Hubicki, Matthew S (DEC)

From: Hubicki, Matthew S (DEC)
Sent: Friday, May 18, 2018 10:31 AM
To: 'Patrick McHugh'
Cc: Crosby, David (DEC); Deyette, Scott (DEC); Marc Godick; Barry White; Christopher Capece; Stephen Grens; Stephen Schmid
Subject: RE: C360099 - Polychrome West Submittal #15 - ISS Mix Design Summary

Good Morning Patrick – I've reviewed this design mix summary for ISS Units and auger mixing (pile modifications). Looks like design criteria meets or exceeds for 1 X 10-6 (permeability) and 50 psi (compressive strength) for both.

I have no comments further on this ISS Mix Design Summary.

Thanks
Matt

Matthew Hubicki
Project Manager, Remedial Bureau C
Division of Environmental Remediation

New York State Department of Environmental Conservation
625 Broadway, Albany, NY 12233-7014
P: 518-402-9605 | F: 518-402-9679 | matthew.hubicki@dec.ny.gov

www.dec.ny.gov |

From: Patrick McHugh [mailto:pmchugh@akrf.com]
Sent: Thursday, May 17, 2018 11:14 AM
To: Hubicki, Matthew S (DEC) <matthew.hubicki@dec.ny.gov>
Cc: Crosby, David (DEC) <david.crosby@dec.ny.gov>; Deyette, Scott (DEC) <scott.deyette@dec.ny.gov>; Marc Godick <mgodick@akrf.com>; Barry White <barry_white@avalonbay.com>; Christopher Capece <Christopher_Capece@avalonbay.com>; Stephen Grens <sgrens@akrf.com>; Stephen Schmid <sschmid@akrf.com>
Subject: C360099 - Polychrome West Submittal #15 - ISS Mix Design Summary

Good morning Matt,

Attached and for your records and/or review is a short write-up regarding the ISS Mix Design for the remedial activities at the Polychrome West Site prepared by Posillico Environmental's subcontractor Geo-Solutions.

The grout mixture will be the same for the slurry wall, ISS Units and auger mixing (pile modifications); however, the auger mixing will be a 15% addition by weight whereas the ISS Units and slurry wall will be a 20% addition by weight.

Please let us know if you have any questions, comments or concerns.

Thanks,
Pat

--

Patrick McHugh, P.E.
Environmental Engineer
.....

AKRF, INC.
Environmental, Planning, and Engineering Consultants

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P) 914.922.2387 | C) 907.378.8737 | F) 914.949.7559

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Geo-Solutions
Soil and Groundwater Problems Solved

1250 Fifth Avenue, New Kensington, PA 15068
T 724-335-7273 **F** 724-335-7271
www.geo-solutions.com

Thursday, May 10, 2018 17-140

Submitted via e-mail: agomez@posillicoinc.com

Posillico Environmental, Inc.
131-36 20th Avenue
College Point, NY 11356
Tel: 631-390-5745

Attn: Alex Gomez, P.E.

RE: Preliminary Design Mix Study Summary
Soil and Groundwater Remediation - In-Situ Soil Solidification
Polychrome East & West Sites
Yonkers, New York

Dear Mr. Gomez,

The following further describes preliminary data collected through the pre-construction laboratory study performed in support of the design for in-situ soil mixing of impacted soils associated with the Polychrome West and Polychrome East sites located in Yonkers, New York.

The overall objective of this study was to evaluate the results obtained, compare the data to the specified dosage of cementitious material and refine the reagent distribution and grout parameters to be used during full-production. This study specifically evaluated the specified performance criteria of strength and permeability of soil mixed material.

GSI's design mix study was developed to test and optimize addition rates of Blast Furnace Slag and Portland cement with site soil composites to create a mixture that is capable of being constructed, is able to achieve the performance requirements and provides an economical solution for solidification and stabilization of impacted soils. Our design mix study can be broken down into three phases;

1) Phase 1 – Soil Classification
2) Phase 2 – Composite Sample Proportioning
3) Phase 3 – Laboratory Testing and Evaluation

Phase 1 – Soil Classification

Soil classification tests will be performed on samples collected from the designed treatment area(s). The following geotechnical properties are to be evaluated to assist GSI in classifying the materials;

- Moisture content (ASTM D 2216)
- Grainsize Distribution (ASTM D 422)
- Soil pH (EPA 600)
- Organic Content (ASTM D 2974)

Laboratory data sheets can be found in **Appendix A**.

Phase 2 – Composite Sample Preparation

Samples obtained through means selected by others were transported in sealed buckets from the site to GSI's office located in New Kensington, Pennsylvania. Based on visual classification during sample collection, soils were segregated into separate containers by soil type. After GSI is able to evaluate the material, "average" and "worst" case scenario composites were generated. These composites were be based on soil type, review of the boring logs provided in the bid documents, and the potential impact each soil type has on the cement's ability to achieve strength and permeability.

Proportioning of the composite samples was based on the percent of a soil type compared to the total weight of the composite sample. For example, assume an average case composite is made up of 45% silts/clays/organic soils and 65% of the sample is sands. A mix of 2,000 grams of a composite would result in the addition of 900 grams of silts/clays/organic soils from the bag samples and 1,100 grams of sands. The Blast Furnace Slag and Portland cement was then added based on the desired water to cement ratio in the form of a wet grout. No dry addition of cement is anticipated.

Phase 3 – Laboratory Testing and Evaluation

Composite samples for design mix evaluation were be molded into 2-inch by 4-inch plastic molds per ASTM D 1632 with variable dosages of Blast Furnace Slag and Portland cement to achieve the design strength and permeability. Samples were temporarily stored in coolers inside of GSI's laboratory with free water in the bottom of the cooler to control moisture and remain at room temperature. Samples were then tested at ages of 1-day, 3-day, 5-days with a pocket penetrometer to evaluate compressive strength while others were transported to an outside laboratory to be tested for unconfined compressive strength per ASTM D 2166 and hydraulic conductivity per ASTM D 5084 starting at an age of 14-days.

Design Mix Study Objectives

The primary objectives which GSI looks to accomplish from the pre-construction design mix study are;

- Create a mixture that is able to be cost effectively implemented in the field that achieves the specified post-treatment objectives.
- Refine reagent dosage and water to solids ratios to minimize cost and volume of spoils.
- Reduce the likelihood of re-work and change orders based on varying field conditions once full production commences.
- Create a soil-cement material with sufficient strength at an early age to support loading of GSI's equipment, and also accommodate future site use.
- Estimate the potential increase in volume (spoils) resulting from the ISS operation.
- Develop baseline quality control parameters that can be used by GSI throughout full-scale production to ensure a successful installation.

Specific performance criteria have been established for this project, which are presented in the following table. These allow for ideal laboratory conditions, and therefore, GSI will be targeting 1.5 to 2.0 times more than the standards required for UCS and an order of magnitude, or greater, for permeability during full-scale production.

Table 1: Performance Criteria

Parameter	Method	Requirement
Unconfined Compressive Strength	ASTM D 1633	50 psi (minimum)
Hydraulic Conductivity	ASTM D 5084	$1x10^{-7}$ cm/sec

For the purposes of this preliminary design mix study summary, GSI is presenting the data currently available for the specified cement dosage of 20% by weight of soil. A summary of the laboratory testing results is provided below. Laboratory data sheets are included in **Appendix B**.

Table 2: 14-day Sample Results

Mix ID	BFS/PC Ratio	Total Cement (%)	Total Bentonite (%)	Cylinders 2"x4"	Cylinders 3"x6"	UCS 14-days (psi)	Permeability 14-days (cm/sec)
1	50/50	20%	0%	4	2	417.4	$2.4x10^{-8}$
2	50/50	20%	1%	3	3	261.5	$1.3x10^{-7}$
3	70/30	20%	0%	4	2	42.8	$9.9x10^{-7}$

Note: Reagent dosage is based off of weight of soil.

This bench scale study demonstrated that a properly performed soil mixing operation can be used on the Polychrome East and West sites to stabilize the near surface soils in the designated improvement areas. The following conclusions may be drawn from the results:

- The sample materials consist of sands and silts with a fines content of approximately 38%.
- The soil pH is neutral (~7.5) and the organic content is elevated at approximately 4.33%.
- The target strength of 50 psi and permeability of $1x10^{-7}$ cm/sec, along with the GSI's factor for laboratory conditions, can be achieved by mixing the site soils with *20% cement (50/50 blend BFS to PC)*, added via water and cement grout.
- Mix 1 displayed in the table above is GSI's selected mix to take into the field for full production work.
- Careful planning and execution of the work in conjunction with a comprehensive quality control program is always recommended for soil mixing.

Conclusion

If you have any questions or comments regarding the information presented within this document, please do not hesitate to contact me directly. I will be available to discuss any questions you may have.

Sincerely,
Geo-Solutions, Inc.

Vincent A. Spillane
Project Manager

Geo-Solutions
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APPENDIX A

JLT Laboratories, Inc.
Geotechnical, Geosynthetic and Materials Testing and Research

938 South Central Avenue
Canonsburg, Pennsylvania, 15317
Tel: 724-746-4441 Fax: 724-745-4261
e-mail: jboschuk@jltlabs.com
www.jltlabs.com

April 16, 2018
18LS3660.01

GeoSolutions
1250 Fifth Avenue
New Kensington, PA 15068

Attn: Josh Bonetto

RE: GEOTECHNICAL TEST RESULTS
YONKERS, NY 17-140

Dear Mr. Bonetto:

Submitted herein are the results of Sieve, pH and Organic Content performed on one (1) sample identified as 17-140-S1 for the above referenced project. All testing was performed per ASTM Standards while subject to JLT's internal QA / QC and data validation procedures.

We appreciate the opportunity of being of service to you and look forward to working with you again. Should you have any questions, comments or require additional information, please do not hesitate to call. Thank you.

Sincerely,

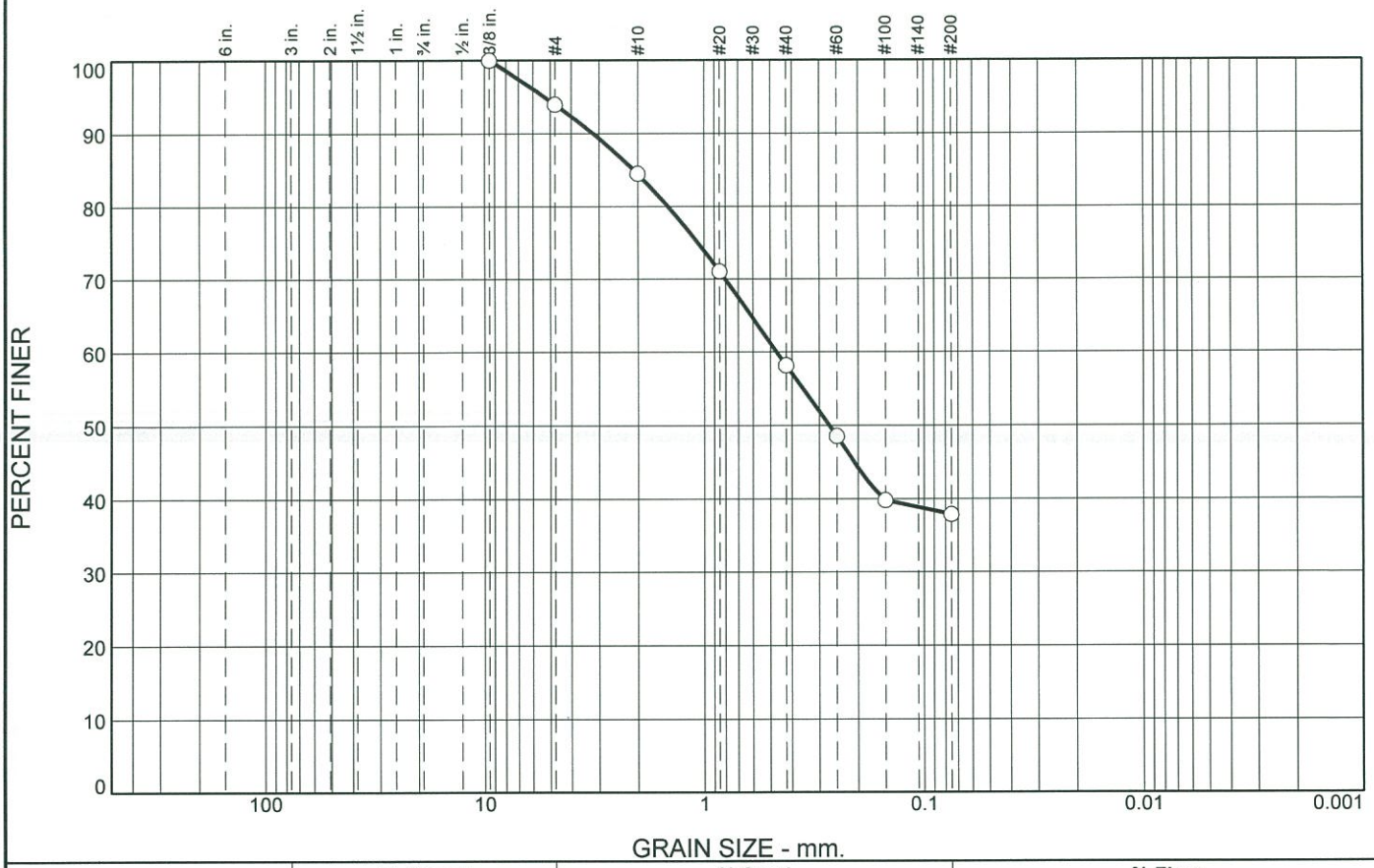
JLT LABORATORIES, INC.

John Boschuk, Jr., P.E., C.F.E.
President

cc: Colm & AP

Enclosures
JB\mlb
\MSWord\letter\1896
Inv# 6912

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	6.0	9.5	26.3	20.3	37.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375	100.0		
#4	94.0		
#10	84.5		
#20	71.1		
#40	58.2		
#60	48.6		
#100	39.8		
#200	37.9		

* (no specification provided)

Material Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 3.1782 D_{85}= 2.0768 D_{60}= 0.4680
D_{50}= 0.2696 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Location: Yonkers (17-140)
Sample Number: 17-140-S1

Date: 04/16/2018

JLT Laboratories, Inc.

Canonsburg, PA

Client: GeoSolutions
Project: Yonkers (17-140)

Project No: 18LS3660.01 **Figure**

Tested By: AE **Checked By:** JB

MOISTURE, ASH AND ORGANIC CONTENT and pH

Organic Content per ASTM D 2974 Methods A and D and pH per ASTM D-4972

Client : GeoSolutions
Project : 17-140 Yonkers NY
ımple ID : Sample 17-140-S1

Job No. : 18LS3660.01
Date : 10/16/2018
Perf'd By : MLB / AE
Chk'd By : JBJr

Bulk Sample Moisture Content = 19.46 %

MOISTURE CONTENT @ 105 Deg "C'

		Rep 1	RFep 2	Rep 3		
Tare ID	Units	2	3	4		
Wet Soil + Tare	grs					
Dry Soil + Tare	grs	121.2629	118.7262	110.6127		
Tare	grs	53.7331	50.5762	56.4965		
Water Loss	grs					
Dry Soil	grs	67.5298	68.1500	54.1162		
Moisture Content	%	0.0000	0.0000	0.0000		

ASH and ORGANIC CONTENT @ 750 Deg "C'

		Rep 1	RFep 2	Rep 3		
Tare ID		2	3	4		
Oven Dry Soil + Tare	grs	121.2629	118.7262	110.6127		
Furnace Dry Soil + Tare	grs	118.4300	115.5692	108.3323		
Tare	grs	53.7331	50.5762	56.4965		
Oven Dry Soil	grs	67.5298	68.1500	54.1162		
Furnace Dry Soil (Ash)	grs	64.6969	64.9930	51.8358		
Ash Content	%	95.8050	95.3676	95.79		
Organic Content	%	4.20	4.63	4.21		

pH Test Data

Rep 1	RFep 2	Rep 3
7.60	7.60	7.50

Due to the limited quantity of material in the split-spoon jars, only one replicate could be performed.

JLT Laboratories, Inc. 938 S. Central Ave, Canonsburg, Pa. 15317 Tel: 724-746-4441 Fax : 724-745-4261

Geo-Solutions
Soil and Groundwater Problems Solved

APPENDIX B

UNCONFINED COMPRESSIVE STRENGTH

ASTM D2166-16 / AASHTO T208-10 (Modified-Peak Load Only) (SOP S-30)

Client:	Geo-Solutions, Inc.	Boring No.:	4/9/18
Client Reference:	Yonkers, NY 17-140	Depth (ft):	17-140-M1
Project No.:	2018-248-001	Sample No.:	15 Day
Lab ID:	2018-248-001-001	Visual Description:	Gray Stabilized Material

INITIAL SAMPLE DIMENSIONS

Length 1 (in):	3.764	Top Dia. (in):	2.008
Length 2 (in):	3.764	Mid. Dia. (in):	2.007
Length 3 (in):	3.763	Bot. Dia. (in):	2.005
Avg. Length (in):	3.764	Area (in^2):	3.163

WATER CONTENT (AFTER TEST)

Tare No.:	3164
Weight of Tare & Wet Sample (g):	376.32
Weight of Tare & Dry Sample (g):	297.72
Weight of Tare (g):	8.11
% Moisture:	27.14

UNIT WEIGHT

Weight of Tube & Wet Sample (g):	368.7	Sample Volume (cm^3):	195.1
Weight of Tube (g):	0.00	Unit Wet Weight (g/cm^3):	1.89
Weight of Wet Sample (g):	368.7	Unit Wet Weight (pcf):	117.95
Avg. Diameter (in):	2.01	Moisture Content (%):	27.14
Avg. Length (in):	3.76	Unit Dry Weight (pcf):	92.77
Avg. Length (cm):	9.56		

ELECTRONIC DEVICE LOAD (lb)	*STRESS (psi)*
1320	**417.38**

Tested By JAC Date 4/24/18 Input Checked By KC Date 4/25/18

DCN: CT-S30A Date: 11/09/09 Revision: 4

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UNCONFINED COMPRESSIVE STRENGTH

ASTM D2166-16 / AASHTO T208-10 (Modified-Peak Load Only) (SOP S-30)

Client:	Geo-Solutions, Inc.	Boring No.:	4/9/18
Client Reference:	Yonkers, NY 17-140	Depth (ft):	17-140-M2
Project No.:	2018-248-001	Sample No.:	15 Day
Lab ID:	2018-248-001-002	Visual Description:	Gray Stabilized Material

INITIAL SAMPLE DIMENSIONS

Length 1 (in):	3.754	Top Dia. (in):	2.007
Length 2 (in):	3.754	Mid. Dia. (in):	2.004
Length 3 (in):	3.754	Bot. Dia. (in):	2.002
Avg. Length (in):	3.754	Area (in^2):	3.155

WATER CONTENT (AFTER TEST)

Tare No.:	3095
Weight of Tare & Wet Sample (g):	370.39
Weight of Tare & Dry Sample (g):	290.35
Weight of Tare (g):	8.16
% Moisture:	28.36

UNIT WEIGHT

Weight of Tube & Wet Sample (g):	362.6	Sample Volume (cm^3):	194.1
Weight of Tube (g):	0.00	Unit Wet Weight (g/cm^3):	1.87
Weight of Wet Sample (g):	362.6	Unit Wet Weight (pcf):	116.57
Avg. Diameter (in):	2.00	Moisture Content (%):	28.36
Avg. Length (in):	3.75	Unit Dry Weight (pcf):	90.81
Avg. Length (cm):	9.54		

ELECTRONIC DEVICE LOAD (lb)	*STRESS (psi)*
825	**261.47**

Tested By JAC Date 4/24/18 Input Checked By KC Date 4/25/18

DCN: CT-S30A Date: 11/09/09 Revision: 4

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UNCONFINED COMPRESSIVE STRENGTH

ASTM D2166-16 / AASHTO T208-10 (Modified-Peak Load Only) (SOP S-30)

Client:	Geo-Solutions, Inc.	Boring No.:	4/9/18
Client Reference:	Yonkers, NY 17-140	Depth (ft):	17-140-M3
Project No.:	2018-248-001	Sample No.:	15 Day
Lab ID:	2018-248-001-003	Visual Description:	Gray Stabilized Material

INITIAL SAMPLE DIMENSIONS

Length 1 (in):	3.748	Top Dia. (in):	2.008
Length 2 (in):	3.746	Mid. Dia. (in):	2.002
Length 3 (in):	3.746	Bot. Dia. (in):	2.000
Avg. Length (in):	3.747	Area (in^2):	3.152

WATER CONTENT (AFTER TEST)

Tare No.:	3242
Weight of Tare & Wet Sample (g):	367.22
Weight of Tare & Dry Sample (g):	283.09
Weight of Tare (g):	8.46
% Moisture:	30.63

UNIT WEIGHT

Weight of Tube & Wet Sample (g):	361.0	Sample Volume (cm^3):	193.5
Weight of Tube (g):	0.00	Unit Wet Weight (g/cm^3):	1.87
Weight of Wet Sample (g):	360.98	Unit Wet Weight (pcf):	116.39
Avg. Diameter (in):	2.00	Moisture Content (%):	30.63
Avg. Length (in):	3.75	Unit Dry Weight (pcf):	89.10
Avg. Length (cm):	9.52		

ELECTRONIC DEVICE LOAD (lb)	*STRESS (psi)*
135	**42.83**

Tested By JAC Date 4/24/18 Input Checked By KC Date 4/25/18

DCN: CT-S30A Date: 11/09/09 Revision: 4

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PERMEABILITY TEST

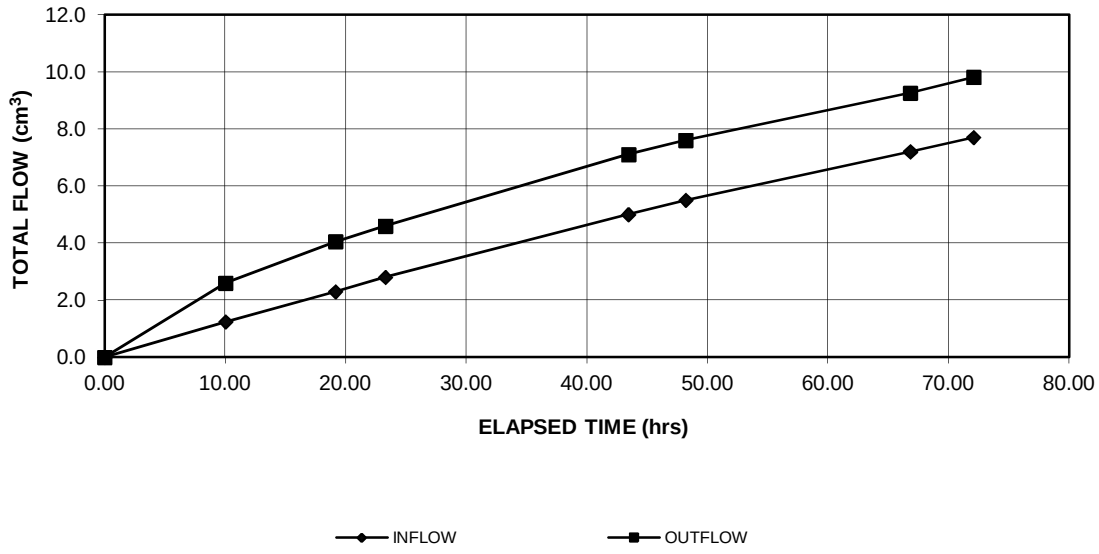
ASTM D 5084-16a

Client:	Geo-Solutions, Inc.	Boring No.:	4/9/18
Client Project:	Yonkers, NY 17-140	Depth (ft):	17-140-M1
Project No.:	2018-248-001	Sample No.:	15 Day
Lab ID No.:	2018-248-001-001	Avg. Conf. Pressure (psi):	6.25

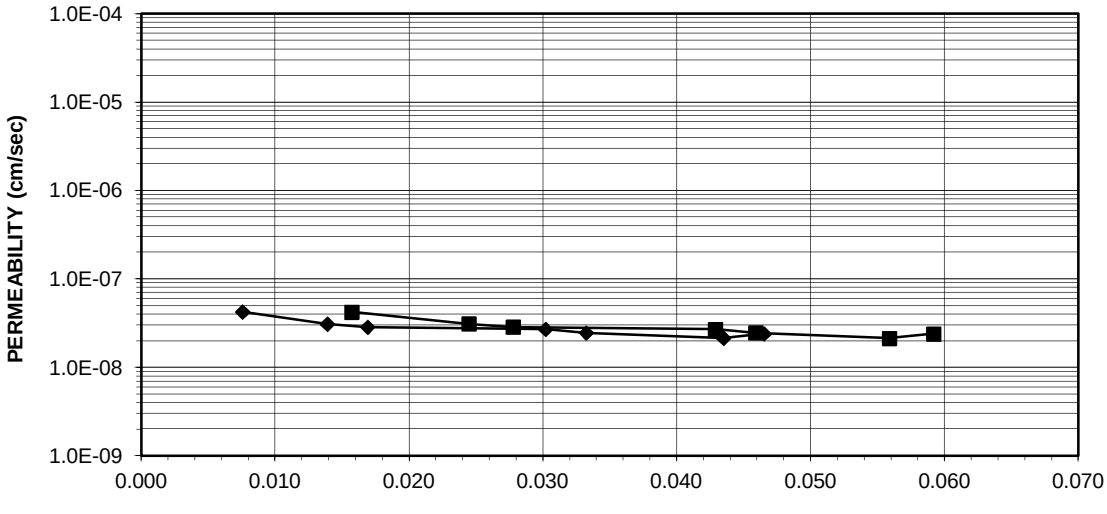
AVERAGE PERMEABILITY = 2.4E-08 cm/sec @ 20°C

AVERAGE PERMEABILITY = 2.4E-10 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: RPE Date: 4/24/18 Checked By: KC Date: 5/7/18

DCN: CT-22 DATE: 1/1/17 REVISION: 11

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PERMEABILITY TEST

ASTM D 5084-16a

Client:	Geo-Solutions, Inc.	Boring No.:	4/9/18
Client Project:	Yonkers, NY 17-140	Depth (ft):	17-140-M1
Project No.:	2018-248-001	Sample No.:	15 Day
Lab ID No.:	2018-248-001-001	Avg. Conf. Pressure (psi):	6.25

Specific Gravity:	2.70	Assumed
Sample Condition:	Previously	Remolded

Visual Description: Dark Gray Stabilized Material

Permeant Type: Deaired Water

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	565	1728
Weight of Tare & Wet Sample (g)	381.56	765.57
Weight of Tare & Dry Sample (g)	315.06	611.93
Weight of Tare (g)	82.40	81.38
Weight of Water (g)	66.50	153.64
Weight of Dry Sample (g)	232.66	530.55
Moisture Content (%)	**28.6**	**29.0**

SPECIMEN:	BEFORE TEST	AFTER TEST
Weight of Tube & Wet Sample (g)	680.76	NA
Weight of Tube (g)	0.00	NA
Weight of Wet Sample (g)	680.76	682.75
Length 1 (in)	3.058	3.035
Length 2 (in)	3.035	3.046
Length 3 (in)	3.040	3.050
Top Diameter (in)	3.024	3.041
Middle Diameter (in)	3.039	3.039
Bottom Diameter (in)	3.038	3.035
Average Length (in)	3.04	3.04
Average Area (in^2)	7.23	7.25
Sample Volume (cm^3)	360.59	361.63
Unit Wet Weight (g/cm^3)	1.89	1.89
Unit Wet Weight (pcf)	117.8	117.9
Unit Dry Weight (pcf)	91.6	91.4
Unit Dry Weight (g/cm^3)	1.47	1.46
Void Ratio, e	0.84	0.84
Porosity, n	0.46	0.46
Pore Volume (cm^3)	164.5	165.5
Total Weight of Sample After Test (g)		691.10

Tested By: RPE Date: 4/24/18 Checked By: KC Date: 5/7/18

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PERMEABILITY TEST

ASTM D 5084-16a

Client:	Geo-Solutions, Inc.	Boring No.:	4/9/18
Client Project:	Yonkers, NY 17-140	Depth (ft):	17-140-M1
Project No.:	2018-248-001	Sample No.:	15 Day
Lab ID No.:	2018-248-001-001	Avg. Conf. Pressure (psi):	6.25

Pressure Heads (Constant)	
Top Cap (psi)	67.5
Bottom Cap (psi)	70.0
Cell (psi)	75.0
Total Pressure Head (cm)	175.8
Hydraulic Gradient	22.73

Final Sample Dimensions	
Sample Length (cm), L	7.73
Sample Diameter (cm)	7.72
Sample Area (cm^2), A	46.78
Inflow Burette Area (cm^2), a-in	0.918
Outflow Burette Area (cm^2), a-out	0.904
B Parameter (%)	97

AVERAGE PERMEABILITY = 2.4E-08 cm/sec @ 20°C

AVERAGE PERMEABILITY = 2.4E-10 m/sec @ 20°C

DATE	TIME		ELAPSED TIME t	TOTAL INFLOW	TOTAL OUTFLOW	TOTAL HEAD h	FLOW (0 flow)	TEMP.	INCREMENTAL PERMEABILITY @ 20°C
(mm/dd/yy)	(hr)	(min)	(hr)	(cm^3)	(cm^3)	(cm)	(1 stop)	(°C)	(cm/sec)
5/01/18	12	44	0.000	0.0	0.0	202.0	0	21.5	NA
5/01/18	22	46	10.033	1.3	2.6	197.7	0	21.5	4.2E-08
5/02/18	7	53	19.150	2.3	4.1	195.0	0	21.3	3.1E-08
5/02/18	12	1	23.283	2.8	4.6	193.9	0	21.7	2.9E-08
5/03/18	8	11	43.450	5.0	7.1	188.7	0	21.4	2.7E-08
5/03/18	12	56	48.200	5.5	7.6	187.6	0	21.5	2.5E-08
5/04/18	7	34	66.833	7.2	9.3	184.0	0	21.3	2.1E-08
5/04/18	12	49	72.083	7.7	9.8	182.8	1	21.6	2.4E-08

Tested By: RPE Date: 4/24/18 Checked By: KC Date: 5/7/18

DCN: CT-22 DATE: 1/1/17 REVISION: 11

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PERMEABILITY TEST

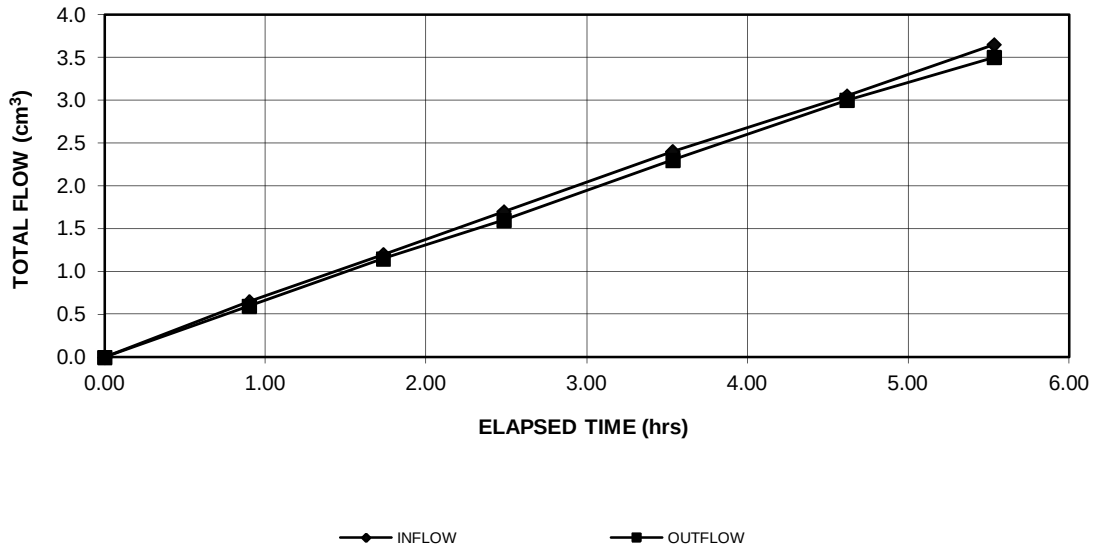
ASTM D 5084-16a

Client:	Geo-Solutions, Inc.	Boring No.:	4/9/18
Client Project:	Yonkers, NY 17-140	Depth (ft):	17-140-M2
Project No.:	2018-248-001	Sample No.:	15 Day
Lab ID No.:	2018-248-001-002	Avg. Conf. Pressure (psi):	6.25

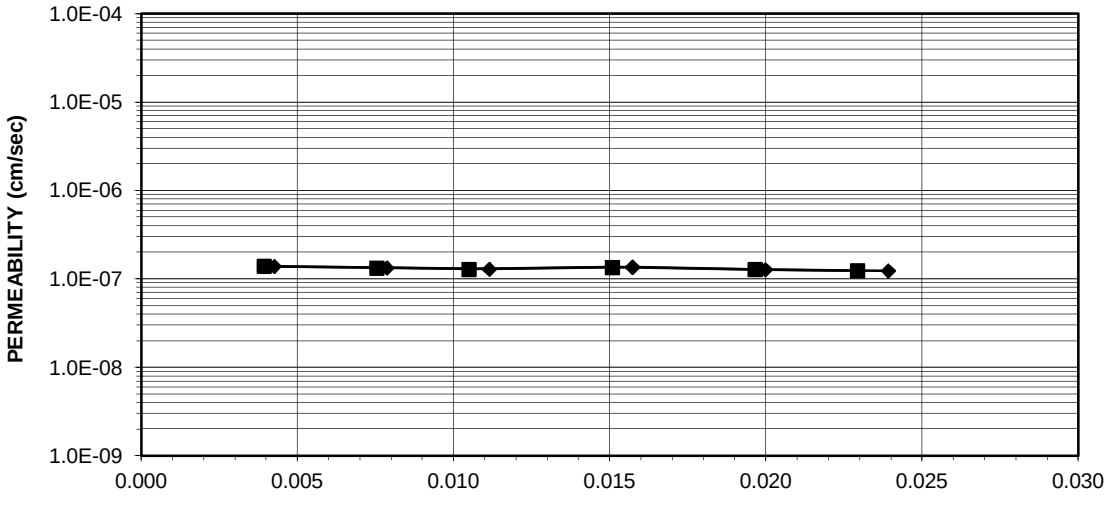
AVERAGE PERMEABILITY = 1.3E-07 cm/sec @ 20°C

AVERAGE PERMEABILITY = 1.3E-09 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: RPE Date: 4/24/18 Checked By: KC Date: 4/30/18

DCN: CT-22 DATE: 1/1/17 REVISION: 11

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PERMEABILITY TEST

ASTM D 5084-16a

Client:	Geo-Solutions, Inc.	Boring No.:	4/9/18
Client Project:	Yonkers, NY 17-140	Depth (ft):	17-140-M2
Project No.:	2018-248-001	Sample No.:	15 Day
Lab ID No.:	2018-248-001-002	Avg. Conf. Pressure (psi):	6.25

Specific Gravity:	2.70	Assumed
Sample Condition:	Previously	Remolded

Visual Description: Dark Gray Stabilized Material

Permeant Type: Deaired Water

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	1125	901
Weight of Tare & Wet Sample (g)	285.01	725.18
Weight of Tare & Dry Sample (g)	239.63	580.08
Weight of Tare (g)	83.60	110.35
Weight of Water (g)	45.38	145.10
Weight of Dry Sample (g)	156.03	469.73
Moisture Content (%)	**29.1**	**30.9**

SPECIMEN:	BEFORE TEST	AFTER TEST
Weight of Tube & Wet Sample (g)	612.09	NA
Weight of Tube (g)	0.00	NA
Weight of Wet Sample (g)	612.09	620.65
Length 1 (in)	2.755	2.768
Length 2 (in)	2.783	2.772
Length 3 (in)	2.773	2.756
Top Diameter (in)	3.040	3.032
Middle Diameter (in)	3.042	3.039
Bottom Diameter (in)	3.031	3.040
Average Length (in)	2.77	2.77
Average Area (in^2)	7.25	7.24
Sample Volume (cm^3)	329.01	328.27
Unit Wet Weight (g/cm^3)	1.86	1.89
Unit Wet Weight (pcf)	116.1	118.0
Unit Dry Weight (pcf)	90.0	90.2
Unit Dry Weight (g/cm^3)	1.44	1.44
Void Ratio, e	0.87	0.87
Porosity, n	0.47	0.47
Pore Volume (cm^3)	153.4	152.6
Total Weight of Sample After Test (g)		620.76

Tested By: RPE Date: 4/24/18 Checked By: KC Date: 4/30/18

DCN: CT-22 DATE: 1/1/17 REVISION: 11

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PERMEABILITY TEST

ASTM D 5084-16a

Client:	Geo-Solutions, Inc.	Boring No.:	4/9/18
Client Project:	Yonkers, NY 17-140	Depth (ft):	17-140-M2
Project No.:	2018-248-001	Sample No.:	15 Day
Lab ID No.:	2018-248-001-002	Avg. Conf. Pressure (psi):	6.25

Pressure Heads (Constant)	
Top Cap (psi)	67.5
Bottom Cap (psi)	70.0
Cell (psi)	75.0
Total Pressure Head (cm)	175.8
Hydraulic Gradient	25.02

Final Sample Dimensions	
Sample Length (cm), L	7.02
Sample Diameter (cm)	7.71
Sample Area (cm^2), A	46.74
Inflow Burette Area (cm^2), a-in	0.897
Outflow Burette Area (cm^2), a-out	0.878
B Parameter (%)	96

AVERAGE PERMEABILITY = 1.3E-07 cm/sec @ 20°C

AVERAGE PERMEABILITY = 1.3E-09 m/sec @ 20°C

DATE	TIME		ELAPSED TIME t	TOTAL INFLOW	TOTAL OUTFLOW	TOTAL HEAD h	FLOW (0 flow)	TEMP.	INCREMENTAL PERMEABILITY @ 20°C
(mm/dd/yy)	(hr)	(min)	(hr)	(cm^3)	(cm^3)	(cm)	(1 stop)	(°C)	(cm/sec)
4/26/18	10	23	0.000	0.0	0.0	202.7	0	20.8	NA
4/26/18	11	17	0.900	0.7	0.6	201.3	0	20.9	1.4E-07
4/26/18	12	7	1.733	1.2	1.2	200.0	0	20.9	1.3E-07
4/26/18	12	52	2.483	1.7	1.6	199.0	0	20.9	1.3E-07
4/26/18	13	55	3.533	2.4	2.3	197.4	0	21.0	1.4E-07
4/26/18	15	0	4.617	3.1	3.0	195.9	0	21.0	1.3E-07
4/26/18	15	55	5.533	3.7	3.5	194.7	1	21.1	1.2E-07

Tested By: RPE Date: 4/24/18 Checked By: KC Date: 4/30/18

DCN: CT-22 DATE: 1/1/17 REVISION: 11

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PERMEABILITY TEST

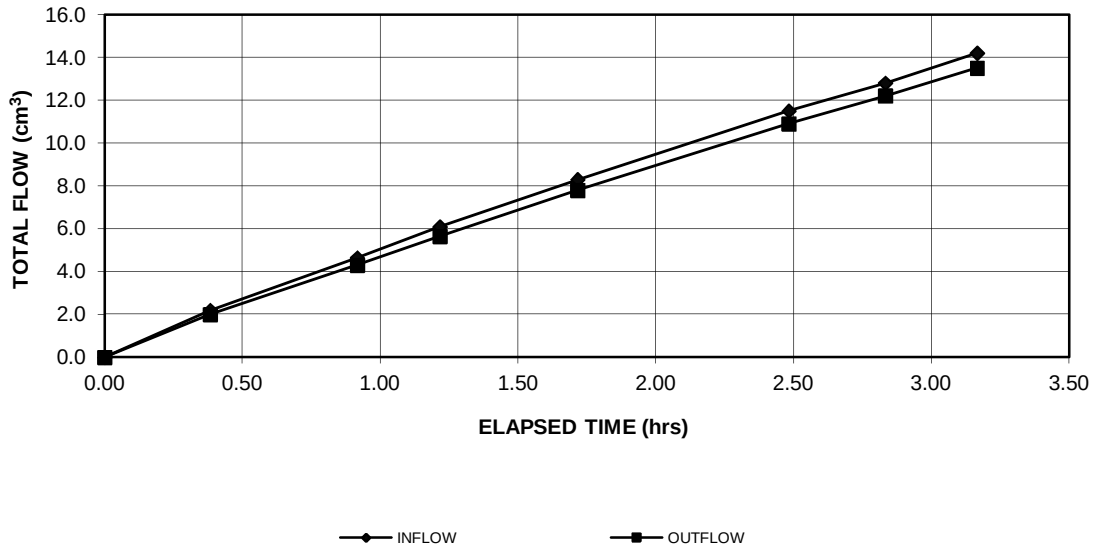
ASTM D 5084-16a

Client:	Geo-Solutions, Inc.	Boring No.:	4/9/18
Client Project:	Yonkers, NY 17-140	Depth (ft):	17-140-M3
Project No.:	2018-248-001	Sample No.:	15 Day
Lab ID No.:	2018-248-001-003	Avg. Conf. Pressure (psi):	6.25

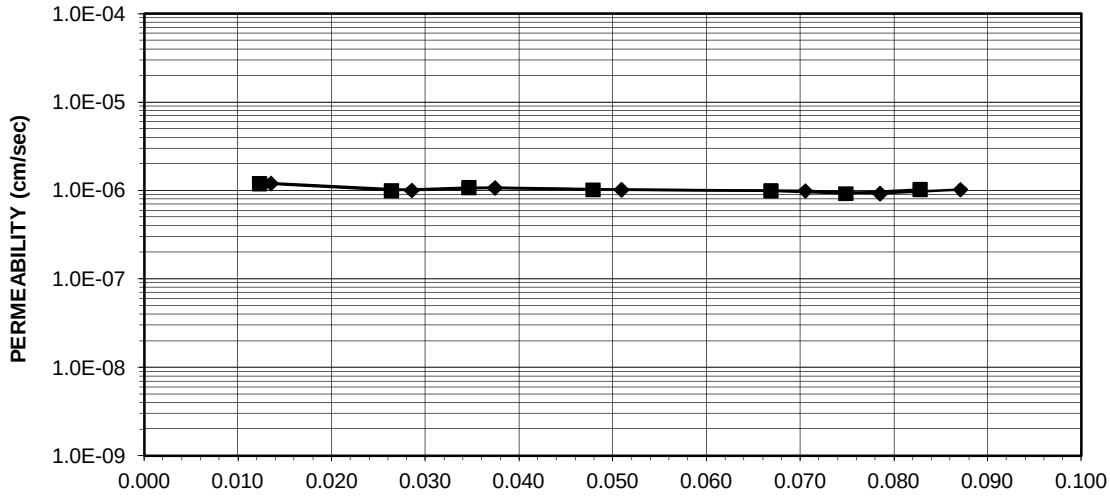
AVERAGE PERMEABILITY = 9.9E-07 cm/sec @ 20°C

AVERAGE PERMEABILITY = 9.9E-09 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: RPE Date: 4/24/18 Checked By: KC Date: 4/27/18

DCN: CT-22 DATE: 1/1/17 REVISION: 11

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PERMEABILITY TEST

ASTM D 5084-16a

Client:	Geo-Solutions, Inc.	Boring No.:	4/9/18
Client Project:	Yonkers, NY 17-140	Depth (ft):	17-140-M3
Project No.:	2018-248-001	Sample No.:	15 Day
Lab ID No.:	2018-248-001-003	Avg. Conf. Pressure (psi):	6.25

Specific Gravity:	2.70	Assumed
Sample Condition:	Previously	Remolded

Visual Description: Dark Gray Stabilized Material

Permeant Type: Deaired Water

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	1706	606
Weight of Tare & Wet Sample (g)	402.96	744.56
Weight of Tare & Dry Sample (g)	327.99	591.40
Weight of Tare (g)	82.68	85.13
Weight of Water (g)	74.97	153.16
Weight of Dry Sample (g)	245.31	506.27
Moisture Content (%)	**30.6**	**30.3**

SPECIMEN:	BEFORE TEST	AFTER TEST
Weight of Tube & Wet Sample (g)	661.87	NA
Weight of Tube (g)	0.00	NA
Weight of Wet Sample (g)	661.87	660.31
Length 1 (in)	2.968	2.981
Length 2 (in)	2.972	2.972
Length 3 (in)	2.985	2.950
Top Diameter (in)	3.030	3.037
Middle Diameter (in)	3.041	3.030
Bottom Diameter (in)	3.040	3.025
Average Length (in)	2.98	2.97
Average Area (in^2)	7.24	7.21
Sample Volume (cm^3)	353.16	350.82
Unit Wet Weight (g/cm^3)	1.87	1.88
Unit Wet Weight (pcf)	117.0	117.5
Unit Dry Weight (pcf)	89.6	90.2
Unit Dry Weight (g/cm^3)	1.44	1.45
Void Ratio, e	0.88	0.87
Porosity, n	0.47	0.46
Pore Volume (cm^3)	165.4	163.1
Total Weight of Sample After Test (g)		663.78

Tested By: RPE Date: 4/24/18 Checked By: KC Date: 4/27/18

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PERMEABILITY TEST

ASTM D 5084-16a

Client:	Geo-Solutions, Inc.	Boring No.:	4/9/18
Client Project:	Yonkers, NY 17-140	Depth (ft):	17-140-M3
Project No.:	2018-248-001	Sample No.:	15 Day
Lab ID No.:	2018-248-001-003	Avg. Conf. Pressure (psi):	6.25

Pressure Heads (Constant)	
Top Cap (psi)	67.5
Bottom Cap (psi)	70.0
Cell (psi)	75.0
Total Pressure Head (cm)	175.8
Hydraulic Gradient	23.32

Final Sample Dimensions	
Sample Length (cm), L	7.54
Sample Diameter (cm)	7.70
Sample Area (cm^2), A	46.54
Inflow Burette Area (cm^2), a-in	0.877
Outflow Burette Area (cm^2), a-out	0.960
B Parameter (%)	96

AVERAGE PERMEABILITY = 9.9E-07 cm/sec @ 20°C

AVERAGE PERMEABILITY = 9.9E-09 m/sec @ 20°C

DATE	TIME		ELAPSED TIME t	TOTAL INFLOW	TOTAL OUTFLOW	TOTAL HEAD h	FLOW (0 flow)	TEMP.	INCREMENTAL PERMEABILITY @ 20°C
(mm/dd/yy)	(hr)	(min)	(hr)	(cm^3)	(cm^3)	(cm)	(1 stop)	(°C)	(cm/sec)
4/26/18	10	22	0.000	0.0	0.0	203.4	0	20.8	NA
4/26/18	10	45	0.383	2.2	2.0	198.7	0	20.9	1.2E-06
4/26/18	11	17	0.917	4.7	4.3	193.5	0	20.9	1.0E-06
4/26/18	11	35	1.217	6.1	5.7	190.5	0	20.9	1.1E-06
4/26/18	12	5	1.717	8.3	7.8	185.7	0	20.9	1.0E-06
4/26/18	12	51	2.483	11.5	10.9	178.8	0	20.9	1.0E-06
4/26/18	13	12	2.833	12.8	12.2	175.9	0	20.9	9.3E-07
4/26/18	13	32	3.167	14.2	13.5	173.0	1	20.9	1.0E-06

Tested By: RPE Date: 4/24/18 Checked By: KC Date: 4/27/18

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