

28 February 2023

Josh Morse, Public Buildings Commissioner
Public Buildings Department
1000 Massachusetts Ave.
Newton, MA 02459

Reference: **Countryside Elementary School**
Newton, MA

Subject: Floodplain Construction Considerations

Dear Josh:

DiNisco Design, the City of Newton's architect for the Countryside Elementary School project, has engaged the Horsley Witten Group (HWG) to be part of the design team. HWG is an extremely well-regarded Massachusetts environmental and sustainable design engineering firm and has been working with us to assist in site analysis and building design. HWG has carefully studied the floodwater maps for the Countryside site, CRWA's flood modeling, and understands the state and FEMA requirements for both building design and flood storage. Their analysis shows that the building can be safely sited on the current property's northern most end without creating any floodwater impacts on neighbors. Below is an excerpt from their analysis.

The Massachusetts Wetlands Protection Act does not allow us to displace more floodwater from the site than is currently displaced below the surface of the 100-year flood elevation (+112.4). All options under consideration comply with this requirement.

The existing school building sits with a first floor elevation of +110.5, almost two feet below the surface of the 100-year flood plain elevation (+112.4). The lowest point of the basement is an additional 14 feet below the 100-year flood elevation. The Massachusetts Building Code requires that the lowest floor elevation be set at a minimum of one foot above the surface of the 100-year flood plain elevation. We have established +114 as our first floor elevation. It's important to note that the first floor elevation will not have an impact on the amount of water displaced by the building.

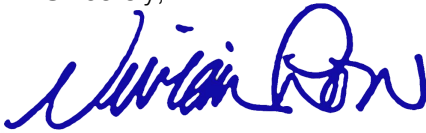
Preliminary studies have shown that locating the building on the northernmost end of the site and elevating the building as described above will protect the building from future flooding while allowing the site to contain the same amount of floodwater storage that it currently does. This will result in a dry school that is equipped to withstand frequent flood events. This will not result in displacement of floodwater onto neighboring properties.

A thorough review of alternative sites citywide determined that the current Countryside School site is the best location for the new school. Other potential sites within the district have their own legal or environmental concerns, including flooding, proximity to wetlands, current parkland designation, or hazardous soils. It is not desirable to locate a new school building outside of the boundaries of the Countryside School district, especially given how many students walk and bike to school.



Please see the attached memo for more information regarding the regulations, requirements and process for the design and construction of a new building on the Countryside site.

Sincerely,



Vivian Low
DiNISCO DESIGN

VL/mh

cc: Alex Valcarce
Steve Brown
Michael Burton

Enclosures: Countryside Floodplain Construction Considerations Memorandum dated 02/28/23
Attachment A: National Flood Hazard Layer FIRMette – City of Newton
Attachment B: Flood Profile, South Meadow Brook – Paul Brook
Attachment C: Countryside Elementary School Existing Site Floodplain
Attachment D: Charles River Flood Model – 100-Year 24-Hour Storm – Present
Attachment E: Charles River Flood Model – 100-Year 24-Hour Storm – 2030
Attachment F: Charles River Flood Model – 100-Year 24-Hour Storm – 2070

Memorandum

Date: 28 February 2023

To: Josh Morse

From: DiNisco Design & Horsley Witten Group

Reference: **Countryside Elementary School**

Subject: Countryside Floodplain Construction Considerations

Summary

Understanding the challenges and concerns with locating a new building on the existing Countryside site, below is a summary of the considerations, regulations and requirements that demonstrate that building new at this location is achievable.

Alternative Sites

A thorough review of alternative sites citywide determined that the current Countryside School site is the best location for the new school. Other potential sites within the district have their own legal or environmental concerns, including flooding, proximity to wetlands, current parkland designation, or hazardous soils. It is not desirable to locate a new school building outside of the boundaries of the Countryside School district, especially given how many students walk and bike to school.

Regulations

The Massachusetts Wetlands Protection Act does not allow us to displace more floodwater from the site than is currently displaced below the surface of the 100-year flood elevation (+112.4). All options under consideration comply with this requirement.

The existing school building sits with a first floor elevation of +110.5, almost two feet below the surface of the 100-year flood plain elevation (+112.4). The lowest point of the basement is an additional 14 feet below the 100-year flood elevation. Massachusetts Building Codes require that the lowest floor elevation be set at a minimum of one foot above the surface of the 100-year flood plain elevation. We have established +114 as our first floor elevation. It's important to note that the first floor elevation will not have an impact on the amount of water displaced by the building.

Preliminary studies have shown that locating the building on the northernmost end of the site and elevating the building as described above will protect the building from future flooding while allowing the site to contain the same amount of floodwater storage that it currently does. This will result in a dry school that is equipped to withstand frequent flood events. This will not result in displacement of floodwater onto neighboring properties.

Countryside Elementary School Site Existing Conditions

The Countryside Elementary School is located at 191 Dedham Street in Newton, MA on an approximately 7.26 acre parcel.



The school site is located west and south of Dedham Street, north of South Meadow Brook and Bound Brook Road, and east of Andrew Street, with a thin wooded area and potential intermittent stream separating the site from the residential properties on Andrew Street. In general, the site slopes down to the west and south, away from Dedham Street and, except for about 4,000 SF at the northern perimeter and northeast corner, is almost entirely set within the 100-year flood zone AE, elevation of +112.4. Refer to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM) for this property (see attachments A, B & C).

Originally constructed in 1953, the two-story building has had several additions:

- 1958 – 6 classroom annex addition
- 1986 – 2 classroom annex addition & renovations
- 1991, 1999, 2000 – 4 modular classrooms and 2 modular offices

The interconnected school buildings are located on the southeast corner of the site. While most of the first floor is “slab-on-grade” at elevation +110.5 (10” above the 10-year flood plain, elevation 109.6), there is approximately 5,200 SF of below-grade basement area. Also, portions of the permanent building are located within the 0-100 foot Riverfront Area and 50% of the school is located within the 100-200 foot Riverfront Area. The chronic flooding and moisture issues that regularly occur at the school are a direct result of the school’s location on the site.

100-year Flood Maps and Models

Flood zones are geographic areas that FEMA has defined according to varying levels of flood risk. These zones are depicted on a community’s Flood Hazard Boundary Map or the Flood Insurance Rate Map and are defined by the site’s topography.

The 100-year flood elevation at the Countryside site, as defined by FEMA is elevation +112.4. A topographic survey completed by DGT Associates (August 9, 2022, updated February 2, 2023) identifies the FEMA Flood Zone AE contour as well as the site’s remaining topography in 1 foot increments.

Flood modeling provided by the Charles River Watershed Association (CRWA) projects the expected flooding on the site during a 100-year, 24-hour storm event. The CRWA model results for a 100-year, 24-hour storm in 2070 do not include the topography but overlaying the current site survey shows that the +112.4-foot contour line closely matches the limits the 2070 projected area will flood during a 100-year storm (see attachments D, E & F).

Hence the current flood area data and impacts being used for design closely align with the projected 2070 data by CRWA.

Design & Regulatory Criteria

Construction within the 100-year flood plain have strict requirements and is regulated by the following:

1. FEMA: defines the elevation of the 100-year flood plain and “Special Flood Hazard Areas” subject to inundation by the 1% annual chance flood. The Countryside site is defined as FEMA Zone AE, with a determined Base Flood Elevation (BFE) of +112.4.
2. State Building Code: defines requirements for structures, for communities that regulate the flood zone based on the FIRM. The design flood elevation (DFE) shall be equal to or higher than the BFE (100-yr elevation, +112.4) plus one foot. Buildings and structures in A Zones shall have the lowest floors elevated to or above the design flood elevation (DFE).

- a. Massachusetts State Building Code: is comprised of a series of international model codes (I Code Series by the ICC) and state-specific amendments adopted by the Board of Building Regulation and Standards (BBRS). The current edition is the 9th Edition Residential Volume and 9th Edition Base Volume.
 - b. ASCE 24-14: Published by the American Society of Civil Engineers (ASCE), Flood Resistant Design and Construction, ASCE 24, is a referenced standard in the International codes. ASCE states the minimum requirements and expected performance of the siting and design and construction of buildings and structures in flood hazard areas that are subject to building code requirements.
3. Wetland Regulations: outlines the permitting process for project approval. Approval requires the design to mitigate and manage stormwater on the site in accordance with the Massachusetts Stormwater Management Handbook. The Project may not cause an increased rate of stormwater runoff from the site into adjacent wetlands or adjacent properties. The Project may not reduce the amount of flood storage on the site nor cause additional flooding on adjacent properties.
- a. Massachusetts Wetland Regulations 310 CMR 10.57: In accordance with 10.57(4)(a)1. *Compensatory storage shall be provided for all flood storage volume that will be lost as the result of a proposed project within Bordering Land Subject to Flooding, when in the judgment of the issuing authority said loss will cause an increase or will contribute incrementally to an increase in the horizontal extent and level of flood waters during peak flows.*

Compensatory storage shall mean a volume not previously used for flood storage and shall be incrementally equal to the theoretical volume of flood water at each elevation, up to and including the 100-year flood elevation, which would be displaced by the proposed project. Such compensatory volume shall have an unrestricted hydraulic connection to the same waterway or water body. Further, with respect to waterways, such compensatory volume shall be provided within the same reach of the river, stream or creek.

The proposed school design will include compensatory flood storage as required. The finish floor elevation of the proposed school will be set at elevation 114.0 and flood storage will be located within the athletic fields and parking lots south of the new building.
 - b. Newton's Flood Plain Ordinance (22-22): In accordance with Section 22-22 (b)(3) *No order of conditions shall be issued under paragraphs (2)(b)-(2)(f) of this subsection unless it is demonstrated to the satisfaction of the conservation commission that the cumulative effect of the proposed project, when combined with all other existing and anticipated development, will not increase the water surface elevation of the 100-year flood at any point within the city.*

The proposed project will require an Order of Conditions from the Newton Conservation Commission. The proposed project will demonstrate that the cumulative effect of the proposed project will not increase the water surface elevation of the 100-year flood elevation as a result of the new building.

- c. Newton Conservation Commission's policies for construction in Flood Zone and compensatory flood storage: Compensatory flood storage is required if the proposed work creates a situation where the amount of flood storage accommodated on the site is reduced because the volume of proposed work displaces more flood waters than current improvements displace. This has been explained by comparing the site to a "brick in a bathtub filled with water." In this analogy, the site is a bathtub, and the existing school building is a brick. If you lift the brick up and relocate it to another side of the bathtub, the water level stays the same. The requirement is that we must keep the water level the same. If the new brick is larger than the old brick, compensatory storage is required.

Design tools for **compensatory flood storage** include constructing portions of the new building and site improvements on piers to provide unrestricted hydraulic connection or excavating areas that are above the 100-year flood elevation.

Design tools for **stormwater mitigation** include bioretention basins, level spreaders, drainage swales, and reduction of impervious surface within the project site. All of these are being considered and will be done in accordance with the Massachusetts Stormwater Management Standards governing the stormwater design approach.

Design & Regulatory Process

Based on the regulatory requirements and additional information from preliminary geotechnical explorations, the following criteria for the Project are as follows:

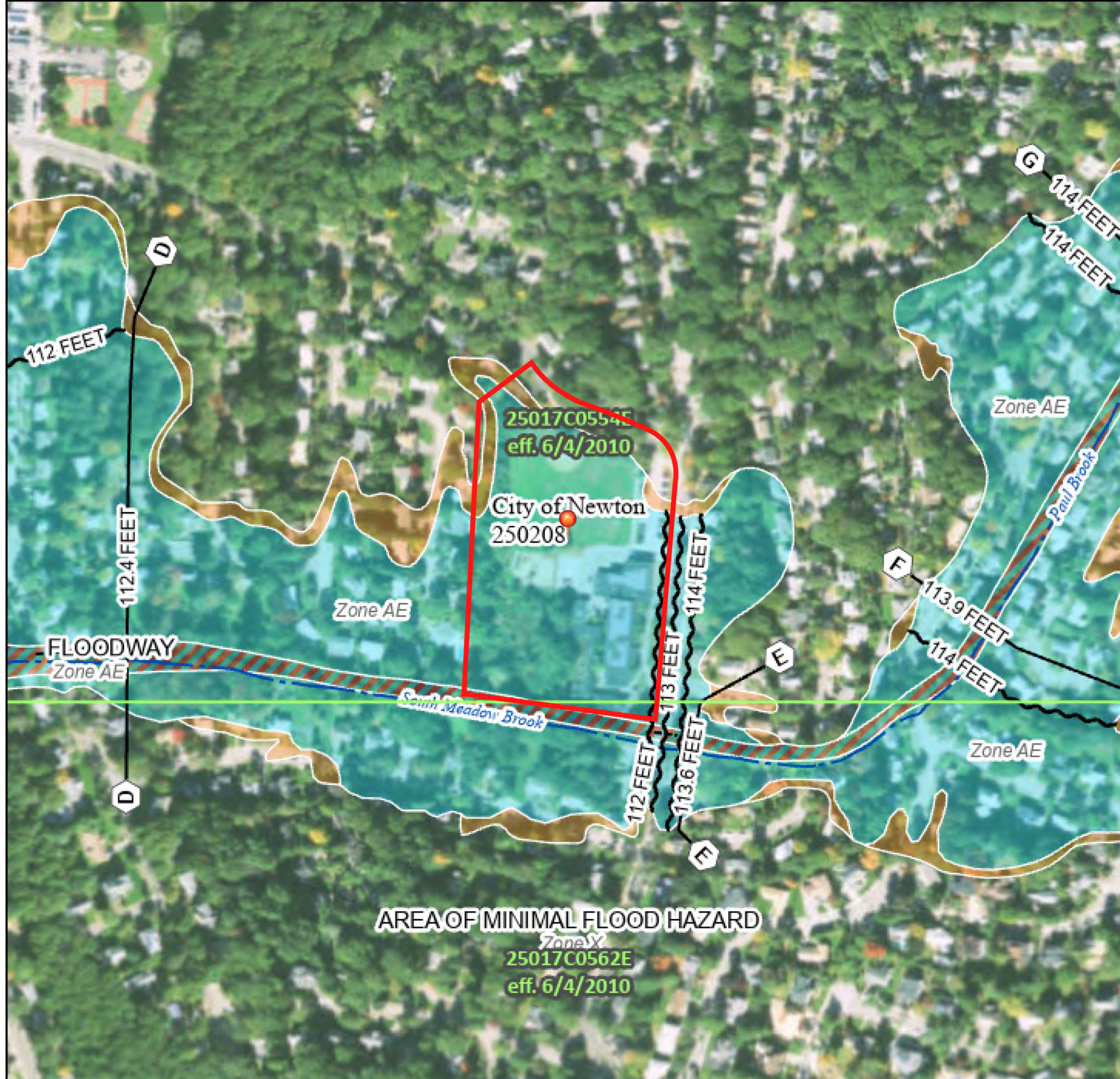
1. The proposed building structure will be located outside of the Riverfront Area.
2. The building structure's lowest floor elevation will be set at elevation +114.
3. The stormwater management design will incorporate best management practices for water quantity, water quality and recharge.

National Flood Hazard Layer FIRMette



ATTACHMENT A

71°12'29"W 42°19'2"N

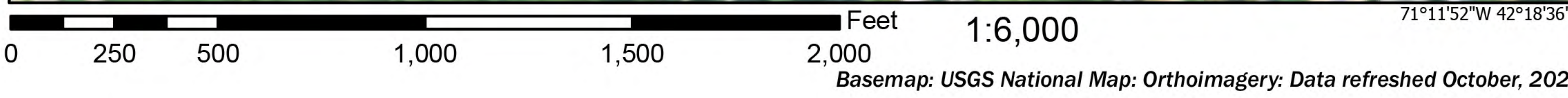


Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) Zone A, V, A99
		With BFE or Depth Zone AE, AO, AH, VE, AR
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
		Future Conditions 1% Annual Chance Flood Hazard Zone X
		Area with Reduced Flood Risk due to Levee. See Notes. Zone X
		Area with Flood Risk due to Levee Zone D
OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard Zone X
		Effective LOMRs
GENERAL STRUCTURES		Area of Undetermined Flood Hazard Zone D
		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES		20.2 Cross Sections with 1% Annual Chance Water Surface Elevation
		17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
		8 Coastal Transect
		513 Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
MAP PANELS		Coastal Transect Baseline
		Profile Baseline
		Hydrographic Feature
		Digital Data Available
		No Digital Data Available
		Unmapped

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.



This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 5/25/2022 at 2:36 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

**COUNTRYSIDE
ELEMENTARY SCHOOL**

Newton, MA

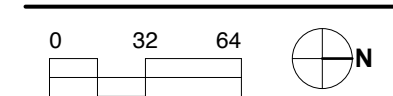
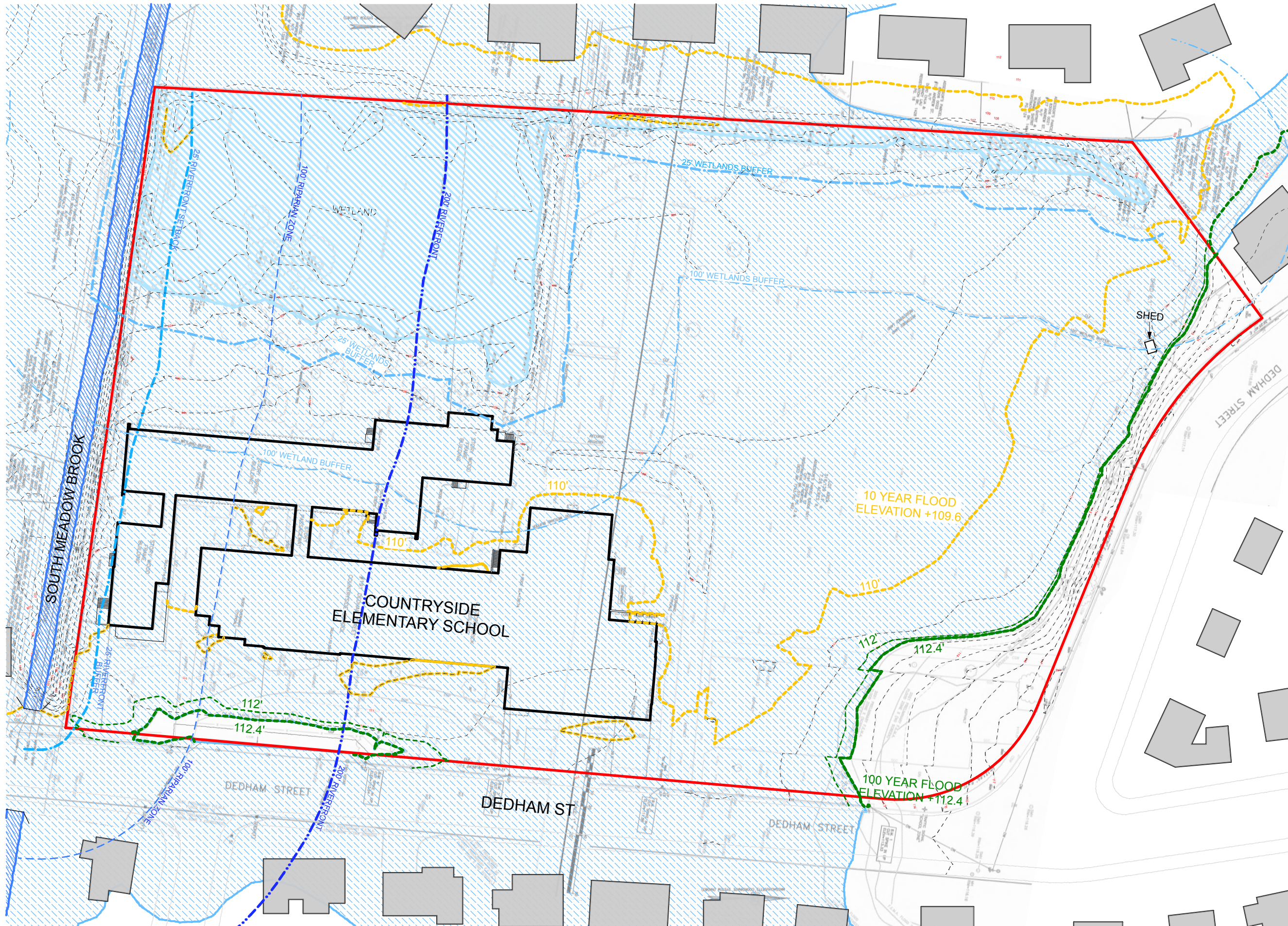
ATTACHMENT C

**EXISTING SITE WETLANDS
AND FLOODPLAIN**

• Wetlands and flood restrictions

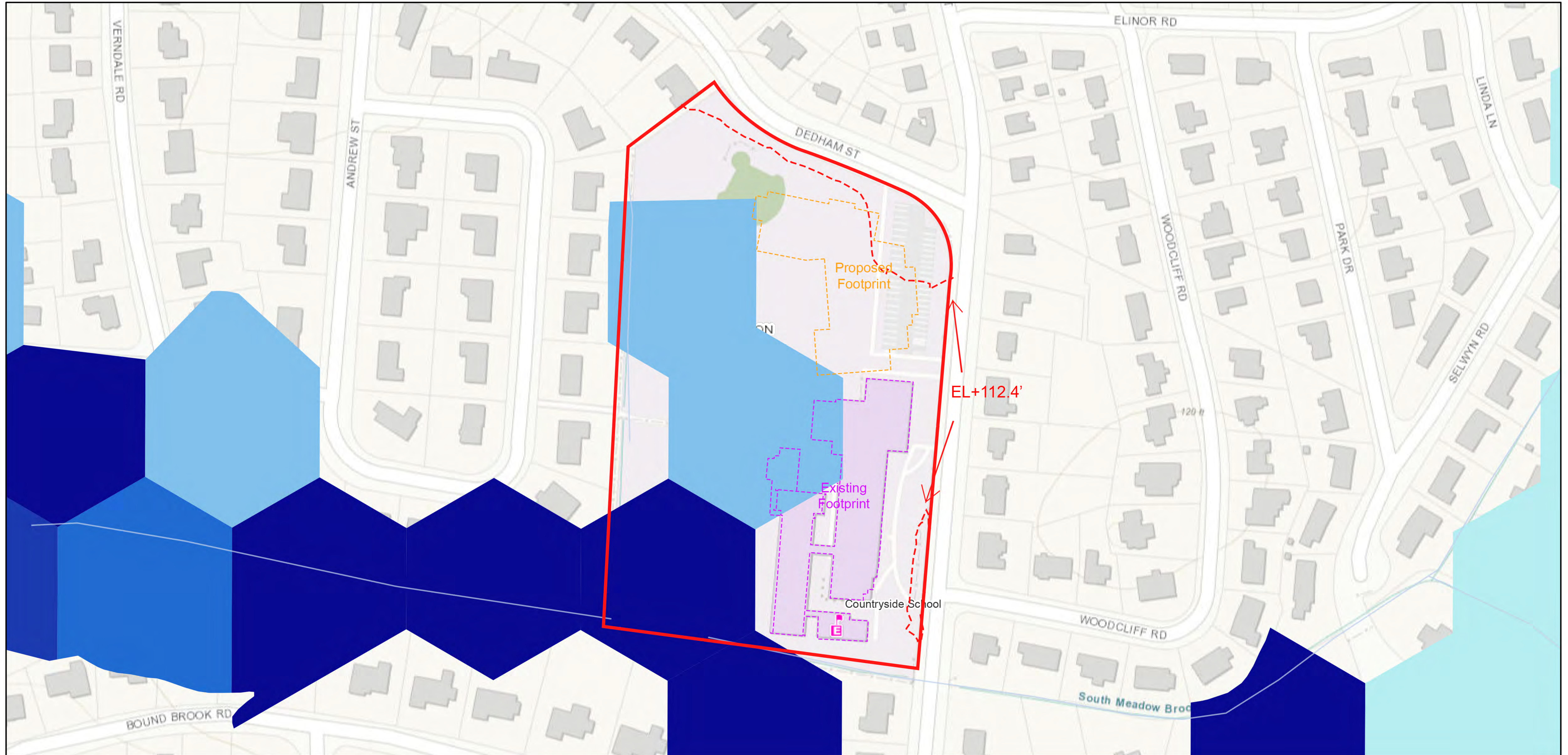
LEGEND

- PROPERTY LINE
- - - 10-YEAR FLOOD ELEVATION
- - - 100-YEAR FLOOD ELEVATION
- - - WETLAND BUFFER
- - - RIVERFRONT ZONE
- ▨ 100-YEAR FLOODPLAIN



27 FEBRUARY 2023

Charles River Flood Model - 100-Year 24-Hour Storm - Present



2/23/2023, 2:01:50 PM

Schools



Public Elementary



Watershed



Subbasins

Hydrologic Connection

100-yr (1% AEP) 24-hour storm - Present

No Flood

>0' - 0.5'

>0.5' - 1.0'

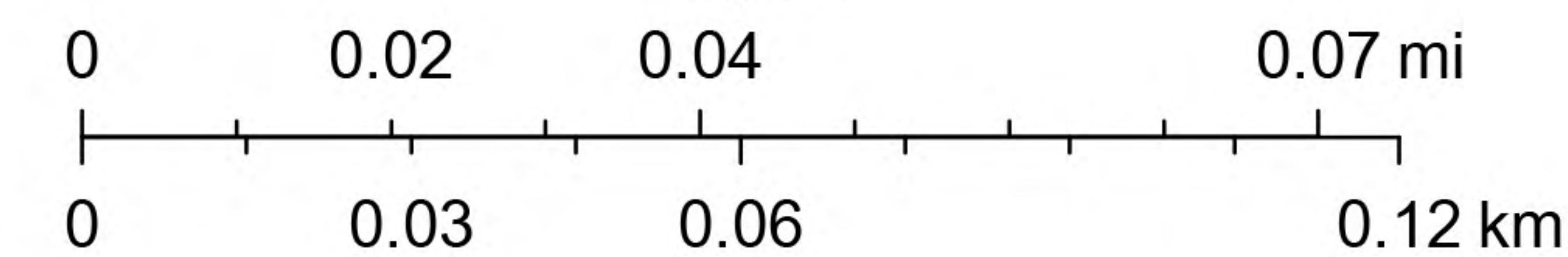
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>2.0' - 3.0'

>3.0'

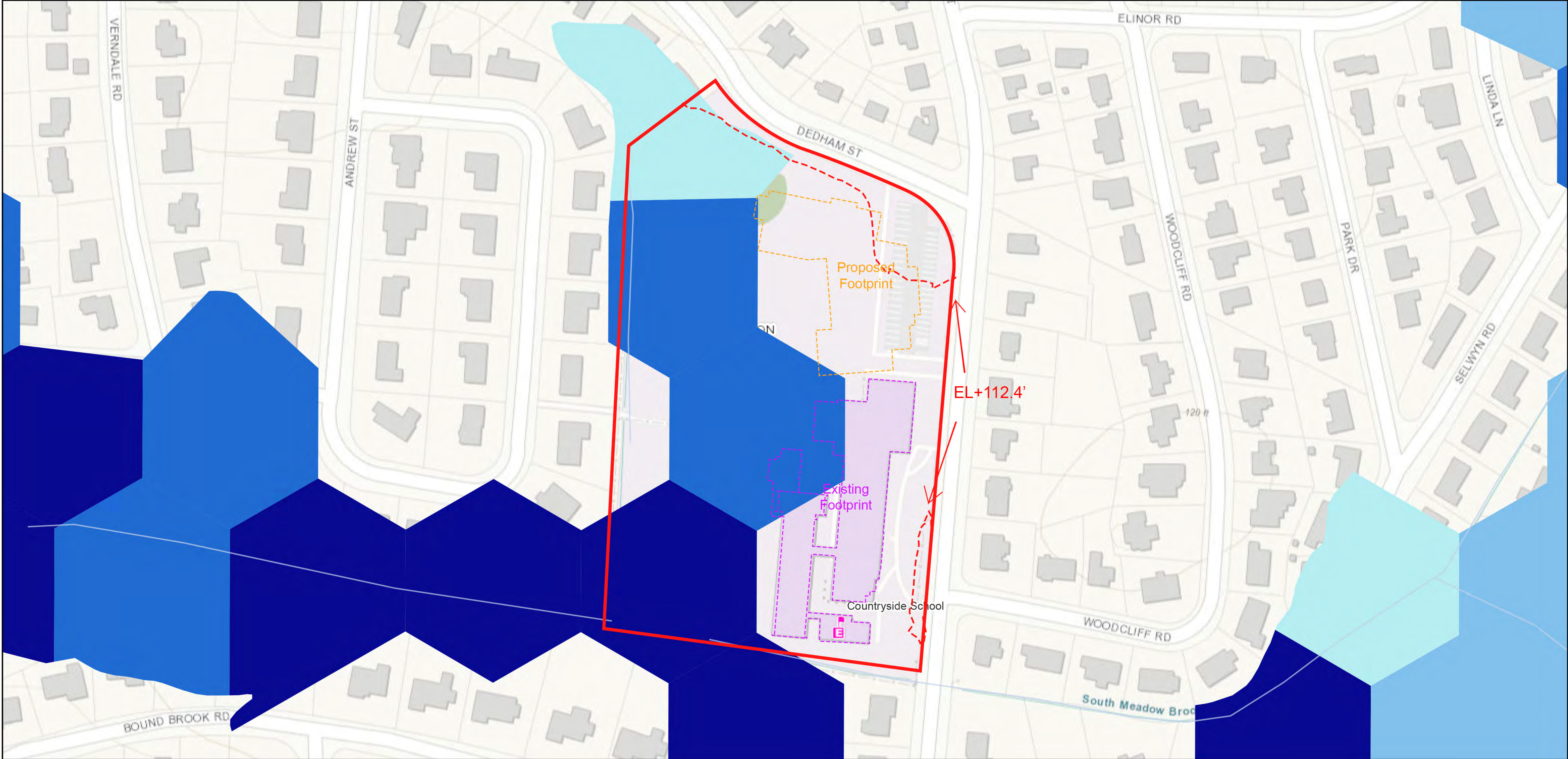
Massachusetts Municipalities

1:2,257



City of Newton, MassGIS, Esri Canada, Esri, HERE, Garmin, INCREMENT P, USGS, EPA, USDA

Charles River Flood Model - 100-Year 24-Hour Storm - 2030



2/23/2023, 1:59:35 PM

Schools



Public Elementary



Watershed



Subbasins

Hydrologic Connection

100-yr (1% AEP) 24-hour storm - 2030

No Flood

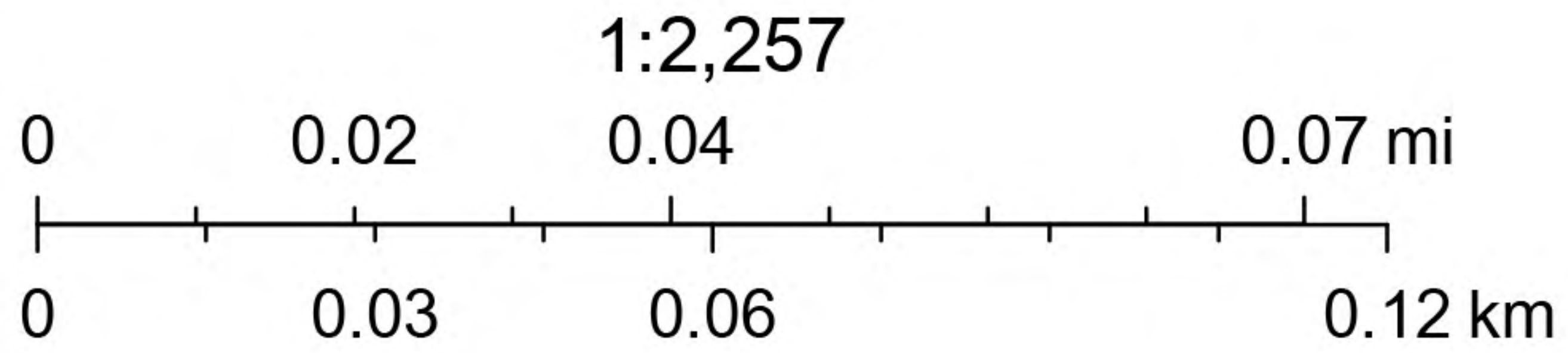
>0' - 0.5'

>0.5' - 1.0'

>1.0' - 2.0'

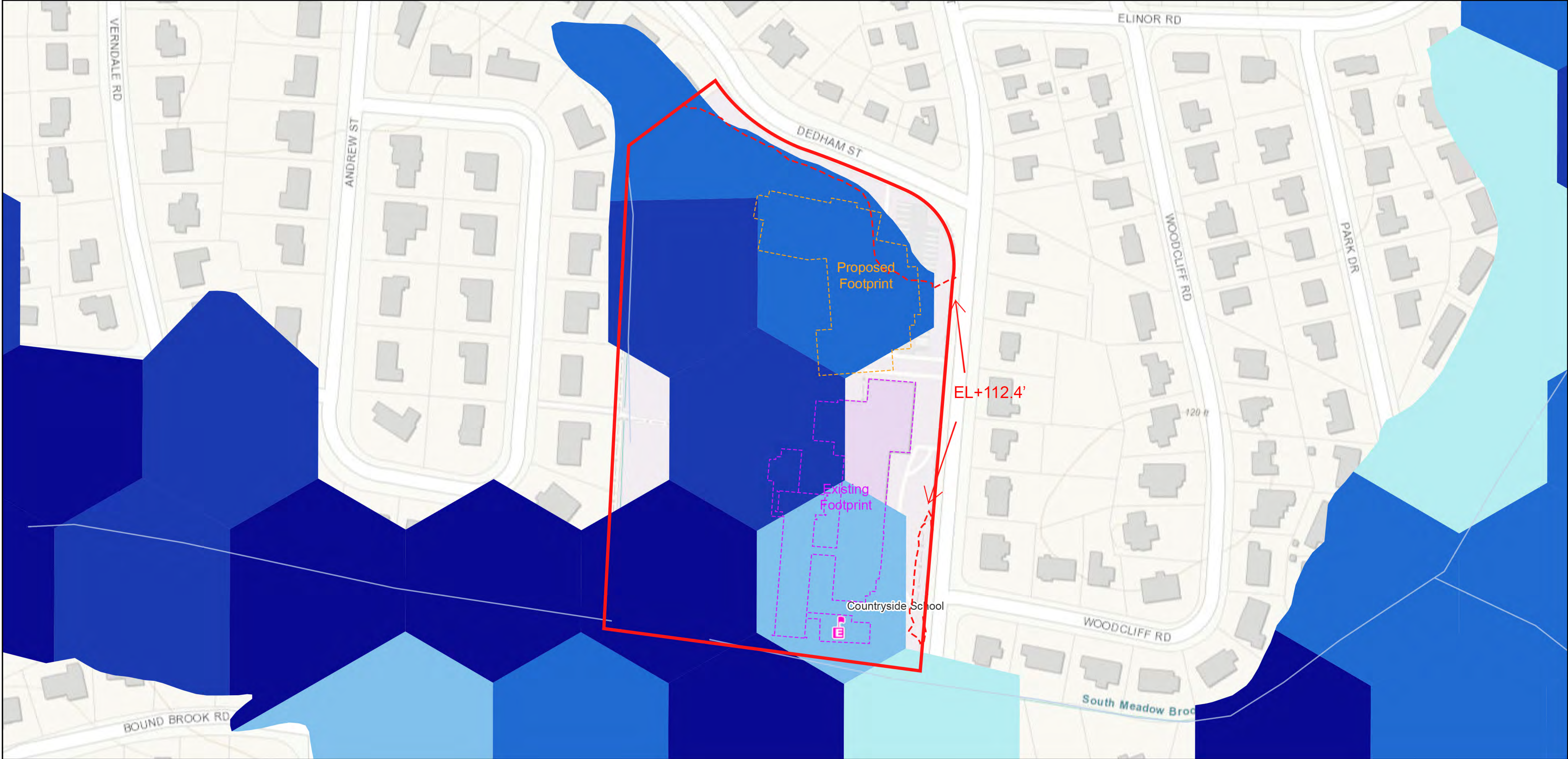
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Massachusetts Municipalities



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Charles River Flood Model - 100-Year 24-Hour Storm - 2070



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Schools



Public Elementary



Watershed



Subbasins

Hydrologic Connection

100-yr (1% AEP) 24-hour storm - 2070

No Flood

>0' - 0.5'

>0.5' - 1.0'

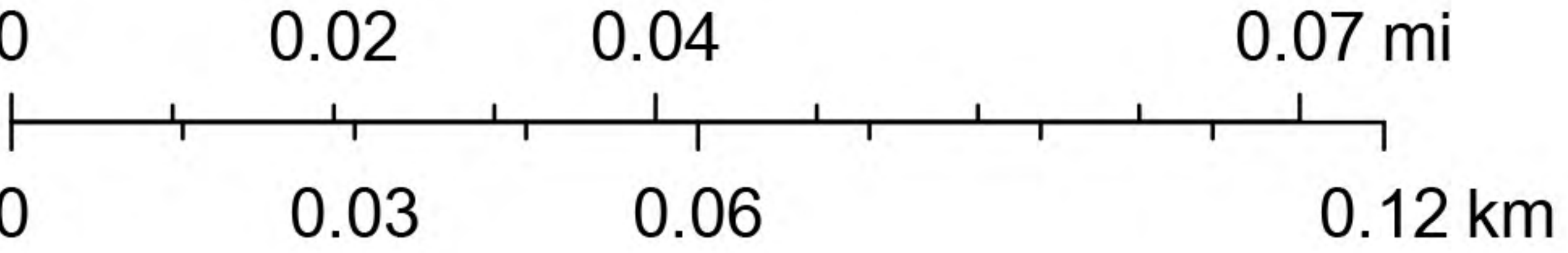
>1.0' - 2.0'

>2.0' - 3.0'

>3.0'

Massachusetts Municipalities

1:2,257



City of Newton, MassGIS, Esri Canada, Esri, HERE, Garmin, INCREMENT P, USGS, EPA, USDA