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APRIL 24, 2024

Town of Arlington Conservation Commission
c/o Mr. David Morgan, Environmental Planner + Conservation Agent
Robbins Memorial Town Hall
730 Massachusetts Avenue
Arlington, Massachusetts 02476

RE: Additional Soil Test Pits and Groundwater Monitoring
Thorndike Place Residential Development

Dear Members of the Arlington Conservation Commission,

As discussed during the April 4, 2024, public hearing on the Thorndike Place Residential Development, the Applicant, Arlington Land Realty, LLC, has contracted with BSC Group, Inc. (BSC) to perform additional soil testing, install an additional groundwater monitoring well, and continue to monitor this new well along with the previously installed three wells on site. The new soil testing was performed and the additional well installed within the limits of the large infiltration system as shown on the attached plan. This letter summarizes the results of the test pits as well as the well monitoring.

On April 17, 2024, BSC observed and logged five (5) additional deep hole test pits (TP-9 through TP-13). An additional groundwater monitoring well was installed in the location of TP-9. Combined with the previously performed TP-2 (2020) and TP-7 and 8 (2023), a total of eight (8) test pits have been performed within the limits of or immediately adjacent to the large infiltration system location. Combined with the previously installed groundwater monitoring well at TP-7 (2023), there are now two (2) wells located within the limits of this system. Per the Commission's request, BSC coordinated with David Morgan to have a representative of the Town on site during the test pit work. The test pit work on April 17, 2024, was observed by Wolfgang Kirstein, EIT, a civil engineer with the Town of Arlington Department of Public Works Engineering Division.

The results of these additional five test pits generally match the previously performed test pits in the area of the large infiltration system. The area is predominantly fill materials with a USDA soil texture of sandy loam. This information further confirms that our use of hydrologic soil group (HSG) C soils and a lower infiltration rate than standard for sandy loam is indeed a conservative design.

While no redoximorphic features were found, groundwater was observed in each test pit during the excavation. This groundwater was observed both as standing water at the bottom of the pit and weeping along the side of the test pit. While test pit logs and photographs are attached to this letter, a summary of our findings is included in the table below.

Test Pit	Existing Grade	Total Depth (in.)	Depth Fill (in.)	Depth Standing GW (in.)	Depth Weeping GW (in)	Depth to Redox (in.)	ESHGW
TP-9	11.47	118	100	116	90	n/a	3.97
TP-10	11.27	130	130	126	94	n/a	3.44
TP-11	11.09	114	114	111	93	n/a	3.34
TP-12	8.37	76	76	68	53	n/a	3.95
TP-13	7.96	74	74	67	57	n/a	3.21

As shown in the table above, the observed groundwater elevations confirm our previously determined Estimated Seasonal High Groundwater (ESHGW) elevation of 4.0.

As also discussed during the April 4, 2024, public hearing, BSC has performed additional monitoring of the previously installed wells and the new well installed on April 17. The results of this monitoring is provided in the table below.

Test Pit/Well	Groundwater Elevation		
	April 1, 2024	April 17, 2024	April 24, 2024
TP-1	2.94	3.01	2.87
TP-6	3.00	2.95	2.68
TP-7	3.41	3.47	3.30
TP-9	n/a	n/a	3.78

The above measured groundwater elevations are further evidence that the previously determined ESHGW elevation of 4.0 is appropriate for the project. BSC will be continuing with weekly monitoring of these wells and this information will be provided to the Commission as it is obtained.

Additionally, it should be noted that the month of March 2024 was one of the wettest months since 1895. The attached graphics from the National Oceanic and Atmospheric Administration (NOAA) demonstrate the severity of precipitation that occurred in March. As such, groundwater elevations during this time would be expected to be above normal conditions. This information further demonstrates that the use of 4.0 as ESHGW elevation is appropriate as no observed or measured groundwater elevations during this Spring have reached or exceeded this elevation.

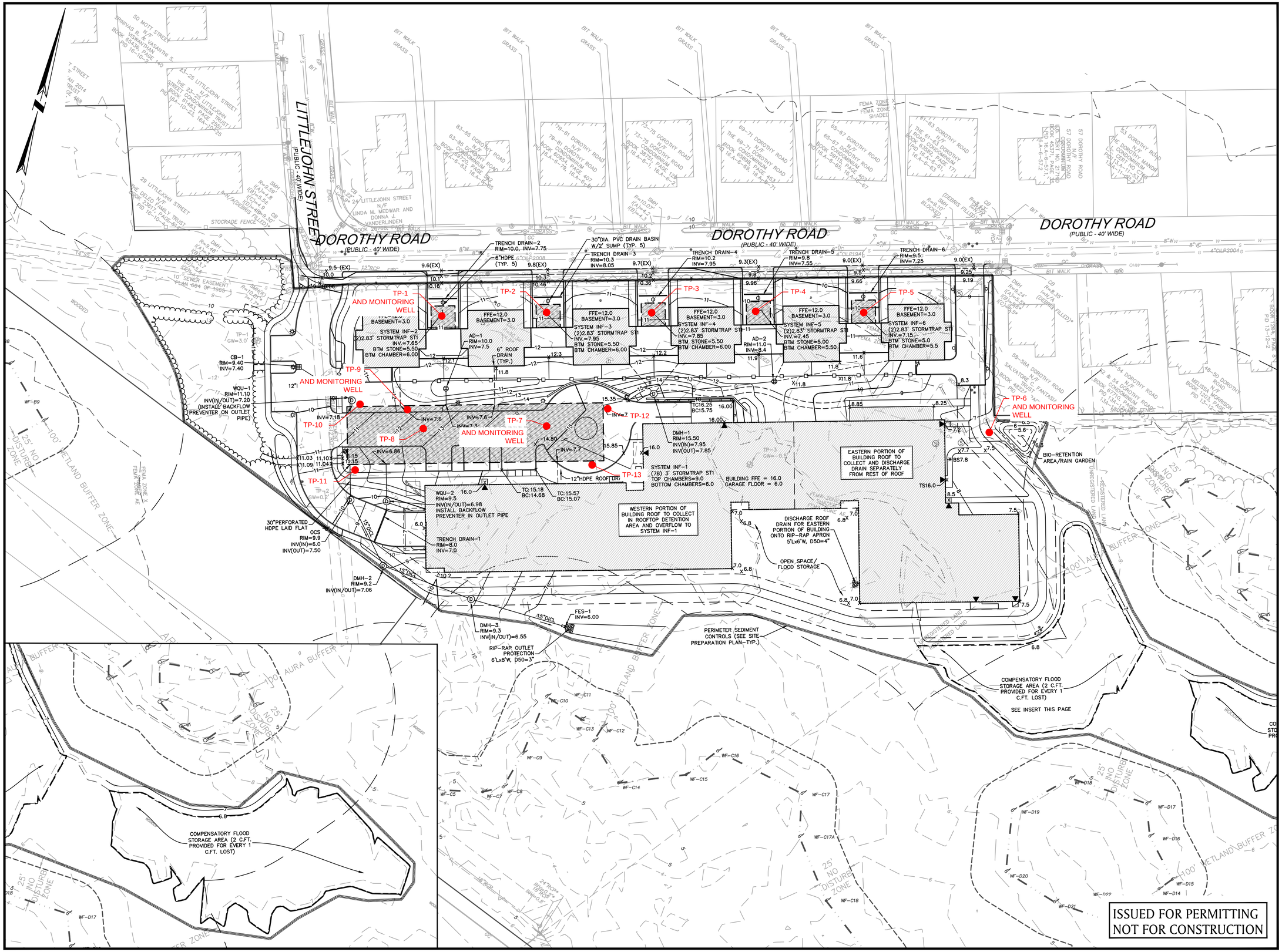
BSC believes that the estimated seasonal high groundwater (ESHGW) elevation has been determined in full compliance with the Massachusetts Stormwater Handbook. With the additional test pit data and groundwater monitoring within the 2024 spring season supporting the ESHGW determined by BSC upon the results of test pits and monitoring wells first read in Spring 2023, we believe the ESHGW of 4.0 is the correct and appropriate value for use in the project's stormwater management design.

We look forward to further discussing the project with you at the upcoming public hearing. Please feel free to contact me at (617) 896-4386 or drinaldi@bscgroup.com should you have any questions on the information in this report.

Sincerely,
BSC GROUP, INC.

Dominic Rinaldi, PE
Senior Associate

Attachments: Test Pit Location Plan
April 17, 2024 Test Pit Logs
April 17, 2024 Test Pit Photos
NOAA Precipitation Information March 2024



THORNDIKE PLACE

DOROTHY ROAD

IN

ARLINGTON
MASSACHUSETTS
(MIDDLESEX COUNTY)

TEST PIT MAP

MAY 2023

REVISIONS:

NO.	DATE	DESC.

PREPARED FOR:

ARLINGTON LAND REALTY, LLC
84 SHERMAN STREET, 2ND FLOOR
CAMBRIDGE, MA 02140

BSC GROUP
803 Summer Street
Boston, Massachusetts
02127
617 896 4300

SCALE: 1" = 30'

0 15 30 60 FEET

FILE: \Civil_Drawings\2340700-GR

DWG.:

JOB. NO: 23407.00

SHEET C-104

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

Arlington Land Realty, LLC.
Owner Name

Dorothy Road
Street Address

16-8-2, 16-8-3, 16-8-4, 16-8-5, 16-8-6, 16-8-7A
Map/Lot #

Arlington
City

MA
State

02474
Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade

2. Soil Survey NRCS USDA Web Soil Survey (Source) 655 (Soil Map Unit) Udorthents, wet substratum (Soil Series)

Depressions
Landform

Soil Limitations

Loamy alluvium and/or sandy glaciofluvial deposits and/or loamy glaciolacustrine deposites and/or loamy marine deposits and/or loamy basal till and/or loamy lodgment till
Soil Parent material

3. Surficial Geological Report 2018/USGS (Year Published/Source) Artificial fill, glaciomarine fine deposits, stagnant ice deposits (Map Unit)

Fine/very fine sand down to very fine sand, silt, silty clay, and clay
Description of Geologic Map Unit:

4. Flood Rate Insurance Map Within a regulatory floodway? ☐ Yes ☒ No

5. Within a velocity zone? ☐ Yes ☒ No

6. Within a Mapped Wetland Area? ☐ Yes ☒ No If yes, MassGIS Wetland Data Layer: (Wetland Type)

7. Current Water Resource Conditions (USGS): April 17, 2024 (Month/Day/ Year) Range: ☐ Above Normal ☒ Normal ☐ Below Normal

8. Other references reviewed: (Zone II, IWPA, Zone A, EEA Data Portal, etc.) Not in Zone II or IWPA (MassMapper)

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-9 (Hole #) | 4/17/24 (Date) | 8:30AM (Time) | Clear, 50 (Weather) | 42.4' N (Latitude) | 71.2' W (Longitude)

1. Land Use: Wooded lot in residential area (e.g., woodland, agricultural field, vacant lot, etc.) | Trees (Vegetation) | Some surface stones, not many (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 7% (Slope (%))

Description of Location: Center of proposed infiltration system (large); between TP-7 and TP-8; about 110 feet from Dorothy Road

2. Soil Parent Material: Glaciofluvial deposits | Depression (Landform) | FS (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body >100 feet | Drainage Way >100 feet | Wetlands 205 feet | Property Line 110 feet | Drinking Water Well >100 feet | Other _____ feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☒ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 90" Depth to Weeping in Hole | 116" Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-100	Fill	Sandy Loam	7.5YR 4/7		Cnc : Dpl:		0	4-6	Massive	Friable	
100-118	C	Fine Sandy Loam	10YR 4/1		Cnc : Dpl:		0	0	Massive	Friable	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes: Installed monitoring well; groundwater weeping from side of pit and standing water at bottom of pit

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-10 (Hole #) | 4/17/24 (Date) | 10:00 AM (Time) | Clear, 50 (Weather) | 42.4' N (Latitude) | 71.2' W (Longitude)

1. Land Use: Wooded lot in residential area (e.g., woodland, agricultural field, vacant lot, etc.) | Trees (Vegetation) | Some surface stones, not many (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 3% (Slope (%))

Description of Location: Northwest corner of infiltration system; about 100' from Dorothy Road

2. Soil Parent Material: Glaciofluvial deposits | Depression (Landform) | BS (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body >100 feet | Drainage Way >100 feet | Wetlands 250 feet | Property Line 79 feet | Drinking Water Well >100 feet | Other _____ feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☒ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 94" Depth to Weeping in Hole | 126" Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-130	Fill	Sandy Loam	7.5YR 4/2		Cnc : Dpl:		0	4-6	Massive	Friable	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes: Groundwater weeping from side of hole and standing water at bottom of pit; debris and construction material present throughout fill

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used (Choose one):	Obs. Hole # TP-9	Obs. Hole # TP-10
☐ Depth to soil redoximorphic features	_____ inches	_____ inches
☒ Depth to observed standing water in observation hole	90 inches	94 inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

_____ Index Well Number _____ Reading Date

$S_h = S_c – [S_r \times (OW_c – OW_{max})/OW_r]$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

   a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

      ☐ Yes ☒ No

   b. If yes, at what depth was it observed (exclude O, A, and E Horizons)? Upper boundary: _____ inches Lower boundary: _____ inches

   c. If no, at what depth was impervious material observed? Upper boundary: 90 inches Lower boundary: 118 inches

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-11 (Hole #) | 4/17/24 (Date) | 10:45AM (Time) | Clear, 55 (Weather) | 42.4' N (Latitude) | 71.2' W (Longitude)

1. Land Use: Wooded lot in residential area (e.g., woodland, agricultural field, vacant lot, etc.) | Trees (Vegetation) | Some surface stones, not many (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 6% (Slope (%))

Description of Location: Southwest corner of infiltration system; about 135' from Dorothy Road

2. Soil Parent Material: Glaciofluvial deposits | Depression (Landform) | FS (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body >100 feet | Drainage Way >100 feet | Wetlands 215 feet | Property Line 46 feet | Drinking Water Well >100 feet | Other _____ feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☒ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 93" Depth to Weeping in Hole | 111" Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-114	Fill	Sandy Loam	7.5YR 4/2		Cnc : Dpl:		0	4-6	Massive	Friable	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-12 (Hole #) | 4/17/24 (Date) | 11:30AM (Time) | Clear, 55 (Weather) | 42.4' N (Latitude) | 71.2' W (Longitude)

1. Land Use: Wooded lot in residential area (e.g., woodland, agricultural field, vacant lot, etc.) | Trees (Vegetation) | Some surface stones, not many (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 3% (Slope (%))

Description of Location: Northeast corner of infiltration system; about 95' from Dorothy Road

2. Soil Parent Material: Glaciofluvial deposits | Depression (Landform) | FS (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body >100 feet | Drainage Way >100 feet | Wetlands 215 feet | Property Line 92 feet | Drinking Water Well >100 feet | Other _____ feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☒ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 53" Depth to Weeping in Hole | 68" Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-76	Fill	Sandy Loam	7.5YR 3/2		Cnc : Dpl:		0	50	Massive	Friable	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes: Larger cobbles/boulders throughout test pit

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used (Choose one):

	Obs. Hole # TP-11	Obs. Hole # TP-12
☐ Depth to soil redoximorphic features	_____ inches	_____ inches
☒ Depth to observed standing water in observation hole	93 inches	53 inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

Index Well Number _____ Reading Date _____

$S_h = S_c – [S_r \times (OW_c – OW_{max})/OW_r]$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

   a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

   ☐ Yes ☒ No

   b. If yes, at what depth was it observed (exclude O, A, and E Horizons)? Upper boundary: _____ inches Lower boundary: _____ inches

   c. If no, at what depth was impervious material observed? Upper boundary: 53 inches Lower boundary: 76 inches

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-13 (Hole #) | 4/17/24 (Date) | 11:45AM (Time) | Clear, 55 (Weather) | 42.4' N (Latitude) | 71.2' W (Longitude)

1. Land Use: Wooded lot in residential area (e.g., woodland, agricultural field, vacant lot, etc.) | Trees (Vegetation) | Some surface stones, not many (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 1% (Slope (%))

Description of Location: Southeast corner of infiltration system; about 135' from Dorothy Road

2. Soil Parent Material: Glaciofluvial deposits | Depression (Landform) | TS (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body >100 feet | Drainage Way >100 feet | Wetlands 180 feet | Property Line 130 feet | Drinking Water Well >100 feet | Other _____ feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☒ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 57" Depth to Weeping in Hole | 67" Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-74	Fill	Sandy Loam	7.5YR 3/2		Cnc : Dpl:	5-10	0	10-20	Massive	Friable	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used (Choose one):

	Obs. Hole # TP-13	Obs. Hole # _____
☐ Depth to soil redoximorphic features	_____ inches	_____ inches
☒ Depth to observed standing water in observation hole	57 inches	_____ inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

_____ Index Well Number _____ Reading Date

$S_h = S_c – [S_r \times (OW_c – OW_{max})/OW_r]$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

   a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

   ☐ Yes ☒ No

   b. If yes, at what depth was it observed (exclude O, A, and E Horizons)? Upper boundary: _____ inches Lower boundary: _____ inches

   c. If no, at what depth was impervious material observed? Upper boundary: 57 inches Lower boundary: 74 inches

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Signature of Soil Evaluator	Date: 4/17/2024
Typed or Printed Name of Soil Evaluator / License #: Emily Derrig, SE 14158	Expiration Date of License: 6/30/2026
Name of Approving Authority Witness	Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Field Diagrams: Use this area for field diagrams:

TP-9 at full depth

BSC GROUP
BUILD | SUPPORT | CONNECT

TP-9 at full depth

BSC GROUP
BUILD | SUPPORT | CONNECT

TP-9 with monitoring well

Test Pit Photographs
April 17, 2024
Thorndike Place, Arlington, MA

BSC GROUP
BUILD | SUPPORT | CONNECT

TP-10 at full depth

BSC GROUP
BUILD | SUPPORT | CONNECT

TP-10 at full depth

BSC GROUP
BUILD | SUPPORT | CONNECT

TP-11 at full depth

BSC GROUP
BUILD | SUPPORT | CONNECT

TP-11 at full depth

BSC GROUP
BUILD | SUPPORT | CONNECT

TP-12 at full depth

BSC GROUP
BUILD | SUPPORT | CONNECT

TP-12 at full depth

BSC GROUP
BUILD | SUPPORT | CONNECT

TP-13 at full depth

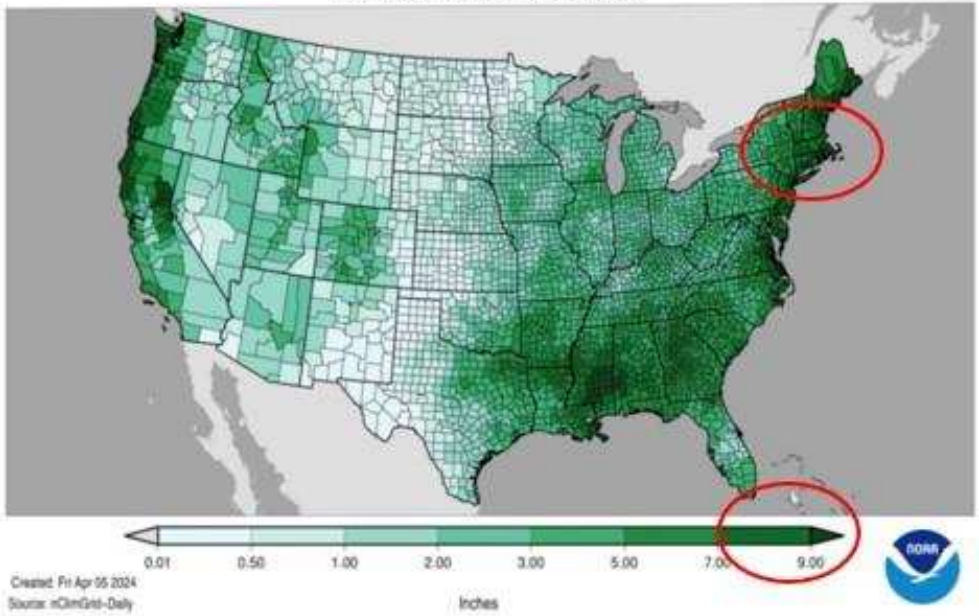
BSC GROUP
BUILD | SUPPORT | CONNECT

TP-13 at full depth

BSC GROUP
BUILD | SUPPORT | CONNECT

Total Precipitation
March 01–31, 2024

NOAA's National Centers for Environmental Information

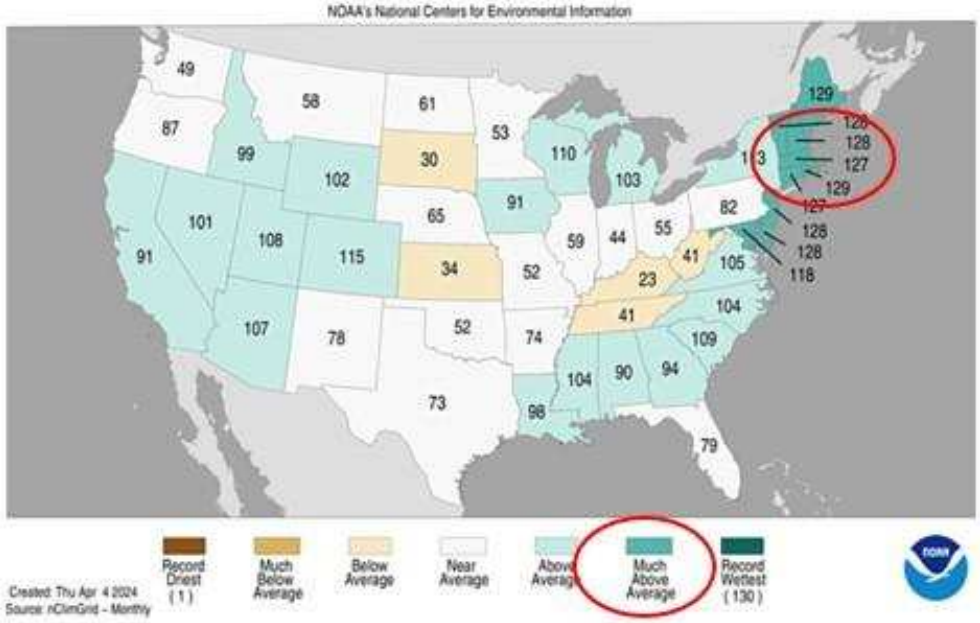


Created: Fri Apr 05 2024
Source: nClimGrid-Daily

Statewide Precipitation Ranks
March 2024

Ranking Period: 1895–2024

NOAA's National Centers for Environmental Information

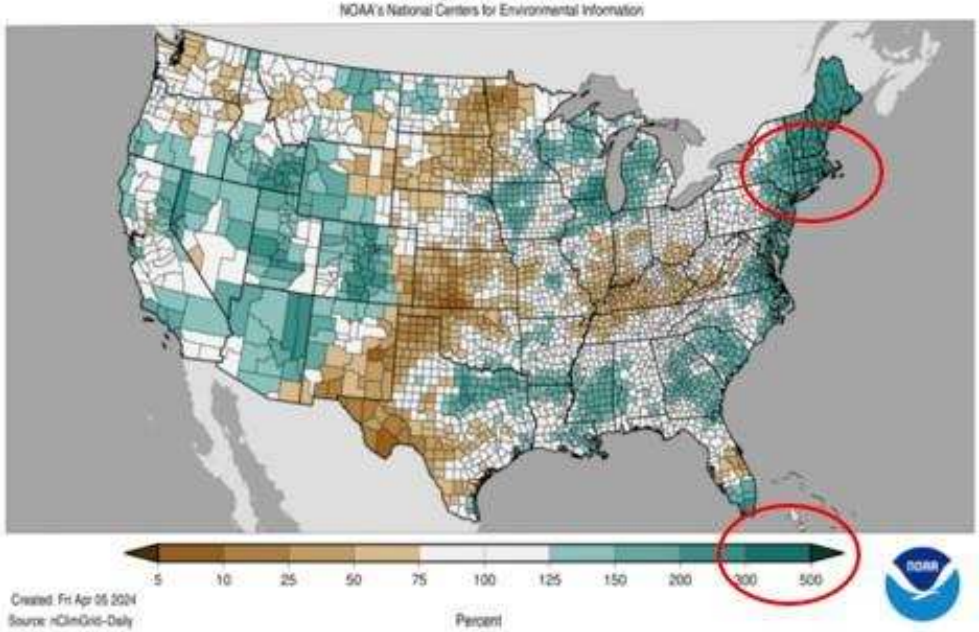


Created: Thu Apr 4 2024
Source: nClimGrid - Monthly

Precipitation Percent of Average
March 01–31, 2024

Average Period: 1991–2020

NOAA's National Centers for Environmental Information

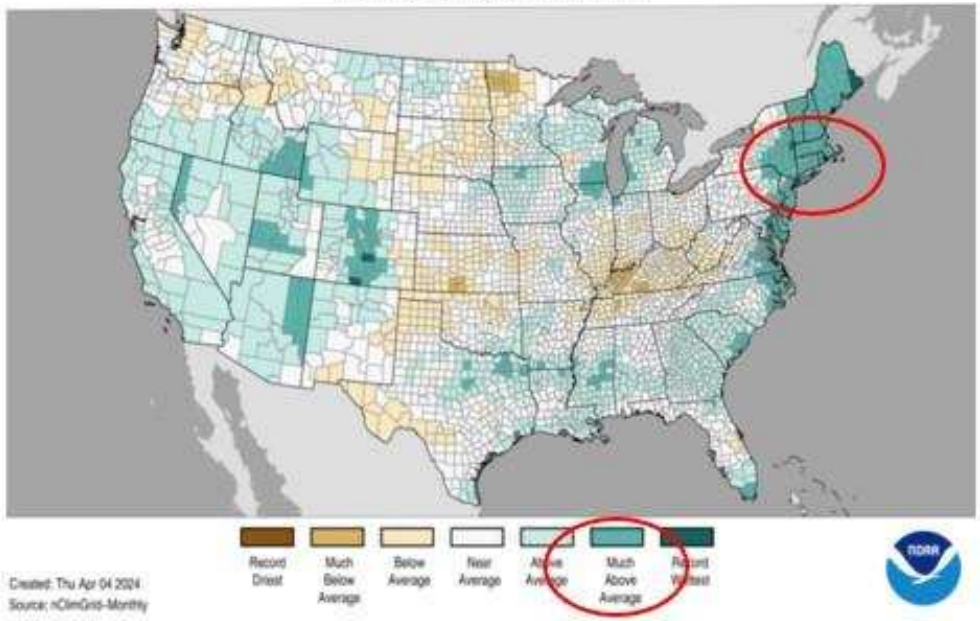


Created: Fri Apr 05 2024
Source: nClimGrid-Daily

County Precipitation Ranks
March 2024

Ranking Period: 1895–2024

NOAA's National Centers for Environmental Information



Created: Thu Apr 04 2024
Source: nClimGrid-Monthly