

FINAL STORM DRAINAGE ANALYSIS

NORTH 16.5 ACRES OF HIGHWAY 41 INDUSTRIAL DEVELOPMENT

16,680 Highway 41 North, Evansville, Indiana
BLA Project No. 107-0129-0PD

16880

Prepared for:

BRAMCO, Inc.
(Brandeis Machinery & Supply)
1801 Waterson Trail
Louisville, KY 40299

By:

Bernardin, Lochmueller & Associates, Inc.
6200 Vogel Road
Evansville, IN 47715-4006
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March 10, 2008

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3-11-08

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INTRODUCTION

BRAMCO, Inc. is developing the north 16.5 acres of the Highway 41 Industrial Development. The project is located in the Northwest Quarter of Section 32 along the west side of U.S. Highway 41 North, approximately one-half mile north of Baseline Road. A preliminary drainage report for the total Highway 41 development and for the subject site, which is the northerly-most portion of the overall development was previously submitted and approved in June 5, 2007.

This submittal is for final approval of that part being developed by BRAMCO who will utilize the site as an industrial heavy equipment sales distributorship. The development will have a sales office and working bay area within a centrally located building. Surrounding the building will be visitor parking, equipment display areas, a wash bay facility and track shop.

Part of the proposed development will drain to the northeast—the remainder will drain to the west. This drainage routing was anticipated in the original drainage plan submittal and, therefore, the retention basins were constructed as a part of a Pregrade Construction Project completed in the Fall of 2007. In the original report, the subject property was identified as Areas 1 and 2 contained therein.

METHOD

As a part of this report, we will use the Rational Formula to re-compute the required storage basin requirements for this site to confirm that the facilities already in place are adequate.

RESULTS

Northeast Basin	West Basin
Original Calculations	
"c" factor assumed 0.70	"c" factor assumed 0.70 <i>(increased for additional development)</i>
Tc = 28 minutes	Tc = 35 minutes
i ₁₀ = 2.98	i ₁₀ = 2.48
A = 4.44	A = 12.4
Storage required ₁₀₀ = 16,852 cft	Storage required ₁₀₀ = 52,860
Allowable release rate = 5.28 cfs	Allowable release rate = 12.28
Facilities as Planned	
"c" factor actual = 0.68	"c" factor actual = 0.51
Tc = 28 minutes	Tc = 35 minutes
i ₁₀ = 2.98	i ₁₀ = 2.48
A = 7.79	A = 8.67
Storage required ₁₀₀ = 27,769	Storage required ₁₀₀ = 19,788
Allowable release rate = 9.27 cfs	Allowable release rate = 8.59 cfs

SUMMARY

The comparative analysis of preliminary versus final is outlined above. The most important note, however, is that the final development calculations, which call for:

NE Basin storage₁₀₀ of 27,769 cft is less than as-built basin capacity of 28,777 cft to elevation 434.00

West Basin storage₁₀₀ of 19,788 cft is less than as-built basin capacity of 30,938 to elevation 436.00

The site will be fully developed for that portion routed to the Northeast Basin.

The west end of the site has room for future development, but as noted above, there is much surplus capacity in the West Basin and there will be a future opportunity to increase the basin size at such time as a final plan for this area is submitted for approval.

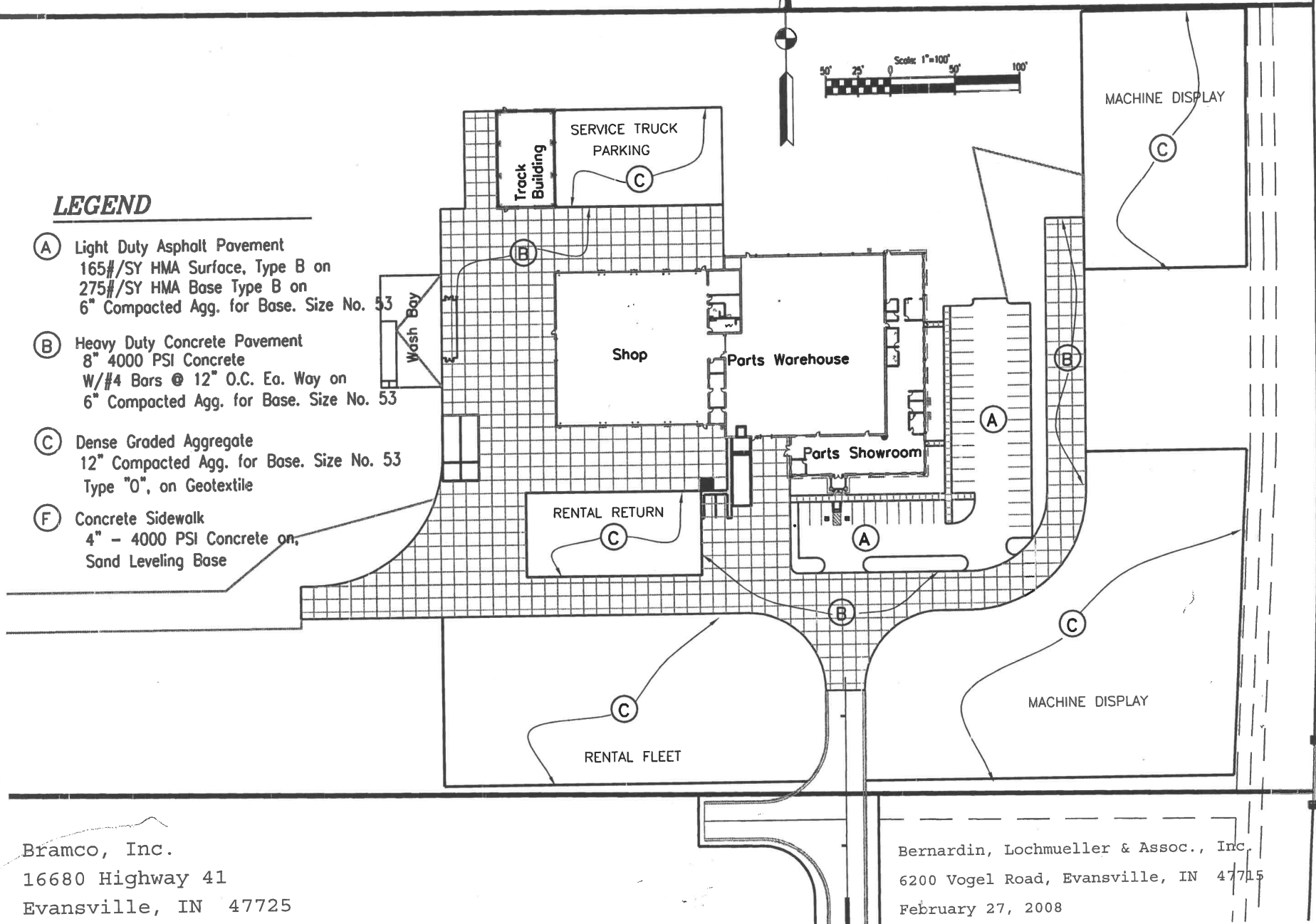
The facilities in place exceed the capacity required by the local drainage ordinance. We respectfully request the Vanderburgh County Drainage Board grant this plan final drainage approval.

Maintenance of these drainage basins shall be assigned to the purchasers of each site. All finish floor elevations on any structure within the development should be established by the Vanderburgh County Building Commission with no finish floor being established below elevation 436.00, and no loading dock set below elevation 432.00 with a means of dewatering them made available.

APPENDIX "A"
GRADING PLAN

LEGEND

- (A) Light Duty Asphalt Pavement
165#/SY HMA Surface, Type B on
275#/SY HMA Base Type B on
6" Compacted Agg. for Base. Size No. 53
- (B) Heavy Duty Concrete Pavement
8" 4000 PSI Concrete
W/#4 Bars @ 12" O.C. Ea. Way on
6" Compacted Agg. for Base. Size No. 53
- (C) Dense Graded Aggregate
12" Compacted Agg. for Base. Size No. 53
Type "O", on Geotextile
- (F) Concrete Sidewalk
4" - 4000 PSI Concrete on,
Sand Leveling Base



Bramco, Inc.
16680 Highway 41
Evansville, IN 47725

Bernardin, Lochmueller & Assoc., Inc.
6200 Vogel Road, Evansville, IN 47715
February 27, 2008

HWY 41 N



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HIGHWAY 41 DEVELOPMENT
BRAMCO, INC. SITE DEVELOPMENT
OF THE NORTHERN 18.34 ACRES
P.O. BOX 32230
LOUISVILLE, KY 40232-2230

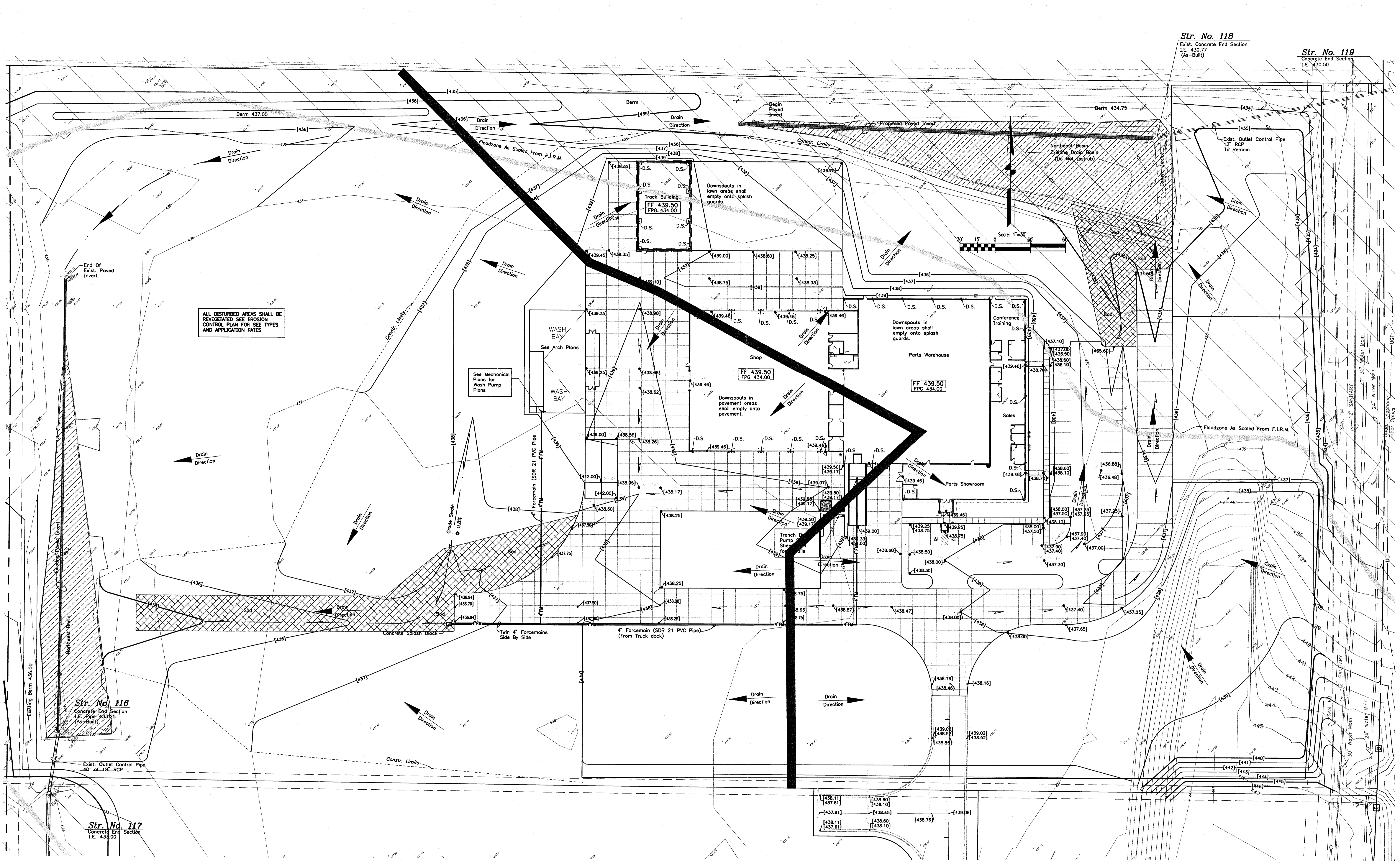
Grading Plan
for
NEW BUILDING
BRANDEIS MACHINERY & SUPPLY CO.
EVANSVILLE, IN

DATE: 1/25/08
DRAWN BY: RMY
CHECKED BY: ---
REVISIONS:

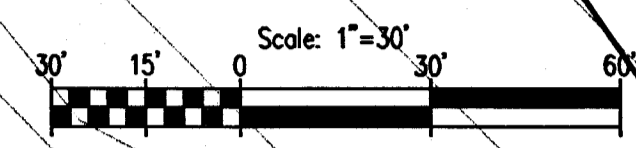
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ALL DISTURBED AREAS SHALL BE REVEGETATED SEE EROSION CONTROL PLAN FOR SEE TYPES AND APPLICATION RATES



General Notes

- All down spout drains shall be emptied at grade.
- All down spout shall have pipe turnouts at base of down spout pipe and discharge onto splash blocks.
- All work including splash blocks shall be installed by building contractor.
- Excess dirt shall be pulled away from building and all final grading against building shall direct storm water runoff away from building.
- 5 S.Y.S. of sod shall be placed at each splash block outlet by landscape contractor.
- Site contractor shall provide an alternate price to add 8" and 10" down spout piping run along face of building and to provide a 10" outlet pipe run as shown on drawing. Alternate bid pricing shall include factory wyes, fittings, and down spout boots.

TBM's

TBM#1: North head bolt of fire hydrant, east side of Boyle Lane in front of INDOT maintenance garage
Elevation= 443.01

TBM#2: Railroad spike in west face of power pole #80/114, approximate eastern right-of-way of US 41 northeast of site, 14-inches above grade
Elevation=432.52

Str. No. 116
Concrete End Section
I.E. 433.25
(As-Built)

Str. No. 117
Concrete End Section
I.E. 433.00

Str. No. 118
Exist. Concrete End Section
I.E. 430.77
(As-Built)

Str. No. 119
Concrete End Section
I.E. 430.50

APPENDIX "B"
RUNOFF COEFFICIENT/TIME OF CONCENTRATION

WEIGHTED "C" FACTOR**Area 1 Northeast Basin – 339,190 SFT / 7.79 Acres** ✓

New Equipment Area	106,111 SF	(0.85)	=	90,194 SF
Building	34,533 SF	(0.95)	=	32,806 SF
Pavement Concrete	37,852 SF	(0.95)	=	35,959 SF
Pavement Asphalt	17,165 SF	(0.90)	=	15,448 SF
Lawn	143,529 SF	(0.40)	=	57,411 SF
Total Area	339,190 SF			231,818 SF
	231,818/339,190		=	0.68

Area 1 West Basin – 377,614 SFT / 8.67 Acres

New Equipment Area	37,509 SF	(.85)	=	23,282 SF
Building	13,314	(0.95)	=	12,648 SF
Concrete	37,660 SF	(0.90)	=	33,894 SF
Wheel Wash	3,956	(0.95)	=	3,758 SF
Asphalt	-0-	-0-	=	-0-
Lawn	295,175	(0.40)	=	118,070
	191,752/377,614		=	0.51

387,614 = 8.90 Ac ±

16.7 Ac ±

TIME OF CONCENTRATIONSHEET FLOW**Run No. 1 – NE Basin 436 – 431 = 5 L = 480**

$$TC = .827 \left[\frac{(0.4)(480)}{\sqrt{0.104}} \right]^{.467} = \underline{28 \text{ min}}$$

Run No. 2 – NW Basin 442 – 435 = 7 L = 720

$$TC = .827 \left[\frac{(0.4)(720)}{\sqrt{0.009}} \right]^{.467} = \underline{35 \text{ min}}$$

INTENSITY***I***

$$I = \frac{C(T)^\alpha}{(Tc+d)^\beta}$$

Factors for Evansville

C = 1.9533

T = duration

$\alpha = 0.1747$

Tc = Time of Concentration (10 yr. undeveloped)

d = 0.522

$\beta = 1.6408$

Run No. 1***I***

$$10 = \frac{1.9533(10)^{0.1747}}{(28/60+0.522)^{1.6408}} = \frac{2.9361}{0.9815} = 2.98$$

Run No. 2***I***

$$10 = \frac{1.9533(10)^{0.1747}}{(35/60+0.522)^{1.6408}} = \frac{2.9361}{1.178} = 2.48$$

APPENDIX "C"
STORAGE VOLUME DATA

PROJECT: BRAMCO WEST
 ENGINEER: BERNARDIN, LOCHMUELLER & ASSOCIATES

DATE: 03/06/08

5\10\25\100
 5\10\25\100
 RELEASE RATE PERIOD:
 WATERSHED AREA (ACRES): 8.67
 TIME OF CONCENTRATION UNDEV. (min): 35
 RAINFALL INTENSITY (INCHES/HR): 100.00 2.4780222 2.102752
 UNDEVELOPED RUNOFF COEFFICIENT: 0.40
 UNDEVELOPED RUNOFF RATE (CFS): 8.59
 DEVELOPED RUNOFF COEFFICIENT: 0.51

25 Year Storm

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	7.88	34.85	8.59	26.26	0.175
0.17	6.27	27.73	8.59	19.14	0.271
0.25	5.24	23.17	8.59	14.58	0.304
0.33	4.46	19.71	8.59	11.12	0.306
0.42	3.78	16.72	8.59	8.12	0.284
0.50	3.31	14.62	8.59	6.03	0.251
0.58	2.92	12.92	8.59	4.33	0.209
0.67	2.57	11.36	8.59	2.77	0.155
0.75	2.31	10.21	8.59	1.62	0.101
0.83	2.09	9.24	8.59	0.65	0.045
0.92	1.88	8.31	8.59	-0.28	-0.022
1.00	1.72	7.61	7.29	0.32	0.026
1.25	1.88	8.33	7.29	1.04	0.108
1.50	1.67	7.37	7.29	0.08	0.010
1.75	1.50	6.63	7.29	-0.66	-0.096
2.00	1.37	6.04	7.29	-1.25	-0.209
2.50	1.16	5.14	7.29	-2.15	-0.448
3.00	1.02	4.50	7.29	-2.79	-0.699
4.00	0.82	3.63	7.29	-3.67	-1.222
6.00	0.60	2.65	7.29	-4.64	-2.319
10.00	0.40	1.78	7.29	-5.51	-4.595

STORAGE (ACRE/FT): 0.31
 STORAGE (CUBIC FT): 13,317.56

PROJECT: BRAMCO WEST
 ENGINEER: BERNARDIN, LOCHMUELLER & ASSOCIATES

DATE: 03/06/08

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 DEVELOPED RUNOFF COEFFICIENT: 0.51

100 Year Storm

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	10.04	44.40	8.59	35.81	0.239
0.17	7.99	35.33	8.59	26.73	0.379
0.25	6.68	29.52	8.59	20.93	0.436
0.33	5.68	25.11	8.59	16.52	0.454
0.42	4.82	21.30	8.59	12.70	0.445
0.50	4.21	18.63	8.59	10.04	0.418
0.58	3.72	16.46	8.59	7.87	0.380
0.67	3.27	14.47	8.59	5.88	0.328
0.75	2.94	13.01	8.59	4.42	0.276
0.83	2.66	11.77	8.59	3.18	0.220
0.92	2.40	10.59	8.59	2.00	0.153
1.00	2.19	9.69	7.29	2.40	0.200
1.25	2.54	11.25	7.29	3.96	0.412
1.50	2.25	9.96	7.29	2.66	0.333
1.75	2.03	8.95	7.29	1.66	0.242
2.00	1.84	8.15	7.29	0.86	0.143
2.50	1.57	6.94	7.29	-0.35	-0.072
3.00	1.37	6.07	7.29	-1.22	-0.305
4.00	1.11	4.89	7.29	-2.40	-0.799
6.00	0.81	3.58	7.29	-3.71	-1.854
10.00	0.54	2.40	7.29	-4.89	-4.076

STORAGE (ACRE/FT) : 0.45
 STORAGE (CUBIC FT) : 19,787.98

PROJECT: BRAMCO WEST
 ENGINEER: BERNARDIN, LOCHMUELLER & ASSOCIATES

DATE: 03/06/08

RELEASE RATE PERIOD: 5\10\25\100
 5\10\25\100
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 UNDEVELOPED RUNOFF COEFFICIENT: 0.40
 UNDEVELOPED RUNOFF RATE (CFS): 8.59
 DEVELOPED RUNOFF COEFFICIENT: 0.51

50 Year Storm

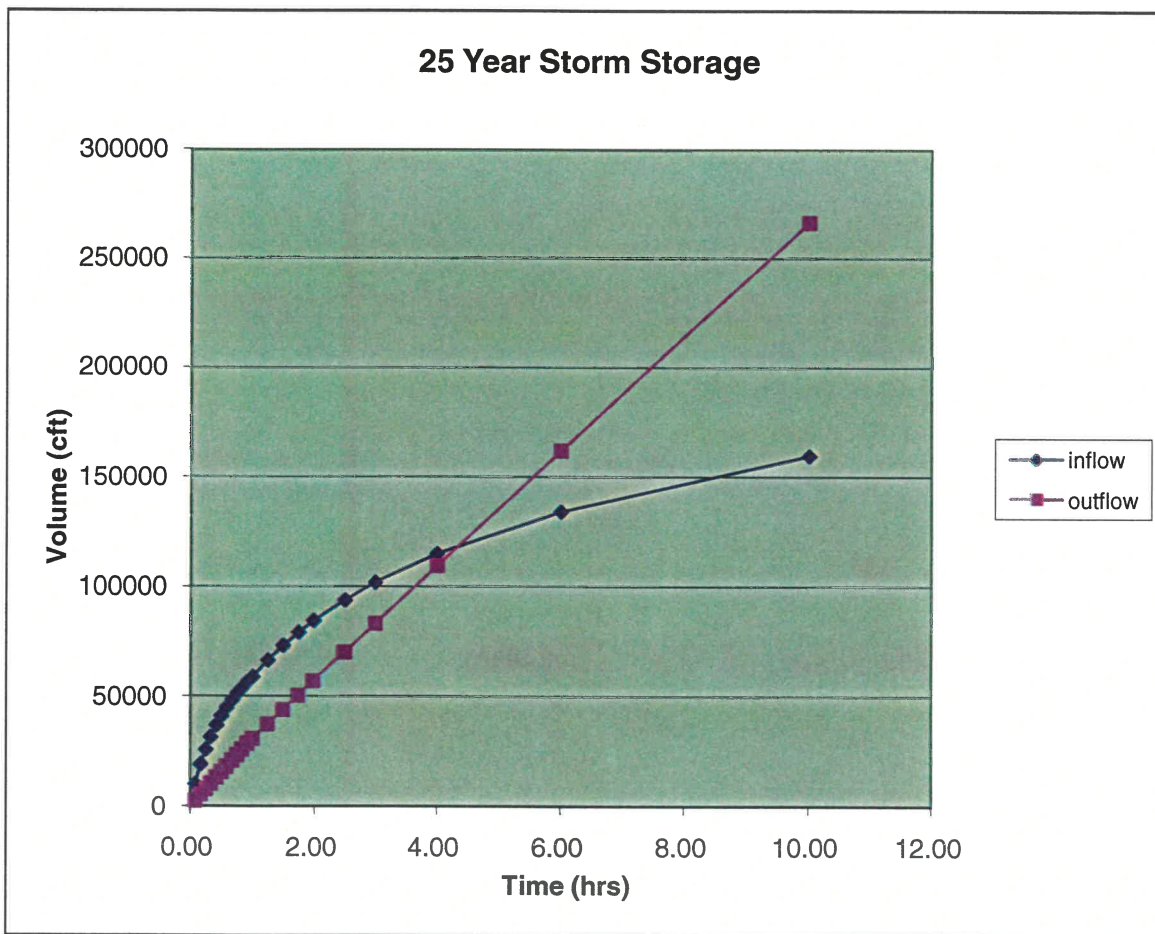
STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	8.90	39.34	8.59	30.74	0.205
0.17	7.08	31.30	8.59	22.70	0.322
0.25	5.92	26.16	8.59	17.56	0.366
0.33	5.03	22.25	8.59	13.65	0.376
0.42	4.27	18.87	8.59	10.28	0.360
0.50	3.73	16.51	8.59	7.91	0.330
0.58	3.30	14.59	8.59	5.99	0.290
0.67	2.90	12.82	8.59	4.23	0.236
0.75	2.61	11.53	8.59	2.93	0.183
0.83	2.36	10.43	8.59	1.84	0.127
0.92	2.12	9.38	8.59	0.79	0.061
1.00	1.94	8.59	7.29	1.30	0.108
1.25	2.19	9.68	7.29	2.39	0.249
1.50	1.94	8.57	7.29	1.28	0.160
1.75	1.74	7.71	7.29	0.41	0.060
2.00	1.59	7.02	7.29	-0.28	-0.046
2.50	1.35	5.98	7.29	-1.32	-0.274
3.00	1.18	5.23	7.29	-2.07	-0.516
4.00	0.95	4.21	7.29	-3.08	-1.027
6.00	0.70	3.09	7.29	-4.21	-2.104
10.00	0.47	2.07	7.29	-5.23	-4.355

PEAK STORAGE (ACRE/FT): 0.38
 PEAK STORAGE (CUBIC FT): 16,357.13

PROJECT: BRAMCO WEST
 ENGINEER: BERNARDIN, LOCHMUELLER & ASSOCIATES

DATE: 03/06/08

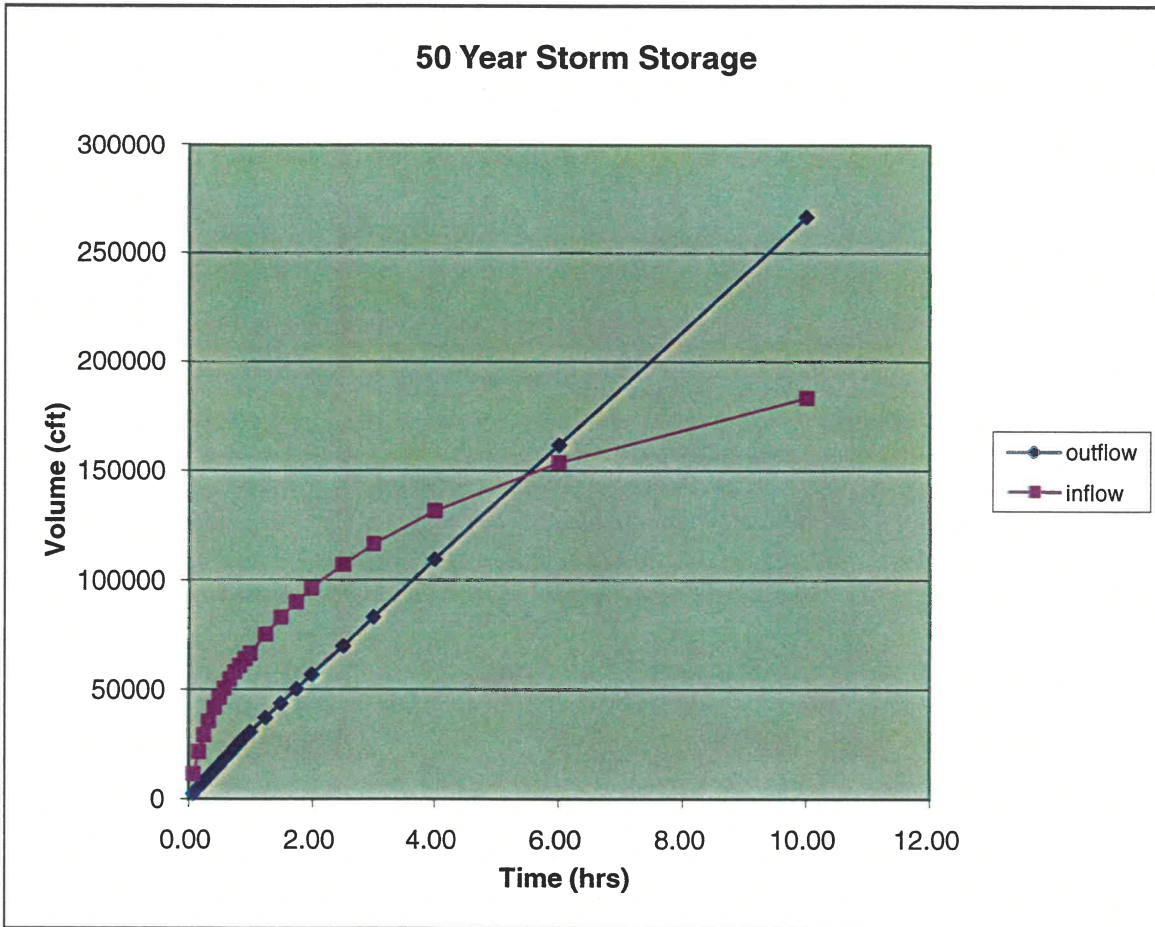
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 DEVELOPED RUNOFF COEFFICIENT: 0.51



PROJECT: BRAMCO WEST
 ENGINEER: BERNARDIN, LOCHMUELLER & ASSOCIATES

DATE: 03/06/08

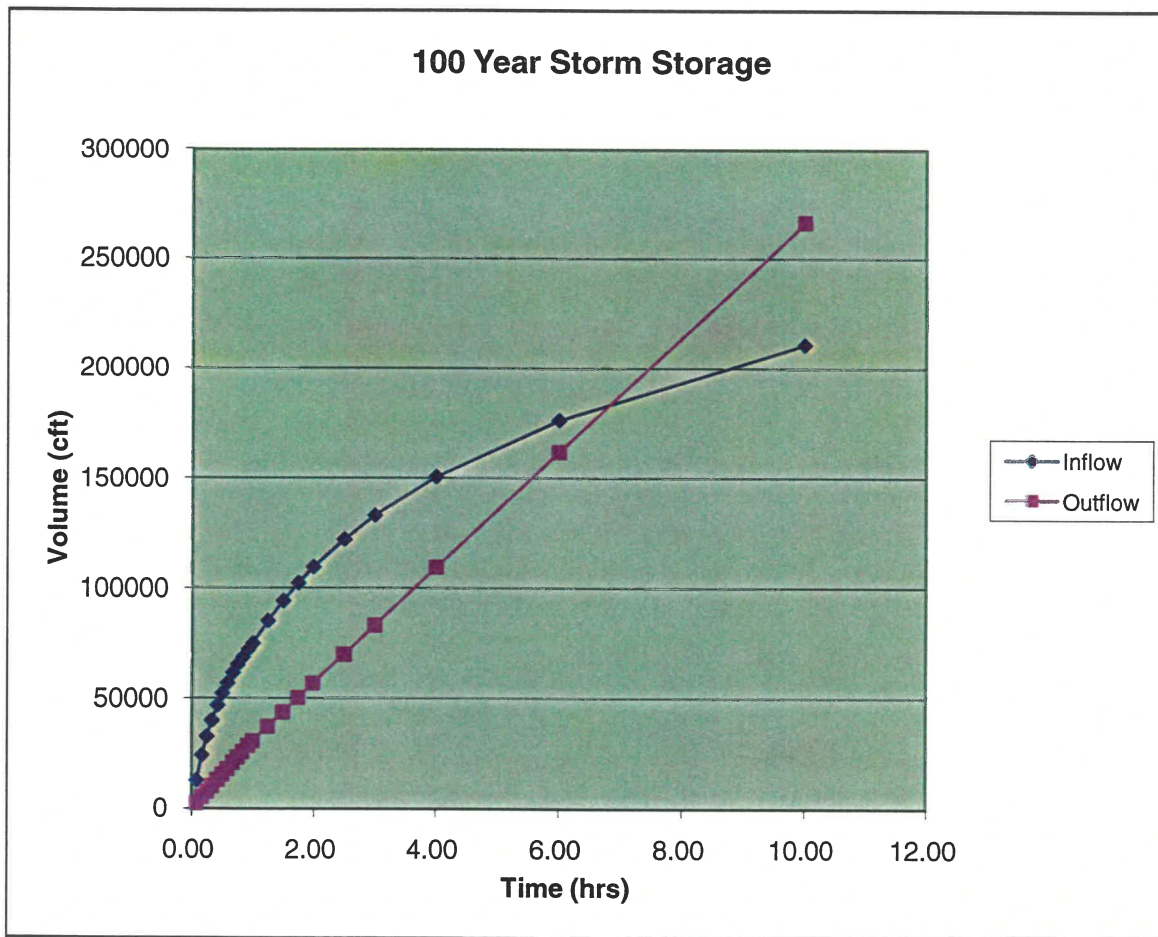
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PROJECT: BRAMCO EAST
 ENGINEER: BERNARDIN, LOCHMUELLER & ASSOCIATES

DATE: 03/06/08

RELEASE RATE PERIOD: 5\10\25\100
 5\10\25\100
 WATERSHED AREA (ACRES): 7.79
 TIME OF CONCENTRATION UNDEV. (min): 28
 RAINFALL INTENSITY (INCHES/HR): 100.00 2.9757133 2.3602057
 UNDEVELOPED RUNOFF COEFFICIENT: 0.40
 UNDEVELOPED RUNOFF RATE (CFS): 9.27
 DEVELOPED RUNOFF COEFFICIENT: 0.68

25 Year Storm

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	7.88	41.75	9.27	32.48	0.217
0.17	6.27	33.22	9.27	23.95	0.339
0.25	5.24	27.76	9.27	18.49	0.385
0.33	4.46	23.61	9.27	14.34	0.394
0.42	3.78	20.03	9.27	10.75	0.376
0.50	3.31	17.52	9.27	8.25	0.344
0.58	2.92	15.48	9.27	6.21	0.300
0.67	2.57	13.61	9.27	4.34	0.242
0.75	2.31	12.23	9.27	2.96	0.185
0.83	2.09	11.07	9.27	1.80	0.124
0.92	1.88	9.96	9.27	0.69	0.053
1.00	1.72	9.11	7.35	1.76	0.147
1.25	1.88	9.98	7.35	2.63	0.273
1.50	1.67	8.83	7.35	1.48	0.185
1.75	1.50	7.95	7.35	0.59	0.086
2.00	1.37	7.23	7.35	-0.12	-0.020
2.50	1.16	6.16	7.35	-1.19	-0.249
3.00	1.02	5.39	7.35	-1.97	-0.491
4.00	0.82	4.34	7.35	-3.01	-1.004
6.00	0.60	3.18	7.35	-4.17	-2.087
10.00	0.40	2.13	7.35	-5.22	-4.353

STORAGE (ACRE/FT): 0.39
 STORAGE (CUBIC FT): 17,179.93

PROJECT: BRAMCO EAST
 ENGINEER: BERNARDIN, LOCHMUELLER & ASSOCIATES

DATE: 03/06/08

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100 Year Storm

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	10.04	53.19	9.27	43.92	0.293
0.17	7.99	42.32	9.27	33.05	0.468
0.25	6.68	35.37	9.27	26.10	0.544
0.33	5.68	30.09	9.27	20.81	0.572
0.42	4.82	25.51	9.27	16.24	0.568
0.50	4.21	22.32	9.27	13.05	0.544
0.58	3.72	19.72	9.27	10.45	0.505
0.67	3.27	17.34	9.27	8.07	0.450
0.75	2.94	15.59	9.27	6.32	0.395
0.83	2.66	14.10	9.27	4.83	0.334
0.92	2.40	12.69	9.27	3.42	0.262
1.00	2.19	11.61	7.35	4.26	0.355
1.25	2.54	13.47	7.35	6.12	0.638
1.50	2.25	11.93	7.35	4.57	0.572
1.75	2.03	10.73	7.35	3.37	0.492
2.00	1.84	9.77	7.35	2.41	0.402
2.50	1.57	8.32	7.35	0.97	0.201
3.00	1.37	7.28	7.35	-0.08	-0.020
4.00	1.11	5.86	7.35	-1.49	-0.497
6.00	0.81	4.29	7.35	-3.06	-1.530
10.00	0.54	2.88	7.35	-4.48	-3.732

STORAGE (ACRE/FT): 0.64
 STORAGE (CUBIC FT): 27,769.72

PROJECT: BRAMCO EAST
 ENGINEER: BERNARDIN, LOCHMUELLER & ASSOCIATES

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 UNDEVELOPED RUNOFF COEFFICIENT: 0.40
 UNDEVELOPED RUNOFF RATE (CFS): 9.27
 DEVELOPED RUNOFF COEFFICIENT: 0.68

50 Year Storm

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	8.90	47.13	9.27	37.85	0.252
0.17	7.08	37.50	9.27	28.22	0.400
0.25	5.92	31.33	9.27	22.06	0.460
0.33	5.03	26.65	9.27	17.38	0.478
0.42	4.27	22.60	9.27	13.33	0.467
0.50	3.73	19.78	9.27	10.50	0.438
0.58	3.30	17.47	9.27	8.20	0.396
0.67	2.90	15.36	9.27	6.09	0.340
0.75	2.61	13.81	9.27	4.54	0.284
0.83	2.36	12.49	9.27	3.22	0.223
0.92	2.12	11.24	9.27	1.97	0.151
1.00	1.94	10.29	7.35	2.93	0.244
1.25	2.19	11.60	7.35	4.24	0.442
1.50	1.94	10.26	7.35	2.91	0.364
1.75	1.74	9.23	7.35	1.88	0.274
2.00	1.59	8.41	7.35	1.05	0.175
2.50	1.35	7.16	7.35	-0.19	-0.041
3.00	1.18	6.26	7.35	-1.09	-0.273
4.00	0.95	5.05	7.35	-2.31	-0.769
6.00	0.70	3.70	7.35	-3.66	-1.829
10.00	0.47	2.48	7.35	-4.88	-4.066

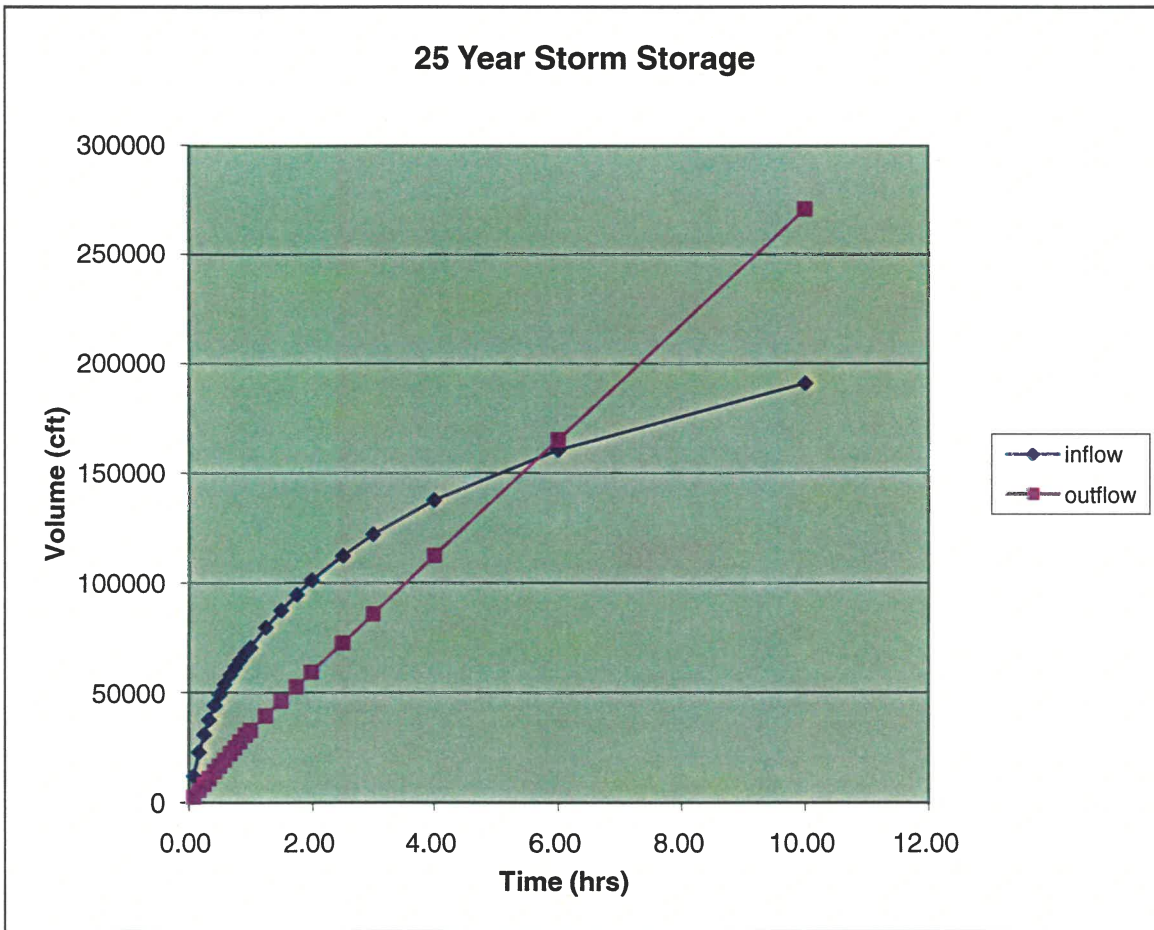
PEAK STORAGE (ACRE/FT): 0.48
 PEAK STORAGE (CUBIC FT): 20,821.34

PROJECT: BRAMCO EAST
 ENGINEER: BERNARDIN, LOCHMUELLER & ASSOCIATES

DATE: 03/06/08

RELEASE RATE PERIOD: 5\10\25\100
 WATERSHED AREA (ACRES): 7.79
 TIME OF CONCENTRATION UNDEV. (min): 28
 RAINFALL INTENSITY (INCHES/HR): 100.00 2.9757133 2.3602057
 UNDEVELOPED RUNOFF COEFFICIENT: 0.40
 UNDEVELOPED RUNOFF RATE (CFS): 9.27
 DEVELOPED RUNOFF COEFFICIENT: 0.68

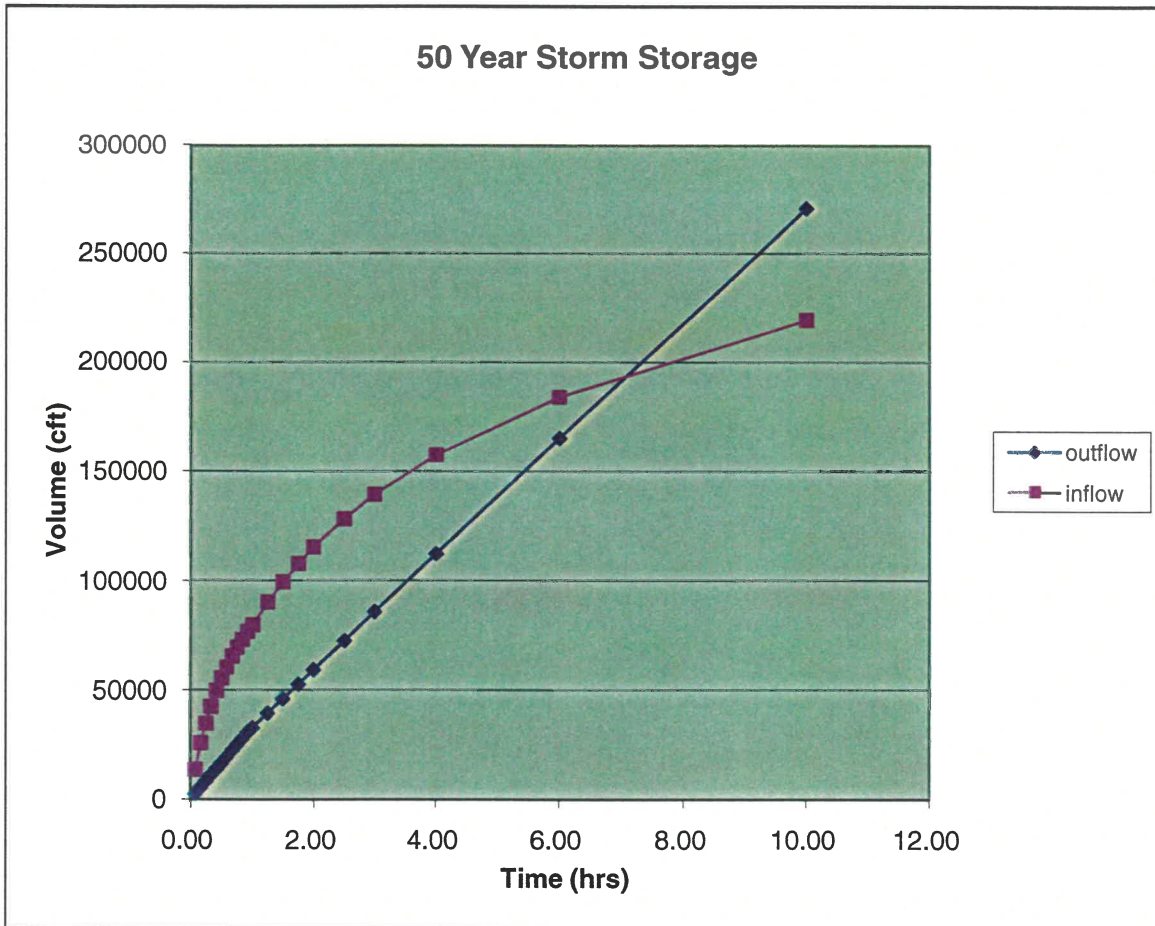
25 Year Storm Storage



PROJECT: BRAMCO EAST
 ENGINEER: BERNARDIN, LOCHMUELLER & ASSOCIATES

DATE: 03/06/08

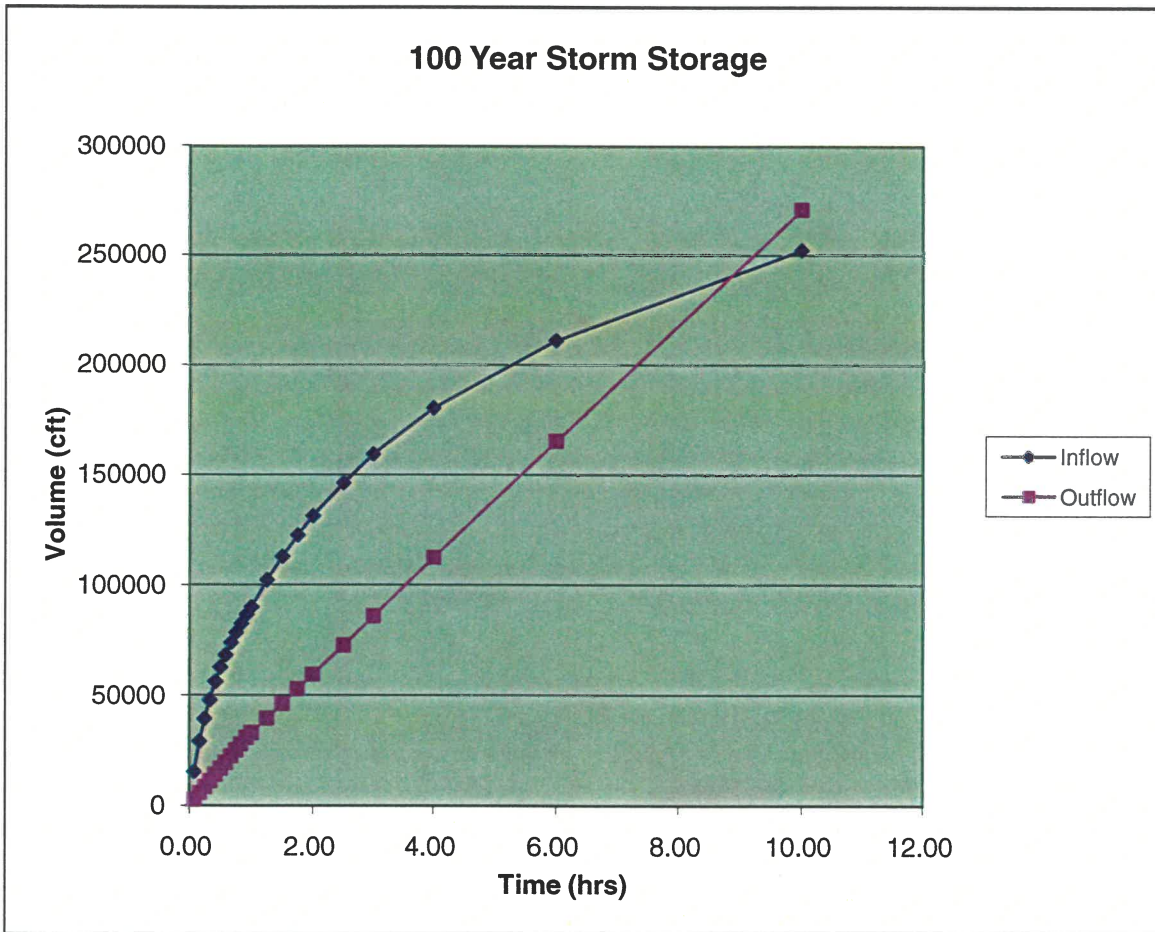
RELEASE RATE PERIOD: 5\10\25\100
 5\10\25\100
 WATERSHED AREA (ACRES): 7.79
 TIME OF CONCENTRATION UNDEV. (min): 28
 RAINFALL INTENSITY (INCHES/HR): 100.00 2.9757133 2.3602057
 UNDEVELOPED RUNOFF COEFFICIENT: 0.40
 UNDEVELOPED RUNOFF RATE (CFS): 9.27
 DEVELOPED RUNOFF COEFFICIENT: 0.68



PROJECT: BRAMCO EAST
 ENGINEER: BERNARDIN, LOCHMUELLER & ASSOCIATES

DATE: 03/06/08

RELEASE RATE PERIOD: 5\10\25\100
 WATERSHED AREA (ACRES): 7.79
 TIME OF CONCENTRATION UNDEV. (min): 28
 RAINFALL INTENSITY (INCHES/HR): 100.00 2.9757133 2.3602057
 UNDEVELOPED RUNOFF COEFFICIENT: 0.40
 UNDEVELOPED RUNOFF RATE (CFS): 9.27
 DEVELOPED RUNOFF COEFFICIENT: 0.68



APPENDIX "D"
BASIN VOLUME

BASIN VOLUME**Project: BRAMCO WEST****Date: 3/10/2008**

ELEVATION	SURFACE AREA (square feet)	Incremental Volume (cubic feet)	Accumulated Volume (cubic feet)	Accumulated Volume (acre/feet)
433.40	0	0	0	0
434.00	477	143	143	0.00
435.00	13,003	6,740	6,883	0.16
436.00	35,107	24,055	30,938	0.71

BASIN VOLUME**Project: BRAMCO NORTHEAST****Date: 3/10/2008**

ELEVATION	SURFACE AREA (square feet)	Incremental Volume (cubic feet)	Accumulated Volume (cubic feet)	Accumulated Volume (acre/feet)
430.75	0	0	0	0
431.00	460	58	58	0.00
432.00	6,594	3,527	3,585	0.08
433.00	12,749	9,672	13,256	0.30
434.00	18,292	15,521	28,777	0.66
434.50	21,312	9,901	38,678	0.89

APPENDIX E
OUTLET CONTROL STRUCTURE

OUTLET CONTROL STRUCTURE

Primary Outflow

SOUTHEAST

ORIFICE EQUATION

$$cd = Cc \times Cv = (.62)(.97) = .60$$

$$\text{Allowable Outflow } Q = cia = (0.4)(2.48)(8.67) = 8.59 \text{ cfs}$$

$$\begin{aligned} Q &= cia \\ c &= 0.40 \\ l &= 2.48 \\ a &= 8.67 \end{aligned}$$

$$\text{Allowable HW} = \text{Rim to centerline of pipe} = 433.40 - 435.40 = 2.0$$

$$(8.59) = Q = (.60)(A) \sqrt{2(32.2)(2.0)}$$

$$A = \frac{8.59}{7.76} = \frac{\Pi d^2}{4}$$

$$d = 1.26 = \text{Use } 18'' \text{ diameter pipe}$$

Primary Outlet = 18" diameter pipe (*already installed*)

Primary Outflow

WEST

ORIFICE EQUATION

$$cd = Cc \times Cv = (.62)(.97) = .60$$

$$\text{Allowable Outflow } Q = cia = (0.4)(2.97)(7.79) = 9.27$$

$$\begin{aligned} Q &= cia \\ c &= 0.40 \\ l &= 2.97 \\ a &= 7.79 \end{aligned}$$

$$\text{Allowable HW} = \text{Rim to centerline of pipe} = 434.50 - 430.75 = 3.75$$

$$(9.27) = Q = (.60)(A) \sqrt{2(32.2)(3.75)}$$

$$A = \frac{9.27}{9.32} = \frac{\Pi d^2}{4}$$

$$d = 1.13 = \text{Use } 12'' \text{ diameter pipe}$$

Primary Outlet = 18" diameter pipe (*already installed*)