



PETROLEUM MANAGEMENT, INC.
Environmental Services Division

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October 28, 2021

Maryland Department of the Environment
Oil Control Program
Attn: Susan Bull
1800 Washington Blvd., Suite 620
Baltimore, MD 21230

Re: Step Drawdown Test
Bates Middle School
Annapolis, Maryland
MDE Facility ID# 3200
MDE Case# 18-0559 AA

Dear Ms. Bull:

Petroleum Management, Inc. (PMI) is proposing to perform a step drawdown of the shallow unconfined aquifer at the referenced Site. The test is being performed on monitoring well MW-1 in an effort to evaluate the possible presence of light non-aqueous phase liquid (LNAPL) in stratigraphic layer(s) below the normal groundwater table elevation.

Background

Prior releases of #2 heating oil have been reported at the Site resulting from spills within the boiler room. These releases have impacted stormwater quality in the nearby outfall to Spa Creek. Groundwater remediation has included the completion of enhanced fluid recovery events and the current and ongoing recovery of LNAPL from wells MW-1 and MW-2 using QED Environmental Systems Genie skimmer pumps. Historically LNAPL thickness in MW-1 has been up to 13.5 feet. The most recent groundwater measurements detected a LNAPL thickness of 0.77 feet in MW-1 and 0.07 feet in MW-2. Prior to the removal of the skimmer pumps on June 23, 2021, the product thicknesses in these two wells had been as low as 0.01 feet or less.

Drawdown Test

The goal of this drawdown test is to acquire specific hydrologic data (i.e., hydraulic conductivity and/or transmissivity) about the impacted unconfined aquifer and to depress the groundwater table in MW-1 to specific depths to investigate the possibility that there are one or more stratigraphic layers at depth(s) below the elevation of the water table that may contain trapped LNAPL that is consequently only released when the water table is depressed to intersect the impacted lithologic layer.

Treatment System Monitoring

PMI personnel will be onsite throughout the 16-hour pump test to monitor system operations. The treatment system will be inspected every 30 minutes for evidence of system failure such as leaks from fluid conveying pipes or hoses, issues with pump operation, and indications of ruptures or tears in the filtration discharge bag. Any system deficiencies will be corrected as soon as they are detected. System monitoring reports will be maintained detailing the results of the inspections and corrective actions taken, if any.

Data Analysis Reporting

Upon completion of the drawdown test PMI will prepare a report detailing the results of the assessment. The report will present data recovered from the test to include the duration and flow rates of pumping activities as well as depth to water measurements, LNAPL recovery measurements, calculated transmissivity, and volume of water recovered, treated, and discharged. PMI will also complete and submit the Discharge Monitoring Report form as required by the General Discharge Permit.

Please feel free to contact me should you have any questions or comments on this Plan.

Respectfully Submitted,



W. Scott Alexander
Environmental Projects Manager



Enc.

cc: Mr. Kent Campbell (HP Environmental, Inc.)
Mr. Brian Wells (AACPS)

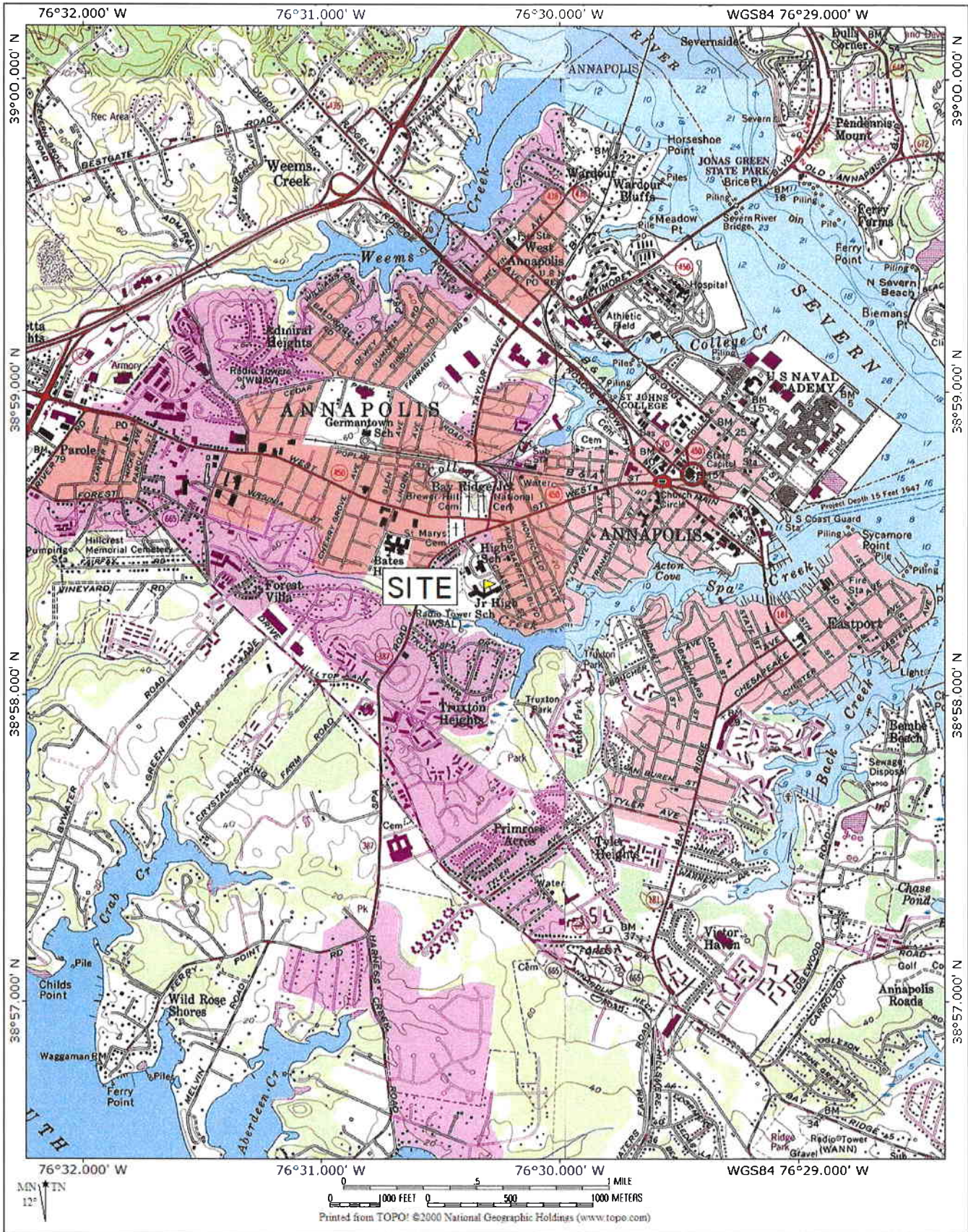
To achieve this goal PMI is proposing to complete a 16-hour draw down test. Groundwater recovered during the test will be pumped into an open top, 8,400-gallon capacity frac tank equipped with weir boards that will act as an oil/water separator and allow for the visual assessment and physical measurement of recovered LNAPL, if any. The effluent from the frac tank will be pumped through a 50-micron bag filter assembly and then two activated carbon vessels set in parallel prior to being discharged to a permeable bladder that will release the water onto the ground surface in the vicinity of MW-8 (Figure 1 and 2). Specifically, the treatment system will include one *Grundfos* submersible pump equipped with a flow controller unit that will recover groundwater from MW-1 and discharge into an 8,400-gallon capacity settling tank (Model 8400 MiniWeir or equivalent) to allow for separation of any LNAPL and settling of any suspended sediment prior to the fluids being pumped through two granular activated carbon vessels (500# GAC Vessels, US Carbon 8x30 virgin coconut shell carbon) to remove dissolved phase contamination. The treated discharge from the GAC vessels will gravity drain through a filtration bag (*DirtBag* Dewatering Bag or equivalent) for a final removal of any suspended sediment. PMI has obtained a General Discharge Permit No. 21OGR-5844 (MDG91098) for the operation of the treatment system and discharge of the treated effluent from the treatment system.

The drawdown test has been designed in large part based on flow rates, product thicknesses, and depths derived from prior enhanced fluid recovery (EFR) events performed at the Site. That data indicates that the anticipated recovery rate required to draw down and hold a specific water table elevation is approximately 2.5 gallons per minute (GPM). The EFR events had drawn the water table down to depths of 20 and 25 feet below grade which resulted in substantial accumulation of LNAPL in MW-1. For this test HPE is proposing to set the pump intake at 25 feet below grade. The pump will be equipped with a flow control box to allow the operator to vary the pump flow rate to achieve drawdown within MW-1 to the predetermined depths shown in Table 1 below and then held at that depth for a specific period of time. .

**Table 1
Draw Down Depths and Times**

Depth of pump intake	Drawdown Depth	Hold Duration
25 feet below grade	18 feet below grade (fbg)	4 hours
	20 fbg	
	22 fbg	
	24 fbg	

Water levels will be monitored using a *HOB0* in-well transducer in the following wells: MW-1, MW-2, MW-3, MW-5, and MW-8. LNAPL recovery rates will be monitored downhole every 5 minutes during the test. Accumulated free product will be removed from the well via vacuum truck at the end of hold period and prior to dropping the water table elevation to the next planned depth. Upon completion of the drawdown test the LNAPL skimmer pumps will be returned to wells MW-1 and MW-2 and brought back online.



HP ENVIRONMENTAL, INC.

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**FIGURE 1
 SITE LOCATION MAP**

Project:

BATES MIDDLE SCHOOL
 701 CHASE STREET
 ANNAPOLIS, MARYLAND

Date:

10-09-19

Drawn by:

KDC

CAD File:

FIGURE1

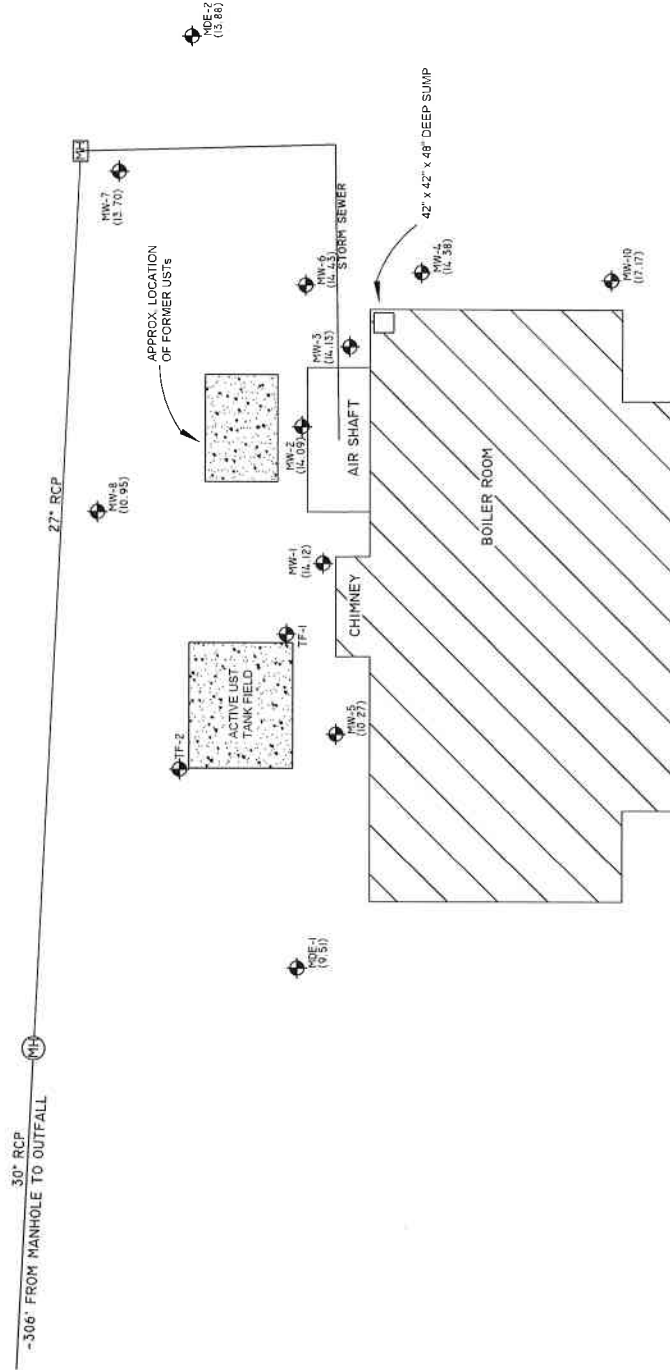
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POE-3
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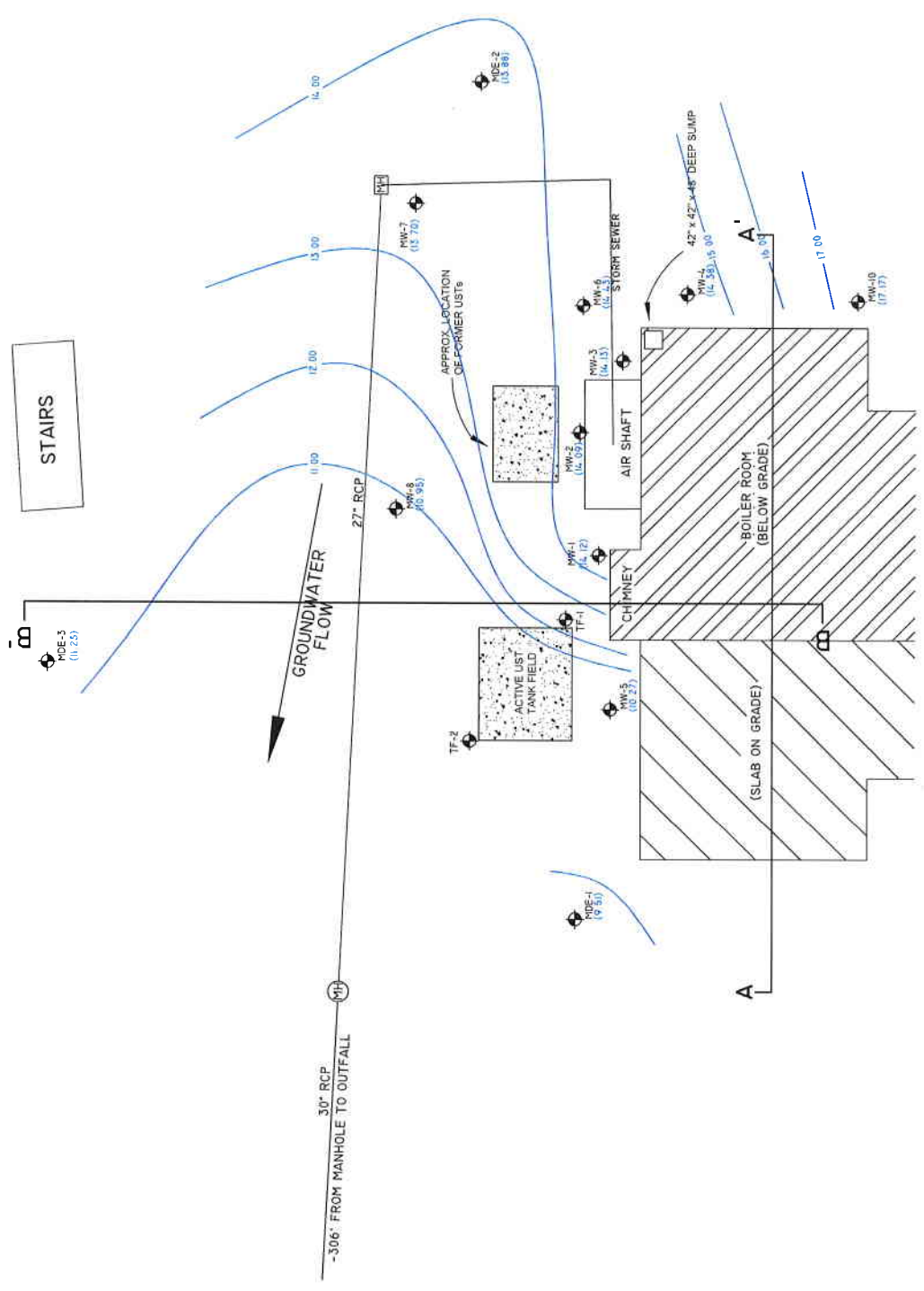
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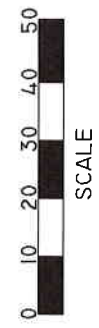
PROJECT: BATES MIDDLE SCHOOL 701 CHASE STREET ANNAPOLIS, MARYLAND		CAD FILE: BATES FIG 2	SCALE: AS SHOWN
DATE: 09/13/19	DRAWN BY: KC		

FIGURE 2
SITE SKETCH

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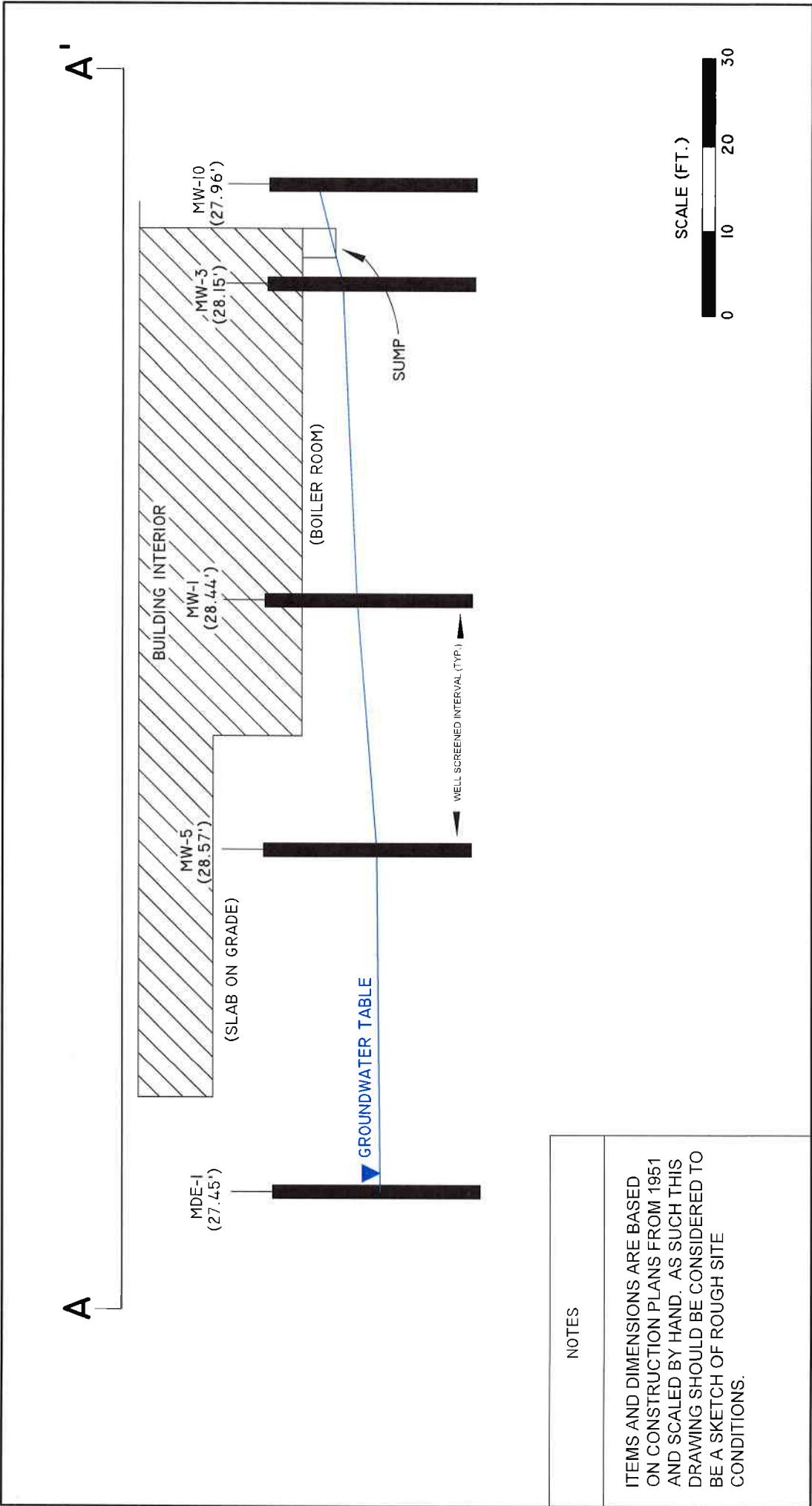
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PROJECT:	BATES MIDDLE SCHOOL 701 CHASE STREET ANNAPOLIS, MARYLAND		
DATE:	09/13/19	DRAWN BY:	KC
		CAD FILE:	BATES FIG 2
		SCALE:	AS SHOWN

FIGURE 3
GROUNDWATER FLOW 08/08/2019

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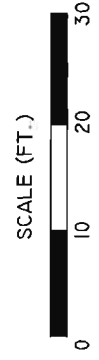
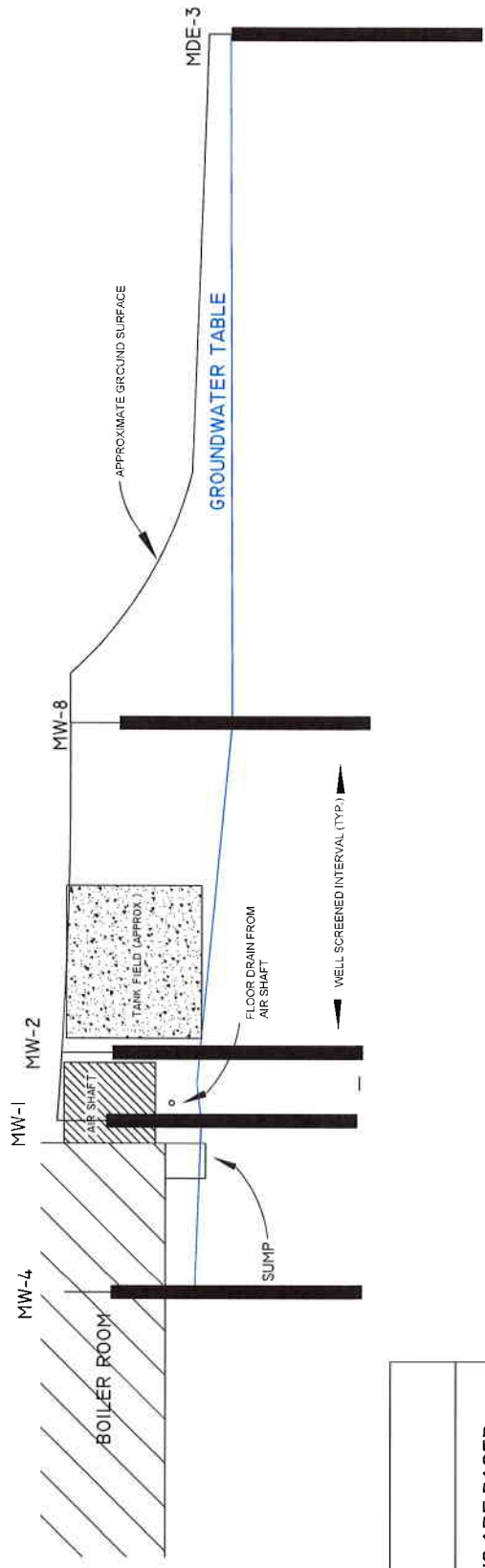
NOTES

ITEMS AND DIMENSIONS ARE BASED ON CONSTRUCTION PLANS FROM 1951 AND SCALED BY HAND. AS SUCH THIS DRAWING SHOULD BE CONSIDERED TO BE A SKETCH OF ROUGH SITE CONDITIONS.

FIGURE 4
CROSS-SECTION A-A'

PROJECT: BATES MIDDLE SCHOOL 701 CHASE STREET ANNAPOLIS, MARYLAND		CAD FILE: FIG 5	SCALE: NTS
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B' B'



NOTES

ITEMS AND DIMENSIONS ARE BASED ON CONSTRUCTION PLANS FROM 1951 AND SCALED BY HAND. AS SUCH THIS DRAWING SHOULD BE CONSIDERED TO BE A SKETCH OF ROUGH SITE CONDITIONS.

FIGURE 5
CROSS-SECTION B-B'

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CAD FILE: FIG 5
SCALE: NTS