mfsengineers.com

Memorandum

MFS ENGINEERS & SURVEYORS

TO: Village of Dobbs Ferry Board of Trustees

CC: Marvel, Zarin & Steinmetz

DATE: 6 April 2021

RE: Stormwater Memorandum (Preliminary)
Innovation & Entrepreneurship Center
Masters School
Dobbs Ferry, NY
MFS Project No.: 1120062

In support of the Village's review of Site Plan documentation for the proposed Innovation & Entrepreneurship Center (IEC) at Masters School, Dobbs Ferry, NY, this Stormwater Memorandum is intended to describe proposed stormwater management features for the Project.

As shown on enclosed Drawing SK-1, existing drainage patterns convey a tributary area of between 0.83 and approximately 1.0 acres to the new building area, and is graded to generally split drainage between two drainage areas. One portion of drainage drains overland towards the Carriage House and ultimately into the wooded area east of the House. The other drains overland to a catch basin in the parking area just north of the Middle School, ultimately being conveyed via pipes to precast drywells in the adjacent lawn.

The total area of disturbance for the Project will exceed 1 acre because of additional areas of work in support of the new building. This additional work includes realignment of the adjacent softball field, which is proposed to be pivoted about the pitcher's mound by several degrees to shift the first-baseline and right field away from the new building; this area (approx. ¼ ac.) will be restored in its new alignment to existing conditions, with no addition of impervious area. Additional consideration has been made for the installation of geothermal wells to support sustainable MEP systems and, if implemented, the construction of this system will involve additional disturbances (approx. ¼ ac.)

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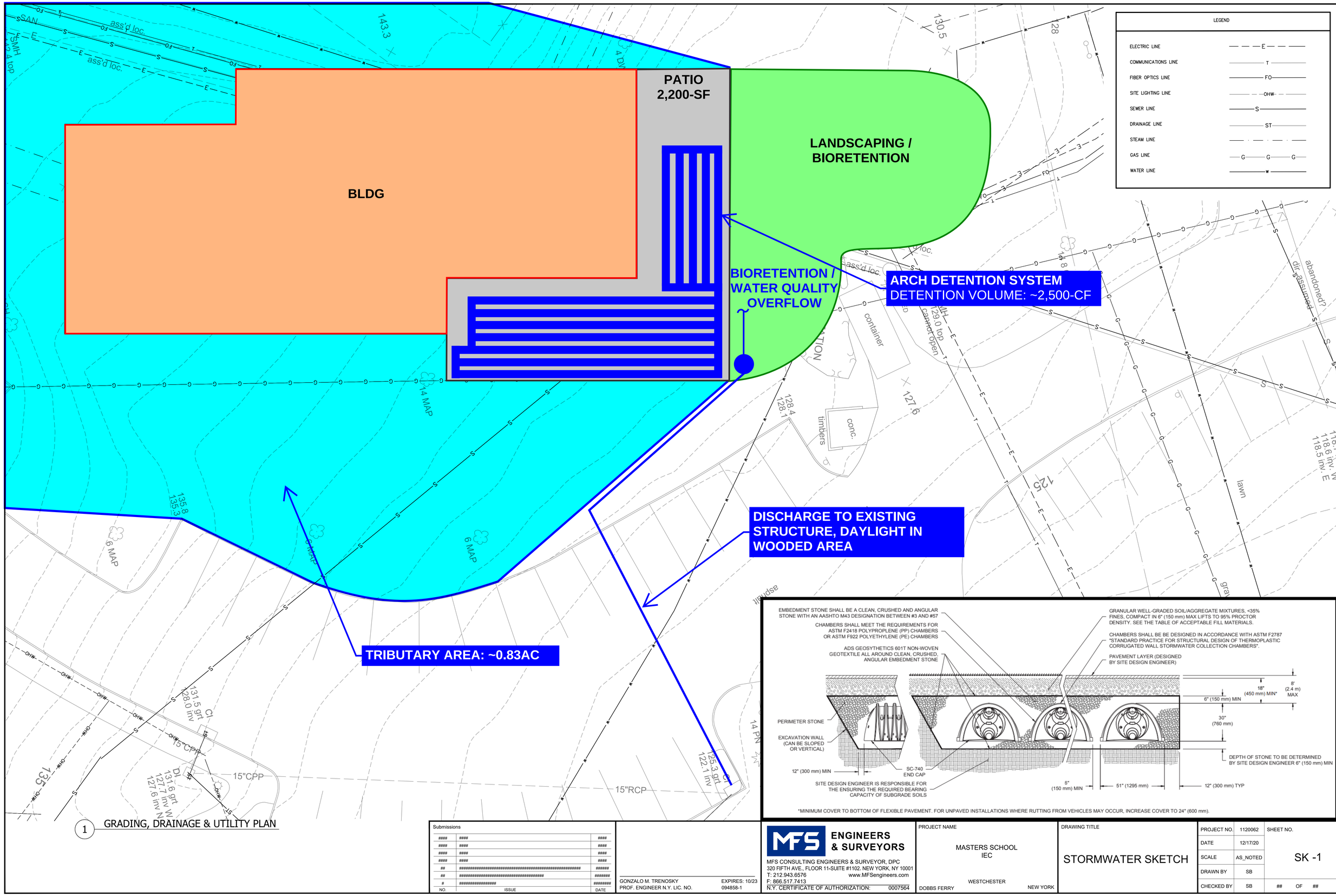
that will be restored to existing conditions with no addition of impervious area.

Proposed upgrades around the proposed IEC include landscaping, pathways, ADA-accessible parking, and regrading. The introduction of new impervious area brings with it the need to further study stormwater flow patterns to ensure that the post-construction runoff quality and rates are less than or equal to those of the pre-construction condition. Based on a modeled study of the existing conditions and the NYS DEC requirements for stormwater analysis, the proposed improvements at the site will result in a net increase in peak discharge rates and therefore requires the introduction of stormwater detention features.

The NYS DEC requires both water quality and quantity considerations when designing new impervious area. As shown on enclosed Drawing SK-2, this Project proposes to address water quality via a bioretention system that is integrated into the site landscaping. Stormwater from the site hardscape – which generally collects the most pollutants – will be collected and conveyed to this system via site grading and/or drains where it will be slowly filtered through engineered media and infiltrated to the extent possible. Preliminary infiltration tests at the location of bioretention show the soil to be favorable to infiltration, refer to Appendix A.

Drainage from the roof, and overflow from the bioretention system, will be conveyed to a subsurface detention system located beneath the site patio. This system, comprised of open-bottom HDPE arch sections within a gravel bed, will store up to 2,500 cubic feet of stormwater while releasing it via a controlled-flow outlet at rates less than or equal to pre-construction conditions. A stormwater pipe from the outlet control structure (O.C.S) will be connected to the existing on-site, campus-maintained catch basin – which presently captures flow from the site– located just north of the Middle School.

As the design of the Project and site develops, we look forward to continuing to work with the Village and its engineering consultant to further coordinate this stormwater design and provide additional requested information. Ultimately, a full SWPPP will be prepared for the Project, and coverage will be obtained under the SPDES General Permit for Stormwater Discharges from Construction Activity (Permit No. GP-0-20-001).



1 GRADING, DRAINAGE & UTILITY PLAN

NOT FOR CONSTRUCTION

Submissions

NO.	ISSUE	DATE
####	####	####
####	####	####
####	####	####
####	####	####
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#	##########	######

GONZALO M. TRENOSKY PROF. ENGINEER N.Y. LIC. NO. 094858-1 EXPIRES: 10/23

MFS ENGINEERS & SURVEYORS
MFS CONSULTING ENGINEERS & SURVEYOR, DPC
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N.Y. CERTIFICATE OF AUTHORIZATION: 0007564

PROJECT NAME
MASTERS SCHOOL
IEC
DOBBS FERRY WESTCHESTER NEW YORK

DRAWING TITLE
STORMWATER SKETCH

PROJECT NO.	1120062	SHEET NO.
DATE	12/17/20	SK -1
SCALE	AS_NOTED	
DRAWN BY	SB	
CHECKED BY	SB	## OF ##

TRIBUTARY AREA: ~0.83AC

BLDG

PATIO

LANDSCAPING / BIORETENTION

LEGEND	
ELECTRIC LINE	E
COMMUNICATIONS LINE	T
FIBER OPTICS LINE	FO
SITE LIGHTING LINE	OHW
SEWER LINE	S
DRAINAGE LINE	ST
STEAM LINE	
GAS LINE	G
WATER LINE	W

1 GRADING, DRAINAGE & UTILITY PLAN

NOT FOR CONSTRUCTION

Submissions

NO.	ISSUE	DATE
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GONZALO M. TRENOSKY — EXPIRES: 10/23
PROF. ENGINEER N.Y. LIC. NO. 094858-1

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PROJECT NAME: MASTERS SCHOOL IEC
WESTCHESTER
DOBBS FERRY NEW YORK

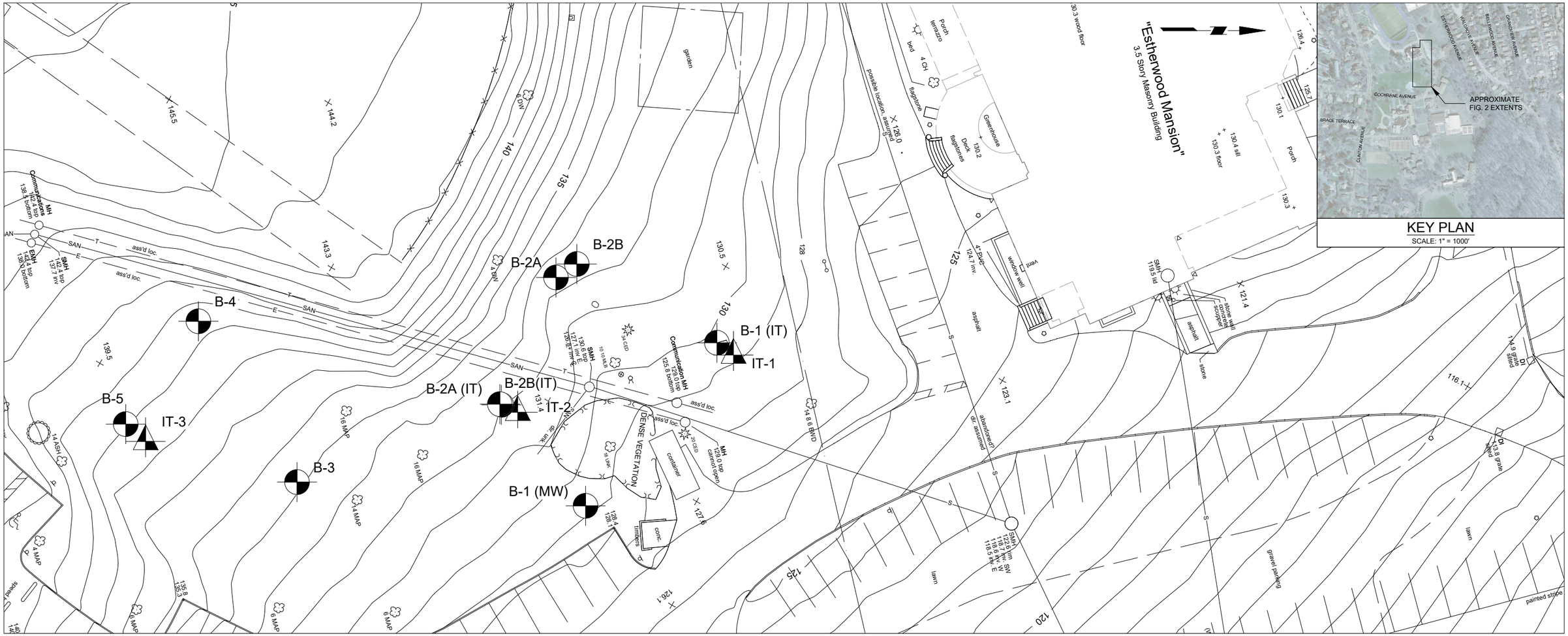
DRAWING TITLE: STORMWATER SKETCH

PROJECT NO.	1120062
DATE	12/17/20
SCALE	AS_NOTED
DRAWN BY	SB
CHECKED BY	SB

SHEET NO. SK -2

OF

APPENDIX A
MFS Infiltration Test Logs



1 AS-DRILLED SUBSURFACE INVESTIGATION LOCATION PLAN

Scale: 1" = 30'

0 30' 60'

NOTE:

1. ALL AS-DRILLED BORING, INFILTRAITON TEST, AND MONITORING WELL LOCATIONS REFERENCE THE FIELD SUBSURFACE INVESTIGATION COMPLETED BY MFS CONSTRUCTION, LLC UNDER THE FULL TIME ENGINEERING INSPECTION OF MFS CONSULTING ENGINEERS AND SURVEYOR, DPC FROM 28 DECEMBER 2020 TO 6 JANUARY 2021.
2. THE PARTIAL BACKGROUND SURVEY USED FOR THIS PLAN WAS OBTAINED FROM THE "TOPOGRAPHIC MAP OF THE DEVELOPED PORTION OF THE MASTERS SCHOOL" DATED 9 JANUARY 2017 PROVIDED IN AUTOCAD FORMAT WHICH IS BASED UPON PHOTOGRAMMETRIC MAPPING PREPARED BY GEOMAPS INTERNATIONAL, INC. USING AERIAL PHOTOGRAPHY TAKEN IN APRIL 2008 WITH SUPPLEMENTAL FIELD MEASUREMENTS COMPLETED BETWEEN 4 OCTOBER AND 31 DECEMBER 2016 COMBINED WITH MAPPING OF PORTIONS OF THE CAMPUS PREVIOUSLY PREPARED BY KENNETH B. SALZMANN, LAND SURVEYOR.
3. ALL AS-DRILLED BORING, MONITORING WELL, AND INFILTRATION TEST LOCATIONS WERE MEASURED IN THE FIELD AT THE TIME OF COMPLETION FROM FIXED OBJECTS AT THE PROJECT SITE AND THE RESPECTIVE LOCATIONS SHALL BE CONSIDERED APPROXIMATE.
4. ALL ELEVATIONS REFERENCED HEREIN ARE BASED ON THE MASTERS SCHOOL DATUM.

LEGEND

- B-#/B-#(IT) — AS-DRILLED BORING LOCATION
- B-# (MW) — MONITORING WELL LOCATION
- IT-# — INFILTRATION TEST LOCATION

MFS ENGINEERS & SURVEYORS
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N.Y. CERTIFICATE OF AUTHORIZATION: 0007564

PROJECT NAME
THE MASTERS SCHOOL
INNOVATION AND ENTREPRENEURSHIP CENTER
DOBBS FERRY, WESTCHESTER COUNTY, NEW YORK

DRAWING TITLE
AS-DRILLED SUBSURFACE INVESTIGATION LOCATION PLAN

PROJECT NO.	1120062	SHEET NO.
DATE	01/11/21	FIG. 2
SCALE	AS_NOTED	
DRAWN BY	ATG	
CHECKED BY	JMF	# OF 1

MFS Consulting Engineers and Surveyor, DPC

IT ID No. IT- 1

Sheet 1 of 1

Prepared for:	Marvel Architects, PLLC	PROJECT:	Masters School - Innovation and Entrepreneurship Center
		LOCATION / BOROUGH :	Dobbs Ferry, NY

INSPECTOR:	Gilbert Del Orbe	DRILLER:	Danny Ninevski	Start Date:	12/31/2020	Weather:	41°F / Light Rain
CONTRACTOR:	MFS Construction, LLC	HELPER:	Tom Feaser	Start Time:	9:00 AM		
P.E./REP.:	Michael Mudalel, PE						

Depth of IT:	8	ft	Drill Bit Type:	3-7/8" TCRB		Weight of Hammer for casing:	140 lbs
Rig Type:	CME 45B		Casing Internal Diameter:	4	in	Type of Hammer:	Auto
			Casing Length:	126	in		

ASTM D-6391 – 11

PERMEABILITY COEFFICIENT (Km) FORMULA:

General Formula:

$$K_m = \pi R_t \times \frac{\left[D\left\{Ln\left(\frac{h_1}{h_2}\right)\right\}\right]}{11 \times (t_2 - t_1)}$$

Formula for 4" internal diameter casing (in/hr):

$$K_m = 1.142 R_t \times \frac{\left[Ln\left(\frac{h_1}{h_2}\right)\right]}{(t_2 - t_1)}$$

where:

$$R_t = {2.2902(0.9842^T)}/{T^{0.1702}}$$

IT-1 @ 8 ft

TEST 1

Water temperature (°C), T: 8.2 Rt= 1.40

FIELD DATA		CALCULATED DATA			
Time (min)	Depth (in)	Height (in)	Ln (H/Ho)	(t_1-t_2)	*Kv (in/hr)
10	12.000	114.000	0.100	0.167	0.9637
20	22.500	103.500	0.197	0.167	0.9304
30	29.000	97.000	0.262	0.167	0.6246
40	34.000	92.000	0.314	0.167	0.5096
60	44.500	81.500	0.436	0.333	0.5835

TEST 2

Water temperature (°C), T: 7.6 Rt= 1.44

FIELD DATA		CALCULATED DATA			
Time (min)	Depth (in)	Height (in)	Ln (H/Ho)	(t_1-t_2)	*Kv (in/hr)
10	14.000	112.000	0.118	0.167	1.1600
20	22.875	103.125	0.200	0.167	0.8130
30	29.000	97.000	0.262	0.167	0.6030
40	34.375	91.625	0.319	0.167	0.5614
60	43.625	82.375	0.425	0.333	0.5240

TEST 3

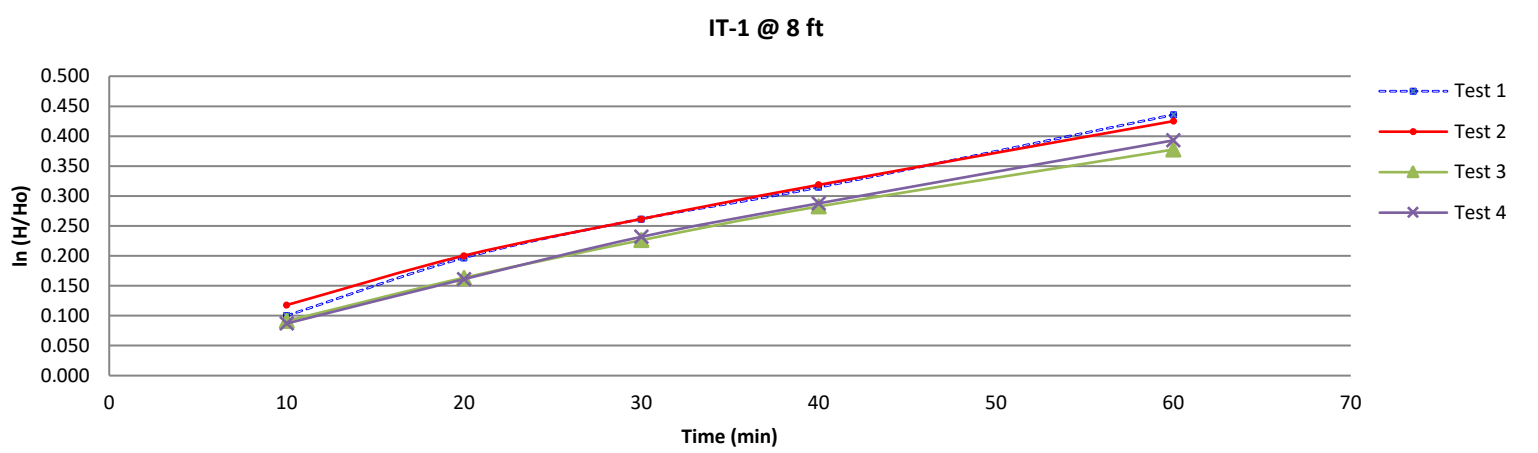
Water temperature (°C), T: 7.5 Rt= 1.44

FIELD DATA		CALCULATED DATA			
Time (min)	Depth (in)	Height (in)	Ln (H/Ho)	(t_1-t_2)	*Kv (in/hr)
10	11.000	115.000	0.091	0.167	0.9031
20	19.000	107.000	0.163	0.167	0.7128
30	25.500	100.500	0.226	0.167	0.6196
40	31.000	95.000	0.282	0.167	0.5564
60	39.625	86.375	0.378	0.333	0.4705

TEST 4

Water temperature (°C), T: 7.4 Rt= 1.45

FIELD DATA		CALCULATED DATA			
Time (min)	Depth (in)	Height (in)	Ln (H/Ho)	(t_1-t_2)	*Kv (in/hr)
10	10.500	115.500	0.087	0.167	0.8636
20	18.750	107.250	0.161	0.167	0.7355
30	26.063	99.937	0.232	0.167	0.7009
40	31.500	94.500	0.288	0.167	0.5552
60	40.938	85.063	0.393	0.333	0.5221



TEST 1 FINAL RESULTS

Time Weighted Average Permeability Coefficient **Km=** 0.6992 in/hr

TEST 2 FINAL RESULTS

Time Weighted Average Permeability Coefficient **Km=** 0.6976 in/hr

TEST 3 FINAL RESULTS

Time Weighted Average Permeability Coefficient **Km=** 0.6221 in/hr

TEST 4 FINAL RESULTS

Time Weighted Average Permeability Coefficient **Km=** 0.6499 in/hr

AVERAGE IT-1 @ 8 ft

Time Weighted Average Permeability Coefficient **Km=** 0.6672 in/hr

Inspectors Remarks:

24 hour pre-soak started 12/30/2020 at 9:00 AM once the temperature was above freeze point. (Note that the temperature did not drop below freezing point during the pre-soak period)

DEFINITION OF VARIABLES

*Km= Mean permeability

T = Temperature of permeant (water), in °C

Ln = Natural Logarithmic

t1 = Time at the start of the test in the same units selected for Km

t2= Time at the end of the test in the units selected for Km

h1= Height of the water above the bottom of the casing at the start of the test in the same units selected for Km

h2= Height of the water above the bottom of the casing at the end of the test in the same units selected for Km

Rt = Ratio of viscosity of water at test temperature to the viscositye of water at 20°C

MFS Consulting Engineers and Surveyor, DPC

IT ID No. IT- 2

Sheet 1 of 1

Prepared for:	Marvel Architects, PLLC	PROJECT:	Masters School - Innovation and Entrepreneurship Center
		LOCATION / BOROUGH :	Dobbs Ferry, NY

INSPECTOR:	Gilbert Del Orbe	DRILLER:	Danny Ninevski	Start Date:	12/31/2020	Weather:	41°F / Light Rain
CONTRACTOR:	MFS Construction, LLC	HELPER:	Tom Feaser	Start Time:	9:03 AM		
P.E./REP.:	Michael Mudalel, PE						

Depth of IT:	7	ft	Drill Bit Type:	3-7/8" TCRB		Weight of Hammer for casing:	140 lbs
Rig Type:	CME 45B		Casing Internal Diameter:	4	in	Type of Hammer:	Auto
			Casing Length:	90	in		

ASTM D-6391 – 11

PERMEABILITY COEFFICIENT (Km) FORMULA:

General Formula:

$$K_m = \pi R_t \times \frac{\left[D\left\{Ln\left(\frac{h_1}{h_2}\right)\right\}\right]}{11 \times (t_2 - t_1)}$$

Formula for 4" internal diameter casing (in/hr):

$$K_m = 1.142 R_t \times \frac{\left[Ln\left(\frac{h_1}{h_2}\right)\right]}{(t_2 - t_1)}$$

where:

$$R_t = {2.2902(0.9842^{T})}/{T^{0.1702}}$$

IT-2 @ 7 ft

TEST 1

Water temperature (°C), T: 7.9 Rt= 1.42

FIELD DATA		CALCULATED DATA			
Time (min)	Depth (in)	Height (in)	Ln (H/Ho)	(t_1-t_2)	*Kv (in/hr)
10	6.500	83.500	0.075	0.167	0.7299
20	13.250	76.750	0.159	0.167	0.8208
30	20.000	70.000	0.251	0.167	0.8964
40	25.625	64.375	0.335	0.167	0.8157
60	35.000	55.000	0.492	0.333	0.7663

TEST 2

Water temperature (°C), T: 7.5 Rt= 1.44

FIELD DATA		CALCULATED DATA			
Time (min)	Depth (in)	Height (in)	Ln (H/Ho)	(t_1-t_2)	*Kv (in/hr)
10	7.000	83.000	0.081	0.167	0.8005
20	14.000	76.000	0.169	0.167	0.8711
30	20.500	69.500	0.258	0.167	0.8839
40	26.500	63.500	0.349	0.167	0.8926
60	37.250	52.750	0.534	0.333	0.9168

TEST 3

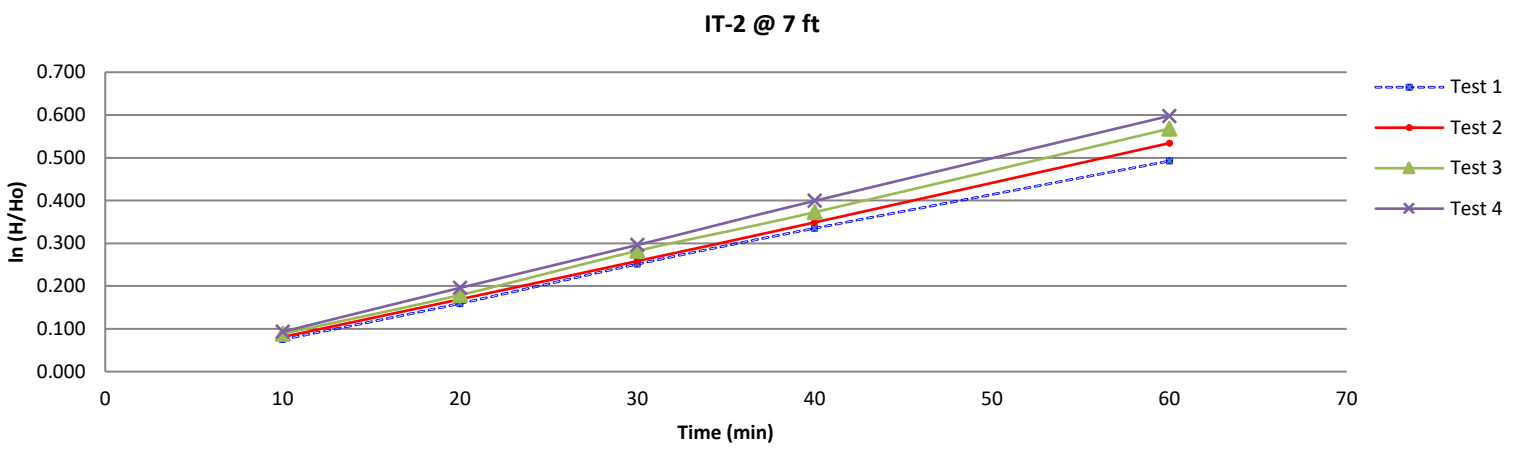
Water temperature (°C), T: 7.6 Rt= 1.44

FIELD DATA		CALCULATED DATA			
Time (min)	Depth (in)	Height (in)	Ln (H/Ho)	(t_1-t_2)	*Kv (in/hr)
10	7.625	82.375	0.089	0.167	0.8718
20	14.750	75.250	0.179	0.167	0.8909
30	22.125	67.875	0.282	0.167	1.0158
40	28.000	62.000	0.373	0.167	0.8916
60	39.000	51.000	0.568	0.333	0.9617

TEST 4

Water temperature (°C), T: 7.4 Rt= 1.45

FIELD DATA		CALCULATED DATA			
Time (min)	Depth (in)	Height (in)	Ln (H/Ho)	(t_1-t_2)	*Kv (in/hr)
10	8.000	82.000	0.093	0.167	0.9239
20	16.000	74.000	0.196	0.167	1.0188
30	23.063	66.937	0.296	0.167	0.9956
40	29.625	60.375	0.399	0.167	1.0240
60	40.500	49.500	0.598	0.333	0.9855



TEST 1 FINAL RESULTS

Time Weighted Average Permeability Coefficient **Km=** 0.7992 in/hr

TEST 2 FINAL RESULTS

Time Weighted Average Permeability Coefficient **Km=** 0.8803 in/hr

TEST 3 FINAL RESULTS

Time Weighted Average Permeability Coefficient **Km=** 0.9323 in/hr

TEST 4 FINAL RESULTS

Time Weighted Average Permeability Coefficient **Km=** 0.9889 in/hr

AVERAGE IT-2 @ 7 ft

Time Weighted Average Permeability Coefficient **Km=** 0.9002 in/hr

Inspectors Remarks:

24 hour pre-soak started 12/30/2020 at 9:00 AM once the temperature was above freeze point. (Note that the temperature did not drop below freezing point during the pre-soak period)

DEFINITION OF VARIABLES

*Km= Mean permeability

T = Temperature of permeant (water), in °C

Ln = Natural Logarithmic

t1 = Time at the start of the test in the same units selected for Km

t2= Time at the end of the test in the units selected for Km

h1= Height of the water above the bottom of the casing at the start of the test in the same units selected for Km

h2= Height of the water above the bottom of the casing at the end of the test in the same units selected for Km

Rt = Ratio of viscosity of water at test temperature to the viscositye of water at 20°C

MFS Consulting Engineers and Surveyor, DPC

IT ID No. IT- 3

Sheet 1 of 1

Prepared for: Marvel Architects, PLLC

PROJECT: Masters School - Innovation and Entrepreneurship Center

LOCATION / BOROUGH : Dobbs Ferry, NY

INSPECTOR:	Gilbert Del Orbe	DRILLER:	Danny Ninevski	Start Date:	12/31/2020	Weather:	41°F / Light Rain
CONTRACTOR:	MFS Construction, LLC	HELPER:	Tom Feaser	Start Time:	9:05 AM		
P.E./REP.:	Michael Mudalel, PE						

Depth of IT:	8	ft	Drill Bit Type:	3-7/8" TCRB		Weight of Hammer for casing:	140 lbs
Rig Type:	CME 45B		Casing Internal Diameter:	4	in	Type of Hammer:	Auto
			Casing Length:	126	in		

ASTM D-6391 – 11

PERMEABILITY COEFFICIENT (Km) FORMULA:

General Formula:

$$K_m = \pi R_t \times \frac{\left[D\left\{Ln\left(\frac{h_1}{h_2}\right)\right\}\right]}{11 \times (t_2 - t_1)}$$

Formula for 4" internal diameter casing (in/hr):

$$K_m = 1.142 R_t \times \frac{\left[Ln\left(\frac{h_1}{h_2}\right)\right]}{(t_2 - t_1)}$$

where:

$$R_t = {2.2902(0.9842^T)}/{T^{0.1702}}$$

IT-3 @ 8 ft

TEST 1

Water temperature (°C), T: 8.1 Rt= 1.41

FIELD DATA		CALCULATED DATA			
Time (min)	Depth (in)	Height (in)	Ln (H/Ho)	(t_1-t_2)	*Kv (in/hr)
10	13.000	113.000	0.109	0.167	1.0524
20	24.875	101.125	0.220	0.167	1.0731
30	35.000	91.000	0.325	0.167	1.0196
40	43.875	82.125	0.428	0.167	0.9918
60	59.000	67.000	0.632	0.333	0.9836

TEST 2

Water temperature (°C), T: 7.6 Rt= 1.44

FIELD DATA		CALCULATED DATA			
Time (min)	Depth (in)	Height (in)	Ln (H/Ho)	(t_1-t_2)	*Kv (in/hr)
10	14.125	111.875	0.119	0.167	1.1710
20	26.250	99.750	0.234	0.167	1.1297
30	37.000	89.000	0.348	0.167	1.1230
40	47.000	79.000	0.467	0.167	1.1738
60	63.000	63.000	0.693	0.333	1.1144

TEST 3

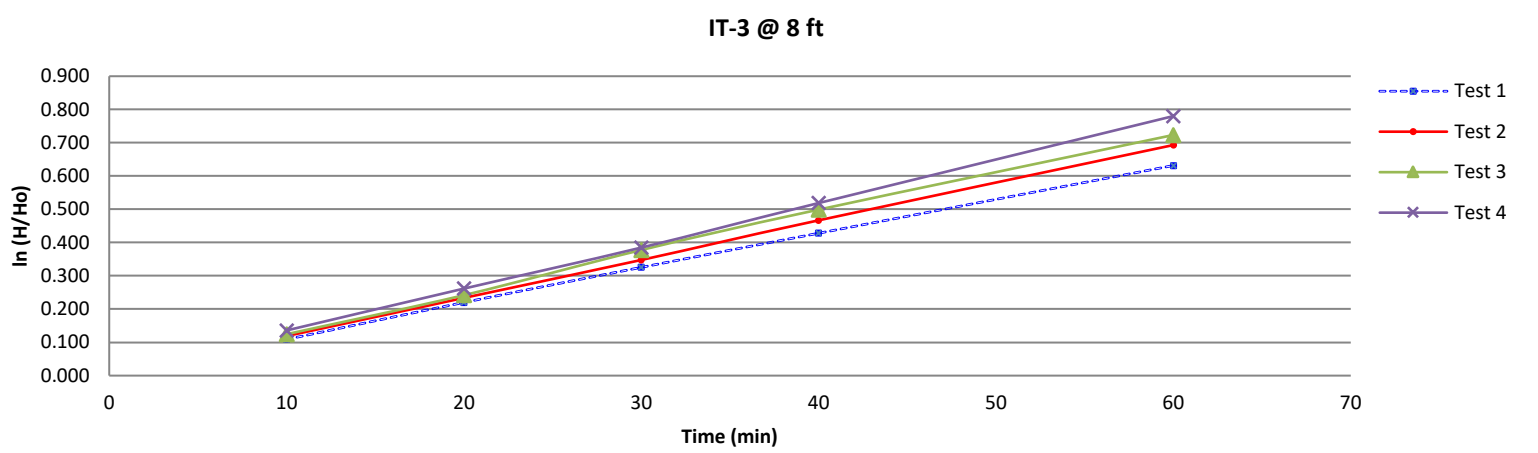
Water temperature (°C), T: 7.5 Rt= 1.44

FIELD DATA		CALCULATED DATA			
Time (min)	Depth (in)	Height (in)	Ln (H/Ho)	(t_1-t_2)	*Kv (in/hr)
10	14.750	111.250	0.125	0.167	1.2309
20	27.063	98.937	0.242	0.167	1.1596
30	39.625	86.375	0.378	0.167	1.3424
40	49.500	76.500	0.499	0.167	1.2003
60	64.875	61.125	0.723	0.333	1.1091

TEST 4

Water temperature (°C), T: 7.5 Rt= 1.44

FIELD DATA		CALCULATED DATA			
Time (min)	Depth (in)	Height (in)	Ln (H/Ho)	(t_1-t_2)	*Kv (in/hr)
10	16.000	110.000	0.136	0.167	1.3426
20	29.000	97.000	0.262	0.167	1.2434
30	40.250	85.750	0.385	0.167	1.2187
40	51.000	75.000	0.519	0.167	1.3242
60	68.250	57.750	0.780	0.333	1.2920



TEST 1 FINAL RESULTS

Time Weighted Average Permeability Coefficient **Km=** 1.0174 in/hr

TEST 2 FINAL RESULTS

Time Weighted Average Permeability Coefficient **Km=** 1.1377 in/hr

TEST 3 FINAL RESULTS

Time Weighted Average Permeability Coefficient **Km=** 1.1919 in/hr

TEST 4 FINAL RESULTS

Time Weighted Average Permeability Coefficient **Km=** 1.2855 in/hr

AVERAGE IT-3 @ 8 ft

Time Weighted Average Permeability Coefficient **Km=** 1.1581 in/hr

Inspectors Remarks:

24 hour pre-soak started 12/30/2020 at 9:00 AM once the temperature was above freeze point. (Note that the temperature did not drop below freezing point during the pre-soak period)

DEFINITION OF VARIABLES

*Km= Mean permeability

T = Temperature of permeant (water), in °C

Ln = Natural Logarithmic

t1 = Time at the start of the test in the same units selected for Km

t2= Time at the end of the test in the units selected for Km

h1= Height of the water above the bottom of the casing at the start of the test in the same units selected for Km

h2= Height of the water above the bottom of the casing at the end of the test in the same units selected for Km

Rt = Ratio of viscosity of water at test temperature to the viscositye of water at 20°C