27. Stormwater Pollution Prevention Plan

Stormwater Pollution Prevention Plan

Stormwater systems have been analyzed and installed as part of previous projects at the IMT, and the supporting documentation can be found in the next several pages. No significant changes to stormwater systems are proposed as part of this project.

Memorandum

To: HNTB, Inc.

From: Ellen O'Brien, Northstar Hydro, Inc.

Date: 1/10/2010

Re: Existing Stormwater Management System, International Marine Terminal, Portland, ME.

Introduction:

The proposed International Marine Terminal redevelopment project proposes to reconstruct portions of the former International Ferry Terminal for use as an international cargo handling facility. Upgrades to the site include building demolition and rehabilitation, pier upgrades, and regrading and repaving storage areas of several acres of the site. This memorandum specifically addresses the function and condition of the existing storm water management system in the area to be redeveloped. This photograph shows the existing condition of the former parking area. Note uneven surface and general deterioration of surface.

Tidal Elevations and Tidal Flood Elevations:

The U.S. DEPARTMENT OF COMMERCE, NOAA, furnished information on normal tide fluctuations, base on tidal gage number **8418150** in Casco Bay. The following chart details normal tide information and tidal datums. More information on the tide gage is listed in the Appendix.

Elevations of tidal datums referred to Mean Lower Low Water (MLLW), in FEET:

HIGHEST OBSERVED WATER LEVEL (02/07/1978) = 14.17
MEAN HIGHER HIGH WATER (MHHW) = 9.91
MEAN HIGH WATER (MHW) = 9.45
MEAN TIDE LEVEL (MTL) = 4.90
* NATIONAL GEODETIC VERTICAL DATUM-1929 (NGVD) = 4.57
MEAN LOW WATER (MLW) = 0.34
MEAN LOWER LOW WATER (MLLW) = 0.00
LOWEST OBSERVED WATER LEVEL (11/30/1955) = -3.41

* NGVD reference based on adjustment of 1967 and NOS levels of 1983.
National Geodetic Vertical Datum (NGVD 29)

Flood tide information was found in FEMA's Flood Insurance Study, published in July of 1986. 100-year flood elevation for the project site is 10' NGVD (or 9.3' NAVD). Seaward of the wall under the pier, the elevation is 12' NGVD or 11.3' NAVD.

NAVD 1988 is approximately 0.7' higher than NGVD 1929. (This number should be verified).

Stormwater System Layout:

The existing storm drain system was inspected and structures were identified in October and December of 2010 by Blais Engineering and Northstar Hydro personnel. Catch basin covers were removed, and materials and general condition and depths noted. Structures were also surveyed in detail by other members of the project team for project plans and for use in redesign work.

The site is drained by two storm drain systems, shown on Drawing XXX. (C001 of 30%). Drainage lines and catch basins are not of consistent material, age or condition. Pipes range from PVC to tile drain, and catch basins range from built-in-place brick to precast concrete, often with risers of different material. An example showing several layers of construction is shown below.

The following photo shows a typical brick catch basin, with shallow sump and PVC pipe inlets and outlets.

The following diagram shows approximately how the two systems are laid out. The systems will be referred to as the southwest system, or System 1, and the northerly system or System 2. Only two storm drain outlets were found on site. An under-pier inspection did not reveal any additional outlets.

The existing storm drain system is shown in summary on the following page.

The purple area is outside of the redevelopment, but drains to outlet 1. The center red area is the area for redevelopment. The upper red area is not within this project phase, but drains to system 2. Approximate system 1 lines and catch basins are shown in yellow, approximate system 2 lines and catch basins are shown in green.

System 1, Southwest portion of site:

The south westerly system (yellow above) drains approximately 2.96 acres to CB 21, just over the fence-line from the portion of the site to be redeveloped, nearly all of which are either paved, or building roofs. Several very small vegetated areas also contribute, but for purposes of analysis, all areas were assumed to be paved. This system outlets via a 24" RCP directly to Portland Harbor just to the south of the former on-ramp for the ferry. This system collects runoff from the area to be redeveloped, and from the southwesterly portion of the site that is not slated for redevelopment at this time. The system drains about 60% of the approximately 3.7 acres of the redeveloped site that is drained via storm drains. During field visits, no tide gate was noted on this system, but there may be a gate at the outlet on the harbor. Of the existing structures in this system, no catch basins have deep sumps or hoods, and several basins are in need of replacement. One basin has a concreted barrier on top of it, and is not usable. Several pipes are undersized and likely need to be upsized or replaced. Many basins need to be reset or relocated to fit the new grading and site use plan. This photo shows a catch basin that clearly needs to be reset/rebuilt and which has been affected by the deterioration of the pavement surface.

The following picture was taken from the building and the left hand portion of the photo drains to System 1 and the right portion drains to System 2. The catch basins that are directly adjacent to the building, excepting one basin, all drain to the southwest system.

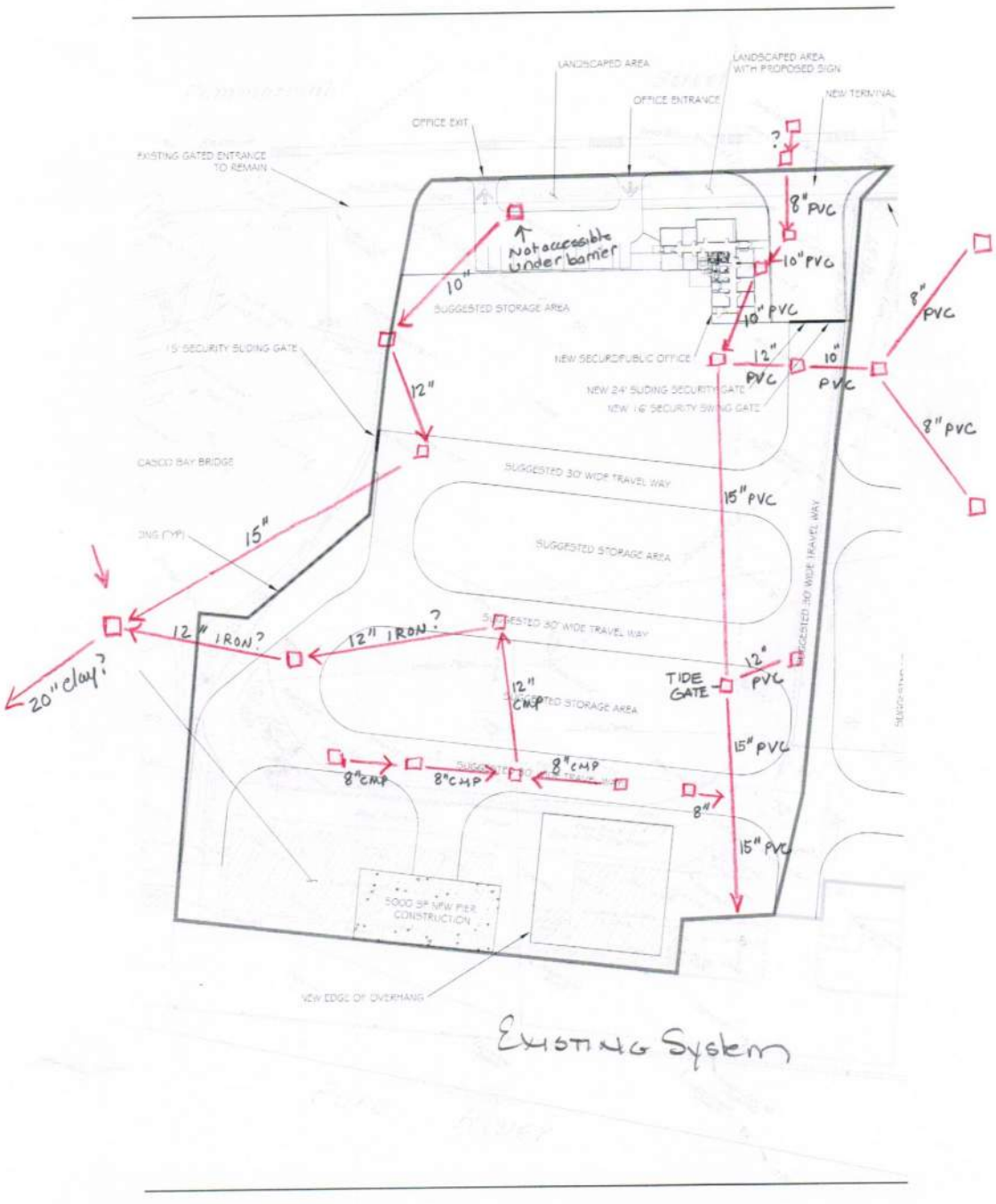
System 2, Northerly portion of site.

The northerly system drains about 40% of the area to be redeveloped, as well as the 1.3 acre parcel on the northerly end of the site. Note that exact drainage lines are very difficult to delineate because of the nature of the existing site grading and deterioration of the surface. System 2 outlets just north of the current office building on the water. The system has a TideFlex tide gate in a deep manhole in the most downstream catch basin in the system. No deep sump or hooded catch basins were found in this system. The outlet for system 2 is shown in this photograph taken near low tide.

The following photo is taken looking towards the water, and towards the outlet of system 2. The wall separates the area to be redeveloped (right) from the northern portion of the site which is not included in this phase of redevelopment, but drains to the redeveloped area drainage system.

Buildings and Piers: Portions of the existing buildings and piers drain to the storm drain system, but most of these areas drain directly to the harbor via channels in the concrete (see below), openings in the pier, and gutters and openings in the piers.

The following diagram summarizes the existing systems within the areas to be redeveloped.



Stormwater Computations:

Model Hydraflow which uses the Rational Method for computing flows was used to analyze the existing system. The 10-year storm IDF curve for Portland, Maine as published in Maine DOT's Highway Design Guide, Chapter 12 was used for modeling stormwater flow.

Curve Number for the site was assumed to be 0.9 as nearly the entire site is covered with pavement or buildings. Very minimal areas are vegetated, including the berm near Congress Street and the area near the entrance to the old ferry terminal. For final design and comparison of existing vs. proposed, and as final grading plans are complete, these areas will be included in existing computations as vegetated.

Time of Concentration at each basin was listed as 5 minutes, the minimum for Hydraflow design computations. Time of concentration was computed for several locations and was found to be less than or equal to 5 minutes.

Flow on this site sheet flows to catch basins. All of the site's runoff flows to on-site catch basins. The only portion of the site not collected by the stormwater system is the piers and about half of the roofs of the terminal buildings. Area to each basin was measured on air photos (see diagram above). Exact directions of flow are very difficult to ascertain for existing conditions as pavement is irregular and grading is not consistent in any direction. For the computations listed below, area draining to each basin was assumed to be a percentage of the total sub-area based on basin location. Exact drainage area to each basin is listed in the computations.

As discussed in detail above, flow outlets to one of two direct outlets to Portland Harbor. Outlets are on riprap or stone, and are generally near median to low tide levels. A TideFlex tide gate is located near the end of System 2.

Flow for these calculations were assumed with low tide. With high tide, the system would experience more "backup". Low tide elevation is typically about 9.9' below high tide, and about 5' below mean sea level. During storm tides, (10' NGVD), many catch basin rims would be inundated just by tide water if tide gates were not installed in the lower parts of the storm drain system.

Calculations are attached, and summarized below for a 10-year storm:

System	Total Area, Acres	Tc, Minutes	CN	Total Flow	System Capacity
1	2.96	7.1	.90	12.61	8.8 D.S. of CB 21
2	2.88	6.4	.90	12.71	5.1 at tidegate

The analysis shows that many pipes do not appear to be adequate to convey the 10-year storm. Catch basins were also included in the analysis, and calculations show that spread around basins may be 0.2' deep (dependent on local conditions around each basin), but as much as 25-30' wide in places. Conveying stormwater flow in this system results in surface storage in the paved parking/storage area, and delayed release of peak flows.

Summary:

- The proposed International Marine Terminal site in Portland was used as the International Ferry Site until several years ago. The site is primarily uneven pavement and buildings, some of which are scheduled for demolition.
- Stormwater is currently drained from the site through a series of catch basins and storm drain lines, flowing over uneven and deteriorating paved surfaces.
- Normal tide range is about 10', and flood tide is 10' above mean sea level, with wave action raising the 100-year level to 12' above mean sea level seaward of the seawall under the buildings and piers.
- The stormwater conveyance system components are of varying age and varying condition. No deep sump or hooded catch basins were found, and no specific water quality improvement measures are currently used on site.
- The site is drained in two directions, to two outlets, both directly into Portland Harbor.
- Sizing calculations, using model Hydraflow (Rational Method) indicate that much of the system is undersized for the 10-year storm, resulting in above grade storage as ponded areas at and surrounding catch basins.
- Many catch basins are in poor condition and require replacing.
- Change in grade for the new storage facility will require that catch basins be replaced or reset to the new grade.

International Marine Terminal

Existing Stormwater System

Appendix

NOAA Portland Tide Gage

FEMA FIS

Portland IDF curve

Hydraflow Computations

PUBLICATION DATE: 12/20/1984

Station ID: 8418150 **SUPERCEDED DATE: 04/21/2003**

Name: PORTLAND, CASCO BAY MAINE

NOAA Chart: 13292 **Latitude: 43° 39.4' N**

USGS Quad: PORTLAND EAST **Longitude: 70° 14.8' W**

T I D A L D A T U M S

Tidal datums at PORTLAND, CASCO BAY based on:

LENGTH OF SERIES: 19 YEARS
TIME PERIOD: 1960-1978
TIDAL EPOCH: 1960-1978
CONTROL TIDE STATION:

Elevations of tidal datums referred to Mean Lower Low Water (MLLW), in FEET:

	HIGHEST OBSERVED WATER LEVEL (02/07/1978)	= 14.17
	MEAN HIGHER HIGH WATER (MHHW)	= 9.91
	MEAN HIGH WATER (MHW)	= 9.45
	MEAN TIDE LEVEL (MTL)	= 4.90
*	NATIONAL GEODETIC VERTICAL DATUM-1929 (NGVD)	= 4.57
	MEAN LOW WATER (MLW)	= 0.34
	MEAN LOWER LOW WATER (MLLW)	= 0.00
	LOWEST OBSERVED WATER LEVEL (11/30/1955)	= -3.41

* NGVD reference based on adjustment of 1967 and NOS levels of 1983.
National Geodetic Vertical Datum (NGVD 29)

FLOOD INSURANCE STUDY

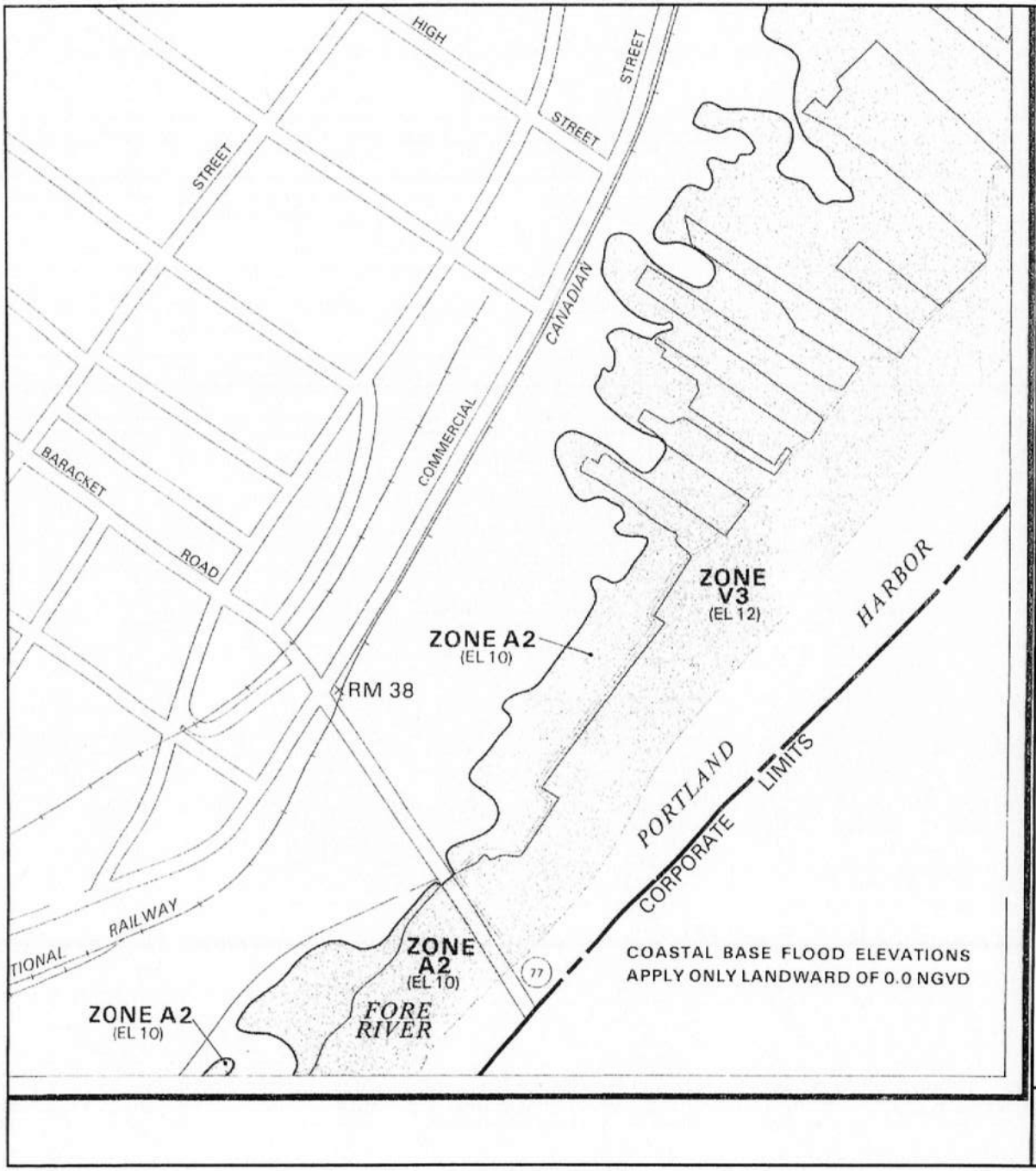
CITY OF PORTLAND AND TOWN OF LONG ISLAND, MAINE

CUMBERLAND COUNTY

REVISED:
DECEMBER 8, 1998

Federal Emergency Management Agency

COMMUNITY NUMBERS
230051-City of Portland
231035-Town of Long Island



APPROXIMATE SCALE

400 0 400 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

CITY OF
PORTLAND, MAINE
CUMBERLAND COUNTY

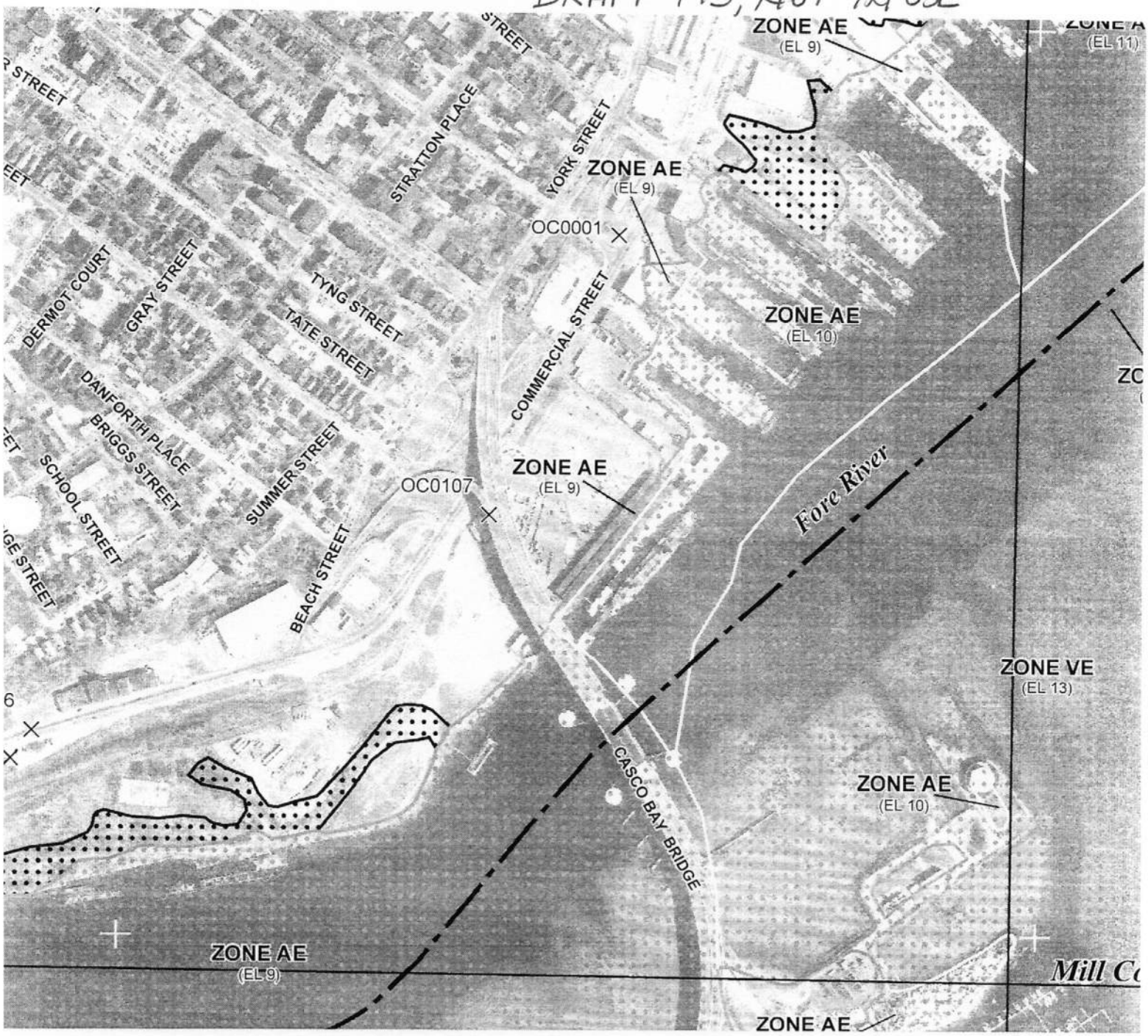
PANEL 13 OF 17
(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
230051 0013 B

EFFECTIVE DATE:
JULY 17, 1986

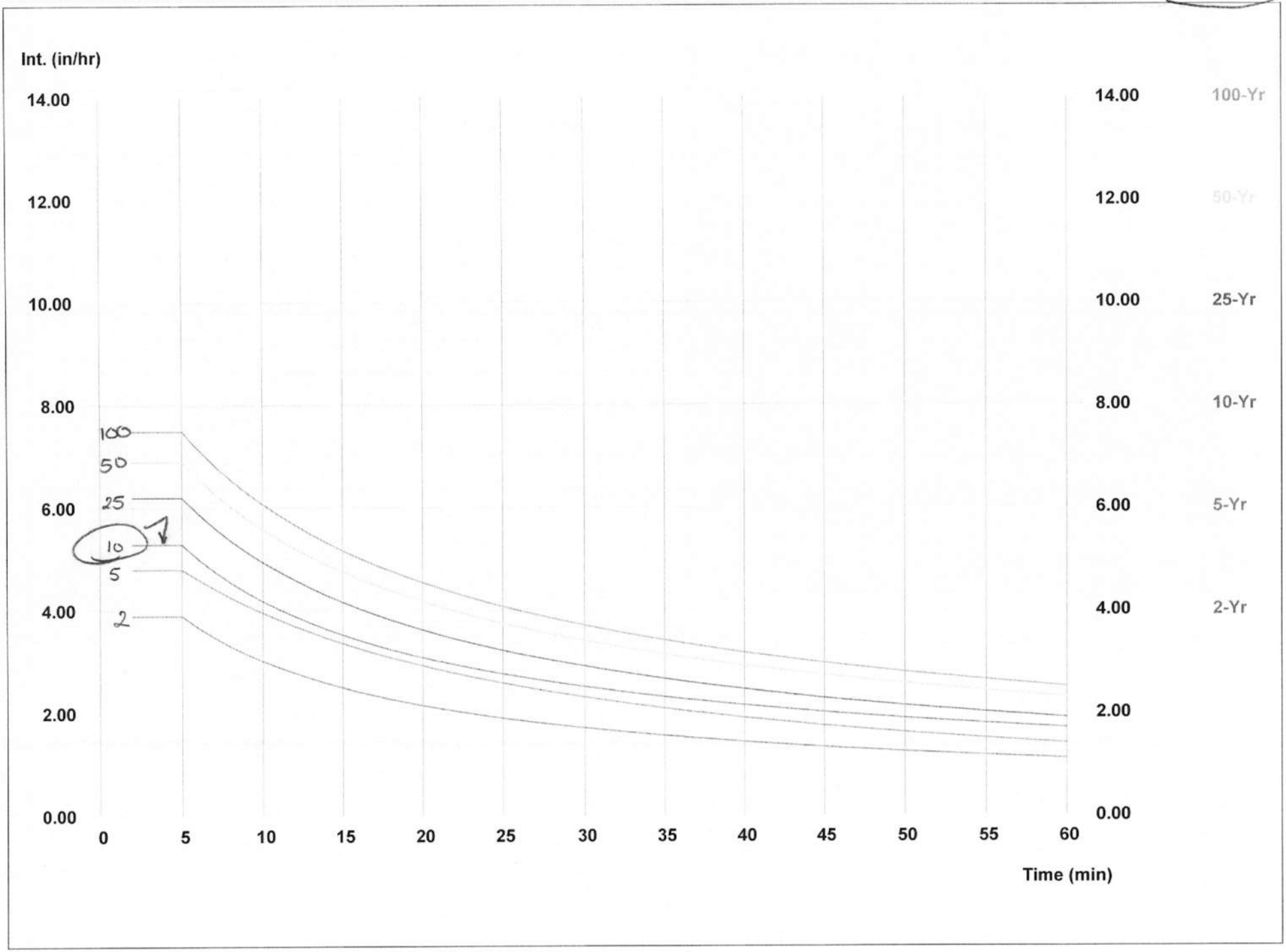
Federal Emergency Management Agency

DRAFT FIS, NOT IN USE

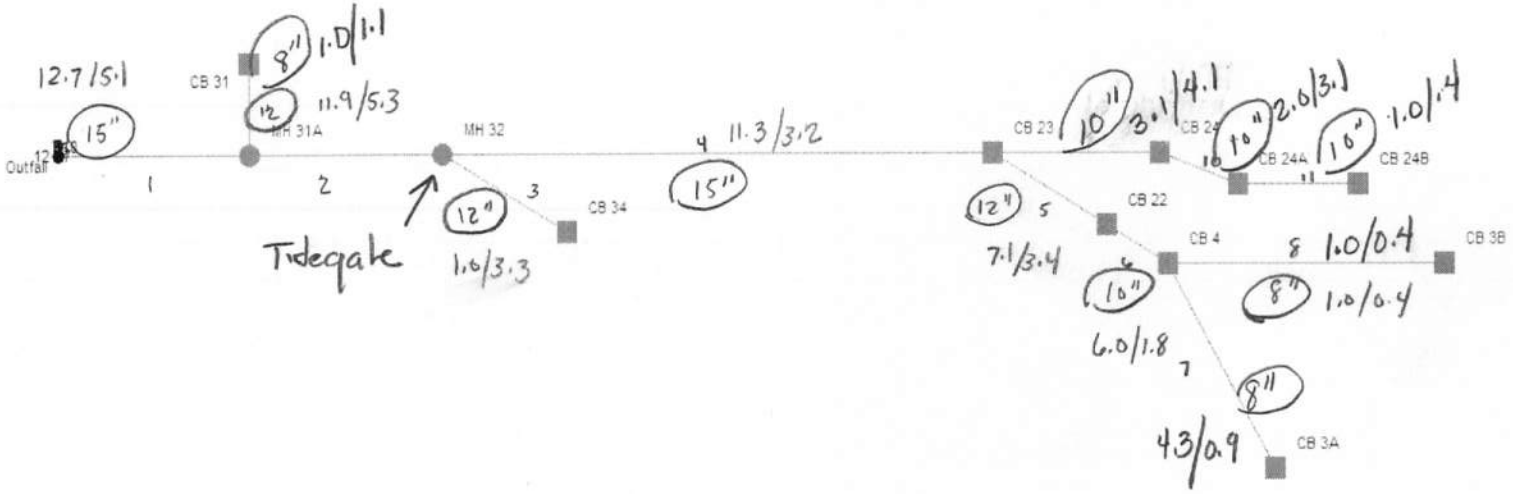


Storm Sewer IDF Curves

IDF file: portland.IDF



Hydraflow Plan View System 2



IMT northeast | No. Lines: 12 | 01-10-2011

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
1	End	80.0	0.0	MH	0.00	0.00	0.00	5.0	-1.00	0.63	-0.50	15	Cir	0.013	1.00	14.00	MH 31A to outfall
2	1	80.0	0.0	MH	0.00	0.00	0.00	5.0	-0.60	0.66	-0.07	15	Cir	0.013	0.56	11.10	MH 32 to MH 31A
3	2	60.0	30.0	Grate	0.00	0.20	0.90	5.0	6.00	0.83	6.50	12	Cir	0.013	1.00	10.10	CB 34 to MH 32
4	2	230.0	0.0	Grate	0.00	0.25	0.90	5.0	1.35	0.24	1.90	15	Cir	0.013	0.83	11.00	CB 23 to 32
5	4	55.0	30.0	Grate	0.00	0.25	0.90	5.0	4.70	0.91	5.20	12	Cir	0.013	0.50	10.40	CB 22 to 23
6	5	30.0	0.0	Grate	0.00	0.20	0.90	5.0	5.60	0.67	5.80	10	Cir	0.013	1.25	12.20	CB 4 to 22
7	6	90.0	30.0	Grate	0.00	0.90	0.90	5.0	8.10	0.56	8.60	8	Cir	0.013	1.00	12.30	cB 3a to 4
8	6	115.0	-30.0	Grate	0.00	0.20	0.90	5.0	7.20	0.09	7.30	8	Cir	0.013	1.00	11.40	CB 3 to 4
9	4	70.0	0.0	Grate	0.00	0.24	0.90	5.0	4.50	3.43	6.90	10	Cir	0.013	0.59	11.40	CB 24 to 23
10	9	35.0	20.0	Grate	0.00	0.24	0.90	5.0	7.00	2.00	7.70	10	Cir	0.013	0.59	11.30	CB 24A to 24
11	10	50.0	-20.0	Grate	0.00	0.20	0.90	5.0	7.50	0.40	7.70	10	Cir	0.013	1.00	11.90	CB 24B to 24A
12	1	35.0	-90.0	Grate	0.00	0.20	0.90	5.0	8.00	0.86	8.30	8	Cir	0.013	1.00	10.80	CB 31 to MH 31A

IMT northeast | Number of lines: 12 | Date: 01-10-2011

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	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.
1	MH 31A to outfall	12.71	15 c	80.0	-1.00	-0.50	0.625	0.22*	3.17*	1.67	4.84	End
2	MH 32 to MH 31A	11.91	15 c	80.0	-0.60	-0.07	0.663	5.04*	7.76*	0.82	8.58	1
3	CB 34 to MH 32	0.95	12 c	60.0	6.00	6.50	0.833	10.03*	10.07*	0.02	10.09	2
4	CB 23 to 32	11.27	15 c	230.0	1.35	1.90	0.239	8.74*	15.74*	1.09	16.83	2
5	CB 22 to 23	7.08	12 c	55.0	4.70	5.20	0.909	16.88*	19.05*	0.63	19.69	4
6	CB 4 to 22	5.95	10 c	30.0	5.60	5.80	0.667	19.69*	21.90*	2.32	24.22	5
7	cB 3a to 4	4.28	8 c	90.0	8.10	8.60	0.556	24.22*	35.55*	2.34	37.90	6
8	CB 3 to 4	0.95	8 c	115.0	7.20	7.30	0.087	25.96*	26.67*	0.12	26.79	6
9	CB 24 to 23	3.13	10 c	70.0	4.50	6.90	3.429	17.63*	19.06*	0.30	19.36	4
10	CB 24A to 24	2.04	10 c	35.0	7.00	7.70	2.000	19.65*	19.96*	0.13	20.09	9
11	CB 24B to 24A	0.95	10 c	50.0	7.50	7.70	0.400	20.26*	20.35*	0.05	20.40	10
12	CB 31 to MH 31A	0.95	8 c	35.0	8.00	8.30	0.857	8.47	8.77	0.20	8.97	1

IMT northeast | Number of lines: 12 | Run Date: 01-10-2011

NOTES: c = cir; e = ellip; b = box; Return period = 10 Yrs. ; *Surcharged (HGL above crown).

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		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	80.0	0.00	2.88	0.00	0.00	2.59	5.0	6.4	4.9	12.71	5.11	10.38	15	0.63	-0.50	-1.00	3.17	0.22	14.00	0.00	MH 31A to outfall
2	1	80.0	0.00	2.68	0.00	0.00	2.41	5.0	6.3	4.9	11.91	5.26	9.71	15	0.66	-0.07	-0.60	7.76	5.04	11.10	14.00	MH 32 to MH 31
3	2	60.0	0.20	0.20	0.90	0.18	0.18	5.0	5.0	5.3	0.95	3.25	1.21	12	0.83	6.50	6.00	10.07	10.03	10.10	11.10	CB 34 to MH 32
4	2	230.0	0.25	2.48	0.90	0.23	2.23	5.0	5.9	5.0	11.27	3.16	9.18	15	0.24	1.90	1.35	15.74	8.74	11.00	11.10	CB 23 to 32
5	4	55.0	0.25	1.55	0.90	0.23	1.40	5.0	5.7	5.1	7.08	3.40	9.02	12	0.91	5.20	4.70	19.05	16.88	10.40	11.00	CB 22 to 23
6	5	30.0	0.20	1.30	0.90	0.18	1.17	5.0	5.7	5.1	5.95	1.79	10.92	10	0.67	5.80	5.60	21.90	19.69	12.20	10.40	CB 4 to 22
7	6	90.0	0.90	0.90	0.90	0.81	0.81	5.0	5.0	5.3	4.28	0.90	12.28	8	0.56	8.60	8.10	35.55	24.22	12.30	12.20	cB 3a to 4
8	6	115.0	0.20	0.20	0.90	0.18	0.18	5.0	5.0	5.3	0.95	0.36	2.73	8	0.09	7.30	7.20	26.67	25.96	11.40	12.20	CB 3 to 4
9	4	70.0	0.24	0.68	0.90	0.22	0.61	5.0	5.6	5.1	3.13	4.05	5.73	10	3.43	6.90	4.50	19.06	17.63	11.40	11.00	CB 24 to 23
10	9	35.0	0.24	0.44	0.90	0.22	0.40	5.0	5.5	5.2	2.04	3.10	3.74	10	2.00	7.70	7.00	19.96	19.65	11.30	11.40	CB 24A to 24
11	10	50.0	0.20	0.20	0.90	0.18	0.18	5.0	5.0	5.3	0.95	1.39	1.75	10	0.40	7.70	7.50	20.35	20.26	11.90	11.30	CB 24B to 24A
12	1	35.0	0.20	0.20	0.90	0.18	0.18	5.0	5.0	5.3	0.95	1.12	3.60	8	0.86	8.30	8.00	8.77	8.47	10.80	14.00	CB 31 to MH 31A

IMT northeast | Number of lines: 12 | Run Date: 01-10-2011

NOTES: Intensity = 24.76 / (Inlet time + 6.20) ^ 0.64; Return period = 10 Yrs.

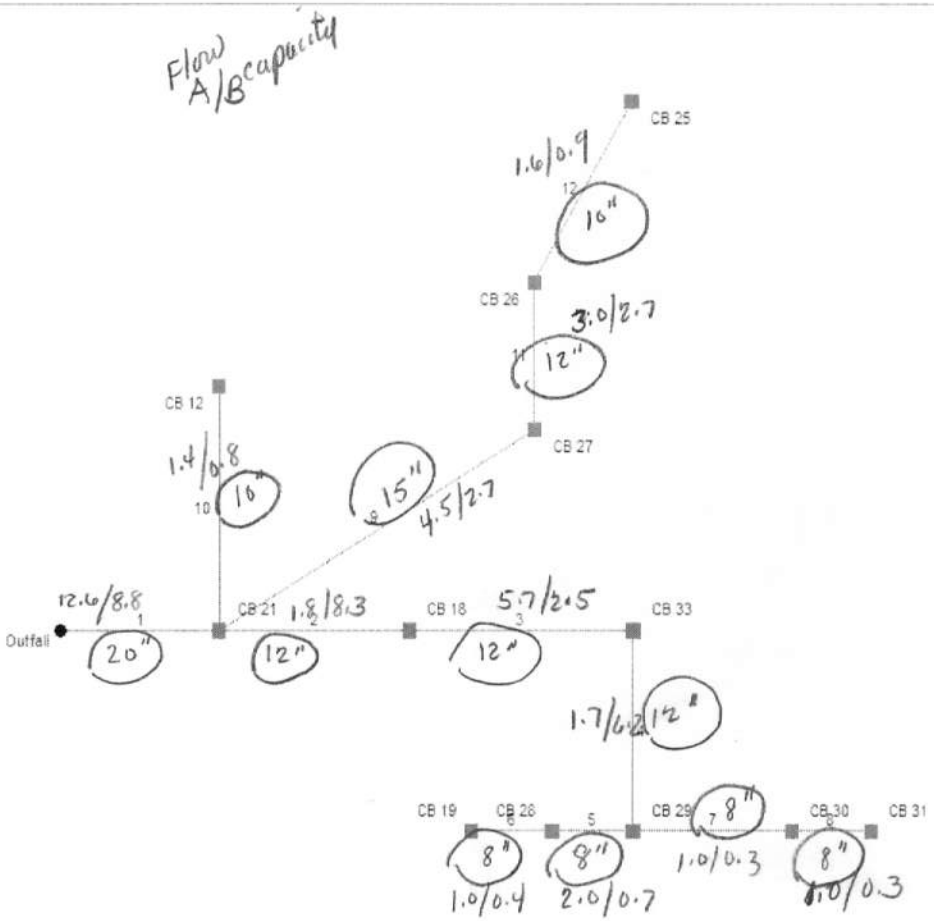
Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp line No
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	MH 31A	0.00	0.51	0.00	0.51	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
2	MH 32	0.00	4.87	0.00	4.87	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
3	CB 34	0.95	0.00	0.44	0.51	Grate	0.0	0.00	0.00	2.00	2.00	0.001	3.00	0.010	0.004	0.013	0.13	28.00	0.13	27.25	0.00	2
4	CB 23	1.19	4.64	1.47	4.36	Grate	0.0	0.00	0.00	2.00	2.00	0.001	3.00	0.010	0.004	0.013	0.24	55.50	0.24	54.50	0.00	2
5	CB 22	1.19	3.29	1.24	3.25	Grate	0.0	0.00	0.00	2.00	2.00	0.001	3.00	0.010	0.004	0.013	0.22	50.50	0.22	49.25	0.00	4
6	CB 4	0.95	3.59	1.25	3.29	Grate	0.0	0.00	0.00	2.00	2.00	0.001	3.00	0.010	0.004	0.013	0.22	50.50	0.22	49.50	0.00	5
7	CB 3A	4.28	0.00	1.21	3.08	Grate	0.0	0.00	0.00	2.00	2.00	0.001	3.00	0.010	0.004	0.013	0.22	50.50	0.21	48.50	0.00	6
8	CB 3B	0.95	0.00	0.44	0.51	Grate	0.0	0.00	0.00	2.00	2.00	0.001	3.00	0.010	0.004	0.013	0.13	28.00	0.13	27.25	0.00	6
9	CB 24	1.14	1.01	0.76	1.39	Grate	0.0	0.00	0.00	2.00	2.00	0.001	3.00	0.010	0.004	0.013	0.17	38.00	0.17	37.25	0.00	4
10	CB 24A	1.14	0.51	0.64	1.01	Grate	0.0	0.00	0.00	2.00	2.00	0.001	3.00	0.010	0.004	0.013	0.16	35.50	0.15	33.75	0.00	9
11	CB 24B	0.95	0.00	0.44	0.51	Grate	0.0	0.00	0.00	2.00	2.00	0.001	3.00	0.010	0.004	0.013	0.13	28.00	0.13	27.25	0.00	10
12	CB 31	0.95	0.00	0.44	0.51	Grate	0.0	0.00	0.00	2.00	2.00	0.001	3.00	0.010	0.004	0.013	0.13	28.00	0.13	27.25	0.00	1

IMT northeast | Number of lines: 12 | Run Date: 01-10-2011

NOTES: Inlet N-Values = 0.016 ; Intensity = 24.76 / (Inlet time + 6.20) ^ 0.64; Return period = 10 Yrs. ; * Indicates Known Q added

Hydraflow Plan View



IMT Portland	No. Lines: 12	01-10-2011

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 (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	100.0	0.20	2.96	0.90	0.18	2.66	5.0	7.1	4.7	12.61	8.80	5.78	20	0.40	5.30	4.90	7.39	6.57	10.70	0.00	from cb 21 to out
2	1	120.0	0.21	1.47	0.90	0.19	1.32	5.0	6.2	4.9	6.55	1.78	8.34	12	0.25	5.70	5.40	12.23	8.17	10.60	10.70	from cb 18 to 21
3	2	140.0	0.21	1.26	0.90	0.19	1.13	5.0	5.9	5.0	5.71	2.52	7.27	12	0.50	6.30	5.60	16.63	13.03	10.80	10.60	from cb 33 to 18
4	3	115.0	0.21	1.05	0.90	0.19	0.94	5.0	5.6	5.1	4.84	1.74	6.16	12	0.96	7.40	6.30	26.59	18.09	10.70	10.80	from cb 29 to 33
5	4	50.0	0.21	0.42	0.90	0.19	0.38	5.0	5.3	5.2	1.97	0.66	5.64	8	1.20	8.10	7.50	33.32	28.01	10.90	10.70	from cb 28 to 29
6	5	50.0	0.21	0.21	0.90	0.19	0.19	5.0	5.0	5.3	1.00	0.38	2.86	8	0.40	8.30	8.10	35.30	33.93	10.80	10.90	from cb 19 to 28
7	4	100.0	0.21	0.42	0.90	0.19	0.38	5.0	5.3	5.2	1.97	0.51	5.64	8	0.70	8.50	7.80	38.62	28.01	10.70	10.70	from cb 30 to 29
8	7	50.0	0.21	0.21	0.90	0.19	0.19	5.0	5.0	5.3	1.00	0.27	2.86	8	0.20	8.70	8.60	40.61	39.24	10.80	10.70	from cb 31 to 30
9	1	230.0	0.33	0.99	0.90	0.30	0.89	5.0	6.1	5.0	4.45	2.69	3.63	15	0.17	5.80	5.40	9.58	8.49	10.50	10.70	from cb 27 to 21
10	1	140.0	0.30	0.30	0.90	0.27	0.27	5.0	5.0	5.3	1.43	0.83	2.62	10	0.14	5.60	5.40	9.18	8.59	9.80	10.70	from cb 12 to 21
11	9	85.0	0.33	0.66	0.90	0.30	0.59	5.0	5.7	5.1	3.02	2.73	3.85	12	0.59	6.50	6.00	10.46	9.85	10.10	10.50	from cb 26 to 27
12	11	120.0	0.33	0.33	0.90	0.30	0.30	5.0	5.0	5.3	1.57	0.89	2.88	10	0.17	6.80	6.60	11.37	10.76	11.60	10.10	from cb 25 to 26

IMT Portland | Number of lines: 12 | Run Date: 01-10-2011

NOTES: Intensity = 24.76 / (Inlet time + 6.20) ^ 0.64; Return period = 10 Yrs.

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp line No
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	CB 21	0.95	2.76	1.56	2.15	Grate	0.0	0.00	0.00	2.00	2.00	0.005	4.00	0.020	0.004	0.013	0.20	34.00	0.19	32.50	0.00	Off
2	CB 18	1.00	0.86	1.03	0.83	Grate	0.0	0.00	0.00	2.00	2.00	0.005	4.00	0.020	0.004	0.013	0.17	26.50	0.16	24.25	0.00	1
3	CB 33	1.00	0.90	1.03	0.86	Grate	0.0	0.00	0.00	2.00	2.00	0.005	4.00	0.020	0.004	0.013	0.17	26.50	0.16	24.25	0.00	2
4	CB 29	1.00	0.96	1.06	0.90	Grate	0.0	0.00	0.00	2.00	2.00	0.005	4.00	0.020	0.004	0.013	0.17	26.50	0.16	24.75	0.00	3
5	CB 28	1.00	0.30	0.82	0.48	Grate	0.0	0.00	0.00	2.00	2.00	0.005	4.00	0.020	0.004	0.013	0.15	21.50	0.15	20.50	0.00	4
6	CB 19	1.00	0.00	0.70	0.30	Grate	0.0	0.00	0.00	2.00	2.00	0.005	4.00	0.020	0.004	0.013	0.14	19.00	0.14	18.00	0.00	5
7	CB 30	1.00	0.30	0.82	0.48	Grate	0.0	0.00	0.00	2.00	2.00	0.005	4.00	0.020	0.004	0.013	0.15	21.50	0.15	20.50	0.00	4
8	CB 31	1.00	0.00	0.70	0.30	Grate	0.0	0.00	0.00	2.00	2.00	0.005	4.00	0.020	0.004	0.013	0.14	19.00	0.14	18.00	0.00	7
9	CB 27	1.57	1.08	1.28	1.38	Grate	0.0	0.00	0.00	2.00	2.00	0.005	4.00	0.020	0.004	0.013	0.18	29.00	0.18	28.25	0.00	1
10	CB 12	1.43	0.00	0.88	0.55	Grate	0.0	0.00	0.00	2.00	2.00	0.005	4.00	0.020	0.004	0.013	0.15	21.50	0.15	21.50	0.00	1
11	CB 26	1.57	0.65	1.14	1.08	Grate	0.0	0.00	0.00	2.00	2.00	0.005	4.00	0.020	0.004	0.013	0.17	26.50	0.17	26.00	0.00	9
12	CB 25	1.57	0.00	0.92	0.65	Grate	0.0	0.00	0.00	2.00	2.00	0.005	4.00	0.020	0.004	0.013	0.16	24.00	0.15	22.25	0.00	11

IMT Portland | Number of lines: 12 | Run Date: 01-10-2011

NOTES: Inlet N-Values = 0.016 ; Intensity = 24.76 / (Inlet time + 6.20) ^ 0.64; Return period = 10 Yrs. ; * Indicates Known Q added

Hydraflow Storm Sewers 2005

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
1	End	100.0	0.0	Grate	0.00	0.20	0.90	5.0	4.90	0.40	5.30	20	Cir	0.013	1.50	10.70	from cb 21 to out
2	1	120.0	0.0	Grate	0.00	0.21	0.90	5.0	5.40	0.25	5.70	12	Cir	0.013	0.50	10.60	from cb 18 to 21
3	2	140.0	0.0	Grate	0.00	0.21	0.90	5.0	5.60	0.50	6.30	12	Cir	0.013	1.50	10.80	from cb 33 to 18
4	3	115.0	90.0	Grate	0.00	0.21	0.90	5.0	6.30	0.96	7.40	12	Cir	0.026	2.25	10.70	from cb 29 to 33
5	4	50.0	90.0	Grate	0.00	0.21	0.90	5.0	7.50	1.20	8.10	8	Cir	0.026	0.50	10.90	from cb 28 to 29
6	5	50.0	0.0	Grate	0.00	0.21	0.90	5.0	8.10	0.40	8.30	8	Cir	0.026	1.00	10.80	from cb 19 to 28
7	4	100.0	-90.0	Grate	0.00	0.21	0.90	5.0	7.80	0.70	8.50	8	Cir	0.026	0.50	10.70	from cb 30 to 29
8	7	50.0	0.0	Grate	0.00	0.21	0.90	5.0	8.60	0.20	8.70	8	Cir	0.026	1.00	10.80	from cb 31 to 30
9	1	230.0	-30.0	Grate	0.00	0.33	0.90	5.0	5.40	0.17	5.80	15	Cir	0.013	1.33	10.50	from cb 27 to 21
10	1	140.0	-90.0	Grate	0.00	0.30	0.90	5.0	5.40	0.14	5.60	10	Cir	0.013	1.00	9.80	from cb 12 to 21
11	9	85.0	-60.0	Grate	0.00	0.33	0.90	5.0	6.00	0.59	6.50	12	Cir	0.013	0.83	10.10	from cb 26 to 27
12	11	120.0	30.0	Grate	0.00	0.33	0.90	5.0	6.60	0.17	6.80	10	Cir	0.013	1.00	11.60	from cb 25 to 26

IMT Portland | Number of lines: 12 | Date: 01-10-2011

Storm Sewer Summary Report

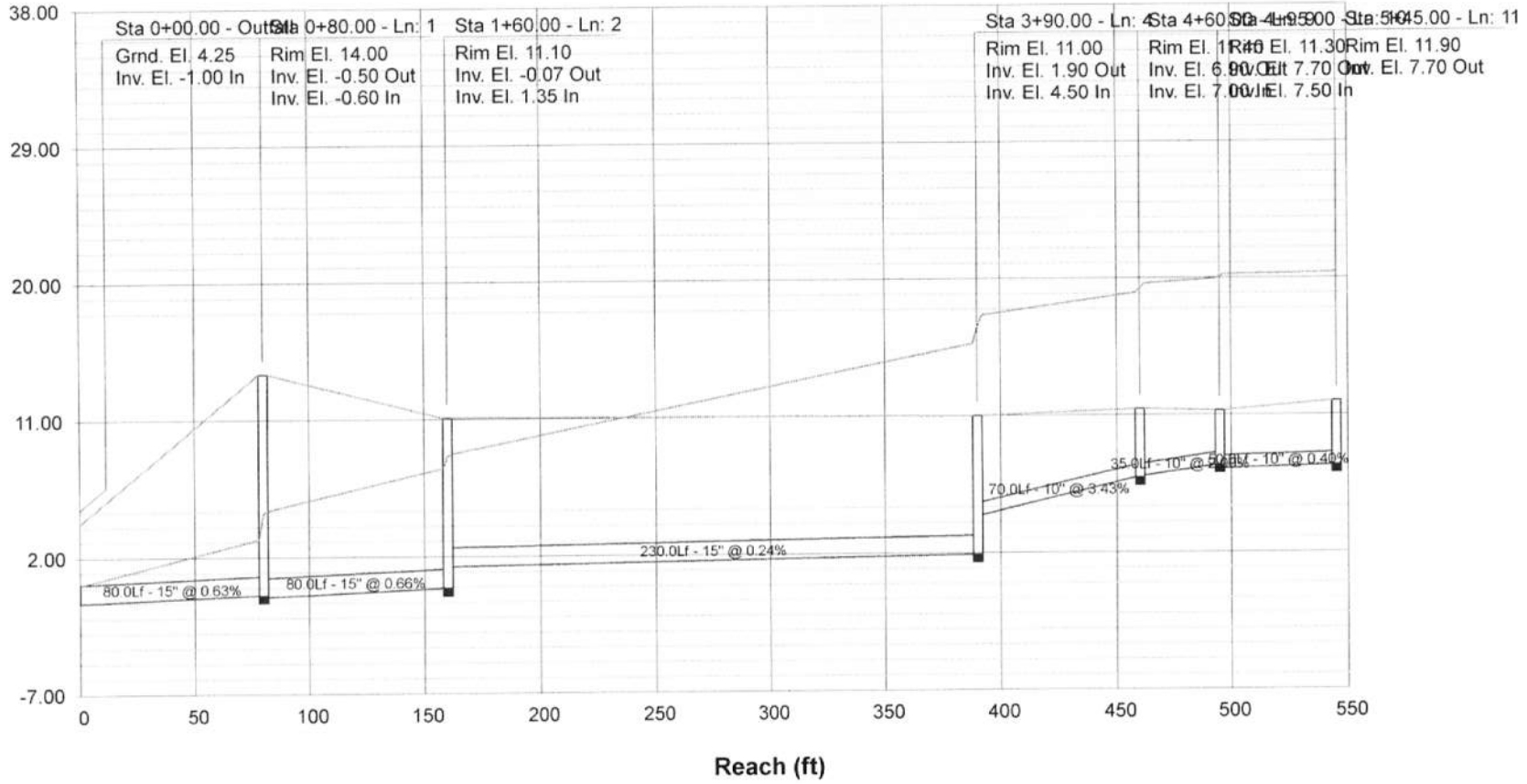
Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	from cb 21 to out	12.61	20 c	100.0	4.90	5.30	0.400	6.57*	7.39*	0.78	8.17	End
2	from cb 18 to 21	6.55	12 c	120.0	5.40	5.70	0.250	8.17*	12.23*	0.54	12.77	1
3	from cb 33 to 18	5.71	12 c	140.0	5.60	6.30	0.500	13.03*	16.63*	1.23	17.86	2
4	from cb 29 to 33	4.84	12 c	115.0	6.30	7.40	0.957	18.09*	26.59*	1.33	27.91	3
5	from cb 28 to 29	1.97	8 c	50.0	7.50	8.10	1.200	28.01*	33.32*	0.25	33.56	4
6	from cb 19 to 28	1.00	8 c	50.0	8.10	8.30	0.400	33.93*	35.30*	0.13	35.43	5
7	from cb 30 to 29	1.97	8 c	100.0	7.80	8.50	0.700	28.01*	38.62*	0.25	38.87	4
8	from cb 31 to 30	1.00	8 c	50.0	8.60	8.70	0.200	39.24*	40.61*	0.13	40.74	7
9	from cb 27 to 21	4.45	15 c	230.0	5.40	5.80	0.174	8.49*	9.58*	0.27	9.85	1
10	from cb 12 to 21	1.43	10 c	140.0	5.40	5.60	0.143	8.59*	9.18*	0.11	9.29	1
11	from cb 26 to 27	3.02	12 c	85.0	6.00	6.50	0.588	9.85*	10.46*	0.19	10.66	9
12	from cb 25 to 26	1.57	10 c	120.0	6.60	6.80	0.167	10.76*	11.37*	0.13	11.50	11

IMT Portland | Number of lines: 12 | Run Date: 01-10-2011

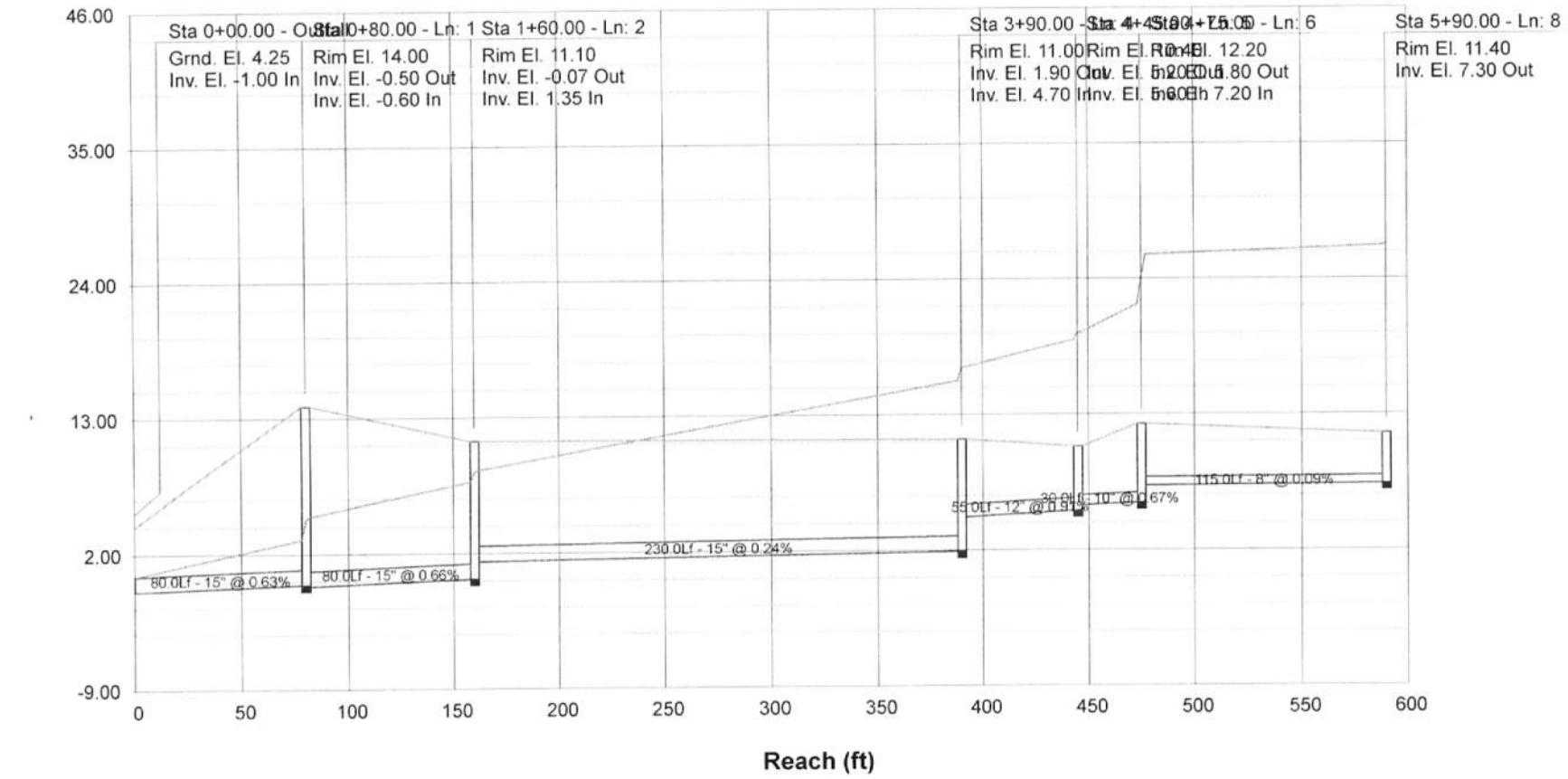
NOTES: c = cir; e = ellip; b = box; Return period = 10 Yrs. ; *Surcharged (HGL above crown).

Storm Sewer Profile

Proj. file: IMT northeast existing.stm



Storm Sewer Profile



Memorandum

To: HNTB, Inc.

From: Ellen O'Brien, Northstar Hydro, Inc.

Date: 1/12/2010

Re: Proposed Stormwater Management System, International Marine Terminal, Portland, ME. 60% Design Submittal, Preliminary Stormwater System Design.

Introduction:

Plans for the proposed International Marine Terminal redevelopment project propose reconstruction of portions of the former International Ferry Terminal for use as an international cargo handling facility. Upgrades to the site include building demolition and rehabilitation, pier upgrades, and regrading and repaving storage areas of several acres of the site. This memorandum specifically addresses the proposed storm water management system in the area to be redeveloped.

Tidal Elevations and Tidal Flood Elevations:

Normal tides range (to mean higher high tide) is 9.9 feet, with mean tide being 5.0' higher than mean lower low tide. Detailed tidal data is presented in the section on the existing stormwater management system. Flood tide information was found in FEMA's Flood Insurance Study, published in July of 1986. 100-year flood elevation for the project site is 10' NGVD (or 9.3' NAVD). Seaward of the wall under the pier, the elevation is 12' NGVD or 11.3' NAVD.

NAVD 1988 is approximately 0.7' higher than NGVD 1929. (This number should be verified).

Stormwater System Layout:

The proposed system is designed with several goals, including:

- Improvement of site drainage
- Maintaining existing drainage outlets and matching outflows as closely as possible
- Addition of water quality improvement measures
- Storing any ponded water in travel-ways rather than in storage areas
- Minimizing ponded water above ground
- Providing alternate outlets if ponding exceeds depth that would inundate any storage structures
- Using parking lot drainage guidelines for assistance with system layout, using the following guidance:
    a. Minimum gutter grades: 0.005, absolute minimum 0.003
    b. Paved surface minimum slope is 0.004 for parking lots, recommend 1-5%
    c. Local ordinance for design frequency, likely 10-year
    d. Rational formula coeff. 0.7-0.95 for asphalt, normally 0.9
    e. Gutters 12-36 inches. Slope may be same or steeper?
    f. Curb inlets better for debris handling, 4-6" opening
    g. Maximum standing water depth 12", no more than 25% of spaces inundated

h. Top of structures to detain water, 4" above max. water level
i. No ponding near primary egress/ingress locations
j. Minimum 20' wide emergency vehicle lane to buildings remains unflooded
k. No ponding under buildings
l. Slopes: usually 2% cross slope, not more than 5%, at ponding locations, not less than 1%

System 1, Southwest portion of site:

The south westerly system drains approximately 1.52 redeveloped acres to existing CB 21, just over the fence-line from the portion of the site to be redeveloped, all of which are either paved, or building roofs. This system outlets via a 24" RCP directly to Portland Harbor just to the south of the former on-ramp for the ferry. No significant change in drainage area is proposed, and for the two drainages on-site, no change in drainage area or land cover is proposed.

Replacement catch basins will be installed along the travelways, designed to minimize ponding, and designed to assure that ponding will not reach storage containers. The system will be connected into the existing system that drains to the southwest via existing catch basin 21.

Catch basins will be deep sump basins, fitted with an outlet hood to assist in water quality improvements to the site.

System 2, Northerly portion of site.

The northerly system drains approximately 1.8 redeveloped acres to the existing outlet at the north end of the pier (see photo below). All drainage area is either paved, or building roofs and all of the area is slated for regrading and pavement improvements. No significant change in drainage area is proposed, and for the two drainages on-site, no change in drainage area or land cover is proposed.

Replacement catch basins will be installed along the travelways, designed to minimize ponding, and designed to assure that ponding will not reach storage containers. The system will be connected into the existing system via several manholes into the existing outlet.

Catch basins will be deep sump basins, fitted with an outlet hood to assist in water quality improvements to the site.

Buildings and Piers: Portions of the existing buildings and piers drain to the storm drain system, but most of these areas drain directly to the harbor via channels in the concrete (see below), openings in the pier, and gutters and openings in the piers. Portions of the site where demolition is scheduled will be regarded to drain directly to the harbor to minimize surcharging the storm drain system. Vegetated buffers will be used where feasible for this direct runoff from the site.

Stormwater Computations:

Model Hydraflow which uses the Rational Method for computing flows will be used to analyze the proposed system, using the 10-year storm IDF curve for Portland, Maine as published in Maine DOT's Highway Design Guide, Chapter 12.

Curve Number for the site is 0.9 as nearly the entire site is covered with pavement or buildings. Very minimal areas are vegetated. For final design and comparison of existing vs. proposed, and as final grading plans are complete, these areas will be included in existing computations as vegetated.

Time of Concentration at each basin is 5 minutes, the minimum for Hydraflow design computations. Time of concentration was computed for several locations and was found to be less than or equal to 5 minutes.

Flow on this site sheet flows to catch basins. The majority of the site's runoff flows to on-site catch basins. The only portion of the site not collected by the stormwater system is the piers and about half of the roofs of the buildings. Area to each basin will be measured on site regrading.

As discussed in detail above, flow outlets to one of two direct outlets to Portland Harbor. Outlets are on riprap or stone, and are generally near median to low tide levels. A TideFlex tide gate is located near the end of System 2.

Flow for these calculations were assumed with low tide. Final design flows will also be done against high tide. With high tide, the system will experience more surcahrge. Low tide elevation is typically about 9.9' below high tide, and about 5' below mean sea level. During storm tides, (10' NGVD), many catch basin rims would be inundated just by tide water if tide gates were not installed in the lower parts of the storm drain system.

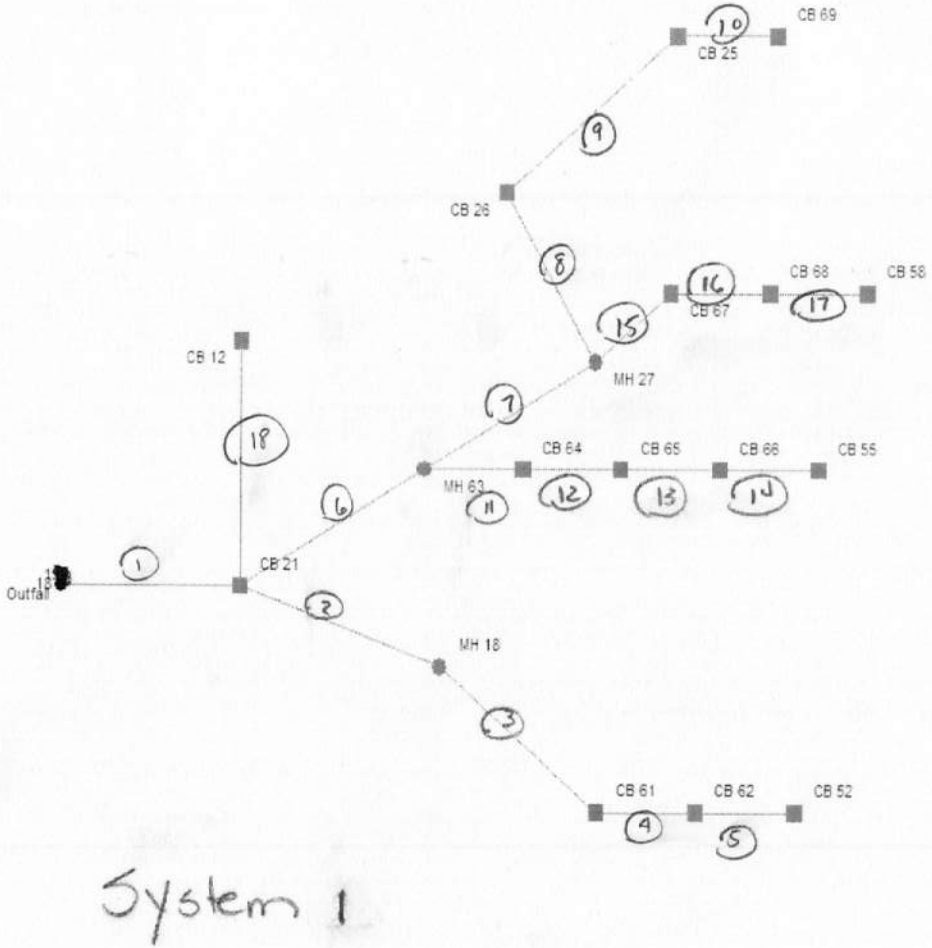
Preliminary calculations are attached, and summarized below for a 10-year storm: Note that areas will be remeasured and reallocated as design progresses. In addition, flows will be balanced and system optimized as design proceeds. This design represents preliminary work and will be balanced with other design components.

System	Total Area, Acres	Tc, Minutes	CN	Total Flow
1	2.5	22.2	.9	6.6
2	4.04	8.0	.9	16.5

Summary:

- The proposed International Marine Terminal site in Portland was used as the International Ferry Site until several years ago. The site will be regraded to drain to new and existing catch basins.
- New and replacement catch basins will include deep sumps and hoods.
- Normal tide range is about 10', and flood tide is 10' above mean sea level, with wave action raising the 100-year level to 12' above mean sea level seaward of the seawall under the buildings and piers.
- The site will continue to drain in two directions, to two outlets, both directly into Portland Harbor.
- Catch basins will be placed in travel-ways so that any surcharge that occurs will create ponding in travelways and not in storage areas.
- New and replacement catch basins will be set to meet the regraded surface.

Hydraflow Plan View



IMT Portland

No. Lines: 18

01-12-2011

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
1	End	100.0	0.0	Grate	0.00	0.20	0.90	5.0	5.10	0.30	5.40	20	Cir	0.013	1.50	10.70	from cb 21 to out
2	1	120.0	20.0	MH	0.00	0.00	0.00	0.0	6.07	0.32	6.46	12	Cir	0.013	0.40	13.60	MH 18 to CB 21
3	2	115.0	20.0	Grate	0.00	0.22	0.90	5.0	6.46	0.36	6.87	12	Cir	0.013	1.04	13.80	CB 61 to MH 18
4	3	55.0	-40.0	Grate	0.00	0.23	0.90	5.0	6.87	0.09	6.92	12	Cir	0.013	0.50	13.80	CB 62 to CB 61
5	4	55.0	0.0	Grate	0.00	0.01	0.90	5.0	6.92	0.11	6.98	12	Cir	0.013	1.00	13.80	CB 52 to CB 61
6	1	120.0	-30.0	MH	0.00	0.00	0.00	0.0	5.40	0.08	5.50	15	Cir	0.013	0.56	12.70	MH 63 to CB 21
7	6	110.0	0.0	MH	0.00	0.00	0.00	0.0	5.60	0.18	5.80	15	Cir	0.013	1.00	13.00	MH 27 to MH 63
8	7	100.0	-90.0	Grate	0.00	0.33	0.90	5.0	5.90	0.60	6.50	12	Cir	0.013	1.48	12.50	CB 26 to MH 27
9	8	125.0	80.0	Grate	0.00	0.13	0.90	5.0	6.60	0.31	6.99	10	Cir	0.013	1.04	12.50	CB 25 to CB 26
10	9	55.0	40.0	Grate	0.00	0.13	0.90	5.0	6.82	0.09	6.87	12	Cir	0.013	1.00	12.50	CB 69 to CB 25
11	6	55.0	30.0	Grate	0.00	0.18	0.90	5.0	6.87	0.45	7.12	12	Cir	0.013	0.50	12.73	CB 64 to MH 63
12	11	55.0	0.0	Grate	0.00	0.17	0.90	5.0	7.12	0.22	7.24	12	Cir	0.013	0.50	12.73	CB 65 to CB 64
13	12	55.0	0.0	Grate	0.00	0.17	0.90	5.0	7.24	0.09	7.29	12	Cir	0.013	0.50	12.73	CB 66 to CB 65
14	13	55.0	0.0	Grate	0.00	0.01	0.90	5.0	7.29	0.11	7.35	12	Cir	0.013	1.00	12.73	CB 55 to CB 66
15	7	55.0	-10.0	Grate	0.00	0.21	0.90	5.0	7.38	0.29	7.54	12	Cir	0.013	1.04	12.16	CB 67 to MH 27
16	15	55.0	40.0	Grate	0.00	0.20	0.90	5.0	7.54	0.11	7.60	12	Cir	0.013	0.50	12.16	CB 68 to CB 67
17	16	55.0	0.0	Grate	0.00	0.01	0.90	5.0	7.60	0.09	7.65	12	Cir	0.013	1.00	12.16	CB 58 to CB 68
18	1	125.0	-90.0	Grate	0.00	0.30	0.90	5.0	6.07	0.16	6.27	12	Cir	0.013	1.00	11.00	CB 18 to CB 21

IMT Portland | Number of lines: 18 | Date: 01-12-2011

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	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.
1	from cb 21 to out	6.56	20 c	100.0	5.10	5.40	0.300	6.57	6.76	0.28	7.04	End
2	MH 18 to CB 21	1.23	12 c	120.0	6.07	6.46	0.325	7.14	7.27	0.02	7.29	1
3	CB 61 to MH 18	1.25	12 c	115.0	6.46	6.87	0.357	7.30	7.47	0.10	7.58	2
4	CB 62 to CB 61	0.66	12 c	55.0	6.87	6.92	0.091	7.65	7.67	0.01	7.68	3
5	CB 52 to CB 61	0.05	12 c	55.0	6.92	6.98	0.109	7.68	7.68	0.00	7.69	4
6	MH 63 to CB 21	4.09	15 c	120.0	5.40	5.50	0.083	7.05*	7.53*	0.10	7.63	1
7	MH 27 to MH 63	2.71	15 c	110.0	5.60	5.80	0.182	7.72*	7.92*	0.08	7.99	6
8	CB 26 to MH 27	2.52	12 c	100.0	5.90	6.50	0.600	7.99*	8.49*	0.24	8.73	7
9	CB 25 to CB 26	1.16	10 c	125.0	6.60	6.99	0.312	8.82*	9.17*	0.07	9.24	8
10	CB 69 to CB 25	0.62	12 c	55.0	6.82	6.87	0.091	9.30*	9.32*	0.01	9.33	9
11	CB 64 to MH 63	1.42	12 c	55.0	6.87	7.12	0.455	7.75	7.82	0.05	7.86	6
12	CB 65 to CB 64	0.95	12 c	55.0	7.12	7.24	0.218	7.90	7.94	0.02	7.96	11
13	CB 66 to CB 65	0.50	12 c	55.0	7.24	7.29	0.091	7.98	7.99	0.01	8.00	12
14	CB 55 to CB 66	0.05	12 c	55.0	7.29	7.35	0.109	8.00	8.00	0.00	8.00	13
15	CB 67 to MH 27	1.14	12 c	55.0	7.38	7.54	0.291	8.04	8.13	0.09	8.22	7
16	CB 68 to CB 67	0.58	12 c	55.0	7.54	7.60	0.109	8.28	8.30	0.01	8.31	15
17	CB 58 to CB 68	0.05	12 c	55.0	7.60	7.65	0.091	8.31	8.31	0.00	8.31	16
18	CB 18 to CB 21	1.43	12 c	125.0	6.07	6.27	0.160	7.15*	7.35*	0.05	7.40	1

IMT Portland | Number of lines: 18 | Run Date: 01-12-2011

NOTES: c = cir; e = ellip; b = box; Return period = 10 Yrs. ; *Surcharged (HGL above crown).

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 (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	100.0	0.20	2.50	0.90	0.18	2.25	5.0	22.2	2.9	6.56	7.62	3.33	20	0.30	5.40	5.10	6.76	6.57	10.70	0.00	from cb 21 to out
2	1	120.0	0.00	0.46	0.00	0.00	0.41	0.0	21.5	3.0	1.23	2.03	1.68	12	0.32	6.46	6.07	7.27	7.14	13.60	10.70	MH 18 to CB 21
3	2	115.0	0.22	0.46	0.90	0.20	0.41	5.0	20.8	3.0	1.25	2.13	2.15	12	0.36	6.87	6.46	7.47	7.30	13.80	13.60	CB 61 to MH 18
4	3	55.0	0.23	0.24	0.90	0.21	0.22	5.0	20.1	3.1	0.66	1.07	1.03	12	0.09	6.92	6.87	7.67	7.65	13.80	13.80	CB 62 to CB 61
5	4	55.0	0.01	0.01	0.90	0.01	0.01	5.0	5.0	5.3	0.05	1.18	0.08	12	0.11	6.98	6.92	7.68	7.68	13.80	13.80	CB 52 to CB 61
6	1	120.0	0.00	1.54	0.00	0.00	1.39	0.0	21.7	3.0	4.09	1.86	3.33	15	0.08	5.50	5.40	7.53	7.05	12.70	10.70	MH 63 to CB 21
7	6	110.0	0.00	1.01	0.00	0.00	0.91	0.0	21.2	3.0	2.71	2.75	2.21	15	0.18	5.80	5.60	7.92	7.72	13.00	12.70	MH 27 to MH 63
8	7	100.0	0.33	0.59	0.90	0.30	0.53	5.0	7.1	4.7	2.52	2.76	3.21	12	0.60	6.50	5.90	8.49	7.99	12.50	13.00	CB 26 to MH 27
9	8	125.0	0.13	0.26	0.90	0.12	0.23	5.0	6.2	5.0	1.16	1.22	2.13	10	0.31	6.99	6.60	9.17	8.82	12.50	12.50	CB 25 to CB 26
10	9	55.0	0.13	0.13	0.90	0.12	0.12	5.0	5.0	5.3	0.62	1.07	0.79	12	0.09	6.87	6.82	9.32	9.30	12.50	12.50	CB 69 to CB 25
11	6	55.0	0.18	0.53	0.90	0.16	0.48	5.0	21.4	3.0	1.42	2.40	2.18	12	0.45	7.12	6.87	7.82	7.75	12.73	12.70	CB 64 to MH 63
12	11	55.0	0.17	0.35	0.90	0.15	0.32	5.0	21.0	3.0	0.95	1.66	1.52	12	0.22	7.24	7.12	7.94	7.90	12.73	12.73	CB 65 to CB 64
13	12	55.0	0.17	0.18	0.90	0.15	0.16	5.0	20.1	3.1	0.50	1.07	0.82	12	0.09	7.29	7.24	7.99	7.98	12.73	12.73	CB 66 to CB 65
14	13	55.0	0.01	0.01	0.90	0.01	0.01	5.0	5.0	5.3	0.05	1.18	0.08	12	0.11	7.35	7.29	8.00	8.00	12.73	12.73	CB 55 to CB 66
15	7	55.0	0.21	0.42	0.90	0.19	0.38	5.0	20.9	3.0	1.14	1.92	2.22	12	0.29	7.54	7.38	8.13	8.04	12.16	13.00	CB 67 to MH 27
16	15	55.0	0.20	0.21	0.90	0.18	0.19	5.0	20.1	3.1	0.58	1.18	0.96	12	0.11	7.60	7.54	8.30	8.28	12.16	12.16	CB 68 to CB 67
17	16	55.0	0.01	0.01	0.90	0.01	0.01	5.0	5.0	5.3	0.05	1.07	0.08	12	0.09	7.65	7.60	8.31	8.31	12.16	12.16	CB 58 to CB 68
18	1	125.0	0.30	0.30	0.90	0.27	0.27	5.0	5.0	5.3	1.43	1.42	1.82	12	0.16	6.27	6.07	7.35	7.15	11.00	10.70	CB 18 to CB 21

IMT Portland | Number of lines: 18 | Run Date: 01-12-2011

NOTES: Intensity = 24.76 / (Inlet time + 6.20) ^ 0.64; Return period = 10 Yrs.

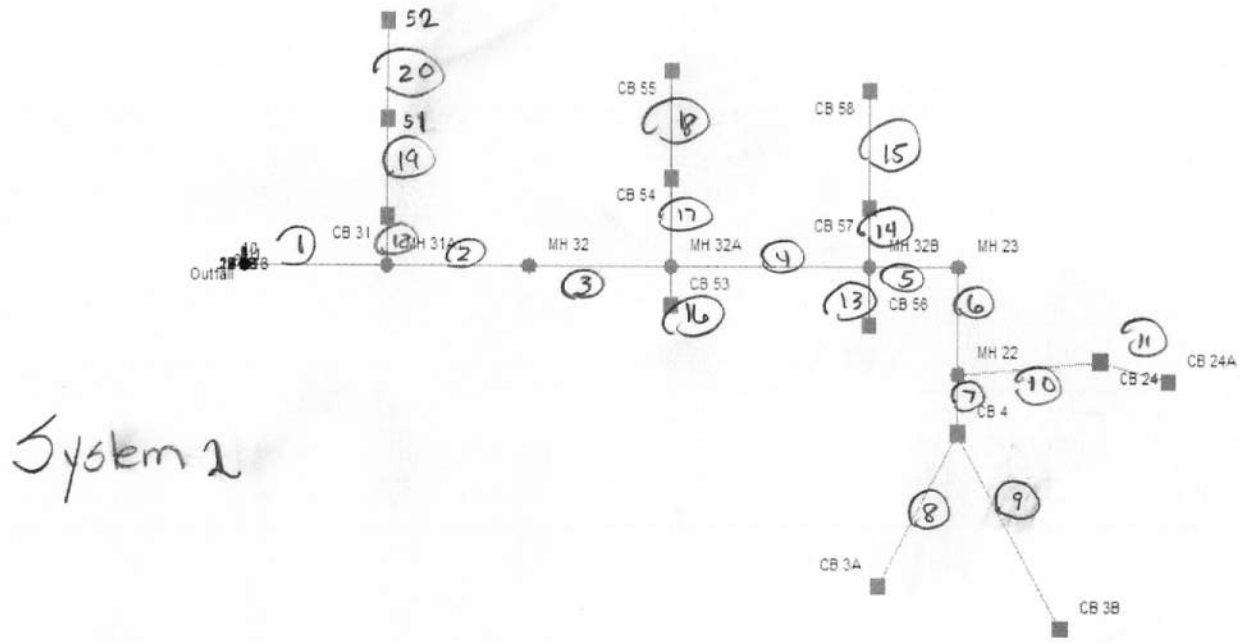
Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp line No
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	CB 21	0.95	0.00	0.67	0.28	Grate	0.0	0.00	0.00	2.00	2.00	0.005	4.00	0.020	0.004	0.013	0.14	19.00	0.13	17.50	0.00	Off
2	MH 18	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
3	CB 61	1.05	0.00	1.05	0.00	Grate	0.0	0.00	0.00	2.00	2.00	0.005	30.00	0.020	0.010	0.013	0.16	8.00	0.16	7.75	0.00	2
4	CB 62	1.10	0.00	1.10	0.00	Grate	0.0	0.00	0.00	2.00	2.00	0.005	30.00	0.020	0.010	0.013	0.16	8.00	0.16	7.90	0.00	3
5	CB 52	0.05	0.00	0.05	0.00	Grate	0.0	0.00	0.00	2.00	2.00	0.005	30.00	0.020	0.010	0.013	0.05	2.50	0.05	2.45	0.00	4
6	MH 63	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
7	MH 27	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
8	CB 26	1.57	0.00	1.57	0.00	Grate	0.0	0.00	0.00	2.00	2.00	0.005	25.00	0.020	0.010	0.013	0.19	9.50	0.18	9.05	0.00	6
9	CB 25	0.62	0.00	0.62	0.00	Grate	0.0	0.00	0.00	2.00	2.00	0.005	25.00	0.020	0.010	0.013	0.13	6.50	0.13	6.40	0.00	8
10	CB 69	0.62	0.00	0.62	0.00	Grate	0.0	0.00	0.00	2.00	2.00	0.005	30.00	0.020	0.010	0.013	0.13	6.50	0.13	6.40	0.00	9
11	CB 64	0.86	0.00	0.86	0.00	Grate	0.0	0.00	0.00	2.00	2.00	0.005	30.00	0.020	0.010	0.013	0.15	7.50	0.14	7.20	0.00	6
12	CB 65	0.81	0.00	0.81	0.00	Grate	0.0	0.00	0.00	2.00	2.00	0.005	30.00	0.020	0.010	0.013	0.15	7.50	0.14	7.05	0.00	11
13	CB 66	0.81	0.00	0.81	0.00	Grate	0.0	0.00	0.00	2.00	2.00	0.005	30.00	0.020	0.010	0.013	0.15	7.50	0.14	7.05	0.00	12
14	CB 55	0.05	0.00	0.05	0.00	Grate	0.0	0.00	0.00	2.00	2.00	0.005	30.00	0.020	0.010	0.013	0.05	2.50	0.05	2.45	0.00	13
15	CB 67	1.00	0.00	1.00	0.00	Grate	0.0	0.00	0.00	2.00	2.00	0.005	30.00	0.020	0.010	0.013	0.16	8.00	0.15	7.65	0.00	7
16	CB 68	0.95	0.00	0.95	0.00	Grate	0.0	0.00	0.00	2.00	2.00	0.005	30.00	0.020	0.010	0.013	0.15	7.50	0.15	7.50	0.00	15
17	CB 58	0.05	0.00	0.05	0.00	Grate	0.0	0.00	0.00	2.00	2.00	0.005	30.00	0.020	0.010	0.013	0.05	2.50	0.05	2.45	0.00	16
18	CB 12	1.43	0.00	1.43	0.00	Grate	0.0	0.00	0.00	2.00	2.00	0.005	30.00	0.020	0.010	0.013	0.18	9.00	0.17	8.70	0.00	1

IMT Portland | Number of lines: 18 | Run Date: 01-12-2011

NOTES: Inlet N-Values = 0.016 ; Intensity = 24.76 / (Inlet time + 6.20) ^ 0.64; Return period = 10 Yrs. ; * Indicates Known Q added

Hydraflow Plan View



IMT northeast	No. Lines: 20	01-12-2011

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
1	End	80.0	0.0	MH	0.00	0.00	0.00	0.0	-1.00	0.63	-0.50	18	Cir	0.013	1.00	14.40	MH 31A to outfall
2	1	80.0	0.0	MH	0.00	0.00	0.00	0.0	-0.60	1.00	0.20	18	Cir	0.013	0.15	13.60	MH 32 to MH 31A
3	2	80.0	0.0	MH	0.00	0.00	0.00	0.0	0.20	2.13	1.90	18	Cir	0.013	1.00	12.80	MH 32A to 32
4	3	110.0	0.0	MH	0.00	0.00	0.00	0.0	1.90	2.34	4.47	18	Cir	0.013	1.00	12.20	MH 32B to MH 32A
5	4	50.0	0.0	MH	0.00	0.00	0.00	0.0	4.47	1.14	5.04	18	Cir	0.013	1.00	12.60	MH 23 to MH 32B
6	5	55.0	90.0	MH	0.00	0.00	0.00	0.0	4.50	1.27	5.20	15	Cir	0.013	1.00	12.60	MH 22 to 23
7	6	30.0	0.0	Grate	0.00	0.20	0.90	5.0	5.60	1.67	6.10	10	Cir	0.013	1.25	12.20	CB 4 to 22
8	7	90.0	30.0	Grate	0.00	0.90	0.90	5.0	8.20	0.56	8.70	8	Cir	0.013	1.00	12.30	cB 3a to 4
9	7	115.0	-30.0	Grate	0.00	0.20	0.90	5.0	7.20	0.43	7.70	8	Cir	0.013	1.00	11.40	CB 3 to 4
10	6	80.0	-95.0	Grate	0.00	0.12	0.90	5.0	5.60	0.25	5.80	12	Cir	0.013	0.59	13.30	CB 24 to 23
11	10	40.0	20.0	Grate	0.00	0.11	0.90	5.0	5.63	0.10	5.67	12	Cir	0.013	1.00	13.40	CB 24A to 24
12	1	25.0	-90.0	Grate	0.00	0.30	0.90	5.0	-0.50	0.40	-0.40	12	Cir	0.013	0.50	13.81	CB 31 to MH 31A
13	4	30.0	90.0	Grate	0.00	0.26	0.90	5.0	4.72	0.13	4.76	12	Cir	0.013	1.00	12.16	CB 56 to MH 32B
14	4	30.0	-90.0	Grate	0.00	0.21	0.90	5.0	4.72	0.33	4.82	12	Cir	0.013	0.50	12.16	CB 57 to MH 32B
15	14	60.0	0.0	Grate	0.00	0.30	0.90	5.0	4.82	0.10	4.88	12	Cir	0.013	1.00	12.16	CB 58 to CB 57
16	3	20.0	90.0	Grate	0.00	0.30	0.90	5.0	2.15	0.15	2.18	12	Cir	0.013	1.00	12.73	CB 53 to MH 32A
17	3	45.0	-90.0	Grate	0.00	0.27	0.90	5.0	2.15	0.56	2.40	12	Cir	0.013	0.50	12.73	CB 54 to MH 32A
18	17	55.0	0.0	Grate	0.00	0.30	0.90	5.0	2.40	0.16	2.49	12	Cir	0.013	1.00	12.73	CB 55 to CB 54
19	12	50.0	0.0	Grate	0.00	0.27	0.90	5.0	-0.15	0.56	0.13	12	Cir	0.013	0.50	13.81	CB 51 to CB 50
20	19	50.0	0.0	Grate	0.00	0.30	0.90	5.0	0.13	0.16	0.21	12	Cir	0.013	1.00	13.81	CB 52 to CB 51

IMT northeast | Number of lines: 20 | Date: 01-12-2011

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	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.
1	MH 31A to outfall	16.52	18 c	80.0	-1.00	-0.50	0.625	0.43*	2.33*	1.36	3.69	End
2	MH 32 to MH 31A	13.07	18 c	80.0	-0.60	0.20	1.000	4.19*	5.43*	0.13	5.56	1
3	MH 32A to 32	13.17	18 c	80.0	0.20	1.90	2.125	5.56*	6.82*	0.86	7.68	2
4	MH 32B to MH 32A	9.70	18 c	110.0	1.90	4.47	2.336	8.08*	9.02*	0.47	9.48	3
5	MH 23 to MH 32B	6.52	18 c	50.0	4.47	5.04	1.140	9.74*	9.93*	0.21	10.15	4
6	MH 22 to 23	6.57	15 c	55.0	4.50	5.20	1.273	10.15*	10.71*	0.45	11.16	5
7	CB 4 to 22	5.95	10 c	30.0	5.60	6.10	1.667	11.16*	13.38*	2.32	15.69	6
8	cB 3a to 4	4.28	8 c	90.0	8.20	8.70	0.556	15.69*	27.03*	2.34	29.37	7
9	CB 3 to 4	0.95	8 c	115.0	7.20	7.70	0.435	17.43*	18.15*	0.12	18.26	7
10	CB 24 to 23	1.04	12 c	80.0	5.60	5.80	0.250	11.58*	11.65*	0.02	11.66	6
11	CB 24A to 24	0.52	12 c	40.0	5.63	5.67	0.100	11.68*	11.69*	0.01	11.70	10
12	CB 31 to MH 31A	3.98	12 c	25.0	-0.50	-0.40	0.400	4.64*	4.96*	0.20	5.16	1
13	CB 56 to MH 32B	1.24	12 c	30.0	4.72	4.76	0.133	9.91*	9.95*	0.04	9.99	4
14	CB 57 to MH 32B	2.35	12 c	30.0	4.72	4.82	0.333	9.81*	9.94*	0.07	10.01	4
15	CB 58 to CB 57	1.43	12 c	60.0	4.82	4.88	0.100	10.10*	10.20*	0.05	10.25	14
16	CB 53 to MH 32A	1.43	12 c	20.0	2.15	2.18	0.150	8.49*	8.53*	0.05	8.58	3
17	CB 54 to MH 32A	2.64	12 c	45.0	2.15	2.40	0.556	8.37*	8.62*	0.09	8.70	3
18	CB 55 to CB 54	1.43	12 c	55.0	2.40	2.49	0.164	8.83*	8.92*	0.05	8.97	17
19	CB 51 to CB 50	2.65	12 c	50.0	-0.15	0.13	0.560	5.38*	5.66*	0.09	5.74	12
20	CB 52 to CB 51	1.43	12 c	50.0	0.13	0.21	0.160	5.87*	5.95*	0.05	6.00	19

IMT northeast | Number of lines: 20 | Run Date: 01-12-2011

NOTES: c = cir; e = ellip; b = box; Return period = 10 Yrs. ; *Surcharged (HGL above crown).

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 (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	80.0	0.00	4.04	0.00	0.00	3.64	0.0	8.0	4.5	16.52	8.30	9.42	18	0.63	-0.50	-1.00	2.33	0.43	14.40	0.00	MH 31A to outfall
2	1	80.0	0.00	3.17	0.00	0.00	2.85	0.0	7.8	4.6	13.07	10.50	7.39	18	1.00	0.20	-0.60	5.43	4.19	13.60	14.40	MH 32 to MH 31
3	2	80.0	0.00	3.17	0.00	0.00	2.85	0.0	7.7	4.6	13.17	15.31	7.45	18	2.13	1.90	0.20	6.82	5.56	12.80	13.60	MH 32A to 32
4	3	110.0	0.00	2.30	0.00	0.00	2.07	0.0	7.3	4.7	9.70	16.05	5.49	18	2.34	4.47	1.90	9.02	8.08	12.20	12.80	MH 32B to MH 3
5	4	50.0	0.00	1.53	0.00	0.00	1.38	0.0	7.1	4.7	6.52	11.21	3.69	18	1.14	5.04	4.47	9.93	9.74	12.60	12.20	MH 23 to MH 32
6	5	55.0	0.00	1.53	0.00	0.00	1.38	0.0	7.0	4.8	6.57	7.28	5.35	15	1.27	5.20	4.50	10.71	10.15	12.60	12.60	MH 22 to 23
7	6	30.0	0.20	1.30	0.90	0.18	1.17	5.0	5.7	5.1	5.95	2.83	10.92	10	1.67	6.10	5.60	13.38	11.16	12.20	12.60	CB 4 to 22
8	7	90.0	0.90	0.90	0.90	0.81	0.81	5.0	5.0	5.3	4.28	0.90	12.28	8	0.56	8.70	8.20	27.03	15.69	12.30	12.20	cB 3a to 4
9	7	115.0	0.20	0.20	0.90	0.18	0.18	5.0	5.0	5.3	0.95	0.80	2.73	8	0.43	7.70	7.20	18.15	17.43	11.40	12.20	CB 3 to 4
10	6	80.0	0.12	0.23	0.90	0.11	0.21	5.0	6.0	5.0	1.04	1.78	1.32	12	0.25	5.80	5.60	11.65	11.58	13.30	12.60	CB 24 to 23
11	10	40.0	0.11	0.11	0.90	0.10	0.10	5.0	5.0	5.3	0.52	1.13	0.67	12	0.10	5.67	5.63	11.69	11.68	13.40	13.30	CB 24A to 24
12	1	25.0	0.30	0.87	0.90	0.27	0.78	5.0	5.7	5.1	3.98	2.25	5.07	12	0.40	-0.40	-0.50	4.96	4.64	13.81	14.40	CB 31 to MH 31A
13	4	30.0	0.26	0.26	0.90	0.23	0.23	5.0	5.0	5.3	1.24	1.30	1.58	12	0.13	4.76	4.72	9.95	9.91	12.16	12.20	CB 56 to MH 32B
14	4	30.0	0.21	0.51	0.90	0.19	0.46	5.0	5.5	5.1	2.35	2.06	3.00	12	0.33	4.82	4.72	9.94	9.81	12.16	12.20	CB 57 to MH 32B
15	14	60.0	0.30	0.30	0.90	0.27	0.27	5.0	5.0	5.3	1.43	1.13	1.82	12	0.10	4.88	4.82	10.20	10.10	12.16	12.16	CB 58 to CB 57
16	3	20.0	0.30	0.30	0.90	0.27	0.27	5.0	5.0	5.3	1.43	1.38	1.82	12	0.15	2.18	2.15	8.53	8.49	12.73	12.80	CB 53 to MH 32A
17	3	45.0	0.27	0.57	0.90	0.24	0.51	5.0	5.5	5.1	2.64	2.65	3.36	12	0.56	2.40	2.15	8.62	8.37	12.73	12.80	CB 54 to MH 32A
18	17	55.0	0.30	0.30	0.90	0.27	0.27	5.0	5.0	5.3	1.43	1.44	1.82	12	0.16	2.49	2.40	8.92	8.83	12.73	12.73	CB 55 to CB 54
19	12	50.0	0.27	0.57	0.90	0.24	0.51	5.0	5.5	5.2	2.65	2.66	3.37	12	0.56	0.13	-0.15	5.66	5.38	13.81	13.81	CB 51 to CB 50
20	19	50.0	0.30	0.30	0.90	0.27	0.27	5.0	5.0	5.3	1.43	1.42	1.82	12	0.16	0.21	0.13	5.95	5.87	13.81	13.81	CB 52 to CB 51

IMT northeast

Number of lines: 20

Run Date: 01-12-2011

NOTES: Intensity = 24.76 / (Inlet time + 6.20) ^ 0.64; Return period = 10 Yrs.

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp line No
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	MH 31A	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
2	MH 32	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
3	MH 32A	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
4	MH 32B	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
5	MH 23	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	Off
6	MH 22	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00	5
7	CB 4	0.95	0.00	0.95	0.00	Grate	0.0	0.00	0.00	2.00	2.00	0.001	30.00	0.020	0.010	0.013	0.21	10.50	0.20	10.15	0.00	6
8	CB 3A	4.28	0.00	4.28	0.00	Grate	0.0	0.00	0.00	2.00	2.00	0.001	30.00	0.020	0.010	0.013	0.36	18.00	0.35	17.75	0.00	7
9	CB 3B	0.95	0.00	0.95	0.00	Grate	0.0	0.00	0.00	2.00	2.00	0.001	30.00	0.020	0.010	0.013	0.21	10.50	0.20	10.15	0.00	7
10	CB 24	0.57	0.00	0.57	0.00	Grate	0.0	0.00	0.00	2.00	2.00	0.001	30.00	0.020	0.010	0.013	0.17	8.50	0.17	8.35	0.00	5
11	CB 24A	0.52	0.00	0.52	0.00	Grate	0.0	0.00	0.00	2.00	2.00	0.001	30.00	0.020	0.010	0.013	0.17	8.50	0.16	8.10	0.00	10
12	CB 31	1.43	0.00	1.43	0.00	Grate	0.0	0.00	0.00	2.00	2.00	0.001	30.00	0.020	0.010	0.013	0.24	12.00	0.24	11.80	0.00	1
13	CB 56	1.24	0.00	1.24	0.00	Grate	0.0	0.00	0.00	2.00	2.00	0.001	30.00	0.020	0.010	0.013	0.23	11.50	0.22	11.15	0.00	4
14	CB 57	1.00	0.00	1.00	0.00	Grate	0.0	0.00	0.00	2.00	2.00	0.001	30.00	0.020	0.010	0.013	0.21	10.50	0.21	10.30	0.00	4
15	CB 58	1.43	0.00	1.43	0.00	Grate	0.0	0.00	0.00	2.00	2.00	0.001	30.00	0.020	0.010	0.013	0.24	12.00	0.24	11.80	0.00	14
16	CB 53	1.43	0.00	1.43	0.00	Grate	0.0	0.00	0.00	2.00	2.00	0.001	30.00	0.020	0.010	0.013	0.24	12.00	0.24	11.80	0.00	3
17	CB 54	1.29	0.00	1.29	0.00	Grate	0.0	0.00	0.00	2.00	2.00	0.001	30.00	0.020	0.010	0.013	0.23	11.50	0.23	11.35	0.00	3
18	CB 55	1.43	0.00	1.43	0.00	Grate	0.0	0.00	0.00	2.00	2.00	0.001	30.00	0.020	0.010	0.013	0.24	12.00	0.24	11.80	0.00	17
19	CB 51	1.29	0.00	1.29	0.00	Grate	0.0	0.00	0.00	2.00	2.00	0.001	30.00	0.020	0.010	0.013	0.23	11.50	0.23	11.35	0.00	12
20	CB 52	1.43	0.00	1.43	0.00	Grate	0.0	0.00	0.00	2.00	2.00	0.001	30.00	0.020	0.010	0.013	0.24	12.00	0.24	11.80	0.00	19

IMT northeast | Number of lines: 20 | Run Date: 01-12-2011

NOTES: Inlet N-Values = 0.016 ; Intensity = 24.76 / (Inlet time + 6.20) ^ 0.64; Return period = 10 Yrs. ; * Indicates Known Q added

Stormwater Pollution Prevention Plan
Portland International Marine Terminal
1-12-2011

Facility Name: ___Portland International Marine Terminal

Facility Address: Commercial Street, Portland, Maine

Owner/Operator:

Maine Dept. of Transportation: Paul Pottle, (207) 624-3555,
Maine Port Authority: John Henshaw, (207) 624-3564, Patrick Arnold (207) 408-5391,
Ports America: Jack Humeniuk, (207) 232-5178,
City of Portland: **TO BE DETERMINED**

Waterbody: Portland Harbor

STORMWATER POLLUTION PREVENTION PLAN (SWPPP) OVERVIEW

This Stormwater Pollution Prevention Plan:

- identifies the SWPPP coordinator with a description of the coordinator's duties;
- identifies members of the SWPPP team and lists their responsibilities;
- describes the facility, with information on location and activities, a site map, and a description of the stormwater drainage system;
- identifies potential stormwater contaminants;
- describes stormwater management controls and various structural and non-structural
- Best Management Practices (BMPs) needed to reduce pollutants in stormwater
- discharges;
- describes the facility's monitoring plan; and,
- describes the implementation schedule and provisions for amendment of the plan.

2. PLANNING AND ORGANIZATION

2.1. SWPPP Coordinator and Team

This is the member roster and list of responsibilities for the pollution prevention team. The team is responsible for implementing the Stormwater Pollution Prevention Plan.

Leader _ Patrick Arnold, _____ Office Phone: __(207) 408-5391_____
Title: __Maine Port Authority_____ Cell Phone or Beeper_____

Responsibilities:
Coordinate all stages of plan development, inspections and implementation; coordinate employee training programs; keep all records and ensure that monitoring and inspection reports are maintained as part of the SWPPP. Coordinates container storage, movement, loading, unloading and site operations. Coordinates and implements other plans i.e. Spill Containment and Counter measure (SPCC) and other applicable laws such as Natural Resources Protection Act.

Member: _Jack Humeniuk_____ Office Phone: __(207)232-5178_____
Title: _Ports America_____ Cell Phone/Beeper # _____

Responsibilities:
Implement the preventive maintenance program; oversee good housekeeping activities; serves as spill response coordinator. Conduct/assist with inspections and training program; conduct and document quarterly visual sampling and comprehensive quarterly inspections.

Member: __Paul Pottle_____ Office Phone: _(207) 624-3555_____
Title: _ Maine Dept. of Transportation

Responsibilities: Record Keeping; assist in SWPPP development.

ASSESSMENT

3.1. Site Description

Instructions: Site location

- Site activities
- Address
- Number of acres
- Length of waterfront
- Buildings and use of buildings
- Storage locations
- Container movement
- Type of vehicles used on site
- Vehicle maintenance activities (if any)
- Other activities that could generate fluids or other potential stormwater

The Portland International Marine Terminal is located on Commercial Street in Portland, between the street and Portland Harbor, and just north of the Casco Bay Bridge.

The entire site covers 14.34 acres. This SWPPP covers 6 acres being redeveloped in Phase I of the Marine Terminal project.

Activities on-site include on- and off-loading of cargo containers from international shipping, storage of said containers and delivery and pickup of containers by truck or rail. Containers are moved on-site with a Liebherr LHM 320 Mobile Harbor Crane, Tailor TEC-950L Container Handler, Mi-Jack Container Handler, and 40' transport trucks. The on-off loading crane is shown in the photo below.

Above: Liebherr LHM 320, Below: Mi-Jack

The site also houses a primary 3,300 s.f. office building for facility management staff near the site entrance on Commercial Street and a secondary maintenance building near Casco Bay.

Stormwater runoff from this facility drains to one of three outlets:

- Outlet 1 is a 20" existing storm drain that will collect stormwater drainage from approximately half of the redeveloped site via catch basins and storm drains. It is

located on the southern end of the site (beyond the redeveloped area) and under the Casco Bay Bridge.

- Outlet 2 is an existing 15" PVC pipe that collects stormwater from approximately the northeastern half of the redeveloped site via catch basins and storm drains. This outlet is shown in the photo above.
- Portions of the piers and roof of the secondary office building drain stormwater directly to Casco Bay via openings in the pier.

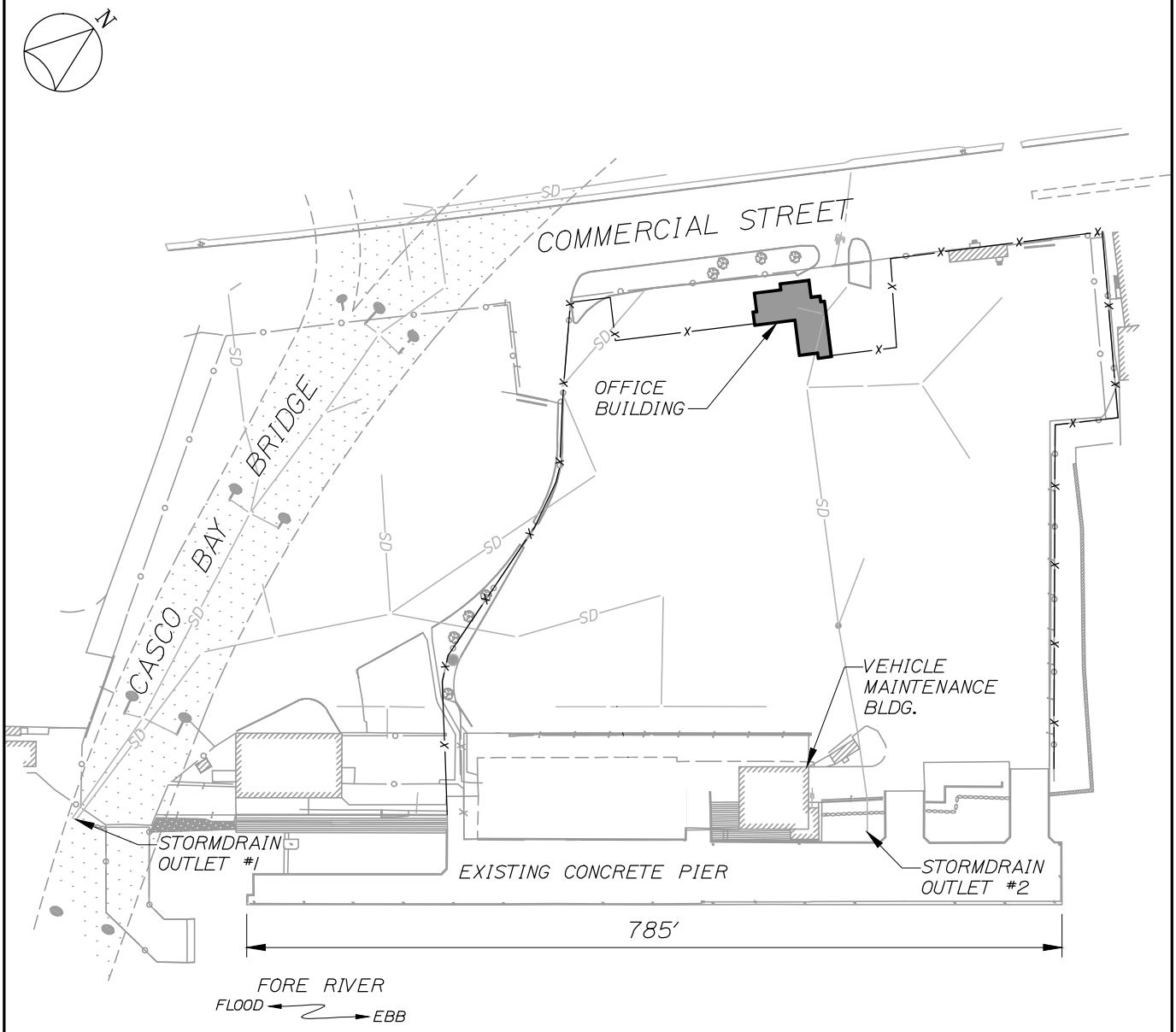
Vehicle maintenance will take place at the existing Maintenance Building located along the in-shore region of the waterfront facility. Residuals such as oil, grease or paint scrapings from typical maintenance operations will be collected and stored in 550-gallon drums and removed from site on a quarterly basis.

Container Cargo Ships will dock at the facility and will on-load and off-load container boxes. Boats do not re-fuel or off-load waste or discharge sewage. Boats may replenish their supply of fresh water and may also recharge electrical capacitors while docked at the facility.

Site Map

A simplified site map of the facility specifically for use with this SWPPP will be prepared as design progresses that will show: **NOT YET COMPLETED**

- Footprint of all buildings
- Footprint of all paved area
- Storage locations
- Parking area
- Potential pollutant sources
- Stormwater outfalls
- Drainage area to each outfall and direction of stormwater flow
- Catch basins
- Name of receiving water
- Vehicle maintenance areas
- Waste storage and disposal areas
- Stormwater runoff areas from off-site
- Access road



SITE MAP

SCALE: 1"=150'

Modified 1/12/18

HNTB

HNTB CORPORATION
ARCHITECTS ENGINEERS PLANNERS

PORTLAND INTERNATIONAL MARINE TERMINAL

PORTLAND, CUMBERLAND COUNTY

Maine Department of Transportation

PIN NO.: 17820.00

DATE: JAN 14, 2011

FIGURE 1

M:\jobs\50921 - Maine Port Authority\002 - Portland IMT Facility\CAD\SHEET G3-C26 PLANS.dwg, 1/14/2011 2:00:21 PM, mielliott

3.3. Significant Material Inventory

SWPPP Material Inventory:

Area	Exposed Material or Potential Source	Potential pollutant	Quantity	Contact with Stormwater likely?	Methods of processing or handling	Risk of release
Office buildings						
Container on-off loading		Oil, grease, assorted fluids		yes		
Container storage		Oil, grease, assorted fluids, metal chips		yes		
Travelways		Oil, grease, assorted fluids, sand, salt		yes		
Waste handling		Trash, non-hazardous waste		no		
Parking		Oil, grease, sand, salt		yes		

Inventory Completed By: ***TO BE DETERMINED_____***

Incoming Boat Inspection: Upon arrival at the Marine Terminal, or as soon as feasible thereafter, boats
must be inspected for leaks and drips. Fluids from leaking boats must be
drained immediately. If this is not possible, leaks must be addressed by using containment method.

Incoming Container Inspection: Upon arrival at the Marine Terminal, containers must be inspected for leaks or drips, whether arrival is from land or from sea. Fluids must be contained immediately.

Stored Container Inspection: Stored containers will be visually inspected as part of daily reconnaissance which includes brief visual security inspections.

Vehicles: vehicles used for container on- and off-loading, as well as for on-site transport will be inspected by the Port Operator during daily off-loading operations; otherwise inspections will occur on a weekly basis. Inspections will occur in the maintenance building where immediate repairs can be implemented.

Provide a narrative description of methods and locations of storage and disposal areas, materials management practices, treatment practices and any structural and nonstructural control measures. – Structural practices are fixed equipment such as secondary containment, berms, trenches, oil, water and grit separators, grassed swales etc.

— *Nonstructural practices may include regularly scheduled actions such as sweeping, training, spill prevention, use of less hazardous materials or chemicals and inspections.* ***Note:*** *DEP is currently updating a BMP manual for Marinas and Boat Yards.*

3.4 Spills and Leaks

No chronic leaks were identified in the site work leading to redevelopment. The site purpose is changing, so leaks from prior use as parking/passenger terminal are not applicable.

3.5 Non stormwater discharges

No non-stormwater discharges were identified during project site inspections. ..
BUILDING OR PIER WASHING, GROUNDWATER DISCHARGES AND OTHER NON-STORMWATER OUTFALLS, TO BE DETERMINED

3.6 Site Summary:

This site will be used for container on- and off-loading from ships and trucks, movement of containers and storage of containers prior to transport. Potential pollutants are those associated with vehicle use and within storage containers.

4.0 IMPLEMENTATION

This section describes practices that are in place or that will be implemented to control pollutants that have the potential to contaminate stormwater.

4.1. Good Housekeeping

Good housekeeping practices are the most effective first step towards preventing pollution in stormwater. The following is a list of good housekeeping practices that apply to the International Marine Terminal Facility.

- Spills are immediately cleaned up with an absorbent material. (See Spill Prevention and Response Procedures in Section 4.7)
- Containers and vehicles are inspected on a daily basis in combination with site security inspections, identifying any leaks/drips around equipment and stored containers.
- All fluid products and wastes are kept indoors, or in sealed containers.
- All changing of fluids, painting, sandblasting, sanding and scraping is done in a designated area with proper containment to capture waste materials, and a drip pan or tarp is used to capture drips or spills. Absorbent pads, kitty litter, or *similar is used* to clean up spills and leaks.
- An inspection program to identify potential pollutant sources will be completed ***FREQUENCY TO BE DETEMINED*** Sweep up waste, use drip pans etc.

4.2. Preventive Maintenance

This preventive maintenance program involves inspections and maintenance of stormwater management controls and routine inspections of facility operations to detect faulty vehicles or containers. Such equipment will be checked regularly for signs of deterioration. Preventive maintenance measures will include but will not be limited to:

- Inspection of all incoming boats/vessels, trucks, and containers.
- Regular inspection of stored containers.
- This facility has a written spill prevention and response policy
- All staff are aware of spill prevention and response procedures

- Spill response equipment is located at all potential spill areas.
- Waste fluids are kept inside and are properly stored in sealed and labeled containers.
- All batteries are stored inside and are properly disposed of weekly.
- Catch basins and sediment chambers are checked and cleaned as needed.
- Other segments of the storm drain system. Please specify: _____
- Hydraulic equipment is kept in good repair to prevent leaks.
- Outdoor drum and storage tank containment areas are checked for leaks.
- Uncontaminated stormwater in secondary containment areas is kept to a minimum.

4.3. Best Management Practices (BMPs)

The following is a list of existing and planned Best Management Practices. When implemented, the BMPs will prevent or reduce the discharge of potential pollutants in stormwater runoff.

To prevent or reduce the potential of stormwater contamination on-site, the following BMPS will be implemented.

- Hazardous materials that are in easily ripped or breakable containers (such as bags, plastic pails)
- are not loaded or unloaded outside when it rains.
- A staff member is present during all fueling operations, and loading and unloading operations.
- When drums are being handled, the storm sewer is covered to help contain potential spills.
- Dumpster lid is closed except when in use.

4.4. Sediment and Erosion Control

There are no potential areas for erosion on this site. The only potential for sediment is use of sand/or salt on travelways during winter operations. This use will be very limited.

4.5. Management of Stormwater Runoff

The following management practices for runoff are used at this facility.

- Stormwater catch basins (deep sump/hooded) will be inspected and cleaned as needed.
- Drainage outfalls discharge to riprap pads.

4.6. Spill Prevention and Response

- Spill response equipment is kept ***TO BE VERIFIED*** and includes ***TO BE VERIFIED***
- All personnel are instructed in its location and use.
- The pollution prevention team leader or the spill coordinator will be advised immediately of all spills of hazardous materials or regulated materials, regardless of quantity.
- Spills will be evaluated to determine the necessary response. If there is a health hazard, fire or
- explosion potential, 911 will be called. If a spill is large or threatens surface waters, including storm drains, state or federal emergency response agencies will be called.(800-482-0777)
- Spills will be contained as close to the source as possible with a dike of absorbent materials from the emergency spill kit. Additional dikes will be constructed to protect stormwater conveyances. A cover or dike will protect any other stormwater structures such as catch basins.

4.7. Employee Training

All employees will be trained annually in the implementation of this SPPP. Pollution prevention team members will meet at least twice a year to discuss the effectiveness of and

improvements to the Plan

5.0 EVALUATION

5.1. Quarterly Visual Monitoring

On a quarterly basis, SWPPP team members will examine the stormwater discharges at each outfall at the International Marine Terminal during a storm event. The visual examination must be made during daylight hours and within 30 minutes after stormwater begins to runoff. At this site, monitoring should occur at or near LOW TIDE. Team members will document observed contamination/problems with date and time and will determine the source of contamination and take action to eliminate it. The quarterly monitoring log will contain at a minimum, the following information:

- Date
- Time, tide level
- Outfall number or description
- Weather conditions
- Observations (contaminants etc)
- Possible source of contaminant
- Action taken to prevent future discharges

5.2. Quarterly Site Inspections (Comprehensive Site Compliance Evaluation)

The SWPPP team for the International Marine Terminal will prepare a Compliance Evaluation Report on a quarterly basis. The report will include information on

- Evidence of pollution
- Evaluation of BMPs
- Inspection of equipment and containers
- Date
- Name of Personnel conduction inspection
- Observations
- Assessment of BMPS
- Corrective actions taken
- Signed/dated certification

Quarterly reports will be kept with the site SWPPP. Both the Evaluation Report and any reports of follow-up action must be certified as follows: "This Compliance Evaluation Report has been prepared by qualified personnel who properly gathered and evaluated information submitted for this Report. The
information in this Report, to the best of my knowledge, is accurate and complete."

5.3. Recordkeeping and Reporting

The International Marine Terminal will maintain records of spills, leaks, inspections and maintenance
activities for at least one year after the permit expires. Records described in this SWPPP will be retained on site for at least three (3) years from the date permit coverage expires or is terminated. These records will be made available to state or federal inspectors upon request. Additionally, employee training records shall also be maintained.

5.4. Plan Revisions

If this facility expands its operations, or changes any significant material handling or storage practices which could impact stormwater, this SWPPP will be amended. The amended Plan will describe the new activities and planned control measures. This Plan will also be amended if a state or

federal inspector determines that it is not effective in controlling stormwater pollutants discharged to waterways.

6. CERTIFICATIONS

Certifications will be signed by an "authorized representative," i.e., someone
who is at or near the top of your facility's management chain that has the authority to sign and certify this type of document.

- ─ Non-Stormwater Discharges
- ─ Stormwater Pollution Prevention Plan
-

Non-Stormwater Discharges

EXAMPLES: All stormwater outfalls to surface waters at this facility have been evaluated and found to be free of non-stormwater discharges.
With the exception of runoff from our salt storage area, all stormwater outfalls to surface waters at this facility have been evaluated and found to be free of non-stormwater discharges.

Stormwater Pollution Prevention Plan

This Stormwater Pollution Prevention Plan has been prepared in accordance with good engineering practices. Qualified personnel properly gathered and evaluated information submitted for this Plan. The information in this Plan, to the best of my knowledge, is accurate and complete.

_____
Name

_____
Title

_____