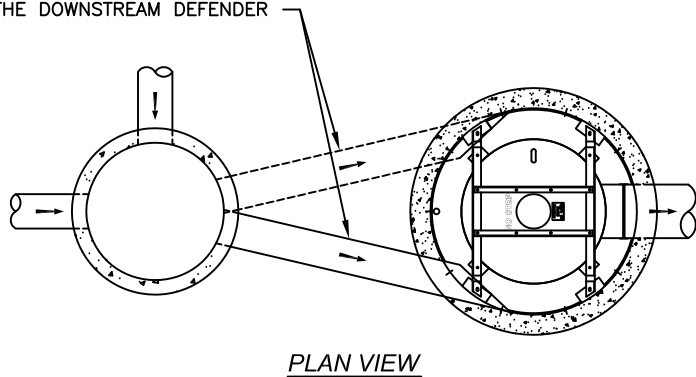


SCHEMATIC ONLY - NOT FOR CONSTRUCTION

TANGENT INLET MAY ENTER ON ANY SIDE OF THE DOWNSTREAM DEFENDER



DESIGN NOTES:

- 1) THE OUTLET PIPE INVERT SHOULD BE AT THE SAME ELEVATION OR LOWER THAN INVERTS INTO THE UPSTREAM CHAMBER.
- 2) THE DOWNSTREAM DEFENDER HAS A SUBMERGED INLET PIPE. THE INLET PIPE INVERT IS ONE INLET PIPE DIAMETER BELOW THE OUTLET PIPE INVERT. THE INLET PIPE ENTERS THE UNIT TANGENTIALLY. THE INLET PIPE SLOPE SHOULD NOT EXCEED 15%. HEADLOSS AT PEAK TREATMENT FLOW USES THE MAXIMUM PIPE DIAMETER FOR THAT UNIT. HEADLOSS WILL INCREASE WITH SMALLER INLET PIPES.
- 3) * DISTANCES ARE APPROXIMATE AND DEPEND ON TOP SLAB THICKNESS. ASSUMES A 4" FRAME AND COVER. CONFIRM WITH A HYDRO REPRESENTATIVE.
- 4) ** MAY NOT BE AVAILABLE IN ALL AREAS. CONFIRM WITH A HYDRO REPRESENTATIVE.

MODEL NUMBER & DIAMETER (FT)	PEAK TREATMENT FLOW (CFS)	MAXIMUM PIPE DIAMETER (IN)	HEADLOSS AT PEAK TREATMENT FLOW (IN)	OIL STORAGE CAPACITY (GALLONS)	SEDIMENT STORAGE CAPACITY (CUBIC YARDS)	MIN. DIST. FROM OUTLET INVERT TO TOP OF RIM (FT) *	STANDARD DIST. FROM SUMP FLOOR TO OUTLET INVERT (FT)
4	3.0	12	8	70	0.70	2.8	4.08
6	8.0	18	12	216	2.10	3.24	5.86
8	15.0	24	13	540	4.65	4.2	7.67
10 **	25.0	30	15	1,050	8.70	5.0	9.44
12 **	38.0	36	16	1,770	14.70	5.6	11.18

Notes

REVISION HISTORY

REV	BY	DATE	DESCRIPTION
1	KJM	6/7/12	MIN RIM

Date: 11/1/2011 Scale: NTS

Drawn: EMH Checked: Approved:

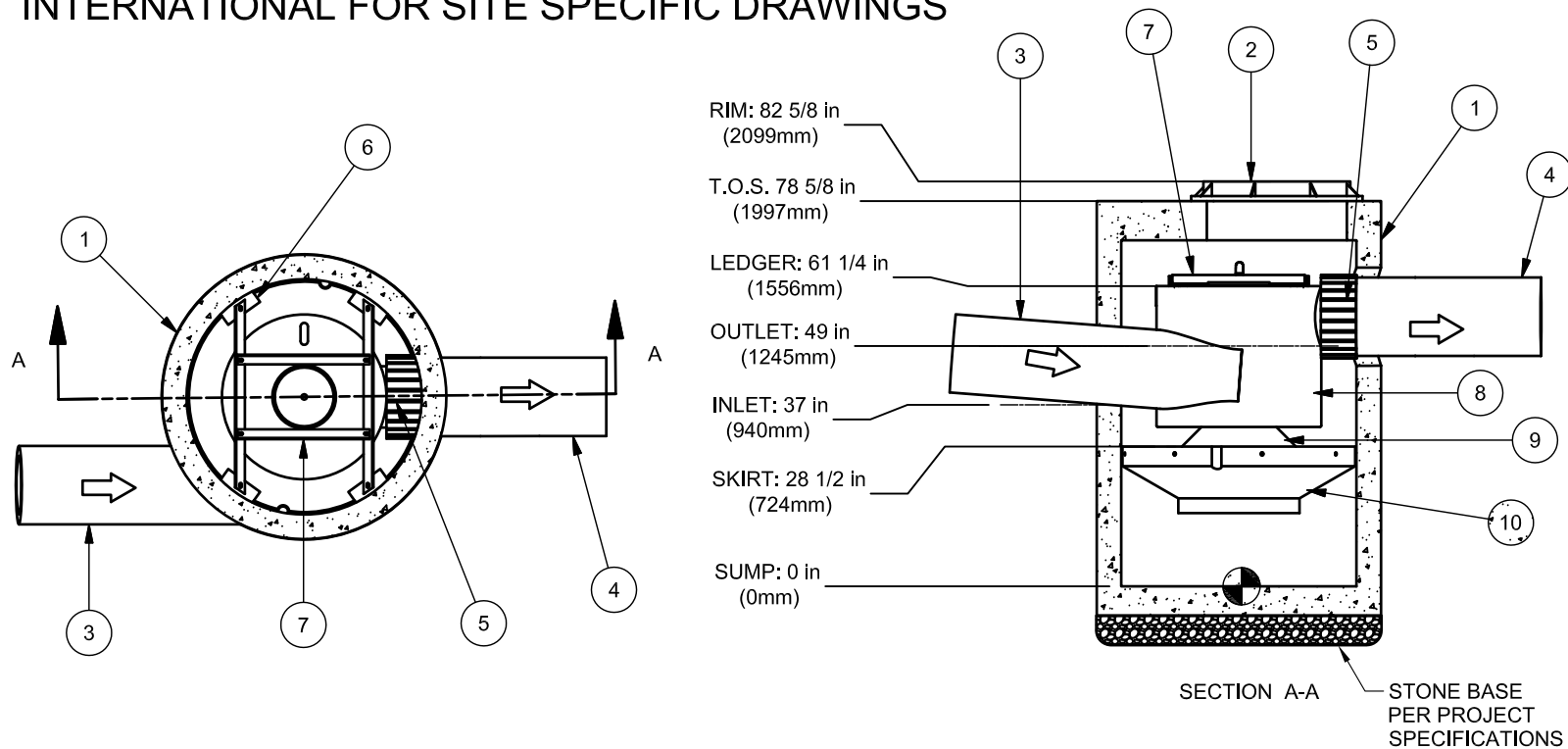
Title: DOWNSTREAM DEFENDER®

STORM DRAIN FIT



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 Fax: (207) 756-6212
 stormwaterinquiry@hydro-int.com

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Notes

1. MANHOLE WALL AND SLAB THICKNESSES ARE NOT TO SCALE.
2. CONTACT HYDRO INTERNATIONAL FOR A BOTTOM OF STRUCTURE ELEVATION PRIOR TO SETTING DOWNSTREAM DEFENDER MANHOLE.
3. TYPICALLY DOWNSTREAM DEFENDERS WILL BE DELIVERED TO THE PROJECT SITE WITH A TOP SLAB ELEVATION 12"± BELOW FINISHED GRADE. PURCHASER SHALL BE RESPONSIBLE FOR GRADE RINGS OR BLOCK AND MORTAR NECESSARY TO MEET FINAL GRADE.

REVISION HISTORY

REV	BY	DATE	DESCRIPTION
A	JLL	8/8/12	Added Note 3
Date		Scale	
9/14/2011		5/16" = 1'-0"	
Drawn	Checked	Approved	
EMH	MRJ	MRJ	

Title

4-FT (1.22m) DIAMETER
DOWNSTREAM DEFENDER

GENERAL ARRANGEMENT



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CAPACITIES:

1. Peak treatment flow: 3.0 cfs (85 l/s)
2. Sediment storage capacity: 0.70 Cu. yd. (0.54 cu. m.)
3. Oil storage capacity: 70 Gal. (265 liters)

ADDITIONAL DESIGN INFORMATION:

1. The outlet pipe stub (not shown) is a roto-molded product with an I.D. of 12 in. that cannot be modified. To avoid the use of a reducer or expander on the outlet a 12 in. outlet pipe should be used if possible. The orientation of the outlet pipe can be adjusted to suit site conditions.
2. Maximum pipe size is 12 in. The inlet pipe invert should be placed one inlet pipe diameter below the outlet pipe invert. The I.D. of the inlet pipe should be placed tangent to the I.D. of the manhole. The orientation of the inlet pipe can be adjusted to suit site conditions. Headloss at 3.0 cfs with a 12 in. inlet: 8 in. (203 mm). Headloss will increase with smaller inlet pipes.
3. Sediment shall be stored in a zone that is isolated from the main flow path and protected from re-entrainment by the benching skirt.
4. Dimensions are general and intended for guidance only.

Parts List

ITEM	DESCRIPTION	SIZE
1	PRECAST MANHOLE (BY HYDRO VIA PRECASTER)	48 in
2	FRAME AND COVER	30 in
3	INLET PIPE (BY OTHERS) ²	12 in
4	OUTLET PIPE (BY OTHERS) ¹	12 in
5	PIPE COUPLING (BY OTHERS)	
6	LEDGER ANGLE	
7	SUPPORT FRAME	
8	DIP PLATE	
9	CENTER SHAFT AND CONE	
10	BENCHING SKIRT	

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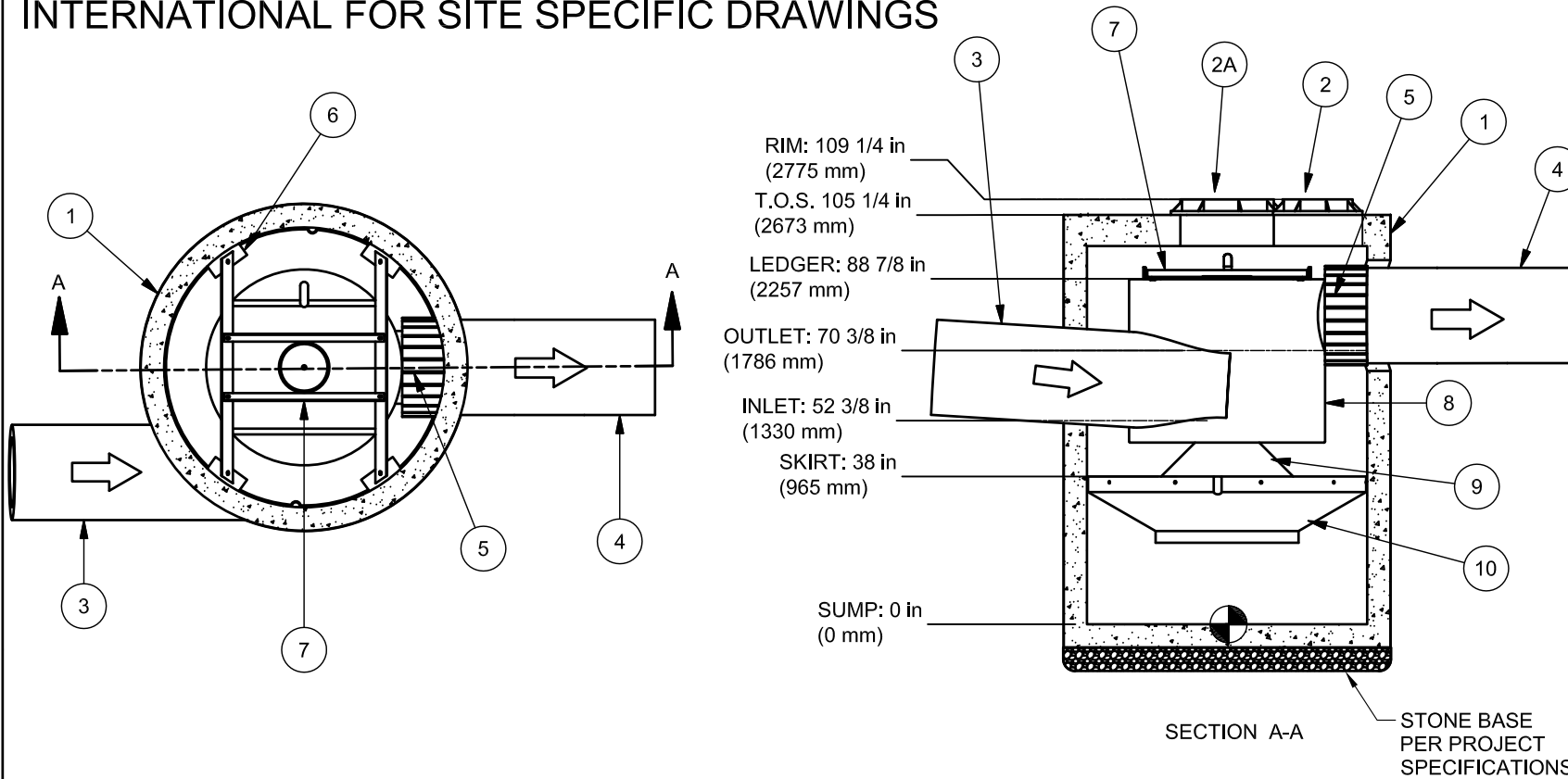
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CAD Ref: D4GA_SI

Project No.

Drawing No. D4GA_SI Rev. A

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- Notes**
1. MANHOLE WALL AND SLAB THICKNESSES ARE NOT TO SCALE.
 2. CONTACT HYDRO INTERNATIONAL FOR A BOTTOM OF STRUCTURE ELEVATION PRIOR TO SETTING DOWNSTREAM DEFENDER MANHOLE.
 3. TYPICALLY DOWNSTREAM DEFENDERS WILL BE DELIVERED TO THE PROJECT SITE WITH A TOP SLAB ELEVATION 12"± BELOW FINISHED GRADE. PURCHASER SHALL BE RESPONSIBLE FOR GRADE RINGS OR BLOCK AND MORTAR NECESSARY TO MEET FINAL GRADE.

REVISION HISTORY

REV	BY	DATE	DESCRIPTION
B	JLL	1/7/13	Metric Dim.
Date		Scale	
9/14/2011		5/16" = 1'-0"	
Drawn	Checked	Approved	
EMH	KJM		

Title
6-FT (1.82m) DIAMETER
DOWNSTREAM DEFENDER

GENERAL ARRANGEMENT

Parts List

ITEM	DESCRIPTION	SIZE
1	PRECAST MANHOLE (BY HYDRO VIA PRECASTER)	72 in
2	FRAME AND COVER	18 in
2A	FRAME AND COVER	24 in
3	INLET PIPE (BY OTHERS) ²	18 in
4	OUTLET PIPE (BY OTHERS) ¹	18 in
5	PIPE COUPLING (BY OTHERS)	
6	LEDGER ANGLE	
7	SUPPORT FRAME	
8	DIP PLATE	
9	CENTER SHAFT AND CONE	
10	BENCHING SKIRT	

CAPACITIES:

1. Peak treatment flow: 8.0 cfs (227 l/s)
2. Sediment storage capacity: 2.10 Cu. yd. (1.61 cu. m.)
3. Oil storage capacity: 216 Gal. (818 liters)

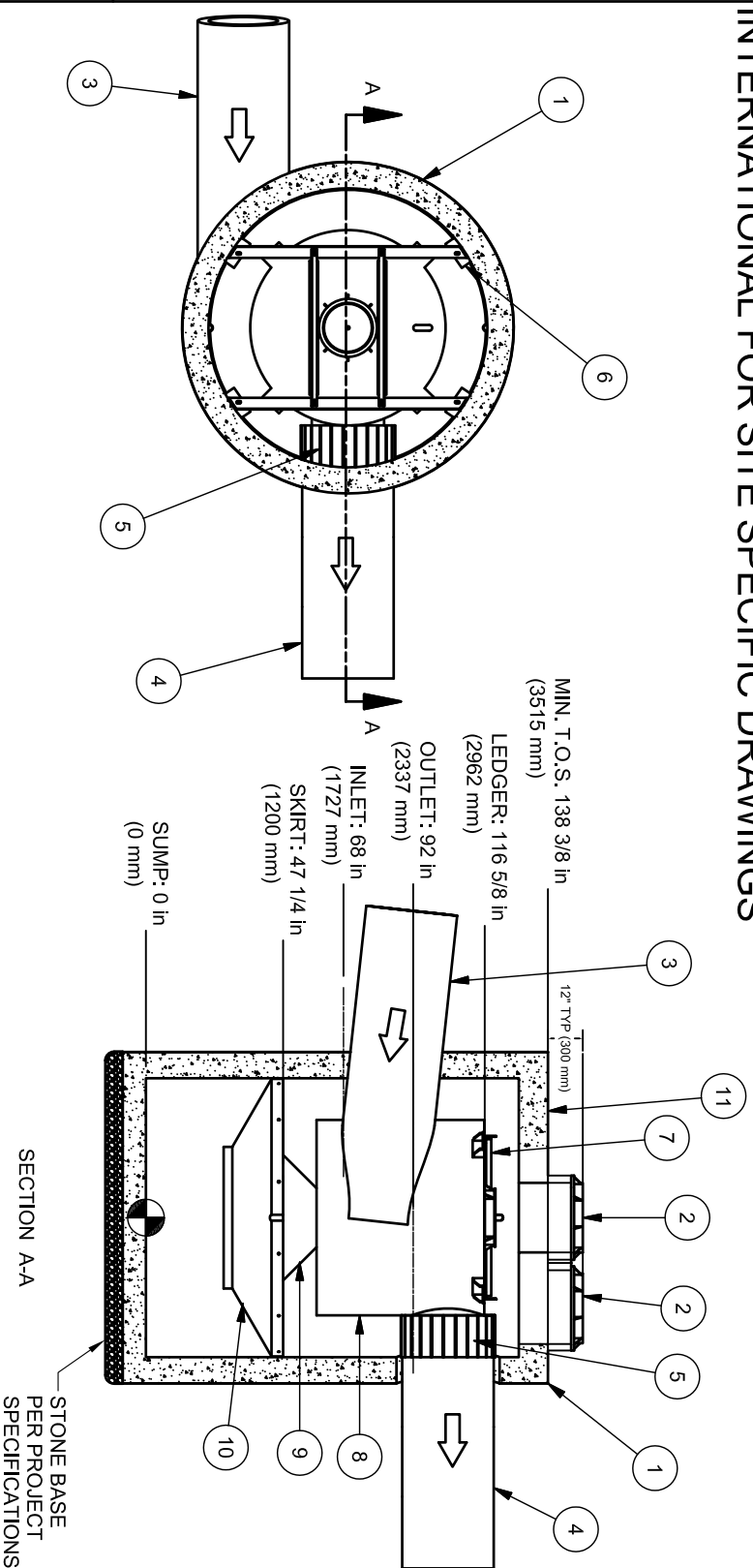
ADDITIONAL DESIGN INFORMATION:

1. The outlet pipe stub (not shown) is a roto-molded product with an I.D. of 18 in. that cannot be modified. To avoid the use of a reducer or expander on the outlet an 18 in. outlet pipe should be used if possible. The orientation of the outlet pipe can be adjusted to suit site conditions.
2. Maximum pipe size is 18 in. The inlet pipe invert should be placed one inlet pipe diameter below the outlet pipe invert. The I.D. of the inlet pipe should be placed tangent to the I.D. of the manhole. The orientation of the inlet pipe can be adjusted to suit site conditions. Headloss at 8.0 cfs with an 18 in. inlet: 12 in. (305 mm). Headloss will increase with smaller inlet pipes.
3. Sediment shall be stored in a zone that is isolated from the main flow path and protected from re-entrainment by the benching skirt.
4. Dimensions are general and intended for guidance only.



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ITEM	DESCRIPTION	SIZE
1	PRECAST MANHOLE (BY HYDRO VIA PRECASTER)	96 in
2	FRAME AND COVER	24 in
3	INLET PIPE (BY OTHERS) ²	24 in
4	OUTLET PIPE (BY OTHERS) ¹	24 in
5	PIPE COUPLING (BY OTHERS)	
6	LEDGER ANGLE	
7	SUPPORT FRAME	
8	DIP PLATE	
9	GENTER SHAFT AND CONE	
10	BENCHING SKIRT	
11	MATERIALS AND LABOR TO ACHIEVE FINAL GRADE (BY OTHERS)	

Parts List

CAPACITIES:

1. Peak treatment flow: 15.0 cfs (425 l/s)
2. Sediment storage capacity: 4.65 Cu. yd. (3.56 cu. m.)
3. Oil storage capacity: 540 Gal. (2044 liters)

ADDITIONAL DESIGN INFORMATION:

1. The outlet pipe stub (not shown) is a roto-molded product with an I.D. of 24 in. that cannot be modified. To avoid the use of a reducer or expander on the outlet a 24 in. outlet pipe should be used if possible. The orientation of the outlet pipe can be adjusted to suit site conditions.
2. Maximum pipe size is 24 in. The inlet pipe invert should be placed one inlet pipe diameter below the outlet pipe invert. The I.D. of the inlet pipe should be placed tangent to the I.D. of the manhole. The orientation of the inlet pipe can be adjusted to suit site conditions. Headloss at 15.0 cfs with a 24 in. inlet: 13 in. (330 mm). Headloss will increase with smaller inlet pipes.
3. Sediment shall be stored in a zone that is isolated from the main flow path and protected from re-entrainment by the benching skirt.
4. Dimensions are general and intended for guidance only.

REV	BY	DATE	DESCRIPTION
B	JLL	1/7/13	Metric Dim.

REVISION HISTORY	Scale
Date: 9/14/2011	3/16" = 1'-0"

Drawn: EMH	Checked: KJM	Approved:
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Title
8-FT (2.44m) DIAMETER DOWNSTREAM DEFENDER

GENERAL ARRANGEMENT

Notes

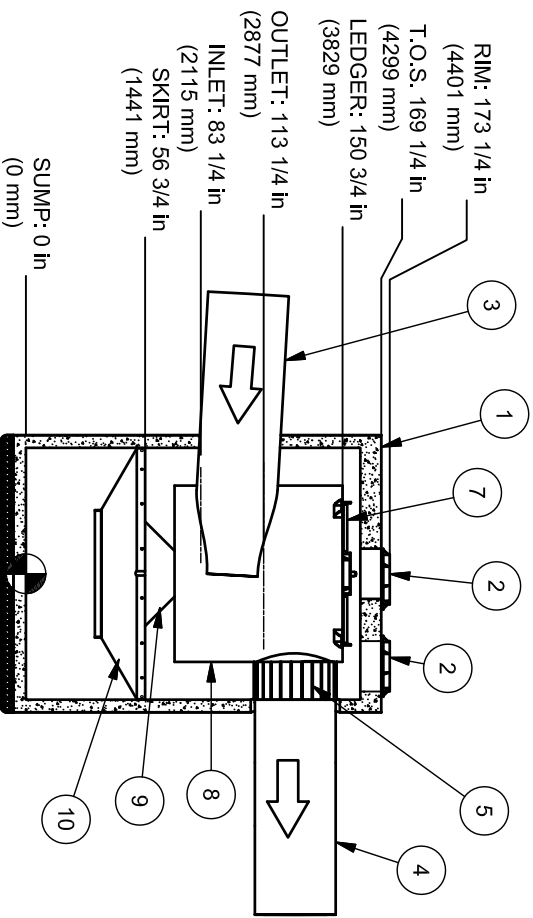
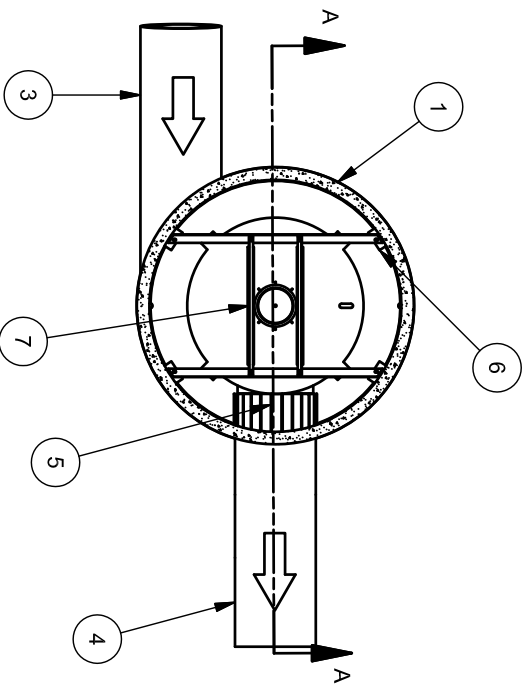
1. MANHOLE WALL AND SLAB THICKNESSES ARE NOT TO SCALE
2. CONTACT HYDRO INTERNATIONAL FOR A BOTTOM OF STRUCTURE ELEVATION PRIOR TO SETTING DOWNSTREAM DEFENDER MANHOLE.
3. TYPICALLY DOWNSTREAM DEFENDERS WILL BE DELIVERED TO THE PROJECT SITE WITH A TOP SLAB ELEVATION 12" BELOW FINISHED GRADE. PURCHASER SHALL BE RESPONSIBLE FOR GRADE RINGS OR BLOCK AND MORTAR NECESSARY TO MEET FINAL GRADE.



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ITEM	DESCRIPTION	SIZE
1	PRECAST MANHOLE (BY HYDRO VIA PRECASTER)	120 in
2	FRAME AND COVER	24 in
3	INLET PIPE (BY OTHERS) ²	30 in
4	OUTLET PIPE (BY OTHERS) ¹	30 in
5	PIPE COUPLING (BY OTHERS)	
6	LEDGER ANGLE	
7	SUPPORT FRAME	
8	DIP PLATE	
9	CENTER SHAFT AND CONE	
10	BENCHING SKIRT	

Parts List

CAPACITIES:

1. Peak treatment flow: 25.0 cfs (708 l/s)
2. Sediment storage capacity: 8.70 Cu. yd. (6.65 cu. m.)
3. Oil storage capacity: 1050 Gal. (3975 liters)

ADDITIONAL DESIGN INFORMATION:

1. The outlet pipe stub (not shown) is a roto-molded product with an I.D. of 30 in. that cannot be modified. To avoid the use of a reducer or expander on the outlet a 30 in. outlet pipe should be used if possible. The orientation of the outlet pipe can be adjusted to suit site conditions.
2. Maximum pipe size is 30 in. The inlet pipe invert should be placed one inlet pipe diameter below the outlet pipe invert. The I.D. of the inlet pipe should be placed tangent to the I.D. of the manhole. The orientation of the inlet pipe can be adjusted to suit site conditions. Headloss at 25.0 cfs with a 30 in. inlet: 15 in. (381 mm). Headloss will increase with smaller inlet pipes.
3. Sediment shall be stored in a zone that is isolated from the main flow path and protected from re-entrainment by the benching skirt.
4. Dimensions are general and intended for guidance only.

SECTION A-A
STONE BASE PER PROJECT SPECIFICATIONS

- ### Notes
1. MANHOLE WALL AND SLAB THICKNESSES ARE NOT TO SCALE.
 2. CONTACT HYDRO INTERNATIONAL FOR A BOTTOM OF STRUCTURE ELEVATION PRIOR TO SETTING DOWNSTREAM DEFENDER MANHOLE.
 3. TYPICALLY DOWNSTREAM DEFENDERS WILL BE DELIVERED TO THE PROJECT SITE WITH A TOP SLAB ELEVATION 12± BELOW FINISHED GRADE. PURCHASER SHALL BE RESPONSIBLE FOR GRADE RINGS OR BLOCK AND MORTAR NECESSARY TO MEET FINAL GRADE.

REVISION HISTORY

REV	BY	DATE	DESCRIPTION
B	JLL	1/7/13	Metric Dim.

Date	Scale
9/14/2011	1/8" = 1'-0"

Drawn	Checked	Approved
EMH	KJM	

10-FT (3.05m) DIAMETER DOWNSTREAM DEFENDER

GENERAL ARRANGEMENT



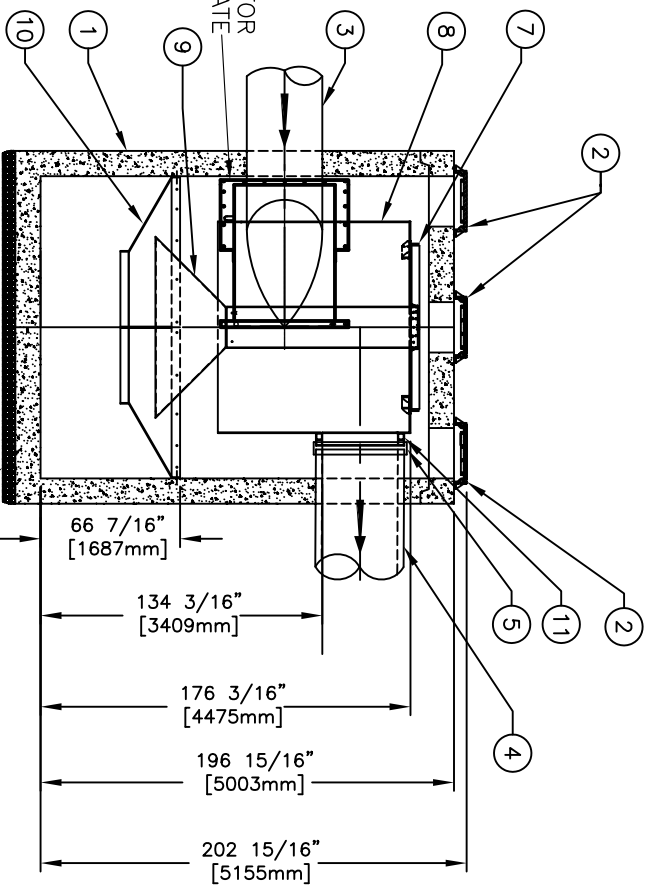
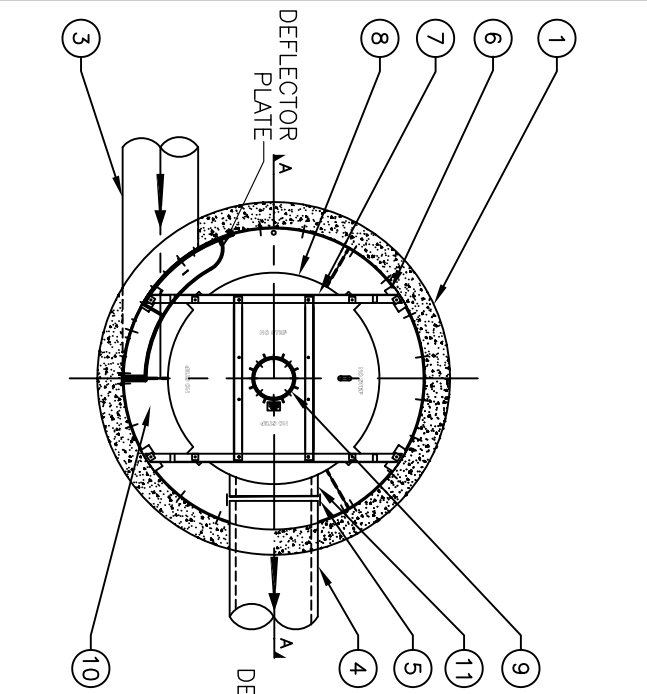
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CAD Ref: D10GA

Project No. Drawing No. D10GA Rev. B

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ITEM	DESCRIPTION	SIZE
1	PRECAST MANHOLE (BY HYDRO VIA PRECASTER)	144 in
2	FRAME AND COVER	24 in
3	INLET PIPE (BY OTHERS) ²	36 in
4	OUTLET PIPE (BY OTHERS) ¹	36 in
5	PIPE COUPLING (BY OTHERS)	
6	LEDGER ANGLE	
7	SUPPORT FRAME	
8	DIP PLATE	
9	CENTER SHAFT AND CONE	
10	BENCHING SKIRT	
11	OUTLET PIPE STUB ¹	36 in

Parts List

- CAPACITIES:**
1. Peak treatment flow: 38.0 cfs (1076 l/s)
 2. Sediment storage capacity: 14.70 Cu. yd. (11.24 cu. m.)
 3. Oil storage capacity: 1770 Gal. (6700 liters)

ADDITIONAL DESIGN INFORMATION:

1. The outlet pipe stub is a roto-molded product with an I.D. of 36 in., that cannot be modified. To avoid the use of a reducer or expander on the outlet a 36 in. outlet pipe should be used if possible. The orientation of the outlet pipe can be adjusted to suit site conditions.
2. Maximum pipe size is 36 in. The inlet pipe invert should be placed one inlet pipe diameter below the outlet pipe invert. The I.D. of the inlet pipe should be placed tangent to the I.D. of the manhole. The orientation of the inlet pipe can be adjusted to suit site conditions. Headloss at 38.0 cfs with a 36 in. inlet: 16 in. (406 mm). Headloss will increase with smaller inlet pipes.
3. Sediment shall be stored in a zone that is isolated from the main flow path and protected from re-entrainment by the benching skirt.
4. Dimensions are general and intended for guidance only.

Notes

1. MANHOLE WALL AND SLAB THICKNESSES ARE NOT TO SCALE.
2. CONTACT HYDRO INTERNATIONAL FOR A BOTTOM OF STRUCTURE ELEVATION PRIOR TO SETTING DOWNSTREAM DEFENDER MANHOLE.
3. TYPICALLY DOWNSTREAM DEFENDERS WILL BE DELIVERED TO THE PROJECT SITE WITH A TOP SLAB ELEVATION 12"± BELOW FINISHED GRADE. PURCHASER SHALL BE RESPONSIBLE FOR GRADE RINGS OR BLOCK AND MORTAR NECESSARY TO MEET FINAL GRADE.

REVISION HISTORY

REV	BY	DATE	DESCRIPTION
B	JLL	6/3/13	Deflector Plate

Date	9/14/2011	Scale	1/8" = 1'-0"
Drawn	EMH	Checked	MJR
		Approved	MJR

12-FT DIAMETER
DOWNSTREAM DEFENDER

GENERAL ARRANGEMENT



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