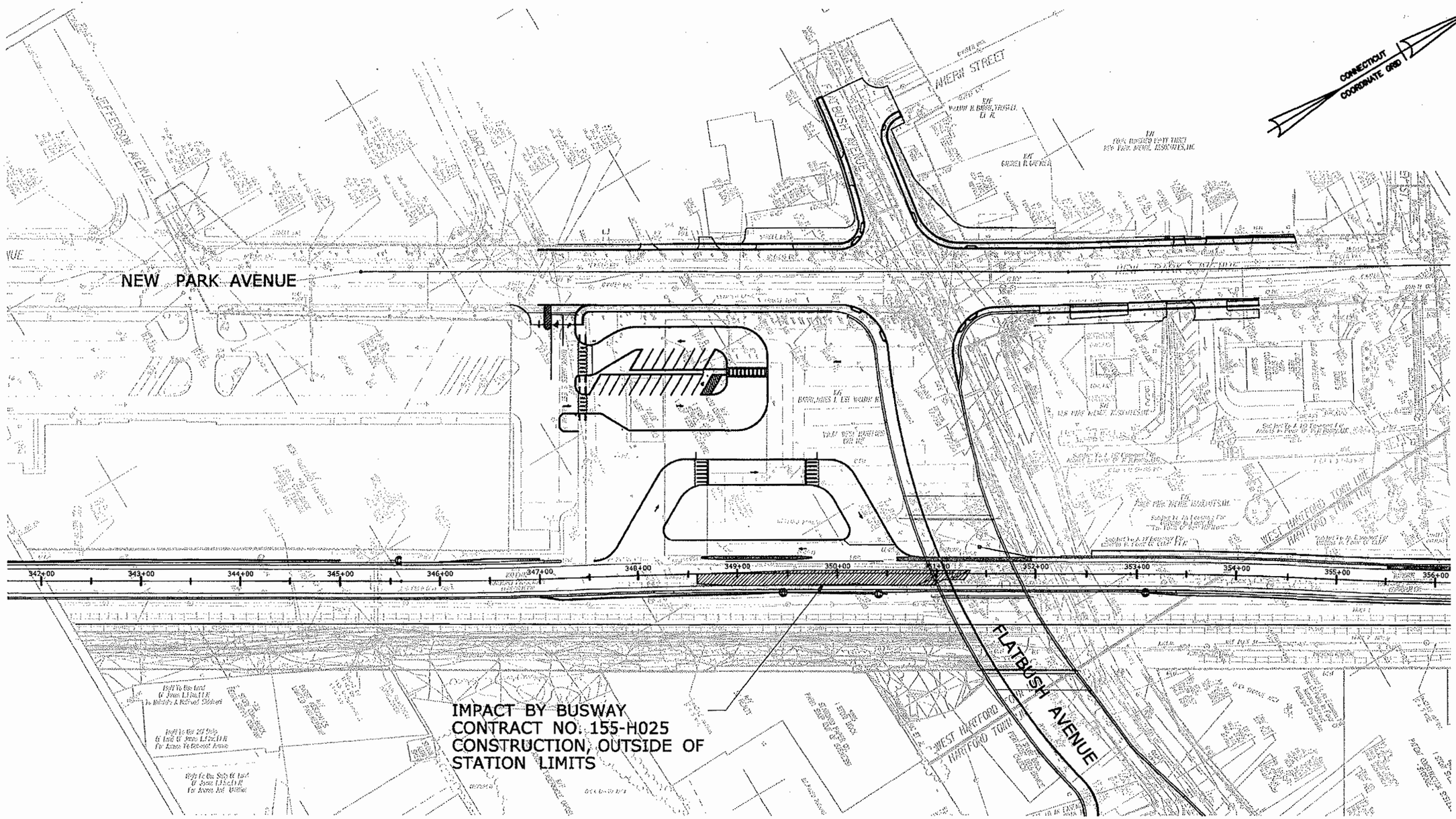
PROPOSED 12" RCP
STORMDRAIN
(BY OTHERS)

PROPOSED CONDITIONS

SCALE 1" = 50'

100 50 0 100

STATE PROJECT NO.: 88-H039 COUNTY: HARTFORD CITY/TOWN: WEST HARTFORD	APPLICATION BY: STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING SCALE 1=50	DATE: OCTOBER 2009 SITE: FLATBUSH AVENUE STATION EXHIBIT: 3.6-B



PROPOSED IMPACT

SCALE 1" = 100'

200 100 0 200

STATE PROJECT NO.: 88-H039 COUNTY: HARTFORD CITY/TOWN:WEST HARTFORD	APPLICATION BY: STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	OFFICE OF ENGINEERING SCALE 1=100	DATE: OCTOBER 2009 SITE: FLATBUSH AVENUE STATION EXHIBIT: 3.6-C

6. Appendix C: Hydrologic and Hydraulic Calculations

SEA Consultants, Inc.
Scientist/Engineers/Architects
200 Corporate Place
Rocky Hill, Connecticut 06067

PROJECT:	New Britain - Hartford Bus Rapid Transit Stations			
PROJECT NO.	88-H039	SHEET NO.	1	
CALCULATED BY:	KSR	DATE:	10/26/2009	
CHECKED BY:	EAS	DATE:	10/29/2009	

Runoff Calculations for the 2, 10, 25, 100 Year Storms
Flatbush Avenue Station

System: New Park Avenue catch basin at site driveway

Pre- Development

Design Point	Area (Acres)	C Value	2yr Rainfall (in/hr)	10yr Rainfall (in/hr)	25yr Rainfall (in/hr)	100yr Rainfall (in/hr)	Q_{2yr} (cfs)	Q_{10yr} (cfs)	Q_{25yr} (cfs)	Q_{100yr} (cfs)
A	0.84	0.73	4.60	6.00	6.70	7.80	2.82	3.68	4.11	4.78
						Total Q =	2.82	3.68	4.11	4.78

Post- Development

Design Point	Area (Acres)	C Value	2yr Rainfall (in/hr)	10yr Rainfall (in/hr)	25yr Rainfall (in/hr)	100yr Rainfall (in/hr)	Q_{2yr} (cfs)	Q_{10yr} (cfs)	Q_{25yr} (cfs)	Q_{100yr} (cfs)
A	0.32	0.90	4.60	6.00	6.70	7.80	1.32	1.73	1.93	2.25
						Total Q =	1.32	1.73	1.93	2.25
						Delta =	-1.50	-1.95	-2.18	-2.54

System: Flatbush Avenue catch basin near rail crossing

Pre- Development

Design Point	Area (Acres)	C Value	2yr Rainfall (in/hr)	10yr Rainfall (in/hr)	25yr Rainfall (in/hr)	100yr Rainfall (in/hr)	Q_{2yr} (cfs)	Q_{10yr} (cfs)	Q_{25yr} (cfs)	Q_{100yr} (cfs)
B	0.58	0.36	4.60	6.00	6.70	7.80	0.96	1.25	1.40	1.63
						Total Q =	0.96	1.25	1.40	1.63

Post- Development

Design Point	Area (Acres)	C Value	2yr Rainfall (in/hr)	10yr Rainfall (in/hr)	25yr Rainfall (in/hr)	100yr Rainfall (in/hr)	Q_{2yr} (cfs)	Q_{10yr} (cfs)	Q_{25yr} (cfs)	Q_{100yr} (cfs)
B	0.00	0.00	4.60	6.00	6.70	7.80	0.00	0.00	0.00	0.00
						Total Q =	0.00	0.00	0.00	0.00
						Delta =	-0.96	-1.25	-1.40	-1.63

System: 8" CMP to back of catch basin on Flatbush Avenue

Pre- Development

Design Point	Area (Acres)	C Value	2yr Rainfall (in/hr)	10yr Rainfall (in/hr)	25yr Rainfall (in/hr)	100yr Rainfall (in/hr)	Q_{2yr} (cfs)	Q_{10yr} (cfs)	Q_{25yr} (cfs)	Q_{100yr} (cfs)
C	1.35	0.87	4.60	6.00	6.70	7.80	5.40	7.05	7.87	9.16
						Total Q =	5.40	7.05	7.87	9.16

Post- Development

Design Point	Area (Acres)	C Value	2yr Rainfall (in/hr)	10yr Rainfall (in/hr)	25yr Rainfall (in/hr)	100yr Rainfall (in/hr)	Q_{2yr} (cfs)	Q_{10yr} (cfs)	Q_{25yr} (cfs)	Q_{100yr} (cfs)
C	0.00	0.00	4.60	6.00	6.70	7.80	0.00	0.00	0.00	0.00
						Total Q =	0.00	0.00	0.00	0.00
						Delta =	-5.40	-7.05	-7.87	-9.16

SEA Consultants, Inc.
Scientist/Engineers/Architects
200 Corporate Place
Rocky Hill, Connecticut 06067

PROJECT:	New Britain - Hartford Bus Rapid Transit Stations		
PROJECT NO.	88-H039	SHEET NO.	2
CALCULATED BY:	KSR	DATE:	10/26/2009
CHECKED BY:		DATE:	

System: Appletree Market (Loading Dock)

Pre- Development

Design Point	Area (Acres)	C Value	2yr Rainfall (in/hr)	10yr Rainfall (in/hr)	25yr Rainfall (in/hr)	100yr Rainfall (in/hr)	Q_{2yr} (cfs)	Q_{10yr} (cfs)	Q_{25yr} (cfs)	Q_{100yr} (cfs)
D	0.56	0.78	4.60	6.00	6.70	7.80	2.01	2.62	2.93	3.41
						Total Q =	2.01	2.62	2.93	3.41

Post- Development

Design Point	Area (Acres)	C Value	2yr Rainfall (in/hr)	10yr Rainfall (in/hr)	25yr Rainfall (in/hr)	100yr Rainfall (in/hr)	Q_{2yr} (cfs)	Q_{10yr} (cfs)	Q_{25yr} (cfs)	Q_{100yr} (cfs)
D	0.29	0.72	4.60	6.00	6.70	7.80	0.96	1.25	1.40	1.63
						Total Q =	0.96	1.25	1.40	1.63
						Delta =	-1.05	-1.37	-1.53	-1.78

System: Appletree Market (Driveway)

Pre- Development

Design Point	Area (Acres)	C Value	2yr Rainfall (in/hr)	10yr Rainfall (in/hr)	25yr Rainfall (in/hr)	100yr Rainfall (in/hr)	Q_{2yr} (cfs)	Q_{10yr} (cfs)	Q_{25yr} (cfs)	Q_{100yr} (cfs)
E	0.16	0.72	4.60	6.00	6.70	7.80	0.53	0.69	0.77	0.90
						Total Q =	0.53	0.69	0.77	0.90

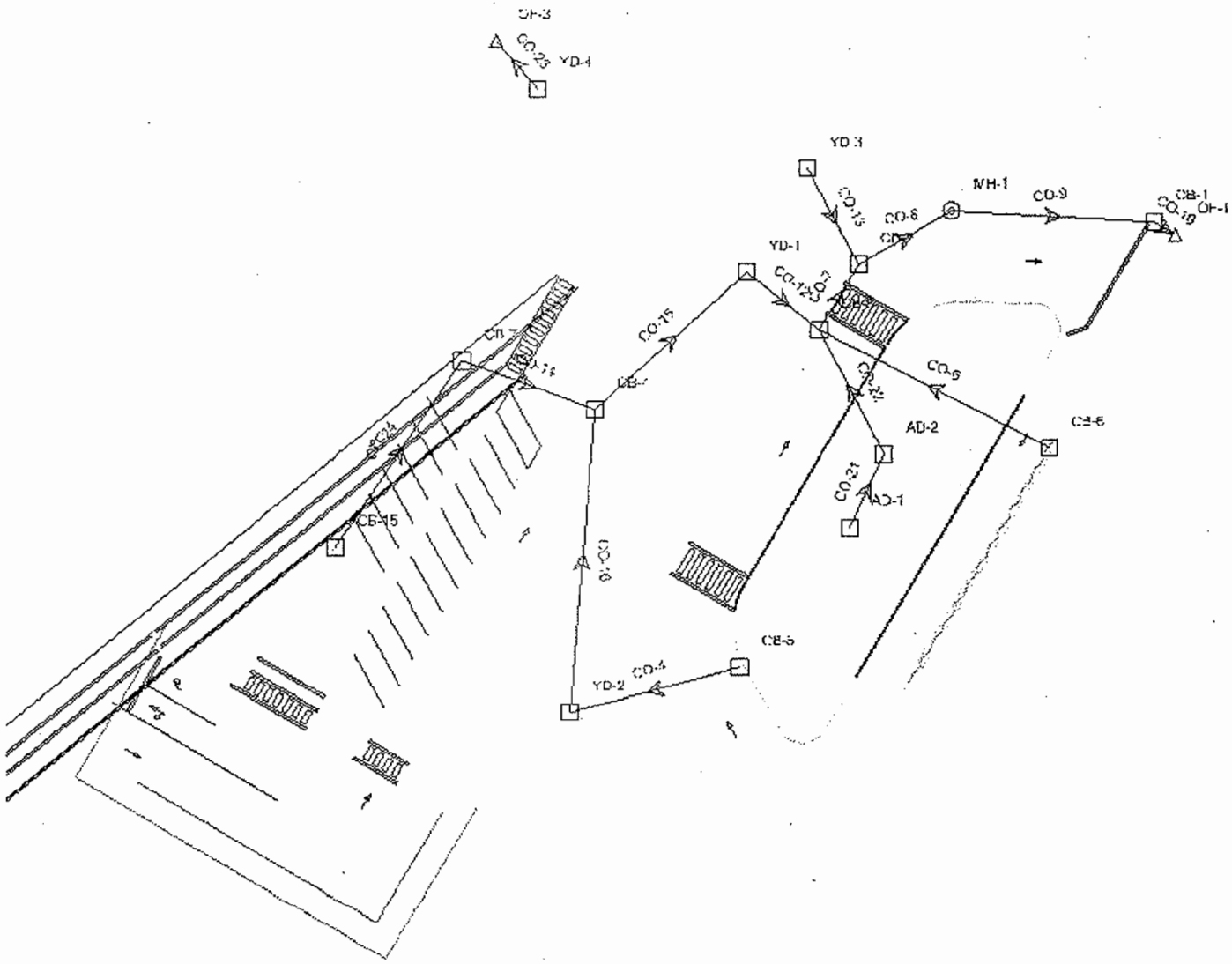
Post- Development

Design Point	Area (Acres)	C Value	2yr Rainfall (in/hr)	10yr Rainfall (in/hr)	25yr Rainfall (in/hr)	100yr Rainfall (in/hr)	Q_{2yr} (cfs)	Q_{10yr} (cfs)	Q_{25yr} (cfs)	Q_{100yr} (cfs)
E	0.03	0.90	4.60	6.00	6.70	7.80	0.12	0.16	0.18	0.21
						Total Q =	0.12	0.16	0.18	0.21
						Delta =	-0.41	-0.53	-0.59	-0.69

Note:

1.) Calculations based on Rational Method, Q = CiA
2.) Design Points designated on Exhibit 3.6-A and 3.6-B

Flatbush Avenue Station



BRT Station Preliminary Drainage Design
DOT Report

Label	Node Upstream Downstream	Upstream Inlet C	Upstream CA (acres)	Ground Upstream Downstream	HGL Upstream Downstream	System Rational Flow (ft³/s)	Length (ft)	Velocity (Average) (ft/s)	System Intensity (in/hr)
CO-4	CB-5	0.704	0.08	70.55	66.66	0.47	64	3.13	6
	YD-2			69.5	66.5				
CO-6	CB-6	0.9	0.06	70.35	65.95	0.39	96	3.39	6
	CB-3			69.52	65.91				
CO-7	CB-3	0.9	0.71	69.52	65.85	3.92	28	2.22	5.477
	CB-2			69.2	65.81				
CO-8	CB-2	0.818	0.91	69.2	65.55	4.99	39	4.55	5.435
	MH-1			70.05	65.32				
CO-9	MH-1	(N/A)	0.91	70.05	64.29	4.96	75	4.75	5.406
	CB-1			70	64.2				
CO-10	CB-1	0.823	0.98	70	64.11	5.31	9	7.38	5.354
	OF-1			69.78	64.1				
CO-12	YD-1	0.628	0.48	70.45	65.93	2.68	34	1.52	5.578
	CB-3			69.52	65.91				
CO-13	YD-3	0.3	0.02	71.8	66.51	0.13	40	3.88	6
	CB-2			69.2	65.81				
CO-14	CB-7	0.696	0.17	70.4	66.49	0.98	52	1.25	5.87
	CB-4			69.74	66.45				
CO-15	CB-4	0.307	0.43	69.74	66.32	2.47	75	3.15	5.697
	YD-1			70.45	65.96				
CO-16	YD-2	0.416	0.13	69.5	66.49	0.76	112	2.81	5.932
	CB-4			69.74	66.45				
CO-21	AD-1	0.9	0.02	72	67.97	0.1	29	1.99	6
	AD-2			71.5	67.81				
CO-22	AD-2	0.9	0.03	71.5	67.78	0.19	52	5.61	5.951
	CB-3			69.52	65.91				
CO-23	YD-4	0.3	0.00	75.8	72.84	0.02	23	1.04	6
	OF-3			77.06	72.84				
CO-24	CB-15	0.75	0.05	71.27	66.5	0.28	82	2.11	6
	CB-7			70.4	66.5				

BRT Station Preliminary Drainage Design
Catchment Area Summary

Label	Scaled Area (acres)	Rational C	Catchment CA (acres)	Time of Concentration (min)	Outflow Node	Catchment Rational Flow (ft^3/s)
CM-1	0.07	0.3	0.02	5	YD-3	0.13
CM-4	0.008	0.3	0.002	5	CB-7	0.01
CM-6	0.08	0.3	0.02	5	CB-7	0.14
CM-7	0.06	0.9	0.051	5	CB-7	0.31
CM-8	0.243	0.3	0.073	5	CB-4	0.44
CM-9	0.004	0.3	0.001	5	CB-4	0.01
CM-10	0.01	0.3	0.00	5	CB-4	0.02
CM-11	0.01	0.3	0.00	5	CB-4	0.01
CM-12	0.03	0.3	0.01	5	YD-1	0.06
CM-13	0.04	0.9	0.036	5	YD-1	0.22
CM-14	0.002	0.3	0.001	5	YD-1	0
CM-16	0.19	0.9	0.17	5	CB-3	1.05
CM-17	0.028	0.3	0.008	5	CB-2	0.05
CM-18	0.247	0.9	0.223	5	CB-2	1.35
CM-19	0.01	0.3	0.00	5	CB-2	0.02
CM-20	0.088	0.9	0.079	5	CB-6	0.48
CM-21	0.018	0.3	0.005	5	CB-5	0.03
CM-22	0.012	0.3	0.004	5	CB-1	0.02
CM-23	0.08	0.9	0.08	5	CB-1	0.45
CM-24	0.028	0.3	0.009	5	CB-5	0.05
CM-25	0.10	0.9	0.087	5	CB-5	0.52
CM-26	0.02	0.9	0.02	5	YD-2	0.12
CM-27	0.09	0.3	0.03	5	YD-2	0.16
CM-28	0.01	0.3	0.00	5	YD-2	0.01
CM-30	0.01	0.3	0.00	5	YD-4	0.02
CM-32	0.001	0.9	0.001	5	CB-7	0
CM-34	0.003	0.9	0.003	5	CB-4	0.02
CM-35	0.021	0.9	0.019	5	CB-3	0.11
CM-36	0.025	0.9	0.023	5	AD-1	0.14
CM-37	0.025	0.9	0.022	5	AD-2	0.14
CM-38	0.111	0.9	0.1	5	CB-7	0.61
CM-39	0.008	0.3	0.002	5	CB-15	0.01
CM-40	0.055	0.9	0.05	5	CB-15	0.3
CM-41	0.008	0.3	0.003	5	CB-15	0.02
CM-42	0.002	0.3	0.001	5	CB-15	0

BRT Station Preliminary Drainage Design
Conduit Summary

Label	Start Node	Stop Node	Invert (Upstream) (ft)	Invert (Downstream) (ft)	Section Size (in)	Flow (ft^3/s)	Length (Unified) (ft)	Slope (Calculated) (ft/ft)	Capacity (Full Flow)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Cover (Start) (ft)	Cover (Stop) (ft)	Velocity (Average) (ft/s)
CO-4	CB-5	YD-2	66.38	65.75	12 inch	0.47	64	0.01	3.53	70.55	69.5	3.17	3.75	3.13
CO-6	CB-6	CB-3	65.69	64.3	12 inch	0.39	96	0.014	4.29	70.35	69.52	3.66	4.22	3.39
CO-7	CB-3	CB-2	63.8	63.66	18 inch	3.92	28	0.005	7.43	69.52	69.2	4.22	4.04	2.22
CO-8	CB-2	MH-1	64.66	64.46	18 inch	4.99	39	0.005	7.52	69.2	70.05	3.04	4.09	4.55
CO-9	MH-1	CB-1	63.26	62.83	18 inch	4.96	75	0.006	7.95	70.05	70	5.29	5.67	4.75
CO-10	CB-1	OF-1	62.73	62.57	18 inch	5.31	9	0.018	14.01	70	69.78	5.77	5.71	7.38
CO-12	YD-1	CB-3	64.07	63.9	18 inch	2.68	34	0.005	7.43	70.45	69.52	4.88	4.12	1.52
CO-13	YD-3	CB-2	66.36	64.16	12 inch	0.13	40	0.055	8.36	71.8	69.2	4.44	4.04	3.88
CO-14	CB-7	CB-4	65.35	65.09	12 inch	0.98	52	0.005	2.52	70.4	69.74	4.05	3.65	1.25
CO-15	CB-4	YD-1	64.99	64.61	12 inch	2.47	75	0.005	2.54	69.74	70.45	3.75	4.84	3.15
CO-16	YD-2	CB-4	65.65	65.09	12 inch	0.76	112	0.005	2.52	69.5	69.74	2.85	3.65	2.81
CO-21	AD-1	AD-2	67.83	67.68	8 inch	0.1	29	0.005	1.14	72	71.5	3.5	3.15	1.99
CO-22	AD-2	CB-3	67.58	64.63	8 inch	0.19	52	0.057	3.74	71.5	69.52	3.25	4.22	5.61
CO-23	YD-4	OF-3	72.64	72.52	12 inch	0.02	23	0.005	2.57	75.8	77.06	2.16	3.54	1.04
CO-24	CB-15	CB-7	65.77	65.36	12 inch	0.28	82	0.005	2.52	71.27	70.4	4.5	4.04	2.11

BRT Station Preliminary Drainage Design

Catch Basin Summary

Label	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Inlet C	Inlet	Depth (In) (ft)	Depth (Out) (ft)	Flow (Total Intercepted) (ft^3/s)	Bypassed Rational Flow (ft^3/s)	Hydraulic Grade In (ft)	Hydraulic Grade Out (ft)	Gutter Depth (in)	Gutter Spread (ft)
CB-2	69.2	61.66	0.818	Combination Type C Single Grate - Grate Type A - Plain Curb	3.37	3.11	1.08	0.81	65.81	65.55	1.8	7.4
CB-7	70.4	63.35	0.696	Combination Type C Single Grate - Grate Type A - Plain Curb	2.31	2.3	0.72	0.35	66.5	66.49	1.4	6
CB-1	70	60.73	0.823	Combination Type C Single Grate - Grate Type A - Plain Curb	3.47	3.38	0.44	0.12	64.2	64.11	1.1	4.7
CB-6	70.35	63.69	0.9	Combination Type C Single Grate - Grate Type A - Plain Curb	2.26	2.26	0.39	0.09	65.95	65.95	1.1	4.4
CB-5	70.55	64.38	0.704	Combination Type C Single Grate - Grate Type A - Plain Curb	2.28	2.28	0.47	0.14	66.66	66.66	1.2	4.9
YD-4	75.8	69.63	0.3	Yard Drain	3.21	3.21	0.02	0	72.84	72.84	0.4	0
YD-3	71.8	64.36	0.3	Yard Drain	2.15	2.15	0.13	0	66.51	66.51	1.1	0
YD-1	70.45	62.07	0.628	Yard Drain	3.89	3.86	0.28	0	65.96	65.93	1.9	0
YD-2	69.5	63.65	0.416	Yard Drain	2.85	2.84	0.3	0	66.5	66.49	2	0
CB-4	69.74	62.99	0.307	Combination Type C Single Grate - Grate Type A - Plain Curb	3.46	3.33	0.84	0	66.45	66.32	0.2	4.8
CB-3	69.52	61.8	0.9	Combination Type C Single Grate - Grate Type A - Plain Curb	3.27	3.21	0.83	0.47	65.91	65.85	1.6	6.5
AD-1	71.7	65.83	0.9	Area Drain	2.14	2.14	0.1	0.04	67.97	67.97	0.7	2.8
AD-2	71.5	65.58	0.9	Area Drain	2.2	2.2	0.1	0.04	67.78	67.78	0.7	2.8
CB-15	71.27	63.86	0.75	Combination Type C Single Grate - Grate Type A - Plain Curb	2.73	2.73	0.28	0.06	66.5	66.5	0.9	3.9

SEA Consultants, Inc.
Scientist/Engineers/Architects
200 Corporate Place
Rocky Hill, Connecticut 06067

PROJECT:	New Britain - Hartford Bus Rapid Transit Stations			
PROJECT NO.	88-H039	SHEET NO.	1 OF	1
CALCULATED BY	KRV	DATE	8/5/2009	
CHECKED BY	AGB	DATE	8/5/2009	

Total Drainage Area (Acres)

Existing =	1.80	% Impervious
Impervious Area =	1.62	90
Proposed =	1.80	
Impervious Area =	1.13	63

Pollutant Reduction

References
CT DEP Stormwater Quality Manual 2004 edition
Chapter 7

1 Water Quality Volume (WQV)

P = 1 inch of rainfall

a Percent proposed impervious cover, (I)
I = 63.0 %
I = percent impervious cover

b Volumetric runoff coefficient, R
R = 0.05+0.009 (I)
R = 0.62
R = volumetric runoff coefficient = 0.05+0.009(I)

c A = 1.80 acres * 0.00281 sq. miles
A = total site area in acres

d WQV = (1")R(A)/12
WQV = 0.09 ac-ft
4,031 cf
WQV= water quality volume (ac-ft)
1 acre = 0.001563 sq. miles
1 acre - ft = 43,560 cf

2 Water Quality Flow (WQF)

a Runoff depth, (Q)
Q = [WQV(ac-ft) x [12(in/ft)] / Drainage Area (acres)
Q = 0.62 in

b NRCS Runoff Curve Number (CN)
CN = 1000 / [10 + 5P + 10Q - 10(Q^2 + 1.25QP)^1/2]
CN = 95.8

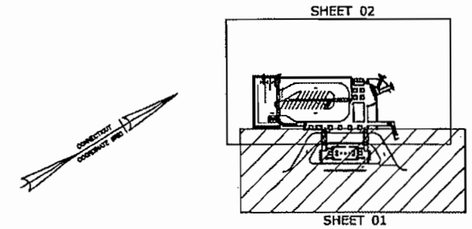
c Read initial abstration, (Ia)
Ia = 0.083
Appendix B, Table 4-1, Chapter 4, TR-55, page B-2

d Compute Ia/P
Ia/P = 0.083

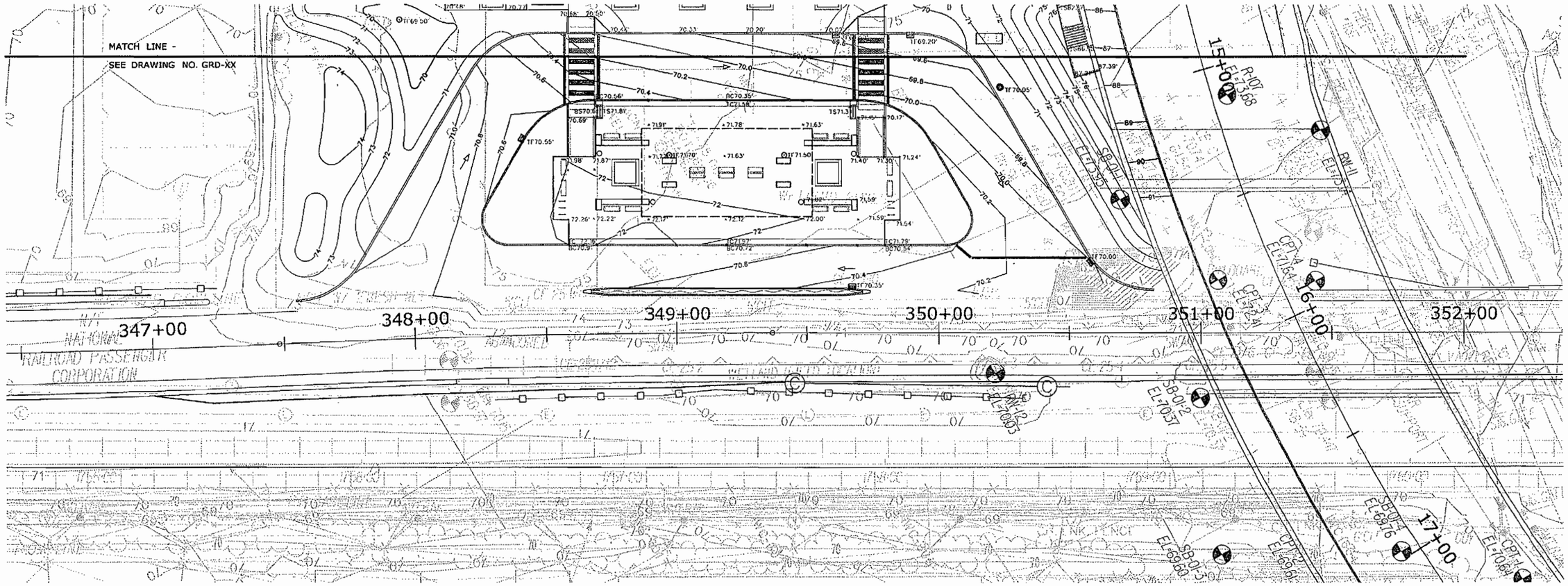
e Read initial abstration, (qu)
Tc = 0.167 hr.
Assumed 10min.
qu = 650 csm/in (Type III Storm)
Appendix B, Table 4-11, Chapter 4, TR-55, page B-2

f Water quality flow (WQF)
WQF = (qu)(A)(Q)
WQF = 1.13 cfs
WQF= water quality flow (cfs)
*A = drainage area (mi^2)

7. Appendix D: Drainage, Grading, and Soil Erosion and Sedimentation Control Plans



KEY PLAN



ENVIRONMENTAL PERMIT REVIEW

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THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.

Plotted Date: 10/29/2009

DESIGNER/DRAFTER: KRV
CHECKED BY: -
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SCALE 1"=20'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: ...\FD-MSH_GRD_88H039_A_FLATBUSH.dgn

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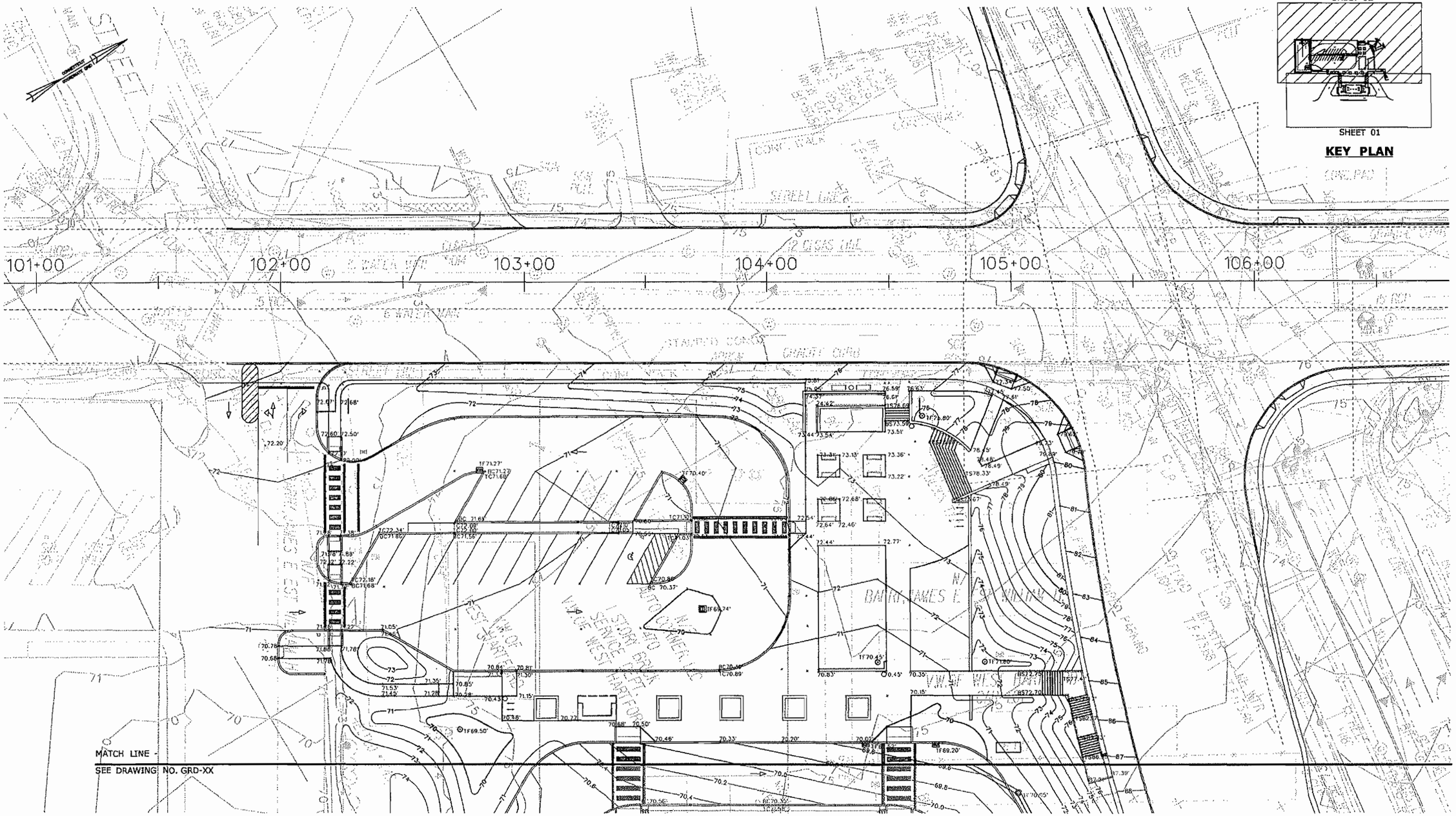
APPROVED BY: DATE: -

PROJECT TITLE: NEW BRITAIN - HARTFORD BUS RAPID TRANSIT STATIONS

TOWN: WEST HARTFORD

DRAWING TITLE: FLATBUSH AVE. STATION GRADING PLAN

PROJECT NO. 88-H039
DRAWING NO. GRD-XX
SHEET NO. S



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SCALE 1"=20'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: ...\FD_MSH_GRD_88H039_B_FLATBUSH.dgn

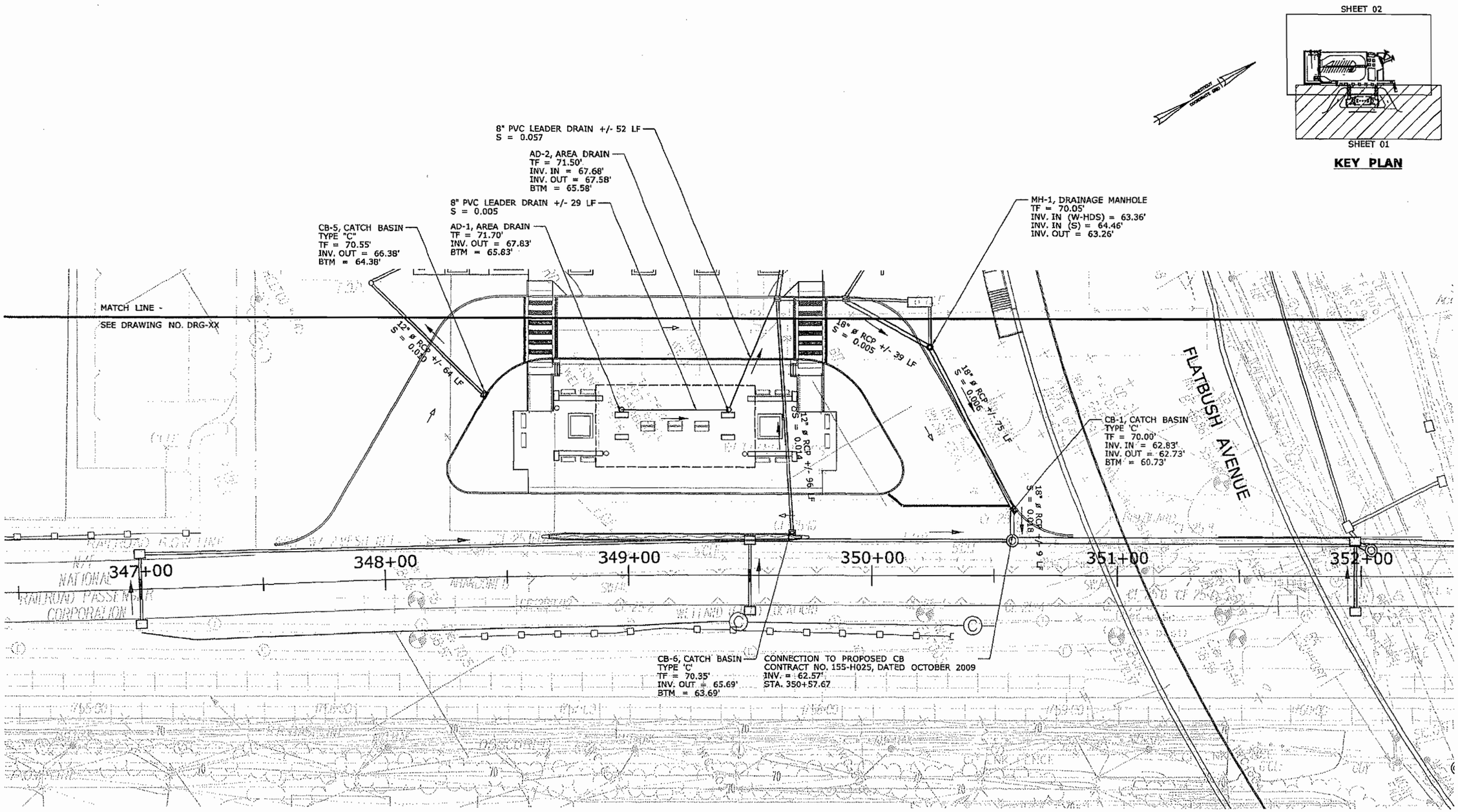
SIGNATURE/ BLOCK:
OFFICE OF ENGINEERING
APPROVED BY: DATE:
-

PROJECT TITLE:
NEW BRITAIN - HARTFORD
BUS RAPID TRANSIT STATIONS

TOWN: WEST HARTFORD

DRAWING TITLE:
FLATBUSH AVE. STATION
GRADING PLAN

PROJECT NO. 88-H039
DRAWING NO. GRD-XX
SHEET NO. S



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REV.	DATE	REVISION DESCRIPTION	SHEET NO.
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Plotted Date: 10/29/2009

DESIGNER/DRAFTER: KSR
CHECKED BY: -
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SCALE 1"=20'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

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APPROVED BY: DATE: - -

PROJECT TITLE: NEW BRITAIN - HARTFORD BUS RAPID TRANSIT STATIONS

TOWN: WEST HARTFORD

DRAWING TITLE: FLATBUSH AVE. STATION DRAINAGE PLAN

PROJECT NO. 88-H039
DRAWING NO. DRG-XX
SHEET NO. S

SHEET 02

SHEET 01

KEY PLAN

NEW PARK AVENUE

FLATBUSH AVENUE

101+00 102+00 103+00 104+00 105+00 106+00

CB-15, CATCH BASIN
TYPE 'C'
TF = 71.27'
INV. OUT = 65.86'
BTM = 63.86'

CB-7, CATCH BASIN
TYPE 'C'
TF = 70.40'
INV. IN = 65.45'
INV. OUT = 65.35'
BTM = 63.35'

YD-4, YARD DRAIN
TF = 75.80'
INV. OUT = 72.64'
BTM = 70.64'

CONNECT TO PROPOSED CB
CONTRACT NO. 155-H030. DATED OCTOBER 2009
INV. = 72.52'

12" ø RCP CLASS V +/- 20 LF
S = 0.005

12" ø RCP +/- 82 LF
S = 0.005

YD-1, YARD DRAIN
TF = 70.45'
INV. IN = 64.61'
INV. OUT = 64.07'
BTM = 62.07'

YD-3, YARD DRAIN
TF = 71.80'
INV. OUT = 66.36'
BTM = 64.36'

RCP +/- 52 LF
0.005

12" ø RCP CLASS V +/- 112 LF
S = 0.005

12" ø RCP +/- 75 LF
S = 0.005

12" ø RCP +/- 40 LF
S = 0.005

12" ø RCP +/- 34 LF
S = 0.005

12" ø RCP +/- 24 LF
S = 0.006

MATCH LINE -
SEE DRAWING NO. DRG-XX

YD-2, YARD DRAIN
TF = 69.50'
INV. IN = 65.75'
INV. OUT = 65.65'
BTM = 63.65'

CB-4, CATCH BASIN
TYPE 'CL'
TF = 69.74'
INV. IN (S) = 65.65'
INV. IN (W) = 65.09'
INV. OUT = 64.99'
BTM = 62.99'

CB-3, CATCH BASIN
TYPE 'C'
TF = 69.52'
INV. IN (W) = 63.90'
INV. IN (E)= 64.30'
INV. IN (E-LEADER DRAIN) = 64.63'
INV. OUT = 63.80'
BTM = 61.80'

18" ø RCP +/- 28 LF
S = 0.005

CB-2, CATCH BASIN
TYPE 'C'
TF = 69.20'
INV. IN (W) = 64.16'
INV. IN (S)= 63.66'
INV. OUT (N - HDS) = 63.66'
INV. OUT (E) = 64.66'
BTM = 61.66'

12" ø RCP +/- 16 LF
S = 0.006

OFFLINE HYDRODYNAMIC SEPARATOR
TOP = 68.30'
INV. IN = 63.52'
INV OUT = 63.46'

ENVIRONMENTAL PERMIT REVIEW

REV.	DATE	REVISION DESCRIPTION	SHEET NO.
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DESIGNER/DRAFTER: KSR
CHECKED BY: -

SCALE IN FEET
0 20 40
SCALE 1"=20'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

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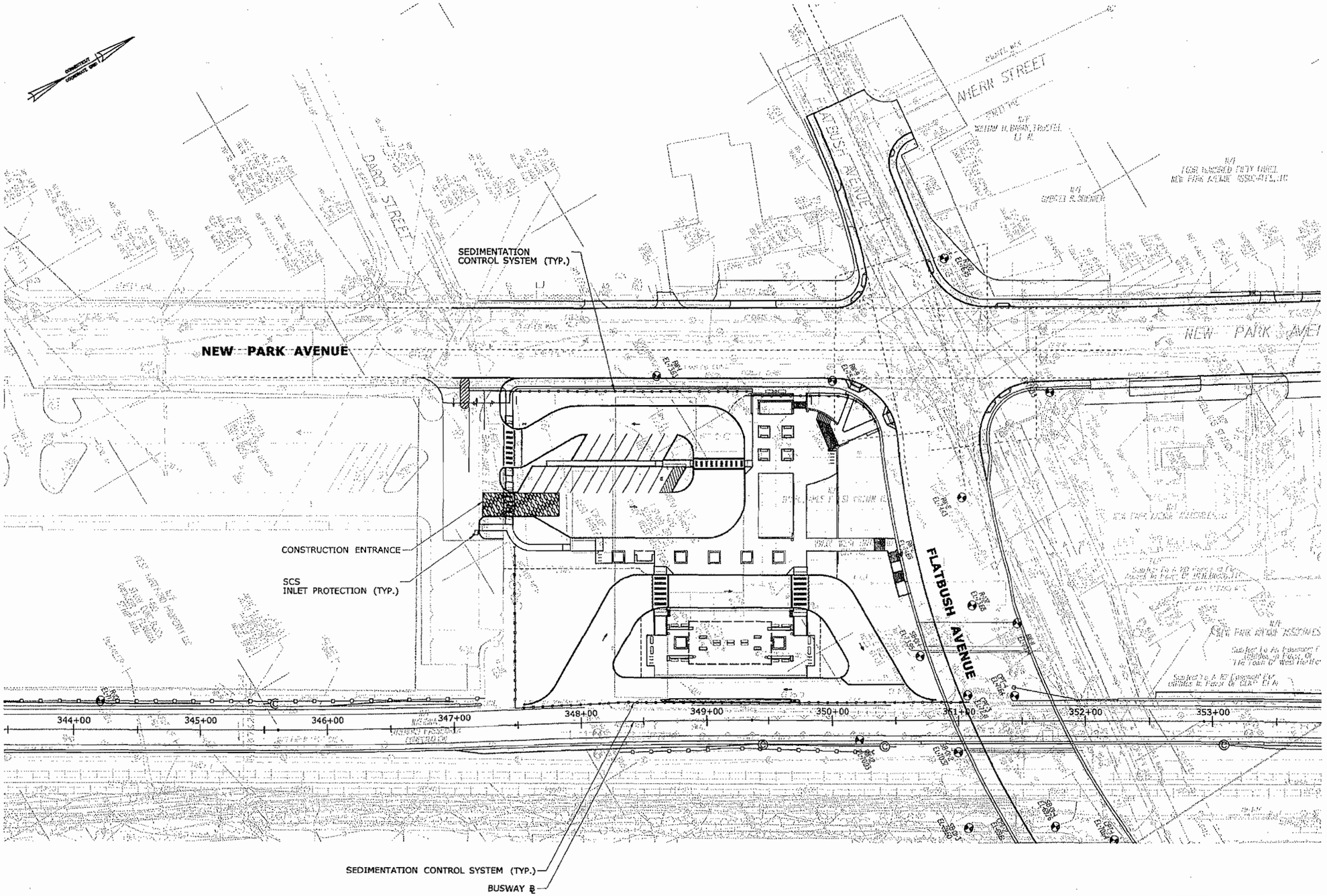
PROJECT TITLE:
NEW BRITAIN - HARTFORD
BUS RAPID TRANSIT STATIONS

TOWN: WEST HARTFORD

DRAWING TITLE:
FLATBUSH AVE. STATION
DRAINAGE PLAN

PROJECT NO. 88-H039
DRAWING NO. DRG-XX
SHEET NO. S



ENVIRONMENTAL PERMIT REVIEW

REV.	DATE	REVISION DESCRIPTION	SHEET NO.
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THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.

Plotted Date: 10/29/2009

DESIGNER/DRAFTER: KRV
CHECKED BY: -

SCALE IN FEET
0 40 80
SCALE 1"=40'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: ...\FD_MSH_SED_88H039_FLATBUSH.dgn

SIGNATURE/BLOCK: OFFICE OF ENGINEERING
APPROVED BY: DATE: - -

PROJECT TITLE: NEW BRITAIN - HARTFORD BUS RAPID TRANSIT STATIONS

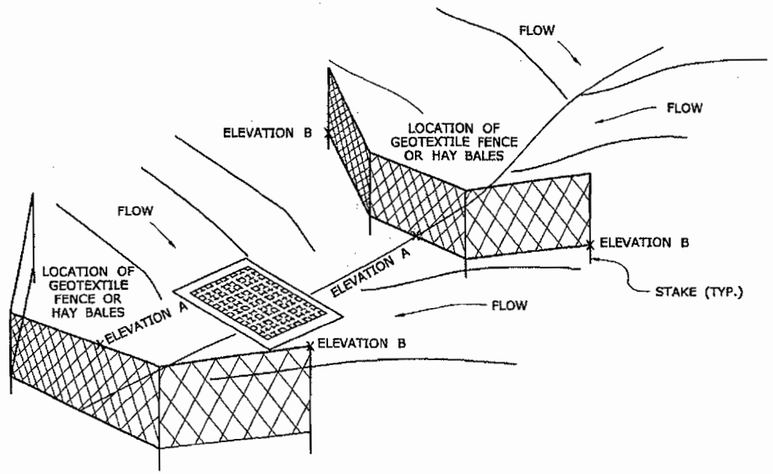
TOWN: WEST HARTFORD

DRAWING TITLE: FLATBUSH AVE. STATION SEDIMENTATION CONTROL

PROJECT NO. 88-H039

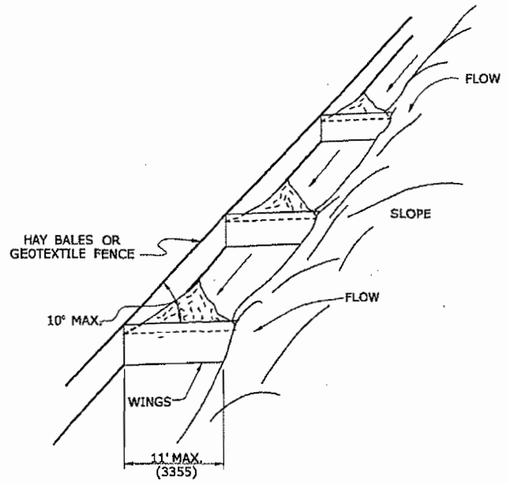
DRAWING NO. SED-XX

SHEET NO. S



TREATMENT FOR A CATCH BASIN ON A SLOPE

(SEE NOTE 4)

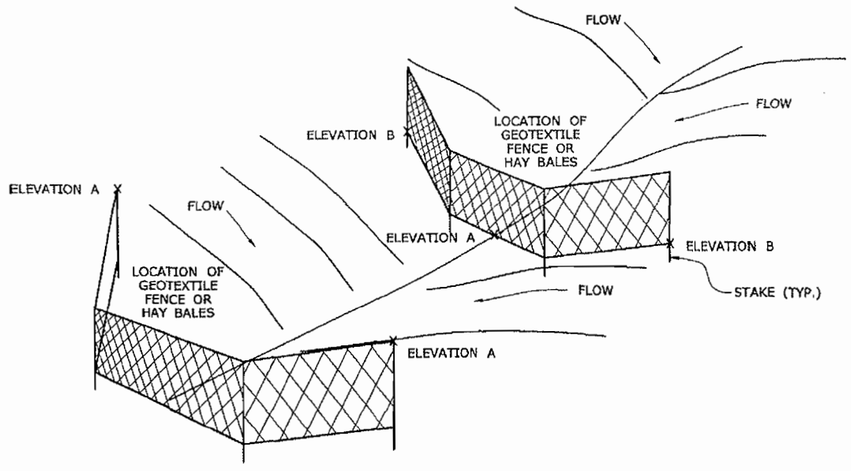


TREATMENT AT TOE OF SLOPE

(SEE NOTE 3)

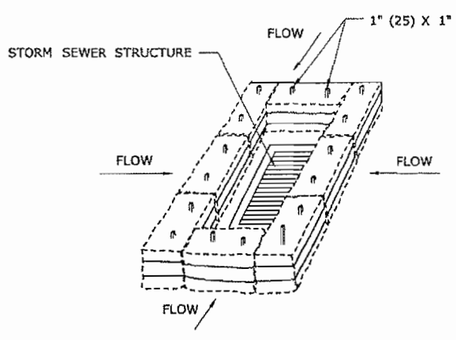
GENERAL NOTES:

1. THE CONTRACTOR SHALL MAINTAIN THE EARTHEN BERM AS DIRECTED BY THE ENGINEER.
2. WHEN USING A SEDIMENTATION CONTROL SYSTEM ALONG THE TOE OF SLOPE, ADD WINGS TO PREVENT SEDIMENT FROM MOVING ALONG THE FENCE AND OFF THE SITE. MINIMUM SPACING FOR WINGS IS 25' (7620).
3. CATCH BASIN ON SLOPE SHOULD NOT BE RINGED. THE SPACING OF SEDIMENTATION CONTROL SYSTEM SHALL VARY WITH SLOPE.
4. ELEVATION B = A + 12" (305) MIN.

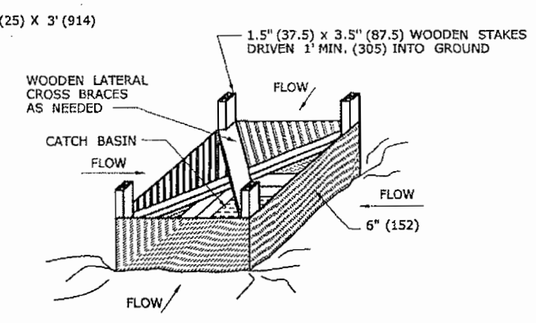


CHECK DAM

(SEE NOTE 4)



HAY BALE AT CATCH BASIN



GEOTEXTILE FENCE AT CATCH BASIN

TREATMENT FOR A CATCH BASIN IN A DEPRESSION

REVISED 9/10/09

REV.	DATE	REVISION DESCRIPTION	SHEET NO.
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-

THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.

Plotted Date: 10/28/2009

DESIGNER/DRAFTER: -
CHECKED BY: -
NTS

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: ...\FD_MSH_DET_88H039_SED.CONTROL2.dgn

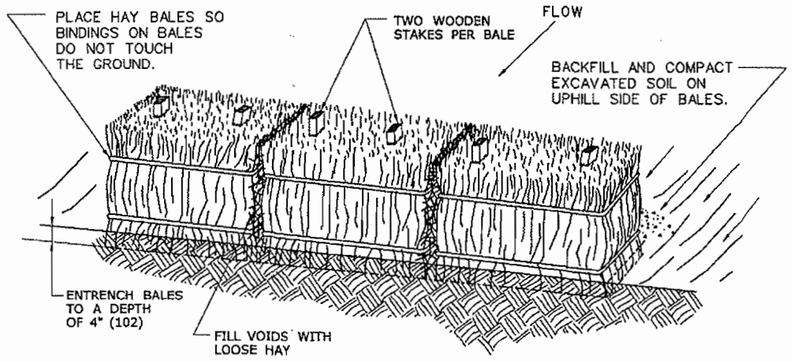
SIGNATURE/ BLOCK:
OFFICE OF ENGINEERING
APPROVED BY: DATE:

PROJECT TITLE:
NEW BRITAIN - HARTFORD BUS RAPID TRANSIT STATIONS

TOWN:

DRAWING TITLE:
SEDIMENTATION CONTROL TREATMENT DETAILS

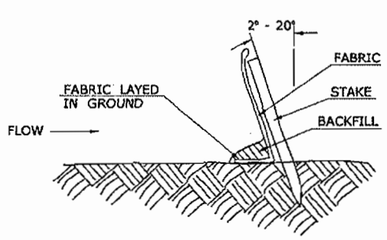
PROJECT NO.: 88-H039
DRAWING NO.: DET-XX
SHEET NO.: S

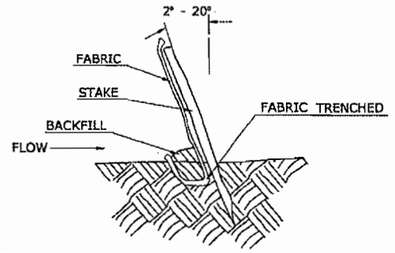


HAY BALE SYSTEM

GENERAL NOTES:

1. HAY BALES SHALL NOT BE USED IN A WATERCOURSE.
2. HAY BALES SHALL BE ENTRENCHED 4" (102) AND TIGHTLY BUTTED TOPGETHER. REMOVE HEAVY BRUSH AND FILL ALL VOIDS WITH LOOSE HAY.
3. WOOD STAKES SHALL HAVE A MINIMUM CROSS-SECTION SIZE OF AT LEAST 1" (102) x 1" (102) AND MINIMUM LENGTH OF 4 FT.(1219)
4. CLEAN OUT ACCUMULATED SEDIMENT WHEN ONE-HALF (1/2) OF THE ORIGINAL HEIGHT OF THE HAY BALE FENCE, AS INSTALLED, BECOMES FILLED WITH SEDIMENT OR AS DIRECTED BY THE ENGINEER.
5. NOT TO BE USED IN THE VICINITY OF URBAN AND RESIDENTIAL AREAS.





END VIEW

BACKFILLING GEOTEXTILE TOE

TRENCHING GEOTEXTILE TOE

GEOTEXTILE FENCE SYSTEM

GENERAL NOTES:

1. GEOTEXTILE FENCE SHOULD BE PLACED SO THE FENCE LEANS TOWARD THE SOURCE OF SEDIMENT.
2. MAXIMUM SPACING FOR WOODEN STAKES OR STEEL POSTS IS 10.0' (3048).
3. WOOD STAKES SHALL HAVE A MINIMUM CROSS-SECTION SIZE OF 1.5" (457) X 1.5" (457) AND MINIMUM LENGTH OF 4 FT. (1219) STEEL POSTS SHALL BE AT LEAST 0.5 LB. PER FOOT WITH A MINIMUM LENGTH OF 4 FT. (1219).
4. WOODEN STAKES OR STEEL POSTS SHALL BE DRIVEN TO A MINIMUM OF 1'(305) INTO THE GROUND.
5. 6" (152) OF GEOTEXTILE SHALL BE BURIED BY BACKFILLING OR TRENCHING AND AT LEAST 2.5'(762) IN HEIGHT OF GEOTEXTILE SHALL BE EXPOSED.
6. FABRIC SHALL BE JOINED ONLY AT A SUPPORT POST WITH A MINIMUM OF 6" (152) OVERLAP AND SECURITY SEALED.
7. UPON RE-ESTABLISHMENT OF GROUND COVER IN DISTURBED AREAS AND WHEN DIRECTED BY THE ENGINEER, OR UPON FINAL INSPECTION FENCE AND ANY SEDIMENT SHALL BE REMOVED. AT NO TIME WILL THE FENCE REMAIN IN PLACE AFTER PROJECT COMPLETION.
8. GEOTEXTILE FENCE SHALL NOT BE USED IN A WATER COARSE.
9. ONLY GEOTEXTILE FROM THE DEPARTMENTS APPROVED PRODUCT LIST SHALL BE USED.
10. BACKFILLING OF GEOTEXTILE SHALL ONLY BE USED WHEN GROUND IS FROZEN OR WHERE OTHER OBSTRUCTIONS ARE ENCOUNTERED THAT PROHIBITE TRENCHING, IE, STUMPS OR ROCKS.
11. CLEAN OUT ACCUMULATION SEDIMENT WHEN ONE-HALF (1/2) OF THE ORIGINAL HEIGHT OF THE GEOTEXTILE FENCE, AS INSTALLED , BECOMES FILLED WITH SEDIMENT OR AS DIRECTED BY THE ENGINEER.

REVISED: 9/10/09

REV.	DATE	REVISION DESCRIPTION	SHEET NO.
-	-	-	-
-	-	-	-
-	-	-	-
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-	-	-	-

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Plotted Date: 10/28/2009

DESIGNER/DRAFTER: -
CHECKED BY: -
NTS

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: ...\FD.MSH.DET.88H039.SED.CONTROL1.dgn

SIGNATURE/ BLOCK:
OFFICE OF ENGINEERING
APPROVED BY: DATE:

PROJECT TITLE:
NEW BRITAIN - HARTFROD BUS RAPID TRANSIT STATIONS

TOWN:

DRAWING TITLE:
SEDIMENTATION CONTROL SYSTEM DETAILS

PROJECT NO. 88-H039
DRAWING NO. DET-XX
SHEET NO. S

8. Appendix E: CTDOT Preliminary Design Comment Responses

Station: Flatbush Reviewer: Hydraulics & Drainage Reviewer Date: 10/8/2009
Responder: Liz Dealy Responder Date: 2009-10-29

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

m e m o r a n d u m

subject: Project No. 88-H039 (171-305 P.E.)
New Britain-Hartford Busway
Flatbush Avenue Station
West Hartford
Preliminary Design Review

date: October 8, 2009

to: Mr. Richard B. Armstrong
Trans. Principal Engineer
Consultant Design
Bureau of Engineering
and Construction

from: Michael E. Masayda
Trans. Principal Engineer
Hydraulics and Drainage
Bureau of Engineering
and Construction

No.	Comment	Inc.	Not Inc.
1	The catch basin summary sheet indicates that several yard drains are located in grassed low points and will each intercept less than 0.5 cfs. Consider regrading these grass areas to allow runoff to discharge onto the pavement and eliminate the need for the additional drainage structures and pipe.		
2	It is uncertain whether the proposed hydrodynamic separator is necessary. Were other stormwater treatment measures investigated? Coordinate with the Office of Environmental Planning to verify that a hydrodynamic separator is required for this station.		
3	The proposed contour line that is near CB #5 is labeled as elev. 71.6, which is one foot higher than the surrounding contour elevations, labeled as elev. 70.6. Review and revise accordingly.		
4	Include the busway mainline stations on the Drainage Plan for reference.		
5	a. The pipe from catch basin #6 will traverse the station facility and connect to a catch basin in the center of the station. Consider connecting CB #6 to CB #1, which is closer to the outlet point and will avoid disruption to the station facility should the storm drainage pipe require future maintenance or replacement. b. If it is verified the hydrodynamic separator referenced in comment No. 2 above is needed, consideration should be given to relocating it to the grass area just north of CB #1 in order to ensure all facility flow is treated. c. The plan shows a set of proposed catch basins just to the south of CB #1 under the mainline contract. It is not necessary to have two sets of catch basins at this location. Coordination should be established with the mainline contract designer to eliminate their set of catch basins.		
6	Intersection grading plans should be developed for the Flatbush station driveways that are proposed at the busway mainline and New Park Avenue.		

Yolanda Antoniak/ya:sd
cc: Joseph J. Obara
Paul Corrente – Drew Piraneo
Mark Alexander – Kim Lesay
Brian T. Cunningham
Chong Lung Chow
088-H039J

Station: Flatbush Reviewer: Hydraulics & Drainage Reviewer Date: 10/8/2009
Responder: Liz Dealy Responder Date: 2009-10-29

Reviewer Comment 1)

1	The catch basin summary sheet indicates that several yard drains are located in grassed low points and will each intercept less than 0.5 cfs. Consider regrading these grass areas to allow runoff to discharge onto the pavement and eliminate the need for the additional drainage structures and pipe.

S E A Response: ***The yard drains are proposed to collect nuisance flows and minimize icing conditions on the platform and plaza areas.***

Reviewer Comment 2)

2	It is uncertain whether the proposed hydrodynamic separator is necessary. Were other stormwater treatment measures investigated? Coordinate with the Office of Environmental Planning to verify that a hydrodynamic separator is required for this station.

S E A Response: ***The hydrodynamic separator has been proposed because of the expected pollutant loads from the busway and parking lots pavements. Primary treatment is not feasible at the site due to the higher elevations of the grassed areas compared to the paved areas.***

Reviewer Comment 3)

3	The proposed contour line that is near CB #5 is labeled as elev. 71.6, which is one foot higher than the surrounding contour elevations, labeled as elev. 70.6. Review and revise accordingly.

S E A Response: ***The contour label has been corrected.***

Reviewer Comment 4)

4	Include the busway mainline stations on the Drainage Plan for reference.

S E A Response: ***Stationing has been added.***

Station: Flatbush Reviewer: Hydraulics & Drainage Reviewer Date: 10/8/2009
Responder: Liz Dealy Responder Date: 2009-10-29

Reviewer Comment 5a)

5	a. The pipe from catch basin #6 will traverse the station facility and connect to a catch basin in the center of the station. Consider connecting CB #6 to CB #1, which is closer to the outlet point and will avoid disruption to the station facility should the storm drainage pipe require future maintenance or replacement.

S E A Response: ***Catch Bain #6 is proposed in its present alignment to allow the flows collected by the device to be treated in the hydrodynamic separator. Its tributary area consists of paved busway lanes. A connection to Catch Basin #1 would bypass treatment.***

Reviewer Comment 5b)

b. If it is verified the hydrodynamic separator referenced in comment No. 2 above is needed, consideration should be given to relocating it to the grass area just north of CB #1 in order to ensure all facility flow is treated.

S E A Response: ***The HDS is proposed just upstream of Catch Basin #1 to allow treatment of all site flows. Locating it downstream of Catch Basin #1 would require its installation within the busway lanes and hampering maintenance activities.***

Reviewer Comment 5c)

c. The plan shows a set of proposed catch basins just to the south of CB #1 under the mainline contract. It is not necessary to have two sets of catch basins at this location. Coordination should be established with the mainline contract designer to eliminate their set of catch basins.

S E A Response: ***Coordination of catch basin locations has been completed.***

Reviewer Comment 6)

6	Intersection grading plans should be developed for the Flatbush station driveways that are proposed at the busway mainline and New Park Avenue.

S E A Response: ***Intersection grading plans will be prepared during final design.***

Station: Flatbush Reviewer: Environmental Planning Reviewer Date: 9/14/2009
Responder: Liz Sommer, P.E. Responder Date: 2009-10-06

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

memorandum

, 2009

subject: Preliminary Design Submission
88-H039 / 171-305
Flatbush Avenue Station
New Britain – Hartford Busway

date: September 14, 2009

to
Brian Cunningham
Transportation Supervising Engineer
Consultant Design - Highways
Bureau of Engineering and Construction

from
Paul Corrente
Transportation Supervising Planner
Environmental Planning Division
Bureau of Policy and Planning

ext.

Type of Review:

☐ Schematic ☒ Preliminary Design ☐ Semi-Final Design ☐ Final Design ☐ Permit ☐ Other:

My staff has reviewed the above mentioned project and the water resource compliance section of this office offers the following comments:

Comment #	Loc. or Sheet #	Comment	Inc.	Not Inc. (If not, WHY)
5	CIV-XX	• The CIV plan sheets shall include the Station markings, toe of slope, drainage, cut and fills, and E&S controls, etc... • Please coordinate with the project designers of Project 155-H025 regarding the transition points connecting concrete curbing, RW, etc...between the busway and platform stations.		
7	DRG	• Please coordinate with the designers of Project 93-H046. • Couldn't the area between Sta. 10+50 LT and Sta. 11+00 LT be graded and utilized into a stormwater treatment measure? • Provide flow arrows for all drainage. • Since the station will have limited access, the drainage design should consider alternative pipes. Determination should be based on overall cost savings. • Why is the design proposing to drain grass areas with yard drains? • Though it is recommended to remove the HDS from the project; however, if it is deemed necessary to install the HDS, why would it be located within a fill slope and in an area to planted? It should be in area easily accessible.		
8	LDS	• Remove Meadow Mix from the project.		

If you have any questions regarding these comments, please contact Mr. Paul Corrente at 860-594-2932.

Andrew Piraneo/ap
cc: Paul Corrente – Andrew Piraneo
Mark Alexander – Kim Lesay – Amanda Freitas
Dave Mancini – Bob Reilly
Laurie LaRocca
Mike Masayda - Chong Lung Chow – Yolanda Antoniak
Jacob Argiro

Station: Flatbush Reviewer: Environmental Planning Reviewer Date: 9/14/2009
Responder: Liz Sommer, P.E. Responder Date: 2009-10-06

Reviewer Comment 5a.)

- The CIV plan sheets shall include the Station markings, toe of slope, drainage, cut and fills, and E&S controls, etc...

S E A Response: ***Additional detail and call-outs have been added where appropriate.***

Reviewer Comment 5b.)

- Please coordinate with the project designers of Project 155-H025 regarding the transition points connecting concrete curbing, RW, etc...between the busway and platform stations.

S E A Response: ***Coordination is an on-going activity between S E A and the mainline busway designers. This work will continue during final design.***

Reviewer Comment 7a.)

- Please coordinate with the designers of Project 93-H046.

S E A Response: ***Coordination is an on-going activity between S E A and the mainline busway designers. This work will continue during final design.***

Reviewer Comment 7b.)

- Couldn't the area between Sta. 10+50 LT and Sta. 11+00 LT be graded and utilized into a stormwater treatment measure?

S E A Response: ***This area contains an earthen berm to provide some view shielding to the adjacent loading dock area. Also, the ground surface in that area is at about elevation 71 and above. The parking lot is at elevation 70. The busway pull off area is at elevation 71 to elevation 69. It would not be possible to convey flows to this area to provide stormwater treatment without significant earth cuts. Finally, available area and the governing hydraulic grade line mainline busway drainage system prevent the construction of all but an inconsequential and insufficient treatment measure.***

Reviewer Comment 7c.)

- Provide flow arrows for all drainage.

S E A Response: ***Flow arrows have been added to the drainage plan sheet.***

Reviewer Comment 7d.)

- Since the station will have limited access, the drainage design should consider alternative pipes. Determination should be based on overall cost savings.

Station: Flatbush Reviewer: Environmental Planning Reviewer Date: 9/14/2009
Responder: Liz Sommer, P.E. Responder Date: 2009-10-06

S E A Response: ***Alternate pipe materials will be considered during final design.***

Reviewer Comment 7e.)

- Why is the design proposing to drain grass areas with yard drains?

S E A Response: ***Yard drains are proposed in these areas to minimize stormwater flows over pedestrian gathering areas so that icing conditions are minimized.***

Reviewer Comment 7f.)

- Though it is recommended to remove the HDS from the project; however, if it is deemed necessary to install the HDS, why would it be located within a fill slope and in an area to planted? It should be in area easily accessible.

S E A Response: ***The HDS has been located in the station plaza area which allows easy maintenance of the device. Locating it further downstream would require its installation within the busway lanes.***

Reviewer Comment 8.)

- Remove Meadow Mix from the project.

S E A Response: ***An alternative seed mix will be proposed during final design upon coordination with the appropriate parties at the Department.***

Station: Flatbush Reviewer: Environmental Planning Reviewer Date: 8/26/2009
Responder: Liz Sommer, P.E. Responder Date: 2009-10-06

From: Lesay, Kimberly C [mailto:Kimberly.Lesay@ct.gov]
Sent: Wednesday, August 26, 2009 12:04 PM
To: Jacob Argiro
Cc: Cunningham, Brian T; Alexander, Mark W; Corrente, Paul N
Subject: Flatbush Station - PD review

Jake - I have reviewed the Flatbush Station plans and offer the following comments:

- **Drainage plan sheets do not appear to have flow arrows for proposed pipes...please include**
- **HDS does not appear to be off-line, and must be. The note indicates off-line, but the drafting does not depict it as such**
- **It appears the CB proposed near Flatbush Ave could be eliminated and instead the pipe connected to the CB's already proposed on this section of the busway.**
- **Utility plans depict MDC water line being relocated. please ensure the timing of this work is included in the sequence of construction as it may affect water handling.**
- **Only secondary stormwater treatment is proposed and does not appear adequate. Please investigate possibilities for primary treatment and / or be prepared to explain site limitations as back up material for the permit applications.**

Kimberly Lesay

Environmental Planning Division

Department of Transportation

2800 Berlin Turnpike

PO Box 317546

Newington, CT 06131-7546

phone (860) 594-2933

fax (860) 594-3028

Kimberly.Lesay@po.state.ct.us

Station: Flatbush Reviewer: Environmental Planning Reviewer Date: 8/26/2009
Responder: Liz Sommer, P.E. Responder Date: 2009-10-06

Reviewer Comment 1a)

- **Drainage plan sheets do not appear to have flow arrows for proposed pipes...please include**

S E A Response: ***Flow arrows have been added to the drainage sheets.***

Reviewer Comment 1b)

- **HDS does not appear to be off-line, and must be. The note indicates off-line, but the drafting does not depict it as such**

S E A Response: ***The HDS proposed is off-line and is shown as such.***

Reviewer Comment 1c)

- **It appears the CB proposed near Flatbush Ave could be eliminated and instead the pipe connected to the CB's already proposed on this section of the busway.**

S E A Response: *If this comment is appears to be referring to YD No. 4. S E A has revised the design to direct this yard drain to the proposed catch basin part of the Flatbush Avenue contract work. This reduces the necessary length of pipe and eliminates a conflict with the proposed 42-inch water main on the site.*

Reviewer Comment 1d)

- **Utility plans depict MDC water line being relocated. please ensure the timing of this work is included in the sequence of construction as it may affect water handling.**

S E A Response: ***Coordination between the station work and all adjacent projects is ongoing.***

Reviewer Comment 1e)

- **Only secondary stormwater treatment is proposed and does not appear adequate. Please investigate possibilities for primary treatment and / or be prepared to explain site limitations as back up material for the permit applications.**

S E A Response: ***Site size limitations and grades preclude primary treatment at the station.***