
APPENDIX B

Borehole Logs



Client: Manitoba Water Services Board (MWSB) Project: Wawanesa Lagoon Functional Design
 Project No.: 13-8212-6000-01 Location: SE1/4 25-7-17W (See Site Plan)
 Drilling Co.: Paddock Drilling Drilling Method: Solid Stem Auger
 Supervised by: Rob Buenaventura Date Started: 4/22/14 Date Completed: 4/22/14

Depth Scale (m)	Stratigraphic Description	Lithology	Depth (m)	Notes	Sample					Depth Scale (m)
					Method	Number	N Value	Rec %	VOC (ppm or %LEL)	
0.5	TOPSOIL, 125 mm thick, black		0.127							0.5
1.0	SILTY CLAY, brown, medium plastic, moist, and silt - below 0.5 m, medium to low plastic, moist, firm				Hand	S1				1.0
2.5	CLAY, brown, high to medium plastic, firm, with silt, some sand sizes, trace gravel sizes		2.438		Hand	S2		*		2.5
3.0	SILTY SAND, brown, fine grained, wet, with silt, some clay		3.048		Hand	S3				3.0
3.5					Hand	S4				3.5
4.0	SILTY CLAY, brown, stiff, medium plastic, and silt, with sand sizes, some gravel sizes - below 4.6m, firm		3.6576							4.0
4.5					Hand	S5				4.5
5.0										5.0
5.5										5.5
6.0					Hand	S6				6.0

END OF TESTHOLE, water seepage observed at 6.1 m below grade and measured in hole sloughing at 3.7 m below grade

- testhole remained opened from 9:30 am to 12:23 pm with measured water at 2.58 m below grade

- testhole backfilled with two (2) bags of bentonite pellets and followed by auger cuttings to grade

DILLON BH WAWANESA NLB.GPJ DILLON TEMPLATE.GDT 6/9/14

Water found
 LITHOLOGY SYMBOLS
 Topsoil
 Silt / Clay
 SAMPLE TYPE
 Grab Sample
 Clay
 Silty Sand

* Indicates sample submitted for analysis



Client: Manitoba Water Services Board (MWSB) Project: Wawanesa Lagoon Functional Design
 Project No.: 13-8212-6000-01 Location: SE1/4 25-7-17W (See Site Plan)
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 Supervised by: Rob Buenaventura Date Started: 4/22/14 Date Completed: 4/22/14

Depth Scale (m)	Stratigraphic Description	Lithology	Depth (m)	Notes	Sample					Depth Scale (m)	
					Method	Number	N Value	Rec %	VOC (ppm or %LEL)		
	TOPSOIL, 230 mm thick, black										
0.5	SILTY CLAY, brown, medium plastic, moist to dry, and silt		0.229								0.5
1.0	- below										1.0
1.5											1.5
2.0											2.0
2.5											2.5
3.0											3.0
3.5											3.5
4.0	SILTY SAND, brown, fine grained, moist to wet, with silt, some clay		3.658								4.0
4.5	SILTY CLAY, brown, medium plastic, moist, stiff, and silt, with sand sizes, some gravel sizes		4.267								4.5
	END OF TESTHOLE, no water seepage observed after drilling and measured in hole sloughing at 4.1 m below grade		4.6								
	- testhole remained opened from 9:55 am to 12:18 pm with measured water at 3.59 m below grade										
	- testhole backfilled with two (2) bags of bentonite pellets and followed by auger cuttings to grade										

DILLON BH WAWANESA NLB.GPJ DILLON TEMPLATE.GDT 6/9/14

Water found
 LITHOLOGY SYMBOLS
 Topsoil
 Silt / Clay
 SAMPLE TYPE
 Grab Sample

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Depth Scale (m)	Stratigraphic Description	Lithology	Depth (m)	Notes	Sample					Depth Scale (m)
					Method	Number	N Value	Rec %	VOC (ppm or %LEL)	
0.5	TOPSOIL, 150 mm thick, black SILTY CLAY, brown, medium plastic, moist, and silt		0.152							0.5
1.0	- below 1.2 m, high plastic, moist, stiff, some sand sizes, trace gravel sizes					S1				1.0
1.5	- below 1.5 m, some gravel sizes					S2		*		1.5
2.0						S3		*		2.0
2.5										2.5
3.0						S4				3.0
3.5	SILTY SAND, brown, fine grained, wet, with silt, some clay		3.353							3.5
4.0	SILTY CLAY, brown, medium plastic, moist, stiff, with sand sizes, trace gravel sizes		3.81							4.0
4.5						S5				4.5
END OF TESTHOLE, no water seepage observed after drilling and measured in hole sloughing at 4.1 m below grade			4.6							
<p>- testhole remained opened from 10:15 am to 12:15 pm and remained dry of water seepage</p> <p>- testhole backfilled with two (2) bags of bentonite pellets and followed by auger cuttings to grade</p>										

DILLON BH WAWANESA NLB.GPJ DILLON TEMPLATE.GDT 6/9/14

LITHOLOGY SYMBOLS

Topsoil
 Silty Sand

Silt / Clay

SAMPLE TYPE

Grab Sample
 Shelby Tube

* Indicates sample submitted for analysis



Client: Manitoba Water Services Board (MWSB) Project: Wawanesa Lagoon Functional Design
 Project No.: 13-8212-6000-01 Location: SE1/4 25-7-17W (See Site Plan)
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Depth Scale (m)	Stratigraphic Description	Lithology	Depth (m)	Notes	Sample					Depth Scale (m)
					Method	Number	N Value	Rec %	VOC (ppm or %LEL)	
0.5	TOPSOIL, 125 mm thick, black		0.127							0.5
1.0	SILTY CLAY, brown, medium plastic, moist, and silt									1.0
1.5	- below 0.9 m, some sand sizes, some gravel sizes					S1				1.5
2.0	- below 2.3 m, occasional silt lenses									2.0
2.5						S2				2.5
3.0										3.0
3.5	SILTY SAND, brown, fine grained, moist to dry, with silt, some clay		3.353							3.5
4.0						S3				4.0
4.5	SILTY CLAY, brown, medium plastic, moist, stiff, with sand sizes, trace gravel sizes		4.115							4.5
	END OF TESTHOLE, no water seepage and sloughing observed after drilling		4.6							
	- testhole remained opened from 10:32 am to 12:13 pm and remained dry of water seepage									
	- testhole backfilled with two (2) bags of bentonite pellets and followed by auger cuttings to grade									

DILLON BH WAWANESA NLB.GPJ DILLON TEMPLATE.GDT 6/9/14

LITHOLOGY SYMBOLS

- Topsoil
- Silty Sand

- Silt / Clay

SAMPLE TYPE

- Grab Sample

* Indicates sample submitted for analysis



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Depth Scale (m)	Stratigraphic Description	Lithology	Depth (m)	Notes	Sample					Depth Scale (m)	
					Method	Number	N Value	Rec %	VOC (ppm or %LEL)		
0.5	TOPSOIL, 150 mm thick, black SILTY CLAY, brown, medium plastic, moist, with sand sizes - below 0.8 m, some sand sizes, trace gravel sizes, occasional gypsum and oxide inclusions		0.152								0.5
1.5	SILTY SAND, brown, fine grained, dry to moist, with silt, some clay, some gravel sizes		1.524								1.5
3.0	CLAYEY SILT, brown, medium plastic, dry to moist, with sand sizes, travel gravel sizes		3.048								3.0
4.0						S3		*			4.0

END OF TESTHOLE, no water seepage or sloughing observed after drilling

4.6

- testhole remained opened from 10:50 am to 12:07 pm and remained dry of water seepage

- testhole backfilled with two (2) bags of bentonite pellets and followed by auger cuttings to grade

DILLON BH WAWANESA NLB.GPJ DILLON TEMPLATE.GDT 6/9/14

LITHOLOGY SYMBOLS

Topsoil	Silt / Clay	SAMPLE TYPE	Grab Sample
Silty Sand	Silt		

* Indicates sample submitted for analysis



Client: Manitoba Water Services Board (MWSB) Project: Wawanesa Lagoon Functional Design
 Project No.: 13-8212-6000-01 Location: SE1/4 25-7-17W (See Site Plan)
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Depth Scale (m)	Stratigraphic Description	Lithology	Depth (m)	Notes	Sample					Depth Scale (m)	
					Method	Number	N Value	Rec %	VOC (ppm or %LEL)		
	TOPSOIL, 230 mm thick, black										
0.5	SILTY CLAY, brown, medium plastic, moist, and silt, firm		0.229								0.5
1.0	- below 1.2 m, high plastic, with silt, stiff										1.0
1.5	- below 3.1 m, medium plastic, and silt, some sand sizes, some grave sizes					S1		*			1.5
2.0						S2		*			2.0
2.5											2.5
3.0											3.0
3.5											3.5
4.0											4.0
4.5	SILTY SAND, brown, fine grained, wet, with silt, some clay		4.115								4.5
	END OF TESTHOLE, water seepage observed at 4.6 m below grade and measured in hole sloughing at 4.1 m below grade		4.6								
	- testhole remained opened from 11:11 am to 12:02 pm with measured water at 3.23 m below grade										
	- testhole backfilled with two (2) bags of bentonite pellets and followed by auger cuttings to grade										

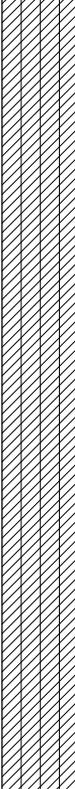
DILLON BH WAWANESA NLB.GPJ DILLON TEMPLATE.GDT 6/9/14

Water found
 LITHOLOGY SYMBOLS
 Topsoil
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Depth Scale (m)	Stratigraphic Description	Lithology	Depth (m)	Notes	Sample					Depth Scale (m)
					Method	Number	N Value	Rec %	VOC (ppm or %LEL)	
0.5	TOPSOIL, 150 mm thick, black SILTY CLAY, brown, medium plastic, moist, stiff, and silt, some sand sizes, trace gravel sizes		0.152							0.5
1.0	- below 3.1 m, some gravel sizes									1.0
1.5	- below 3.7 m, occasional oxide inclusions									1.5
2.0										2.0
2.5										2.5
3.0										3.0
3.5										3.5
4.0										4.0
4.5										4.5
	END OF TESTHOLE, no water seepage to sloughing observed after drilling		4.6							
	- testhole remained opened from 11:23 am to 11:59 am and remained dry of water seepage									
	- testhole backfilled with two (2) bags of bentonite pellets and followed by auger cuttings to grade									

DILLON BH WAWANESA NLB.GPJ DILLON TEMPLATE.GDT 6/9/14

LITHOLOGY SYMBOLS  Topsoil

 Silt / Clay

SAMPLE TYPE

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Depth Scale (m)	Stratigraphic Description	Lithology	Depth (m)	Notes	Sample					Depth Scale (m)	
					Method	Number	N Value	Rec %	VOC (ppm or %LEL)		
	TOPSOIL, 230 mm thick, black										
0.5	SILTY CLAY, brown, medium plastic, moist, stiff, and silt, some sand sizes, some gravel sizes		0.229				S1			0.5	
1.0	- below 4.0 m, very stiff to stiff, occasional oxide inclusions, occasional silt lenses									1.0	
1.5										1.5	
2.0								S2			2.0
2.5								S3			2.5
3.0											3.0
3.5										3.5	
4.0										4.0	
4.5										4.5	
5.0										5.0	
5.5										5.5	
6.0										6.0	
END OF TESTHOLE, no water seepage or sloughing observed after drilling			6.1								
<p>- testhole remained opened from 11:47 am to 11:54 am and remained dry of water seepage</p> <p>- testhole backfilled with two (2) bags of bentonite pellets and followed by auger cuttings to grade</p>											

DILLON BH WAWANESA NLB.GPJ DILLON TEMPLATE.GDT 6/9/14

LITHOLOGY SYMBOLS Topsoil

Silt / Clay

SAMPLE TYPE Grab Sample
 Shelby Tube

* Indicates sample submitted for analysis

APPENDIX C

Soils Analysis Results



Stantec Consulting Ltd.
199 Henlow Bay, Winnipeg MB R3Y 1G4

May 14, 2014
File: 123311175

Attention: Rob Buenaventura
Dillon Consulting Limited
1558 Wilson Place
Winnipeg, MB R3T 0Y4

Dear Rob,

Reference: Wawanesa Wastewater Treatment Study

Soil samples were submitted to our laboratory on April 23, 2014. The following tests were conducted on selected soil samples.

- Water content (ASTM D2216)
- Particle-Size Analysis (ASTM D422)
- Liquid limit (multi point), plastic limit, and plasticity index (ASTM D4318)
- Hydraulic conductivity (ASTM D5084)

We appreciate the opportunity to assist you in this project. Please call if you have any questions regarding this report.

Regards,

STANTEC CONSULTING LTD.

A handwritten signature in black ink, appearing to read "Jason Thompson".

Jason Thompson, C.E.T.
Associate - Manager, Materials Testing Services
Phone: (204) 928-4004
Fax: (204) 488-6947
Jason.Thompson@stantec.com

Attachment: Table 1 - Water Content Test Data
Table 2 - Particle Size, Atterberg Limits and Hydraulic Conductivity Test Data
3x - Atterberg Limit Test Report,
5x - Particle Size Analysis Test Report
2x - Hydraulic Conductivity Test Report



Reference: Wawanesa Wastewater Treatment Study

TABLE 1
 WATER CONTENT TEST DATA

Sample ID	Sample depth (ft.)	Water Content (%)
TH1- S2	7.5	16.4
TH3 – S2	5	22.7
TH3 – S6	5 - 7	21.3
TH5 – S3	13	13.1
TH6 – S1	4	20.8

TABLE 2
 PARTICLE SIZE ,ATTERBERG LIMIT AND HYDRAULIC CONDUCTIVITY TEST DATA

Sample ID	Sample Depth (ft.)	Particle Size Analysis						Atterberg Limits			Hydraulic Conductivity “k ₂₀ ” (cm/s)
		Gravel (%) 75 to 4.75 mm	Sand (%)			Silt (%) <0.075 to 0.002 mm	Clay (%) <0.005 mm	Liquid Limit	Plastic Limit	Plasticity Index	
			Coarse <4.75 to 2.0 mm	Medium <2.0 to 0.425 mm	Fine <0.425 to 0.075 mm						
TH1-S2	7.5	3.5	3.0	5.3	19.2	40.1	28.9	34	15	19	NT
TH3-S2	5	1.7	0.5	3.7	8.4	36.3	49.4	44	18	26	NT
TH3-S3	5-7	1.3	1.5	5.1	10.6	42.1	39.4	33	16	17	2.1 x 10 ⁻⁷
TH5-S3	13	2.1	3.7	11.5	31.4	34.2	17.1	24	15	9	NT
TH6-S1	4	1.1	0.3	0.5	3.3	63.9	30.9	38	19	19	NT
TH6-S2	5-7	NT						NT			9.1 x 10 ⁻⁹

Notes:

1. A high speed stirring device was used for 1 minute to disperse the test sample for particle size analysis
2. Atterberg limits conducted in accordance with ASTM D4318 Method B (single-point liquid limit)
3. The soil samples were air-dried during sample preparation for Atterberg limits and particle size analysis
4. NT denotes not tested

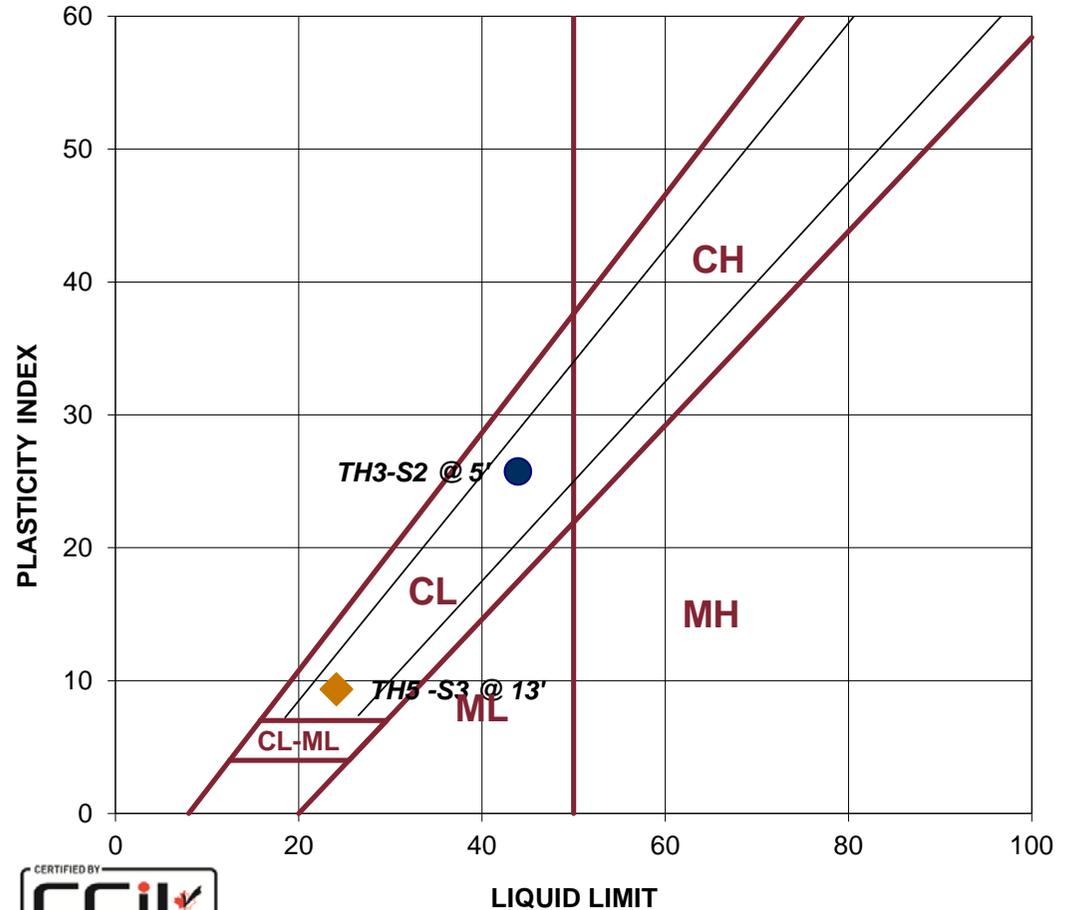


Atterberg Limits
 ASTM D4318
 Method B- One Point

Client: Dillon Consulting Limited
 Project Name: Wawanesa Wastewater Treatment Study
 Project No: 123311175
 Date Received: April 23, 2014
 Date Tested: April 30, 2014
 Tested By: Nestor Abarca

LABORATORY
 199 Henlow Bay
 Winnipeg, Manitoba
 Canada R3Y 1G4
 Tel: (204) 488-6999

Sample: TH3-S2 @ 5'		Sample: TH5 -S3 @ 13'	
LIQUID		LIQUID	
1	2	Trial No.	
24	23	Number of Blows	26 26
425	478	Container Number	401 473
44.13	45.42	Wt. Sample (wet+tare)(g)	38.77 43.40
38.82	39.51	Wt. Sample (dry+tare)(g)	35.23 39.69
26.73	26.06	Wt. Tare (g)	20.55 24.31
12.1	13.5	Wt. Dry Soil (g)	14.7 15.4
5.3	5.9	Wt. Water (g)	3.5 3.7
43.9%	43.9%	Water Content (%)	24.1% 24.1%
43.7%	43.5%	Corrected Water Content (%)	24.2% 24.2%
PLASTIC		PLASTIC	
1	2	Trial No.	
494	489	Container Number	535 459
32.63	37.77	Wt. Sample (wet+tare)(g)	47.73 49.12
31.05	36.05	Wt. Sample (dry+tare)(g)	44.76 46.01
22.32	26.66	Wt. Tare (g)	24.65 24.98
8.7	9.4	Wt. Dry Soil (g)	20.1 21.0
1.6	1.7	Wt. Water (g)	3.0 3.1
18.1%	18.3%	Water Content (%)	14.8% 14.8%
AVERAGE VALUES		AVERAGE VALUES	
1	2	1	2
LL	44	LL	24
PL	18	PL	15
PI	26	PI	9
CLASSIFICATION		CLASSIFICATION	
CL		CL	



Reporting of these test results constitutes a testing service only. Engineering interpretation or evaluation of the test results is provided only on written request. The data presented above is for the sole use of the client stipulated above. STANTEC is not responsible, nor can be held liable, for the use of this report by any other party, with or without the knowledge of STANTEC.

Reviewed By: Jason Thompson, C.E.T.

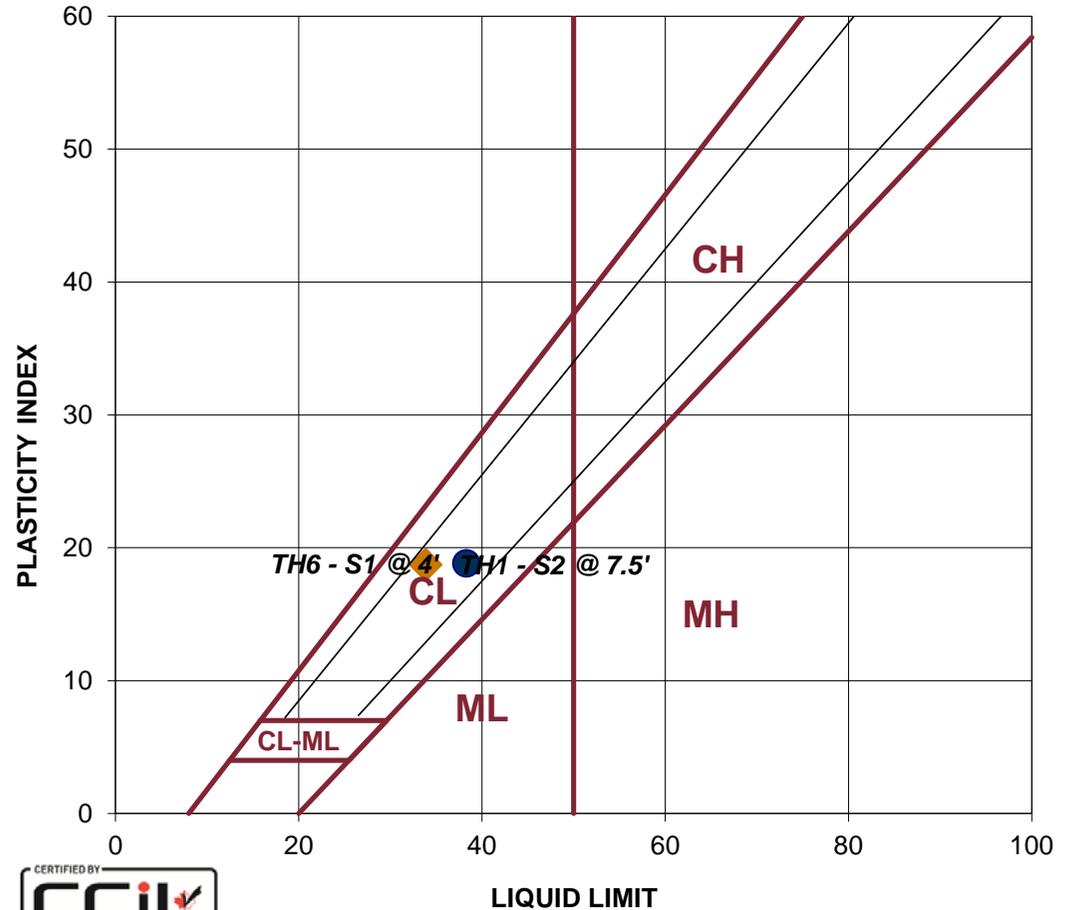


Atterberg Limits
 ASTM D4318
 Method B- One Point

Client: Dillon Consulting Limited
 Project Name: Wawanesa Wastewater Treatment Study
 Project No: 123311175
 Date Received: April 23, 2014
 Date Tested: April 25, 2014
 Tested By: Larry Presado

LABORATORY
 199 Henlow Bay
 Winnipeg, Manitoba
 Canada R3Y 1G4
 Tel: (204) 488-6999

Sample: TH6 - S1 @ 4'		Sample: TH1 - S2 @ 7.5'	
LIQUID		LIQUID	
1	2	Trial No.	
26	27	Number of Blows	24 25
429	471	Container Number	434 411
34.14	31.78	Wt. Sample (wet+tare)(g)	36.31 30.27
31.35	29.27	Wt. Sample (dry+tare)(g)	33.48 27.87
24.09	22.69	Wt. Tare (g)	25.15 20.76
7.3	6.6	Wt. Dry Soil (g)	8.3 7.1
2.8	2.5	Wt. Water (g)	2.8 2.4
38.4%	38.1%	Water Content (%)	34.0% 33.8%
38.6%	38.5%	Corrected Water Content (%)	33.8% 33.8%
PLASTIC		PLASTIC	
1	2	Trial No.	
510	486	Container Number	518 442
35.61	37.6	Wt. Sample (wet+tare)(g)	33.52 31.5
33.93	35.57	Wt. Sample (dry+tare)(g)	32.36 30.14
25.33	25.11	Wt. Tare (g)	24.71 21.15
8.6	10.5	Wt. Dry Soil (g)	7.7 9.0
1.7	2.0	Wt. Water (g)	1.2 1.4
19.5%	19.4%	Water Content (%)	15.2% 15.1%
AVERAGE VALUES		AVERAGE VALUES	
1	2	1	2
LL	38	LL	34
PL	19	PL	15
PI	19	PI	19
CLASSIFICATION		CLASSIFICATION	
CL		CL	



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Reviewed By: Jason Thompson, C.E.T.

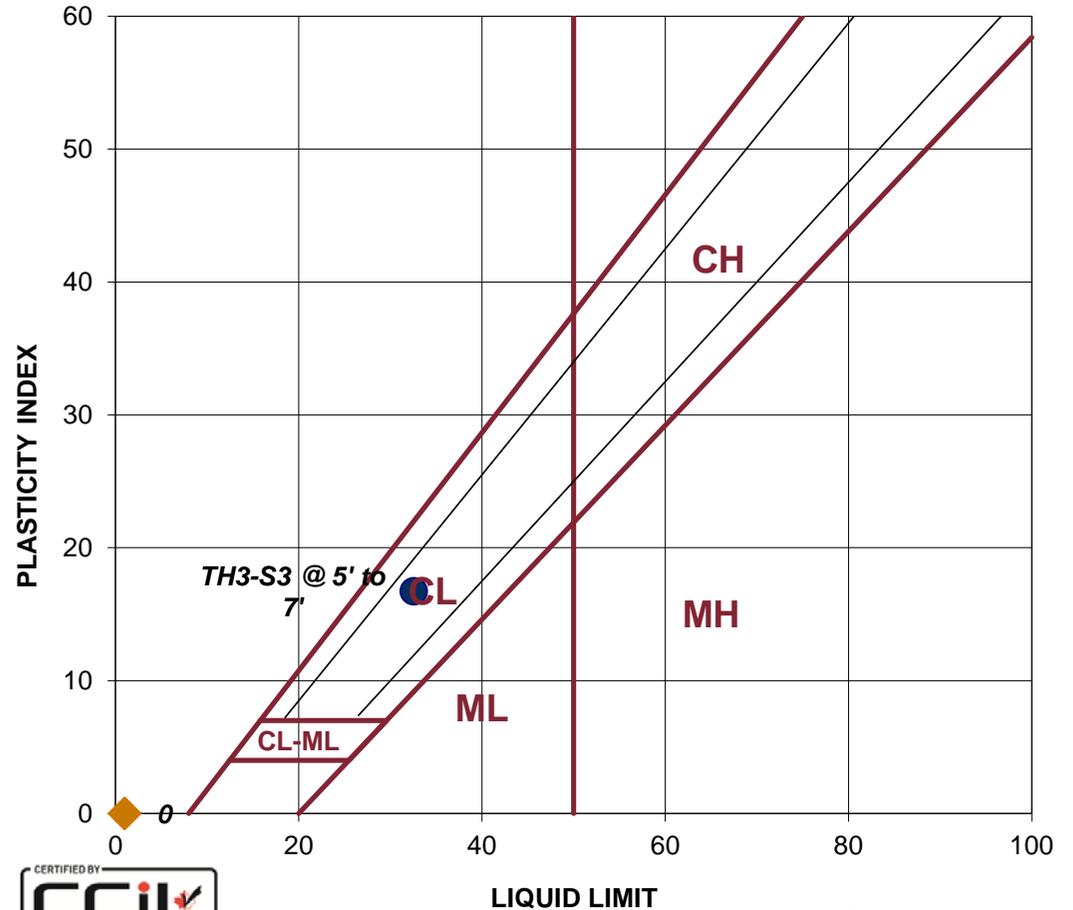


Atterberg Limits
 ASTM D4318
 Method B- One Point

Client: Dillon Consulting Limited
 Project Name: Wawanesa Wastewater Treatment Study
 Project No: 123311175
 Date Received: April 23, 2014
 Date Tested: April 30, 2014
 Tested By: Nestor Abarca

LABORATORY
 199 Henlow Bay
 Winnipeg, Manitoba
 Canada R3Y 1G4
 Tel: (204) 488-6999

Sample:		Sample:	
TH3-S3 @ 5' to 7'			
LIQUID		LIQUID	
1	2	Trial No.	1 2
23	22	Number of Blows	
404	523	Container Number	
35.98	40.59	Wt. Sample (wet+tare)(g)	
31.45	36.16	Wt. Sample (dry+tare)(g)	
17.57	22.53	Wt. Tare (g)	
13.9	13.6	Wt. Dry Soil (g)	
4.5	4.4	Wt. Water (g)	
32.6%	32.5%	Water Content (%)	
32.3%	32.0%	Corrected Water Content (%)	
PLASTIC		PLASTIC	
1	2	Trial No.	1 2
534	497	Container Number	
37.58	38.32	Wt. Sample (wet+tare)(g)	
35.91	36.48	Wt. Sample (dry+tare)(g)	
25.34	24.92	Wt. Tare (g)	
10.6	11.6	Wt. Dry Soil (g)	
1.7	1.8	Wt. Water (g)	
15.8%	15.9%	Water Content (%)	
AVERAGE VALUES		AVERAGE VALUES	
1	2	1	2
LL	33	LL	
PL	16	PL	
PI	17	PI	
CLASSIFICATION		CLASSIFICATION	
CL		NON-PLASTIC	



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Reviewed By: Jason Thompson, C.E.T.



LABORATORY
 199 Henlow Bay
 Winnipeg MB R3Y 1G4
 Tel: (204) 488-6999

PARTICLE SIZE ANALYSIS
ASTM D422

Dillon Consulting Ltd
 1558 Wilson Place
 Winnipeg, Manitoba
 R3T 0Y4

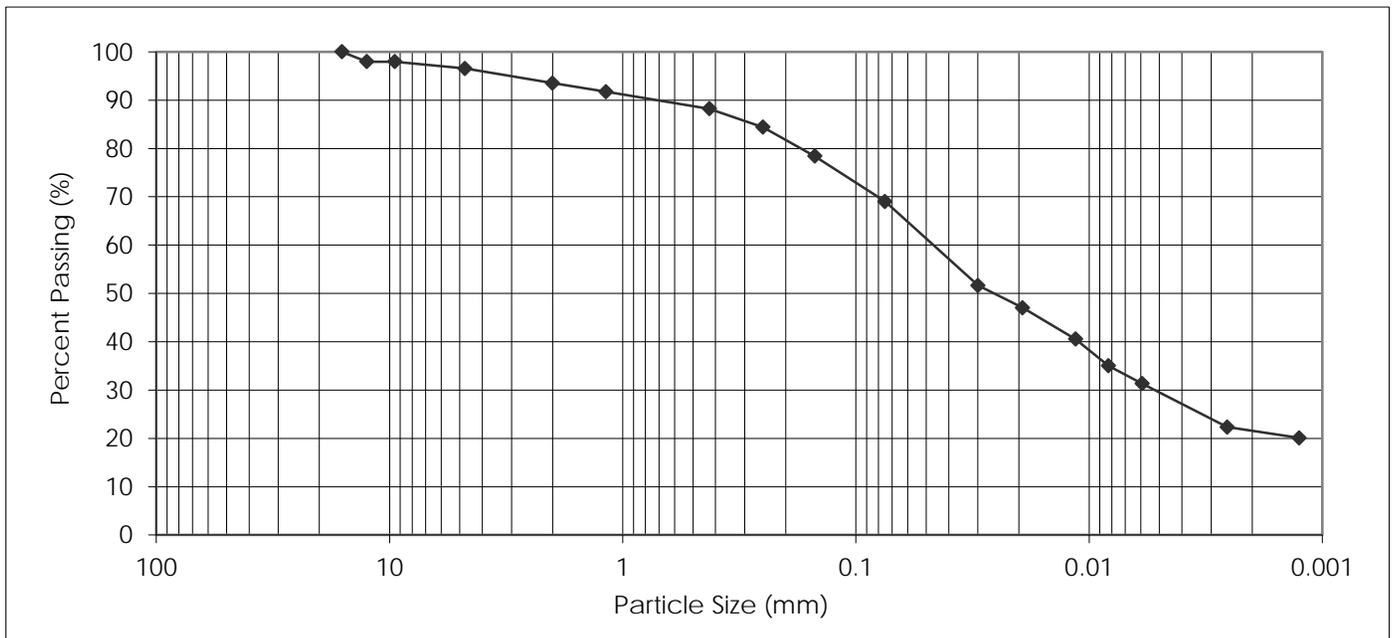
PROJECT: Wawanesa Wastewater
 Treatment Study

Attention: Rob Buenaventura

PROJECT NO.: 123311175

SAMPLED BY: Client
 SAMPLE ID: TH1-S2 @ 7.5'

DATE RECEIVED: April 23, 2014
 TESTED BY: Larry Presado



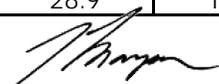
PARTICLE SIZE	PERCENT PASSING
37.50 mm	100.0
25.00 mm	100.0
19.00 mm	100.0
16.00 mm	100.0
12.50 mm	98.0
9.50 mm	98.0
4.75 mm	96.5
2.00 mm	93.5

PARTICLE SIZE	PERCENT PASSING
1.18 mm	91.7
0.425 mm	88.2
0.250 mm	84.4
0.150 mm	78.4
0.075 mm	69.0
0.005 mm	28.9
0.002 mm	21.4
0.001 mm	NT*

Gravel, % 75 to 4.75 mm	Sand, %			Silt, % <0.075 to 0.005 mm	Clay, % <0.005 mm	Colloids, % < 0.001 mm
	Coarse <4.75 to 2.0 mm	Medium <2.0 to 0.425 mm	Fine <0.425 to 0.075 mm			
3.5	3.0	5.3	19.2	40.1	28.9	NT*

NT* Sample not tested for colloids

May 6, 2014

REVIEWED BY:  Jason Thompson, C.E.T.



LABORATORY
 199 Henlow Bay
 Winnipeg MB R3Y 1G4
 Tel: (204) 488-6999

**PARTICLE SIZE ANALYSIS
 ASTM D422**

Dillon Consulting Ltd.
 1558 Wilson Place
 Winnipeg, Manitoba
 R3T 0Y4

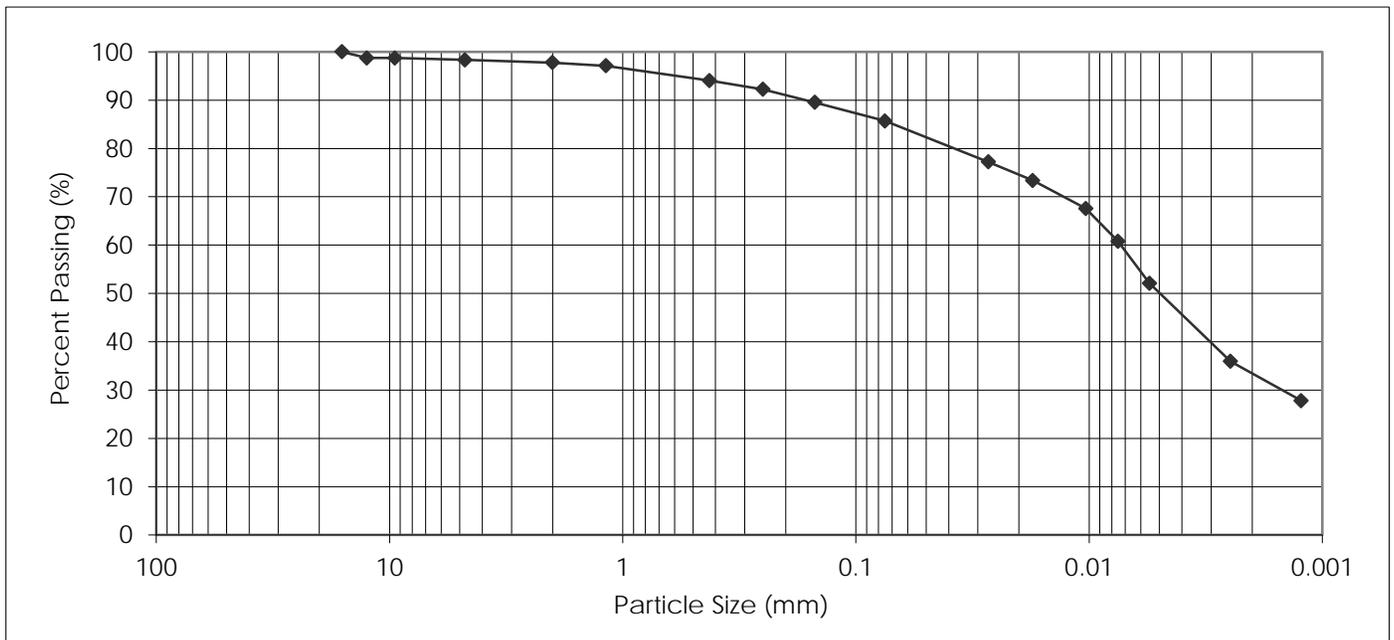
PROJECT: Wawanesa Wastewater
 Treatment Study

Attention: Rob Buenaventura

PROJECT NO.: 123311175

SAMPLED BY: Client
 SAMPLE ID: TH3-S2 @ 5'

DATE RECEIVED: April 23, 2014
 TESTED BY: Larry Presado



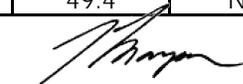
PARTICLE SIZE	PERCENT PASSING
37.50 mm	100.0
25.00 mm	100.0
19.00 mm	100.0
16.00 mm	100.0
12.50 mm	98.7
9.50 mm	98.7
4.75 mm	98.3
2.00 mm	97.8

PARTICLE SIZE	PERCENT PASSING
1.18 mm	97.1
0.425 mm	94.1
0.250 mm	92.2
0.150 mm	89.5
0.075 mm	85.7
0.005 mm	49.4
0.002 mm	32.8
0.001 mm	NT*

Gravel, % 75 to 4.75 mm	Sand, %			Silt, % <0.075 to 0.005 mm	Clay, % <0.005 mm	Colloids, % < 0.001 mm
	Coarse <4.75 to 2.0 mm	Medium <2.0 to 0.425 mm	Fine <0.425 to 0.075 mm			
1.7	0.5	3.7	8.4	36.3	49.4	NT*

NT* Sample not tested for colloids

May 5, 2014

REVIEWED BY:  Jason Thompson, C.E.T.



LABORATORY
 199 Henlow Bay
 Winnipeg MB R3Y 1G4
 Tel: (204) 488-6999

PARTICLE SIZE ANALYSIS
ASTM D422

Dillon Consulting Ltd.
 1558 Wilson Place
 Winnipeg, Manitoba
 R3T 0Y4

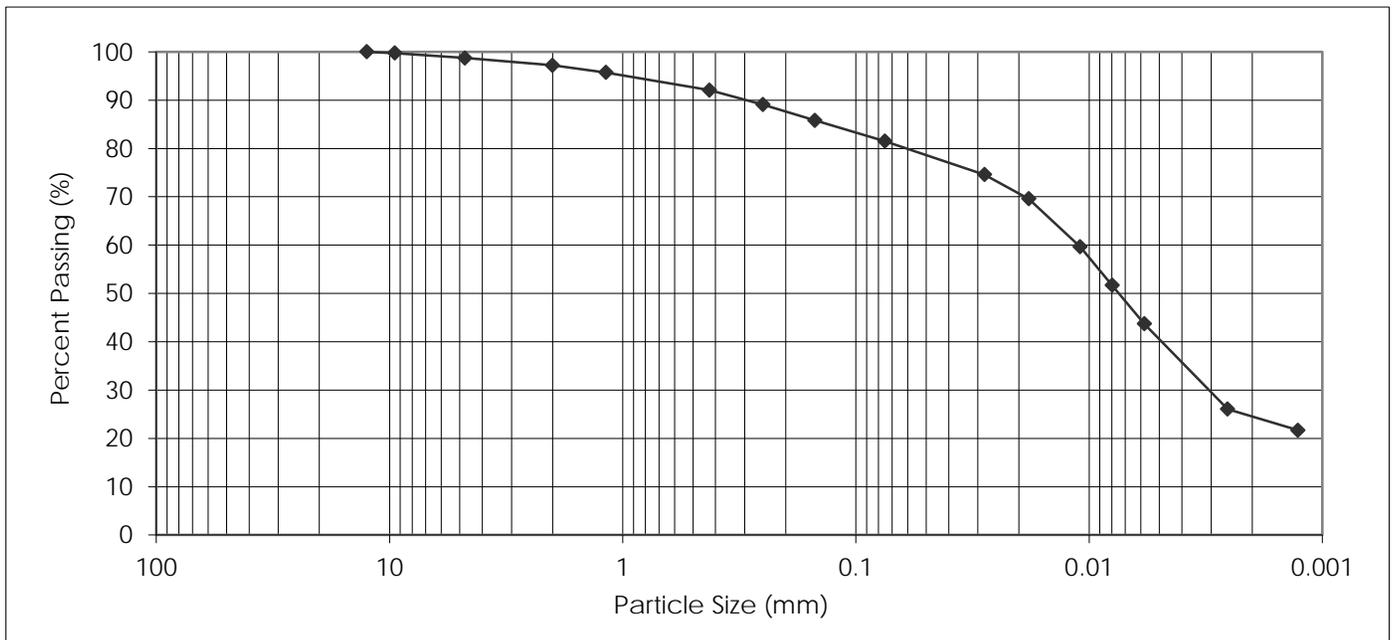
PROJECT: Wawanesa Wastewater
 Treatment Study

Attention: Rob Buenaventura

PROJECT NO.: 123311175

SAMPLED BY: Client
 SAMPLE ID: TH3 - S3 @ 5' to 7'

DATE RECEIVED: April 23, 2014
 TESTED BY: Larry Presado



PARTICLE SIZE	PERCENT PASSING	PARTICLE SIZE	PERCENT PASSING
37.50 mm	100.0	1.18 mm	95.7
25.00 mm	100.0	0.425 mm	92.1
19.00 mm	100.0	0.250 mm	89.1
16.00 mm	100.0	0.150 mm	85.8
12.50 mm	100.0	0.075 mm	81.5
9.50 mm	99.8	0.005 mm	39.4
4.75 mm	98.7	0.002 mm	24.2
2.00 mm	97.2	0.001 mm	NT*

Gravel, % 75 to 4.75 mm	Sand, %			Silt, % <0.075 to 0.005 mm	Clay, % <0.005 mm	Colloids, % < 0.001 mm
	Coarse <4.75 to 2.0 mm	Medium <2.0 to 0.425 mm	Fine <0.425 to 0.075 mm			
1.3	1.5	5.1	10.6	42.1	39.4	NT*

NT* Sample not tested for colloids

May 6, 2014

REVIEWED BY:  Jason Thompson, C.E.T.



LABORATORY
 199 Henlow Bay
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PARTICLE SIZE ANALYSIS
ASTM D422

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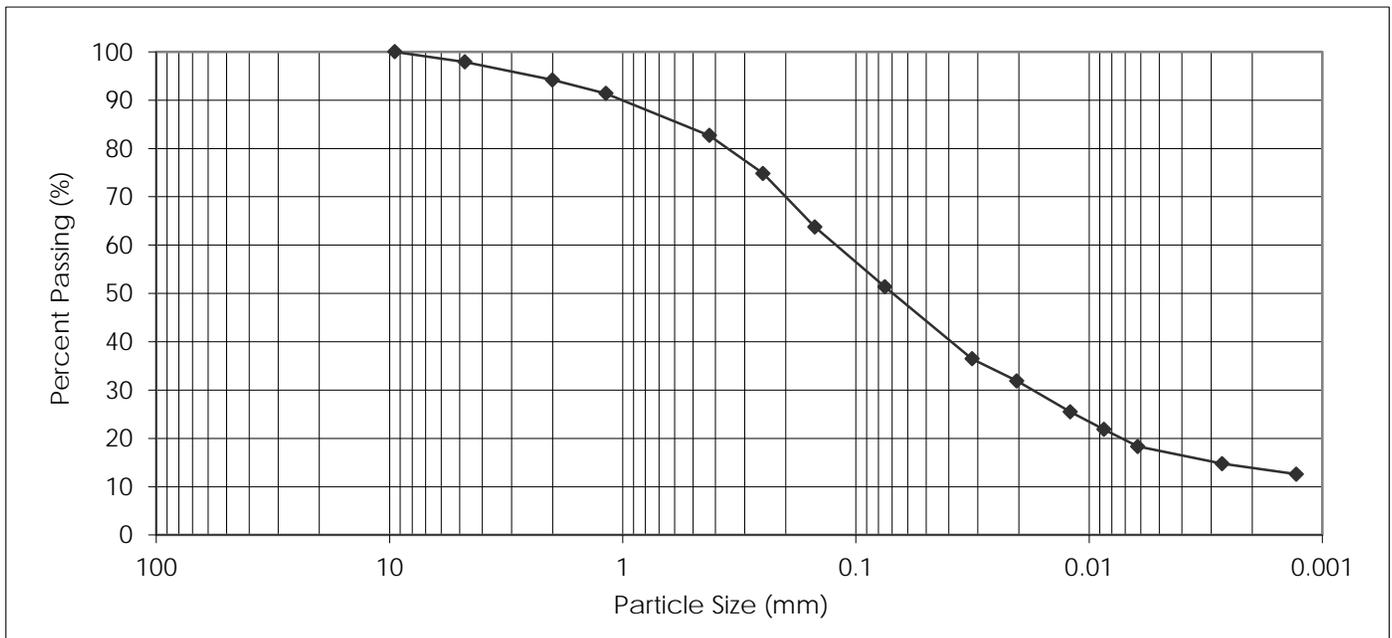
PROJECT: Wawanesa Wastewater
 Treatment Study

Attention: Rob Buenaventura

PROJECT NO.: 123311175

SAMPLED BY: Client
 SAMPLE ID: TH5- S3 @ 13'

DATE RECEIVED: April 23, 2014
 TESTED BY: Larry Presado



PARTICLE SIZE	PERCENT PASSING	PARTICLE SIZE	PERCENT PASSING
37.50 mm	100.0	1.18 mm	91.4
25.00 mm	100.0	0.425 mm	82.7
19.00 mm	100.0	0.250 mm	74.8
16.00 mm	100.0	0.150 mm	63.8
12.50 mm	100.0	0.075 mm	51.3
9.50 mm	100.0	0.005 mm	17.1
4.75 mm	97.9	0.002 mm	13.7
2.00 mm	94.2	0.001 mm	NT*

Gravel, % 75 to 4.75 mm	Sand, %			Silt, % <0.075 to 0.005 mm	Clay, % <0.005 mm	Colloids, % < 0.001 mm
	Coarse <4.75 to 2.0 mm	Medium <2.0 to 0.425 mm	Fine <0.425 to 0.075 mm			
2.1	3.7	11.5	31.4	34.2	17.1	NT*

NT* Sample not tested for colloids

May 5, 2014

REVIEWED BY: Jason Thompson, C.E.T.



LABORATORY
 199 Henlow Bay
 Winnipeg MB R3Y 1G4
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**PARTICLE SIZE ANALYSIS
 ASTM D422**

Dillon Consulting Ltd.
 1558 Wilson Place
 Winnipeg, Manitoba
 R3T 0Y4

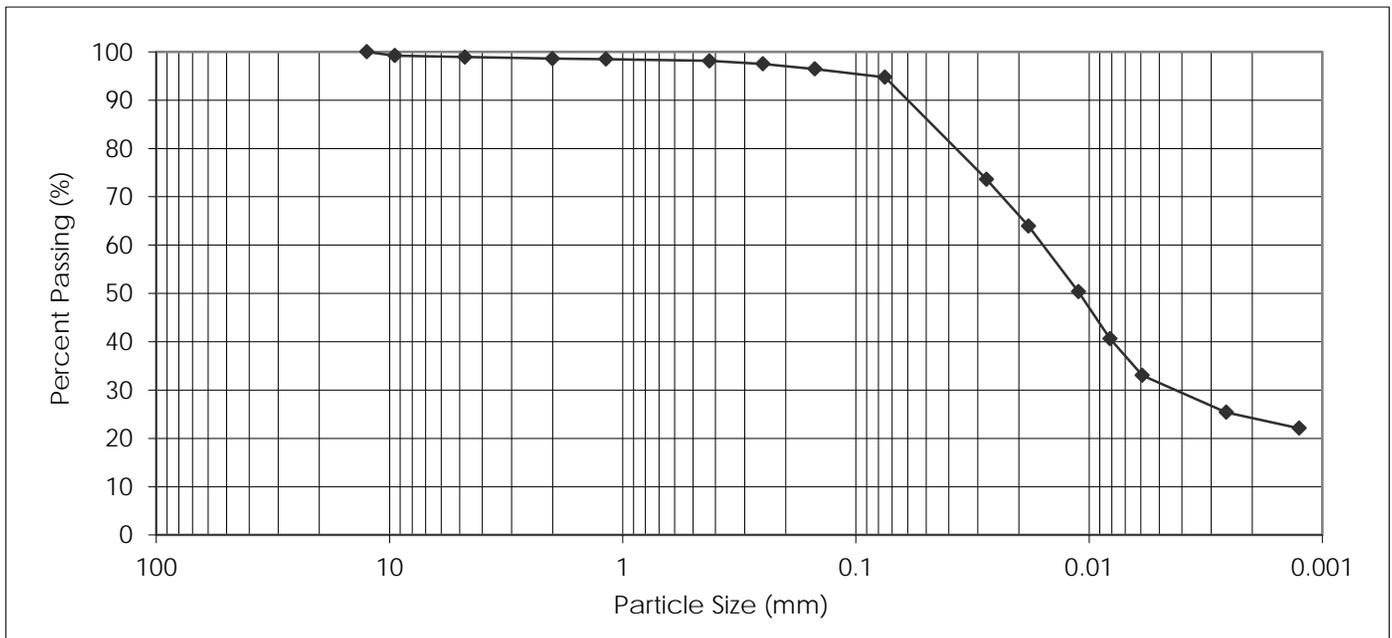
PROJECT: Wawanesa Wastewater
 Treatment Study

Attention: Rob Buenaventura

PROJECT NO.: 123311175

SAMPLED BY: Client
 SAMPLE ID: TH6- S1 @ 4'

DATE RECEIVED: April 23, 2014
 TESTED BY: Larry Presado



PARTICLE SIZE	PERCENT PASSING
37.50 mm	100.0
25.00 mm	100.0
19.00 mm	100.0
16.00 mm	100.0
12.50 mm	100.0
9.50 mm	99.2
4.75 mm	98.9
2.00 mm	98.6

PARTICLE SIZE	PERCENT PASSING
1.18 mm	98.5
0.425 mm	98.1
0.250 mm	97.5
0.150 mm	96.5
0.075 mm	94.8
0.005 mm	30.9
0.002 mm	23.9
0.001 mm	NT*

Gravel, % 75 to 4.75 mm	Sand, %			Silt, % <0.075 to 0.005 mm	Clay, % <0.005 mm	Colloids, % < 0.001 mm
	Coarse <4.75 to 2.0 mm	Medium <2.0 to 0.425 mm	Fine <0.425 to 0.075 mm			
1.1	0.3	0.5	3.3	63.9	30.9	NT*

NT* Sample not tested for colloids

May 5, 2014

REVIEWED BY:  Jason Thompson, C.E.T.



LABORATORY
 199 Henlow Bay
 Winnipeg MB R3Y 1G4
 Tel: (204) 488-6999

**HYDRAULIC CONDUCTIVITY
 ASTM D5084**

Dillon Consulting Limited
 1558 Wilson Place
 Winnipeg, Manitoba
 R3T 0Y4

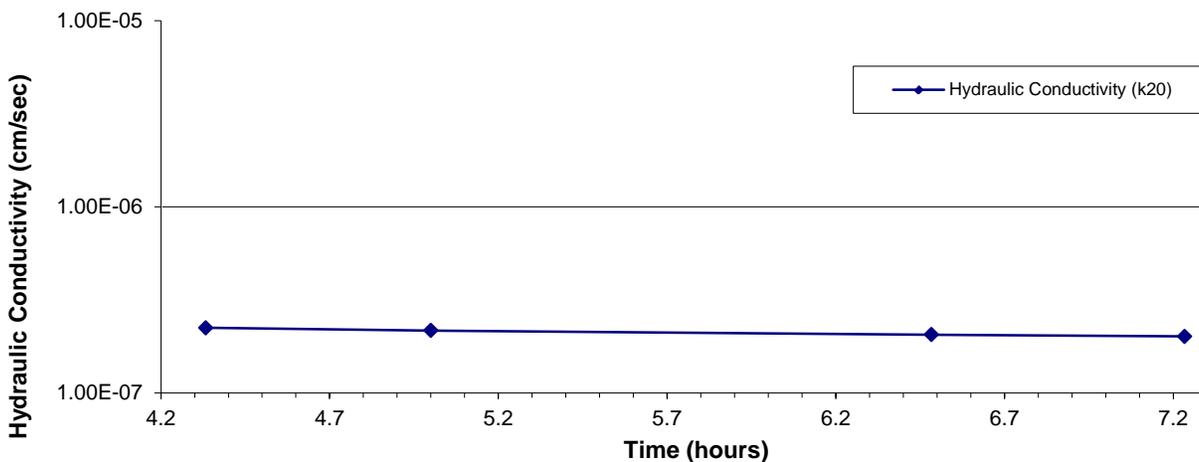
PROJECT: Wawanessa
 Wastewater
 Treatment Study

Attention: Rob Buenaventura

PROJECT NO.: 123311175

SAMPLE I.D.: TH3-S3 @ 1.5 to 2.1 m
SOIL DESCRIPTION: tan, dense, moist, low plasticity silt till with some clay
 some fine to coarse sand, trace fine gravel
DATE TESTED: April 25 to May 6, 2014
CONFINING PRESSURE (kPa): 137.9
EFFECTIVE SATURATION STRESS (kPa): 34.5
ASSUMED SPECIFIC GRAVITY: 2.71
HYDRAULIC GRADIENT: 18.9
TYPE OF PERMEANT LIQUID: De-aired Water
HYDRAULIC CONDUCTIVITY, "k" (cm/s): 2.3E-07
HYDRAULIC CONDUCTIVITY, "k₂₀" (cm/s): 2.1E-07

	Height (mm)	Diameter (mm)	Wet Mass (g)	Dry Density (g/cm ³)	Water Content (%)	Saturation (%)
Initial Reading	79.5	72.5	665.0	1.787	13.5	70.8
Final Reading	78.5	72.5	672.6	1.721	20.6	97.3



May 13, 2014

REVIEWED BY:  Jason Thompson, C.E.T.



LABORATORY
 199 Henlow Bay
 Winnipeg MB R3Y 1G4
 Tel: (204) 488-6999

**HYDRAULIC CONDUCTIVITY
 ASTM D5084**

Dillon Consulting Limited
 1558 Wilson Place
 Winnipeg, Manitoba
 R3T 0Y4

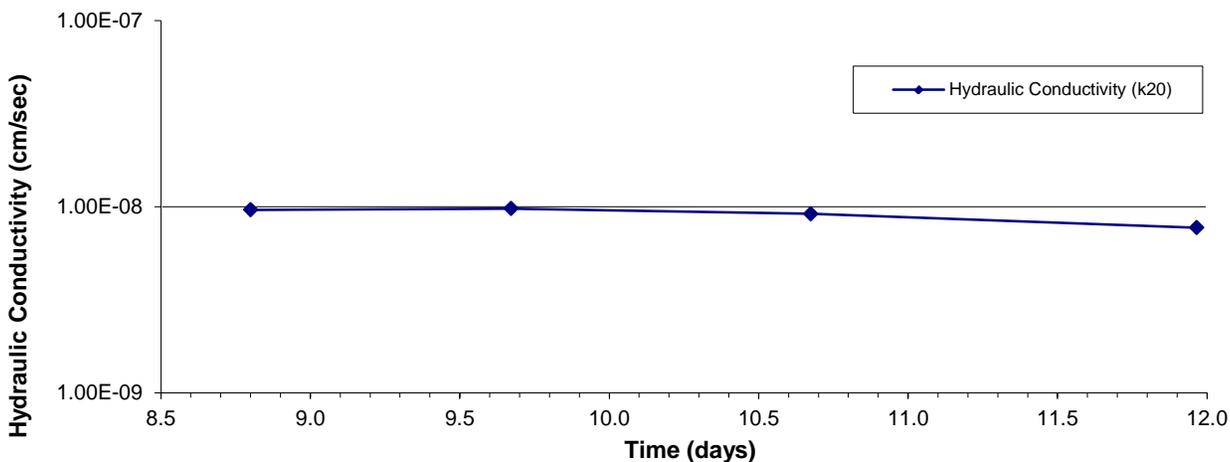
PROJECT: Wawanessa
 Wastewater
 Treatment Study

Attention: Rob Buenaventura

PROJECT NO.: 123311175

SAMPLE I.D.: TH6-S2 @ 1.5 to 2.1 m
SOIL DESCRIPTION: tan, dense, moist, low plasticity silt till with some clay trace silt and trace fine to coarse gravel
DATE TESTED: April 25 to May 7, 2014
CONFINING PRESSURE (kPa): 137.9
EFFECTIVE SATURATION STRESS (kPa): 34.5
ASSUMED SPECIFIC GRAVITY: 2.71
HYDRAULIC GRADIENT: 18.8
TYPE OF PERMEANT LIQUID: De-aired Water
HYDRAULIC CONDUCTIVITY, "k" (cm/s): 9.7E-09
HYDRAULIC CONDUCTIVITY, "k₂₀" (cm/s): 9.1E-09

	Height (mm)	Diameter (mm)	Wet Mass (g)	Dry Density (g/cm ³)	Water Content (%)	Saturation (%)
Initial Reading	79.5	71.9	652.4	1.638	23.4	96.8
Final Reading	79.0	72.1	659.1	1.638	24.9	103.1



Note: Sample was compacted into 70 mm mold using the compactive effort outlined in standard test method ASTM D698, Method C prior to testing

May 13, 2014

REVIEWED BY:  Jason Thompson, C.E.T.

Reporting of these test results constitutes a testing service only. Engineering interpretation or evaluation of the test results is provided only on written request. The data presented above is for the sole use of the client stipulated above. Stantec is not responsible, nor can be held liable, for the use of this report by any other party, with or without the knowledge of Stantec.

APPENDIX D

Selected Site Photographs



Existing sewage lift station location



Existing wastewater treatment building



Commercial Street west of PR 340 looking east



Lagoon site access along Commercial Street looking east



Lagoon site - view from NW to SE corners



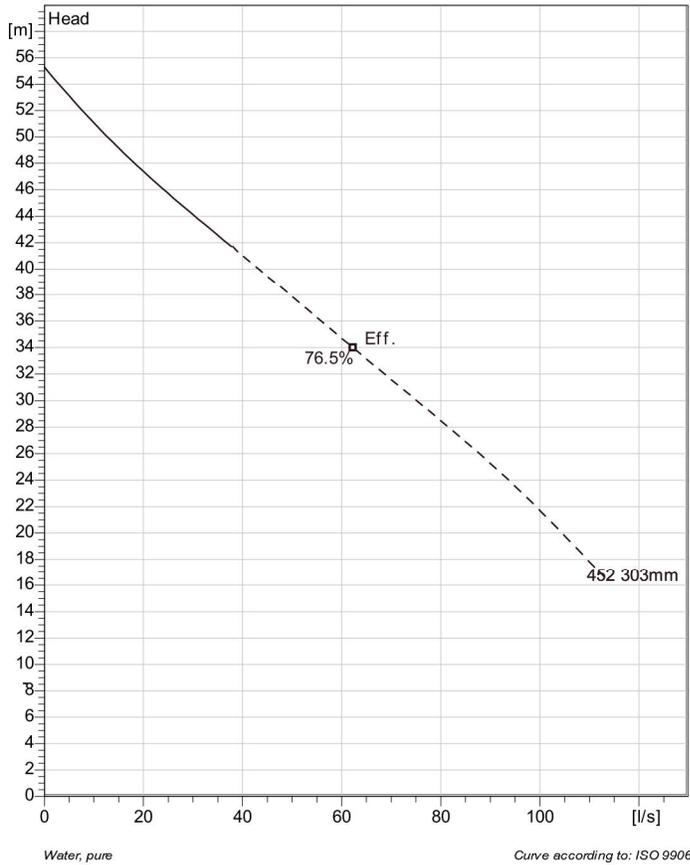
Existing drainage feature east of lagoon discharge location

APPENDIX E

Pump Data Sheet

NP 3171 HT 3~ 452

Technical specification



Note: Picture might not correspond to the current configuration.

General

Patented self cleaning semi-open channel impeller, ideal for pumping in most waste water applications. Possible to be upgraded with Guide-pin® for even better clogging resistance. Modular based design with high adaptation grade.

Pump

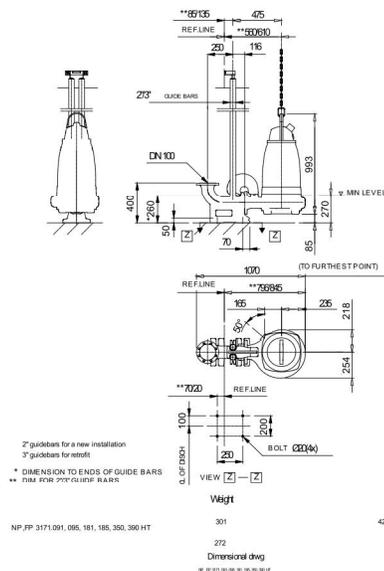
Impeller material	Grey cast Iron
Outlet width	100 mm
Suction Flange Diameter	100 mm
Impeller diameter	303 mm
Number of blades	2

Motor

Motor #	N3171.181 25-17-4AA-W 30hp
Stator variant	6
Frequency	60 Hz
Rated voltage	600 V
Number of poles	4
Phases	3~
Rated power	22.4 kW
Rated current	29 A
Starting current	194 A
Rated speed	1760 1/min
Power factor	
1/1 Load	0.84
3/4 Load	0.79
1/2 Load	0.67
Efficiency	
1/1 Load	89.0 %
3/4 Load	90.0 %
1/2 Load	90.0 %

Configuration

Installation: P - Semi permanent, Wet



Project	Project ID	Created by	Created on	Last update
			2014-05-27	

NP 3171 HT 3~ 452

Performance curve

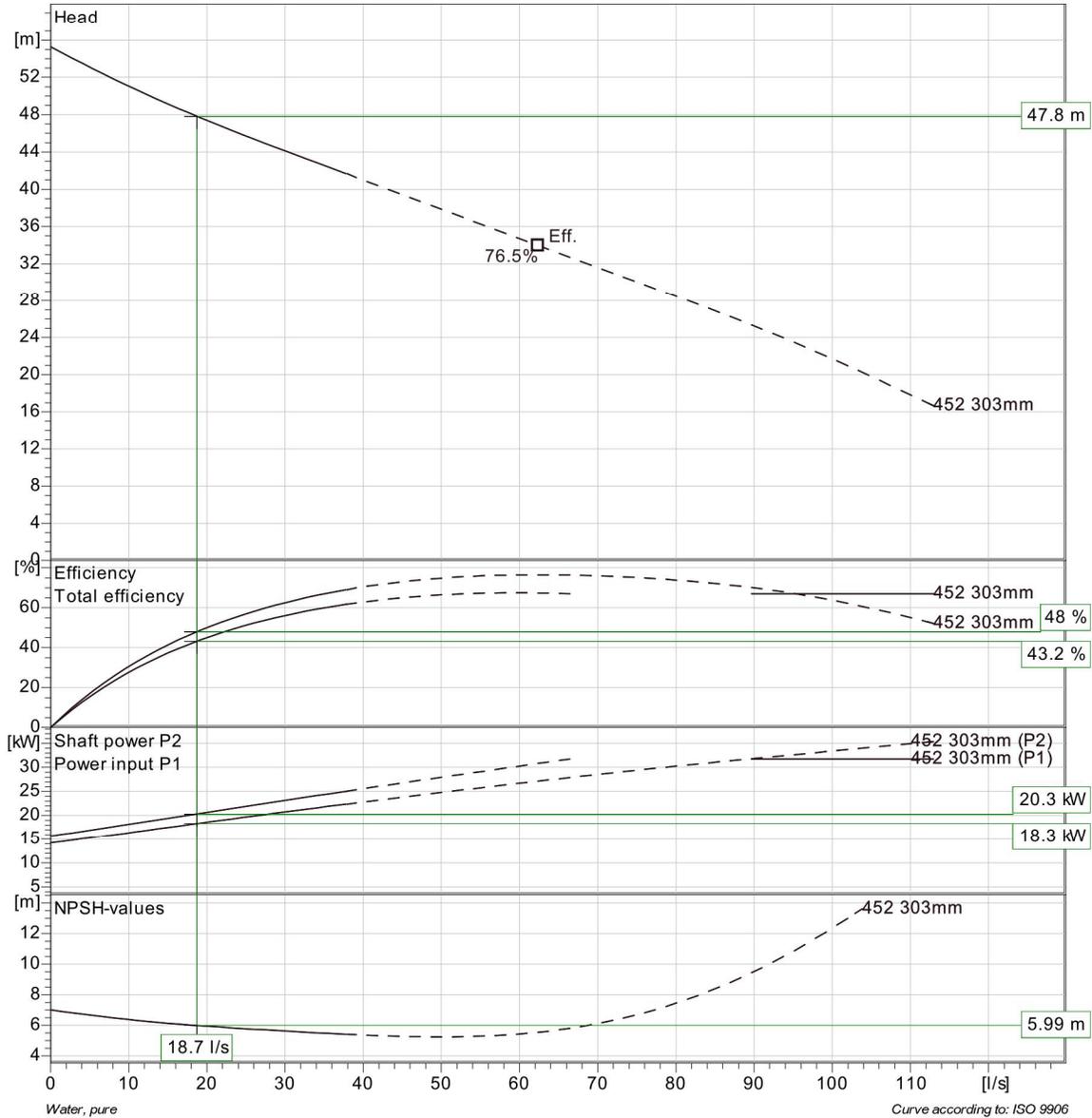
Pump

Outlet width	100 mm
Suction Flange Diameter	100 mm
Impeller diameter	303 mm
Number of blades	2

Motor

Motor #	N3171.181 25-17-4AA-W 30hp
Stator variant	6
Frequency	60 Hz
Rated voltage	600 V
Number of poles	4
Phases	3~
Rated power	22.4 kW
Rated current	29 A
Starting current	194 A
Rated speed	1760 1/min

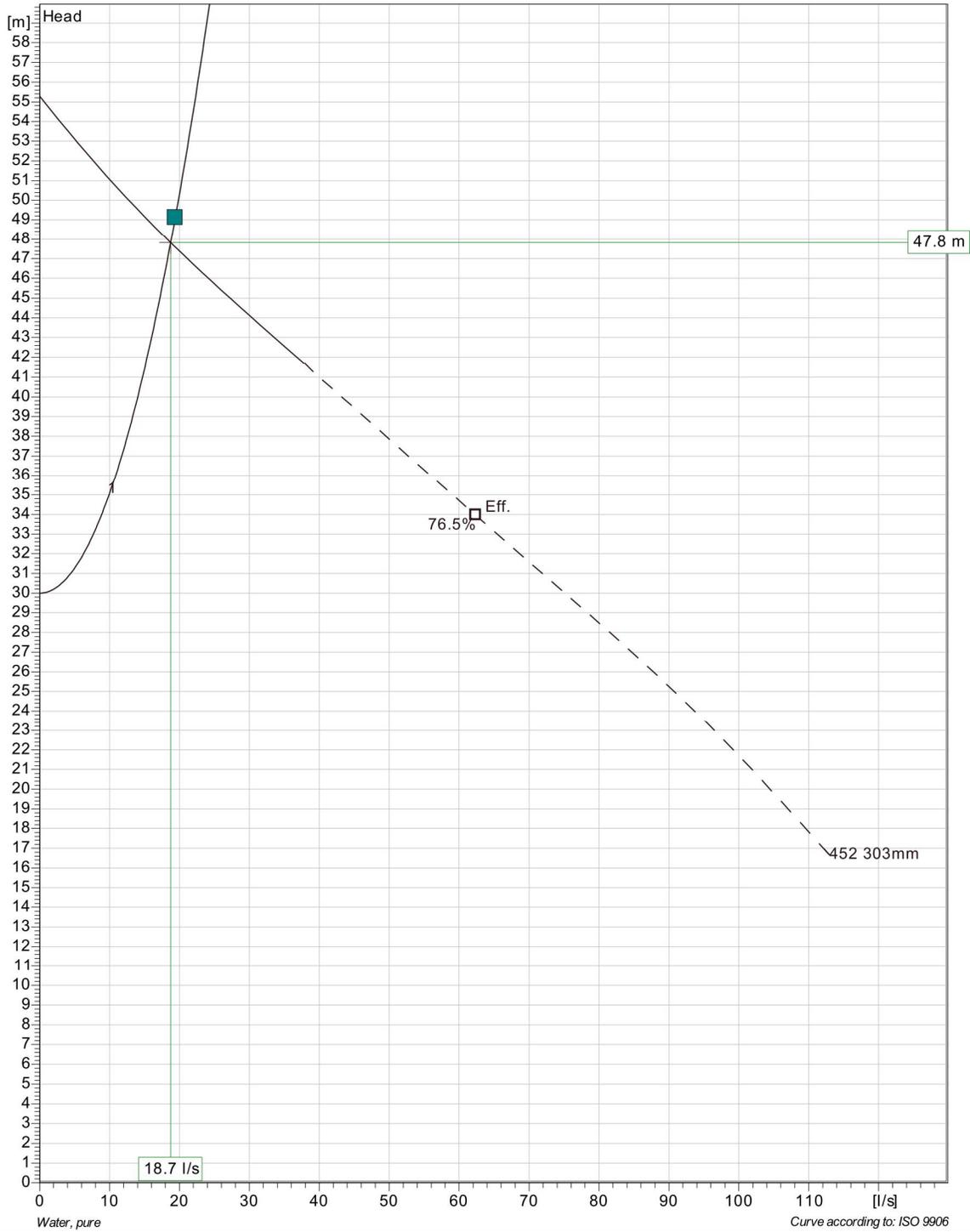
Power factor	
1/1 Load	0.84
3/4 Load	0.79
1/2 Load	0.67
Efficiency	
1/1 Load	89.0 %
3/4 Load	90.0 %
1/2 Load	90.0 %



Project	Project ID	Created by	Created on 2014-05-27	Last update
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NP 3171 HT 3~ 452

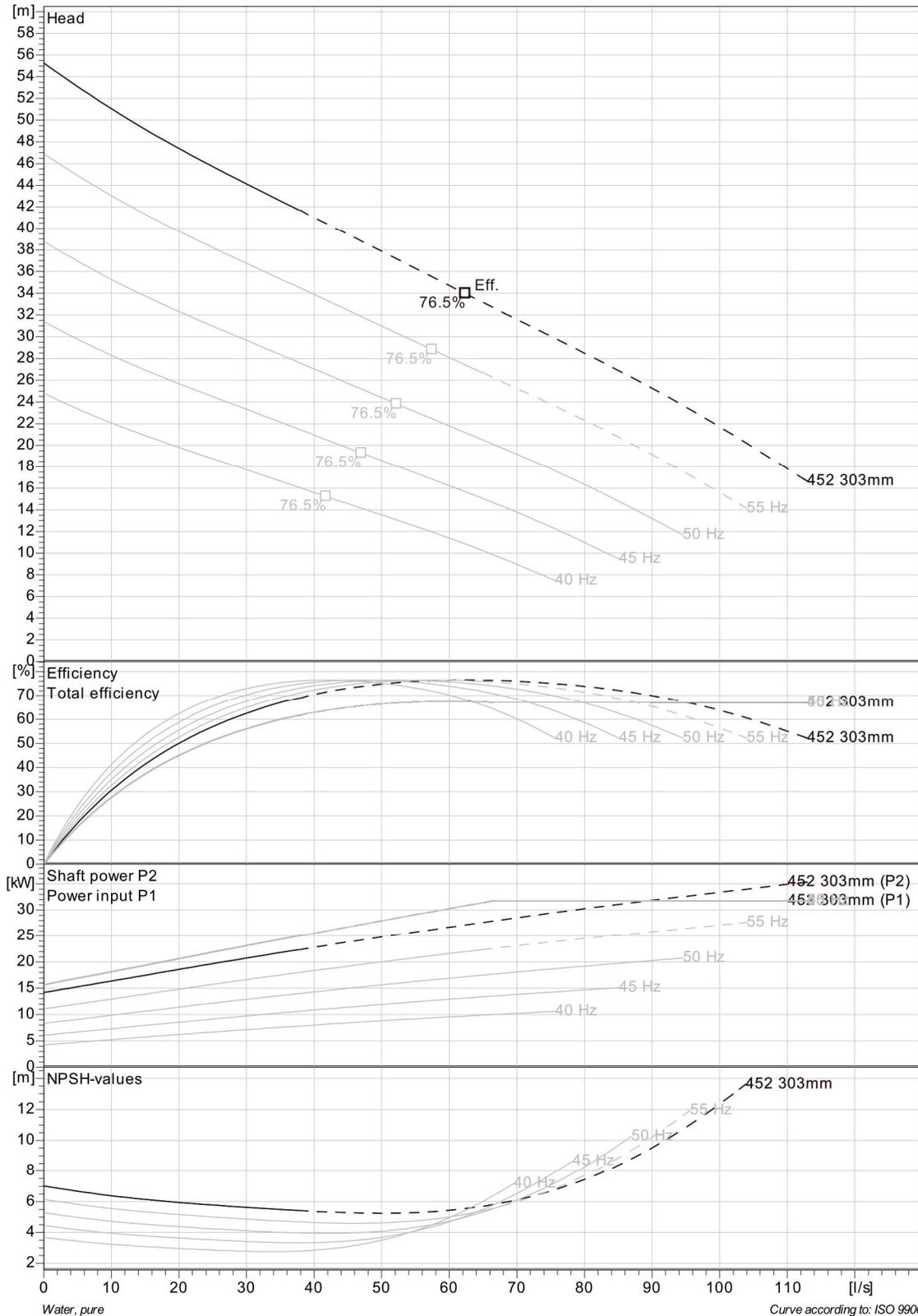
Duty Analysis



Pumps running /System	Individual pump			Total					
	Flow	Head	Shaft power	Flow	Head	Shaft power	Hyd. eff.	Specific energy	NPSHre
1	18.7 l/s	47.8 m	18.3 kW	18.7 l/s	47.8 m	18.3 kW	48 %	0.301 kWh/m ³	5.99 m

Project	Project ID	Created by	Created on 2014-05-27	Last update
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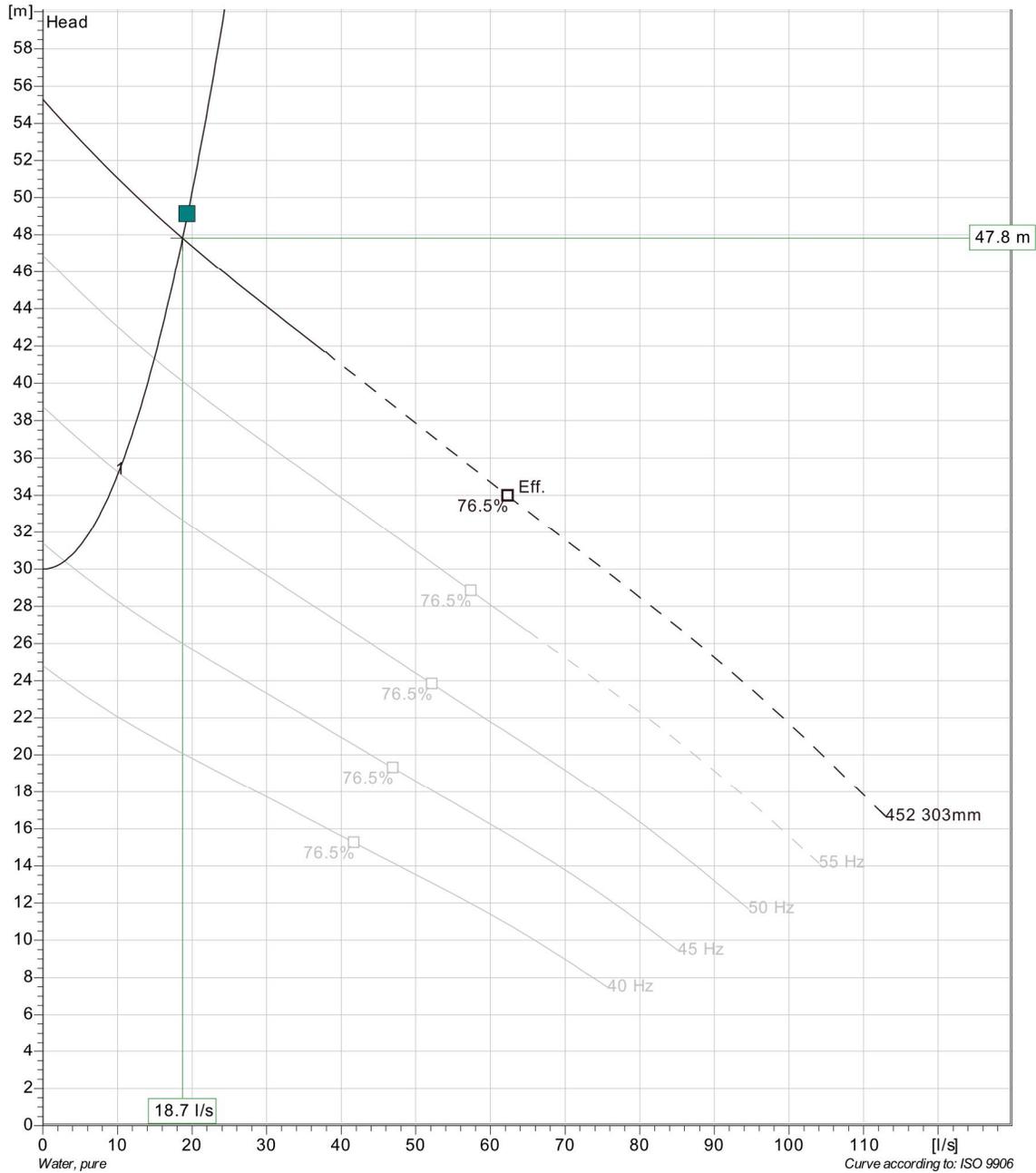
NP 3171 HT 3~ 452
VFD Curve



Project	Project ID	Created by	Created on	Last update
			2014-05-27	

NP 3171 HT 3~ 452

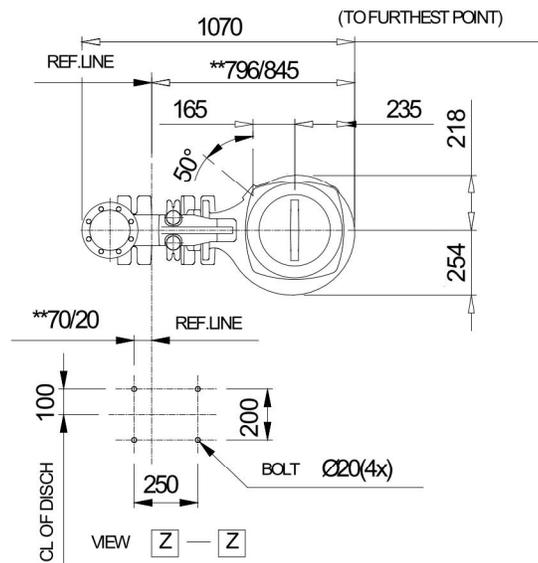
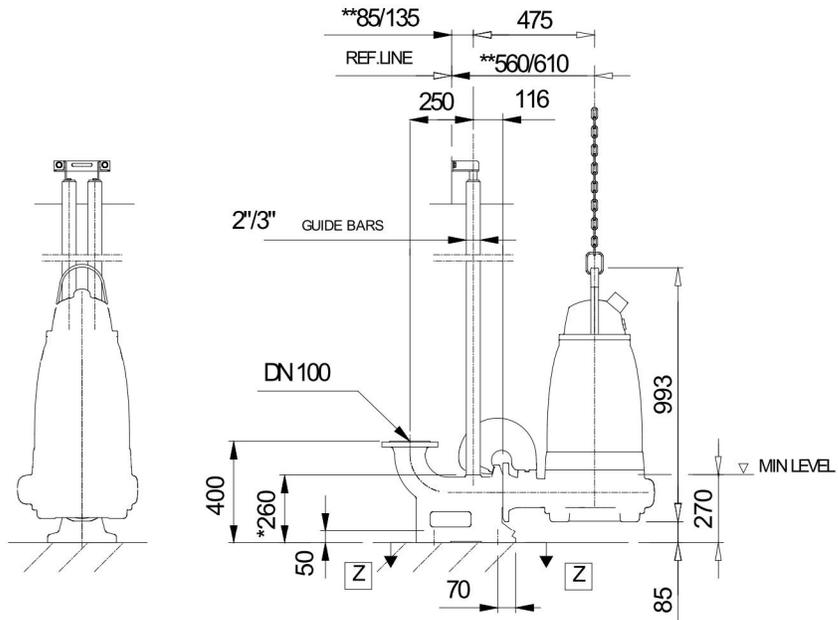
VFD Analysis



Pumps running /System	Individual pump			Total						
	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hyd eff.	Specific energy	NPSHre
1	60 Hz	18.7 l/s	47.8 m	18.3 kW	18.7 l/s	47.8 m	18.3 kW	48 %	0.301 kWh/m ³	5.99 m
1	55 Hz	14.9 l/s	41.3 m	13.9 kW	14.9 l/s	41.3 m	13.9 kW	43.7 %	0.36 kWh/m ³	5.34 m
1	50 Hz	10.1 l/s	35.2 m	9.89 kW	10.1 l/s	35.2 m	9.89 kW	35.5 %	0.497 kWh/m ³	4.72 m
1	45 Hz	2.93 l/s	30.4 m	6.44 kW	2.93 l/s	30.4 m	6.44 kW	13.6 %	1.56 kWh/m ³	4.29 m
1	40 Hz									

Project	Project ID	Created by	Created on	Last update
			2014-05-27	

NP 3171 HT 3~ 452
Dimensional drawing



2' guidebars for a new installation
3' guidebars for retrofit
* DIMENSION TO ENDS OF GUIDE BARS
** DIM. FOR 2 2/3" GUIDE BARS

Weight

301

42

272

Dimensional chvg

NP,FP 3171.091,095,181,185,350,390 HT

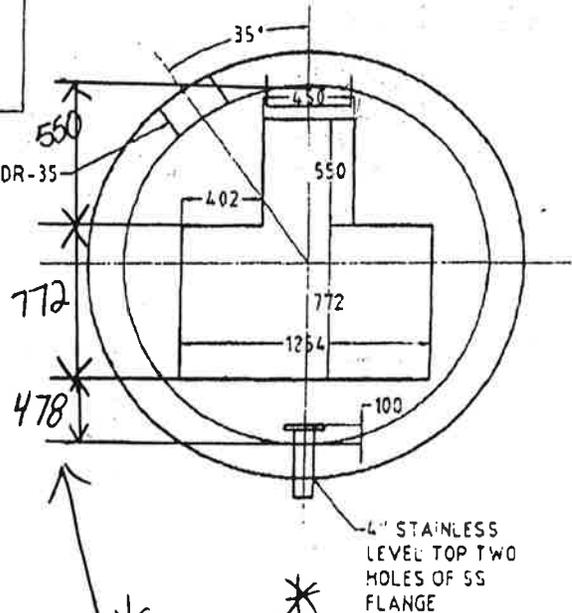
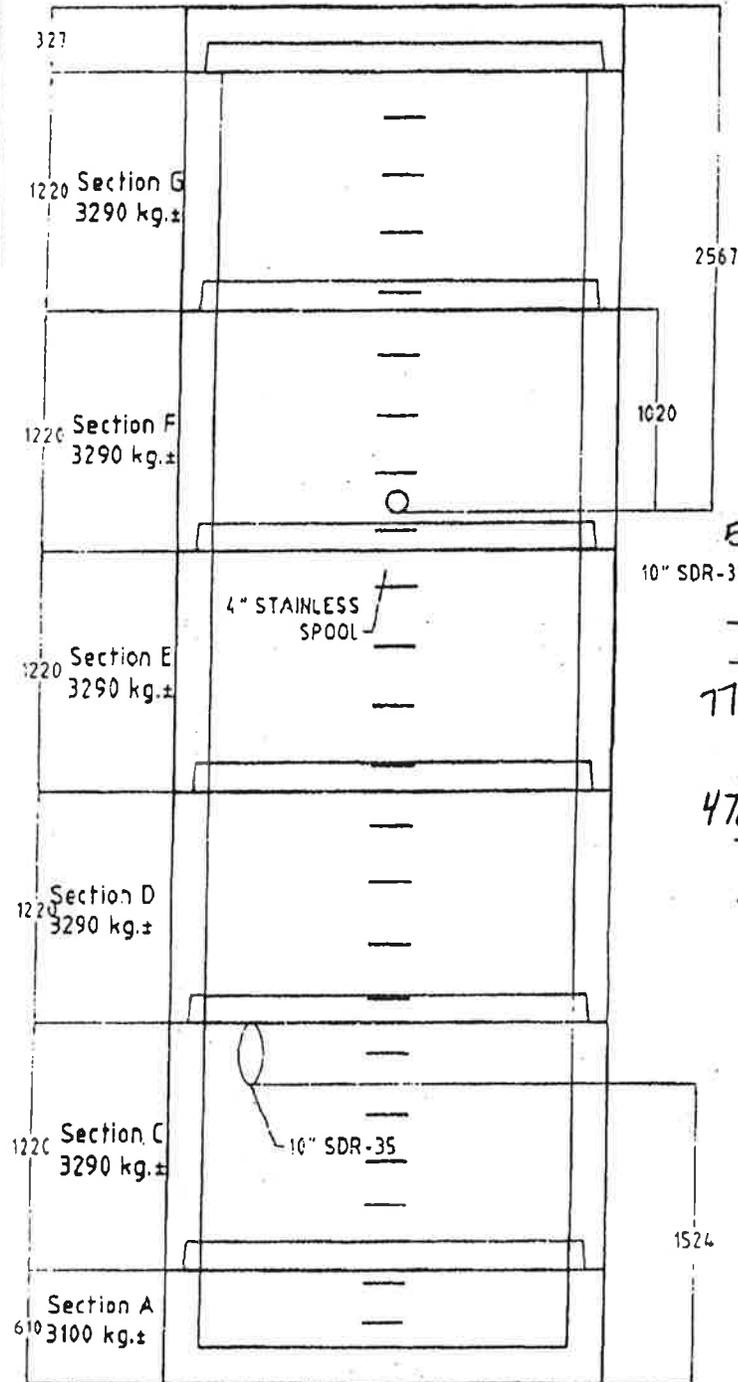
NP,FP 3171.091, 095, 181, 185, 350, 390 HT

Project	Project ID	Created by	Created on	Last update
			2014-05-27	

APPENDIX F

Existing Lift Station Drawings

To: Jason



* NOTE *
(478)

4" STAINLESS
LEVEL TOP TWO
HOLES OF SS
FLANGE

Project WAWANESA

Customer
CONTEC PROJECTS

1800φ
Lift Station



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Spec. ASTM C76M / C478

Scale
NTS

Date
MAY 24, 2007

Drawn by
GAVEL