4 Affected Environment, Environmental Consequences, and Mitigation

4.18 Solid and Hazardous Waste Material Management

4.18.1 Introduction

This section assesses the potential construction-related and operational effects of the No Build Alternative and Build Alternative on solid waste and hazardous materials, including identification of mitigation measures that will be employed to protect public health, construction worker safety, and the environment. **Appendix 4.18, Solid and Hazardous Waste Material Management Technical Report,** supplements this section.

The term "solid waste" includes both hazardous and non-hazardous wastes and is defined as any garbage, refuse, sludge from a wastewater treatment plant, water supply treatment plant, or air pollution control facility, and other discarded material, including solid, liquid, semi-solid, or contained gaseous material, resulting from industrial, commercial, mining, and agricultural operations and from community activities.[1] For this assessment, solid waste includes construction debris and excavated soil.

The term "hazardous waste" means a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may (1) cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or (2) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed.[2]

The term "hazardous materials" collectively refers to hazardous substances and hazardous wastes. Hazardous material means a substance or material that the Secretary of Transportation has determined is capable of posing an unreasonable risk to health, safety, and property when transported in commerce, and has been designated as hazardous.[3] Hazardous materials commonly include petroleum products, pesticides, organic compounds, asbestos, and heavy metals. Hazardous waste may include spent, discarded, spilled, or contaminated products, or wastes from certain industrial processes, as well as material (e.g., soil, water, construction debris, and/or building materials) that exhibit any of the four characteristics of hazardous wastes (ignitability, corrosivity, reactivity, and toxicity).

---

[1] The Public Health and Welfare: Solid Waste Disposal, Definitions. 42 United States Code (USC) Section 6903(27). https://uscode.house.gov/view.xhtml?req=granuleid:USC-prelim-title42-section6903&num=0&edition=prelim

[2] The Public Health and Welfare: Solid Waste Disposal, Definitions. 42 USC Section 6903(5). https://uscode.house.gov/view.xhtml?req=granuleid:USC-prelim-title42-section6903&num=0&edition=prelim

[3] Hazardous Materials Safety Regulations. 49 Code of Federal Regulations (CFR) Section 171.8. https://www.ecfr.gov/current/title-49/subtitle-B/chapter-I

4.18.1.1 Regulatory Context

Solid and hazardous waste management is subject to the following regulatory programs:

- Resource Conservation and Recovery Act (42 USC Section 6901 et seq.)[4]
- Massachusetts Solid Waste Management Regulations (310 Code of Massachusetts Regulations [CMR] 19.00)[5]
- Massachusetts Hazardous Waste Regulations (310 CMR 30.000)[6]

The cleanup and assessment of hazardous waste sites is regulated under the following:

- Comprehensive Environmental Response, Compensation, and Liability Act (Superfund) (42 USC Section 9601 et seq.)[7]
- Massachusetts Oil and Hazardous Material Release Prevention and Response Act (Massachusetts General Law 21E),[8] which is implemented by Massachusetts Department of Environmental Protection (MassDEP) through the Massachusetts Contingency Plan (310 CMR 40.0000)[9]

Refer to **Appendix 4.18, Solid and Hazardous Waste Material Management Technical Report,** for a comprehensive listing of the regulations and guidance documents that provided framework for this assessment.

4.18.1.2 Methodology and Study Areas

The Massachusetts Department of Transportation (MassDOT) derived information on the presence or likely presence of oil and/or hazardous material (OHM) releases and disposal sites through review of the following data sources:

- Federal and state regulatory database records
- MassDEP Waste Site & Reportable Releases Data Portal
- Historical Sanborn® maps
- Historical U.S. Geologic Survey topographic maps
- Historical aerial photographs
- 2020 U.S. Army Corps of Engineers Cape Cod Canal Highway Bridges Major Rehabilitation Evaluation Report/Environmental Assessment

---

[4] https://www.epa.gov/laws-regulations/summary-resource-conservation-and-recovery-act
[5] https://www.mass.gov/regulations/310-CMR-1900-solid-waste-management#:~:text=310%20CMR%2019.000%20is%20intended%20to%20protect%20public,Download%20a%20PDF%20copy%20of%20the%20regulation%20below.
[6] https://www.mass.gov/regulations/310-CMR-30000-massachusetts-hazardous-waste-regulations
[7] https://www.epa.gov/laws-regulations/summary-comprehensive-environmental-response-compensation-and-liability-act
[8] https://malegislature.gov/Laws/GeneralLaws/PartI/TitleII/Chapter21E
[9] https://www.mass.gov/regulations/310-CMR-400000-massachusetts-contingency-plan

The Study Areas for this assessment encompass a 0.25-mile buffer around the construction limits of disturbance at Sagamore Bridge and Bourne Bridge. MassDOT considered a 0.25-mile buffer zone for this assessment because it is considered highly unlikely for contaminated media to migrate beyond this distance.

4.18.2 Affected Environment

4.18.2.1 Past and Current Conditions

The Sagamore Bridge and Bourne Bridge Study Areas have a similar land use history that consists mostly of rural, low-density residential and light commercial uses that continued to develop over time. Major land uses within the general vicinity of the Study Areas include a railroad system that runs along the south side of Cape Cod Canal, former and current gasoline service stations, and Joint Base Cape Cod, a 22,000-acre military installation surrounded by the Upper Cape towns of Bourne, Falmouth, Mashpee, and Sandwich. Sanborn Maps for the years 1913 and 1924 depict the Keith Electric Car Company, which manufactured horse-drawn carriages, stagecoaches, prairie schooners for the Gold Rush, and later freight/box cars for the railroad system. The Keith Car Company was along Cape Cod Canal in the vicinity of Sagamore Bridge. The plant was demolished in the 1930s, following the second expansion of Cape Cod Canal.

Based on the historical and current land uses within the Study Areas, OHM could potentially be released into soil and groundwater within the construction limits of disturbance. Historical fill materials placed within the approaches to the bridges may contain contaminants such as metals and polycyclic aromatic hydrocarbons. Prior industrial, commercial and railway uses contribute to residual impacts to soil and groundwater, including metals, coal and ash-containing lead and arsenic, railroad ties treated with chemicals such as creosote, spilled or leaked petroleum products, and other OHM.

According to the U.S. Army Corps of Engineers, the existing paint system on Sagamore Bridge and Bourne Bridge contains residual amounts of lead.[10] Asbestos-containing materials (ACM) may be present in building materials and utilities within the Study Areas. ACMs and polychlorinated biphenyl (PCB)-containing materials may also be present in bridge components within the Study Areas.

4.18.2.2 Sensitive Receptors

Sensitive receptors are human and environmental resources that are more susceptible to the adverse effects of exposure to hazardous materials, such as elderly people, children, individuals with pre-existing health conditions, as well as threatened or endangered species. As such, sensitive receptors are identified as land uses, including, but not limited to, residential areas, retirement communities, schools, hospitals, daycare facilities, wetlands, and waterbodies.

[10] U.S. Army Corps of Engineers Cape Cod Canal Highway Bridges Major Rehabilitation Evaluation Report/Environmental Assessment, March 2020.

The Study Areas for this assessment feature a variety of sensitive receptors:

- Elderly people (aged 65 and older)
- Children (under age 18)
- Individuals with pre-existing and chronic health conditions
- Residential areas
- Schools
- Endangered species
- Wetlands and waterbodies
- Stormwater critical areas
- U.S. Environmental Protection Agency-designated Sole Source Aquifers

Information on these identified sensitive receptors is presented in other sections of this DEIS:

- **Section 4.6, Land Use, Zoning, and Community Cohesion**
- **Section 4.7, Community Facilities**
- **Section 4.9, Wetlands and Floodplains**
- **Section 4.10, Water Quality and Stormwater**
- **Section 4.11, Threatened, Endangered, and Protected Species and Habitats**
- **Section 4.20, Public Health**

4.18.2.3 Underground Storage Tanks and Solid Waste Landfills

Underground Storage Tanks

An underground storage tank (UST) means any one or combination of tanks (including any connected underground pipes) that is used to contain an accumulation of regulated substances,[11] where at least 10% of its combined volume (tank and connected pipes) is beneath the surface of the ground.[12]

Storage of OHM in USTs occurs at all gasoline service stations and at many large commercial and municipal properties. Modern USTs that are registered and adequately monitored likely do not pose a risk to the environment. However, these storage vessels pose potential sources of contamination that could affect soil and/or groundwater from an unknown or unreported release.

Seven known sites identified within the Sagamore Bridge Study Area either currently or have historically contained USTs:

- 19 Meetinghouse Lane
- 48 Meetinghouse Lane

[11] The term "regulated substance" includes petroleum and petroleum-based substances that comprise a complex blend of hydrocarbons, such as motor fuels, jet fuels, distillate fuel oils, residual fuel oils, lubricants, petroleum solvents, and used oils.

[12] Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks (UST). 40 Code of Federal Regulations Part 280. https://www.epa.gov/sites/default/files/2015-07/documents/regs2015-redline.pdf

- 847 Sandwich Road
- 896 Sandwich Road
- Canal Fuel Company at 70 Cranberry Highway (There is a record of a release from the tank at 70 Cranberry Highway.)
- Stop & Shop at 80 Cranberry Highway
- Sagamore Service Station at 100 Cranberry Highway

Ten known sites identified within the Bourne Bridge Study Area either currently or have historically contained USTs:

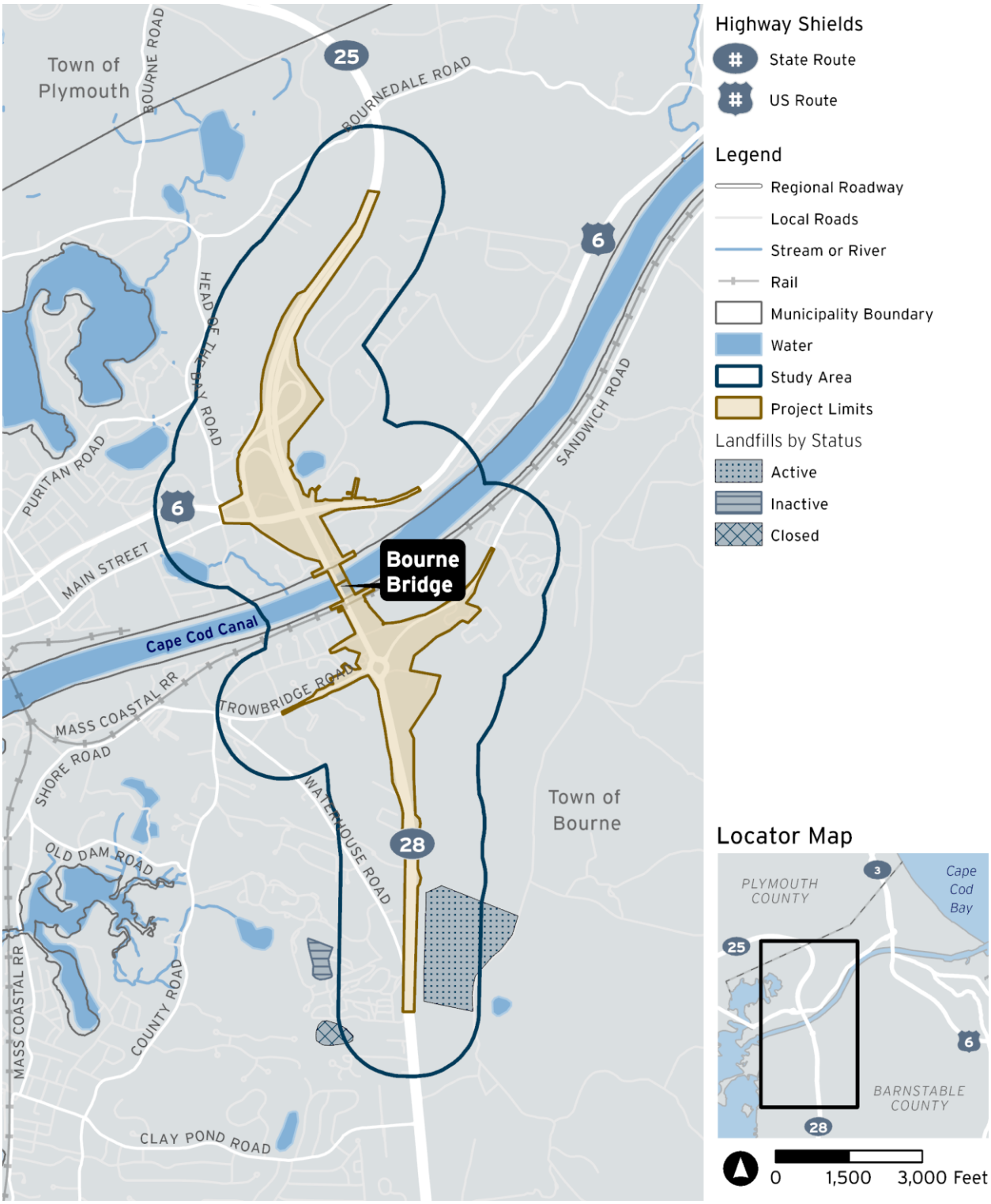
- Bourne Bridge Approach
- 2 Head of the Bay Road
- 343 Scenic Highway
- Canal Road
- 220 Sandwich Road
- Bourne Bridge Rotary
- 4 MacArthur Boulevard
- 48 MacArthur Boulevard
- 50 MacArthur Boulevard
- 60 MacArthur Boulevard

Solid Waste Landfills

A solid waste landfill is a facility or part of a facility established in accordance with a valid site assignment for the disposal of solid waste into or on land.[13] No active or inactive solid waste landfills are within the Sagamore Bridge Study Area. One active solid waste facility, Bourne Landfill, was identified within the Bourne South quadrant. This facility is on Dump Road to the east of State Route 28 (MacArthur Boulevard). MassDOT identified smaller, inactive landfills within the Bourne South quadrant. **Figure 4.18-1** identifies the locations of active and inactive solid waste landfills within the Bourne Bridge Study Area.

[13] Solid Waste Facility Regulations. 310 Code of Massachusetts Regulations 19.000. https://www.mass.gov/regulations/310-CMR-19000-solid-waste-facility-regulations

Figure 4.18-1. Solid Waste Landfills Relative to Bourne Bridge Study Area



Source: Massachusetts Department of Transportation, 2024

4.18.2.4 Identified Sites of Environmental Concern

Review of federal and state regulatory databases identified 127 sites of concern within the Sagamore Bridge and Bourne Bridge Study Areas that may possibly contain OHM. For this assessment, MassDOT classified these sites as the following:

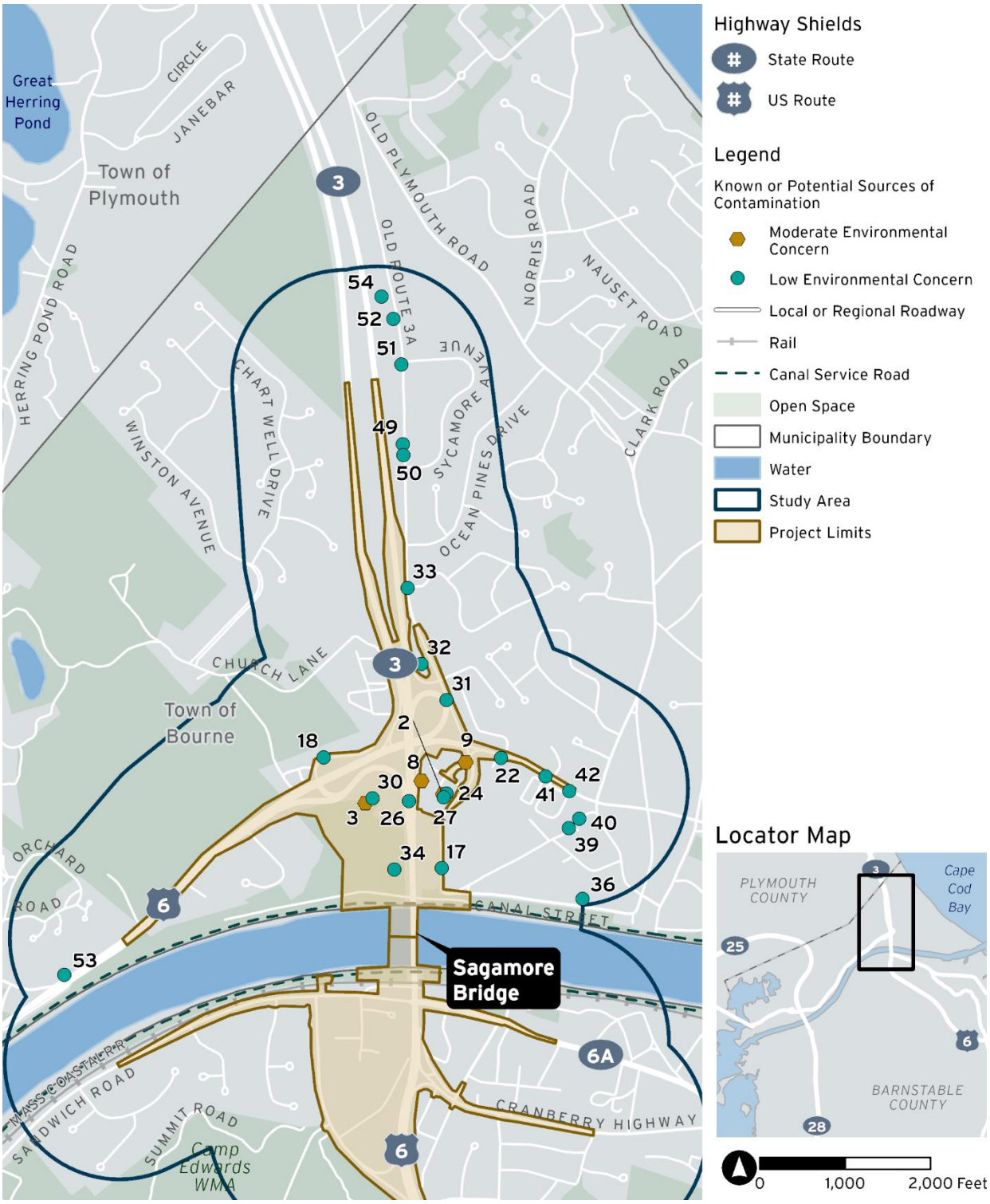
- **High Environmental Concern** – These sites include locations where OHM impacts are known to exist, or it is highly likely to encounter OHM in environmental media irrespective of regulatory closure status. These sites are most likely associated with soil or groundwater contamination within the construction limits.
- **Moderate Environmental Concern** – These sites include locations within the construction limits where OHM may exist in environmental media, but due the age, type, and the extent of the release, and/or regulatory status as closed, are not expected to present significant contaminant management concerns.
- **Low Environmental Concern** – These sites include locations where no known releases have occurred, or where the databases listings do not indicate potential for environmental impacts (i.e., Resource Conservation and Recovery Act generators, locations that have permitted aboveground storage tanks or USTs, locations where asbestos removal occurred, etc.).

Figure 4.18-2 through Figure 4.18-5 identify the locations of impact and the associated level of environmental concern within the Sagamore North, Sagamore South, Bourne North, and Bourne South quadrants. Refer to **Attachments 1 through 5** in **Appendix 4.18, Solid and Hazardous Waste Material Management Technical Report**, for additional information, including figure ID number references, site names, addresses, applicable databases, risk level, contaminant details, and regulatory status.

Site 12 (moderate environmental concern), identified in the Sagamore South quadrant (refer to **Figure 4.18-3**), was closed with an Activity and Use Limitation.[14] This site is associated with the Pairpoint Glass Company at 851 Sandwich Road in the town of Bourne. Refer to **Attachment 1** in **Appendix 4.18, Solid and Hazardous Waste Material Management Technical Report,** for additional details specific to this identified Activity and Use Limitation disposal site.

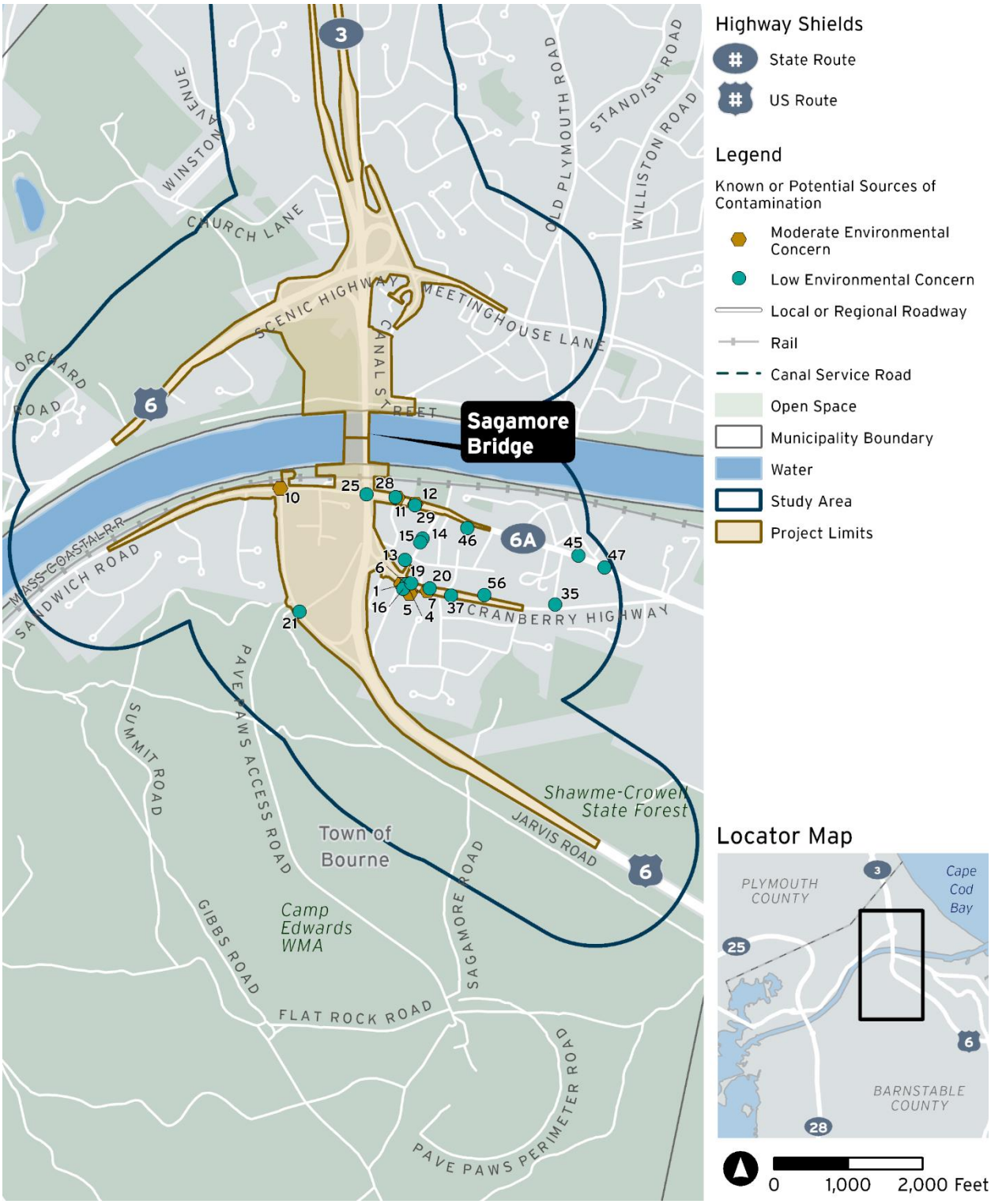
[14] An Activity and Use Limitation is a legal document recorded or registered with the Registry of Deeds that identifies activities and uses that are consistent and inconsistent with, and ongoing obligations and conditions that are necessary to maintain, a level of No Significant Risk at a disposal site where contamination remains after completing assessment and/or cleanup activities. They require oversight and regulatory coordination for any excavation or disturbance within the boundaries of the Activity and Use Limitation area.

Figure 4.18-2. Known or Potential Sources of Contamination (Sagamore North Quadrant)



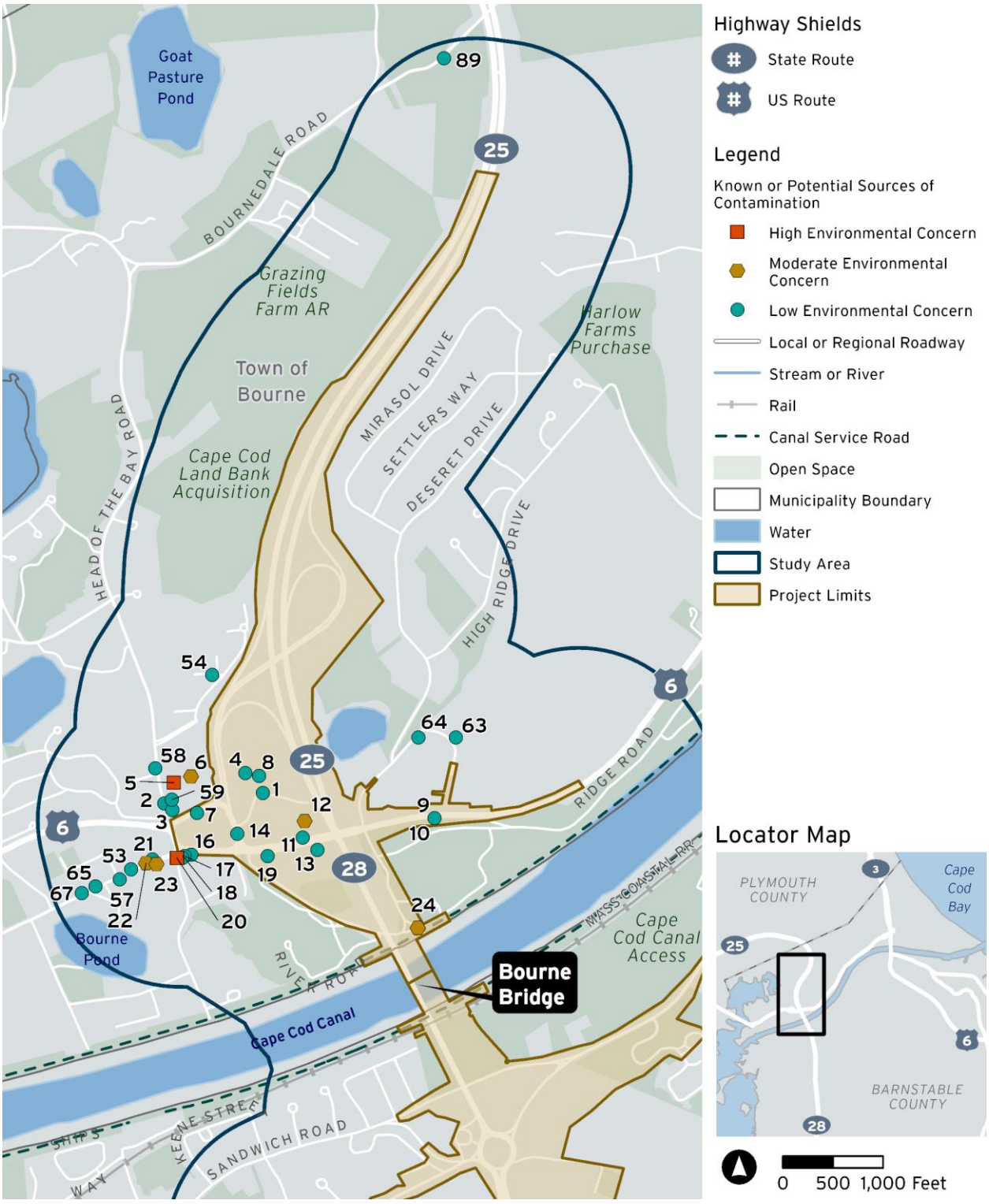
Source: Massachusetts Department of Transportation, 2025

Figure 4.18-3. Known or Potential Sources of Contamination (Sagamore South Quadrant)



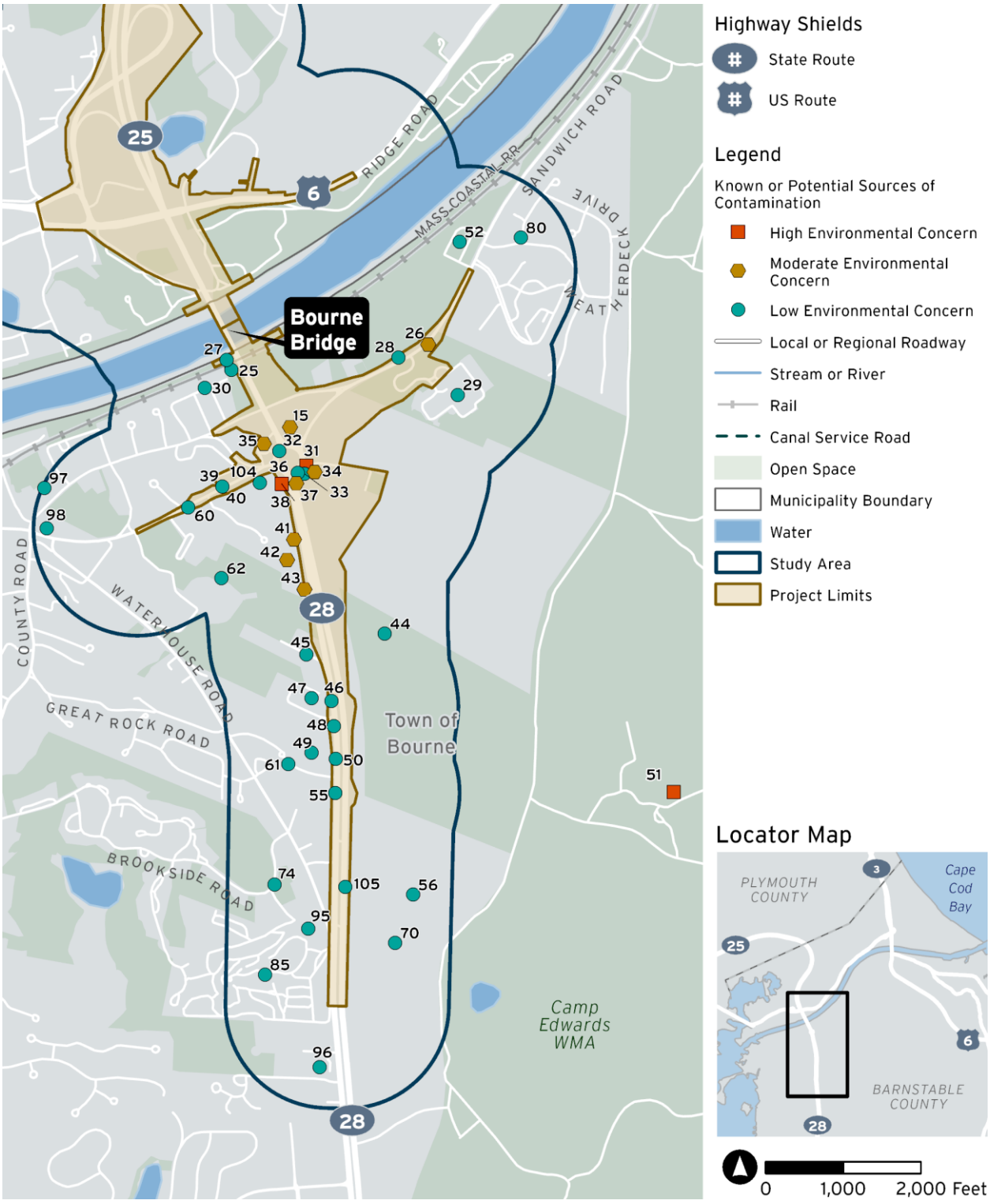
Source: Massachusetts Department of Transportation, 2025

Figure 4.18-4. Known or Potential Sources of Contamination (Bourne North Quadrant)



Source: Massachusetts Department of Transportation, 2025

Figure 4.18-5. Known or Potential Sources of Contamination (Bourne South Quadrant)



Source: Massachusetts Department of Transportation, 2025

4.18.3 No Build Alternative

The No Build Alternative would involve the continued operation of Sagamore Bridge and Bourne Bridge with ongoing maintenance by the U.S. Army Corps of Engineers to keep the bridges in a state of good repair. Routine maintenance and emergency repairs would involve the continued removal of historic lead-based paint (LBP) from the bridges. The No Build Alternative also includes near-term projects included in the Cape Cod Region's Federal Fiscal Year 2025-2029 Transportation Improvement Program, which would involve construction activities with potential for encountering OHM.

Any future bridge maintenance repairs and construction of planned projects scheduled for implementation in the Cape Cod Region's Federal Fiscal Year 2025-2029 Transportation Improvement Program would require adherence to applicable federal and state regulations to prevent potential exposures to OHM.

4.18.4 Build Alternative

4.18.4.1 Construction Effects

The Build Alternative would involve demolishing the existing Sagamore and Bourne Bridges, which contain LBP. The Build Alternative is also expected to encounter contaminated soil and groundwater during soil disturbance within and near OHM-affected sites within the Study Areas. Proposed dredging within Cape Cod Canal for removal of existing bridge pier foundations would involve generating and handling sediments that may be contaminated with OHM.

Construction of the Build Alternative would involve building demolition that could disturb existing hazardous building materials. ACMs are likely to exist in buildings constructed before 1980. ACM poses risks to construction worker safety and the public when disturbed during construction. In addition to the Sagamore and Bourne Bridges, LBP is likely to exist in buildings or structures constructed before 1978. Demolition activities can release harmful lead dust or chips, which pose risks to construction worker safety and public health. In older buildings constructed between the 1950s and 1970s, PCBs may be present in caulking, floor mastic, and fluorescent light ballasts. In addition, buildings with thermostats installed before 2006 may contain mercury that requires proper handling and disposal. The Build Alternative also has potential risk for worker, public, and environmental exposure to hazardous materials due to accidental releases or spills of petroleum products, chemical supplies, and materials during construction.

Construction of the Build Alternative would be managed according to applicable federal and state regulations regarding the use, storage, handling, disposal, and transport of hazardous materials. Compliance with applicable laws and regulations governing the use, storage, transportation, and disposal of hazardous materials would reduce the risk of human and environmental exposure to these materials. **Section 4.18.5.1** provides a discussion of mitigation measures that would be employed to minimize the risk of human and environmental exposure to hazardous materials.

Demolition Waste and Material Management

Table 4.18-1 and **Table 4.18-2** list estimated quantities of demolition waste, and **Table 4.18-3** and **Table 4.18-4** list estimated quantities of excavated and fill material that would be generated for the Build Alternative. Final quantities will be determined in construction after opportunities for recycling are considered.

Table 4.18-1. Demolition Waste Quantity Estimates (Sagamore Bridge)

Location	Waste Type	Estimated Quantity
Sagamore Bridge Canal Span/Approaches	Steel	4,600 tons
	Rebar (steel)	1,500 tons
	Concrete	63,200 tons
Sagamore North Quadrant, U.S. Route 6 over Scenic Highway	Steel	0 tons
	Rebar (steel)	230 tons
	Concrete	6,300 tons
Total Demolition Waste	---	75,830 tons

Source: Massachusetts Department of Transportation, 2024

Table 4.18-2. Demolition Waste Quantity Estimates (Bourne Bridge)

Location	Waste Type	Estimated Quantity
Bourne Bridge Canal Span/Approaches	Steel	7,750 tons
	Rebar (steel)	2,100 tons
	Concrete	85,300 tons
Bourne North Quadrant, State Route 28 over Scenic Highway	Steel	255 tons
	Rebar (steel)	130 tons
	Concrete	3,600 tons
Bourne North Quadrant, State Route 25 On-/Off-Ramp over State Route 25	Steel	285 tons
	Rebar (steel)	135 tons
	Concrete	3,700 tons
Total Demolition Waste	---	103,255 tons

Source: Massachusetts Department of Transportation, 2024

Table 4.18-3. Material Quantity Estimates (Sagamore Bridge)

Location	Type	Estimated Quantity
Sagamore North Quadrant	Excavated Material	460,000 cubic yards
	Fill Material	215,000 cubic yards
Sagamore South Quadrant	Excavated Material	689,000 cubic yards
	Fill Material	161,000 cubic yards

Source: Massachusetts Department of Transportation, 2025

Table 4.18-4. Material Quantity Estimates (Bourne Bridge)

Location	Type	Estimated Quantity
Bourne North Quadrant	Excavated Material	498,000 cubic yards
	Fill Material	267,000 cubic yards
Bourne South Quadrant	Excavated Material	553,000 cubic yards
	Fill Material	328,000 cubic yards

Source: Massachusetts Department of Transportation, 2025

MassDOT's Contract Specifications will require all demolition waste to be properly segregated and managed based on the nature of the waste and the presence of OHM. Recycling and reuse of concrete, steel and other materials would be implemented as part of the Build Alternative, where possible. On-site reuse of soils and sediments can be maximized based on visual, olfactory, and geotechnical properties. All surplus soils and sediments will undergo laboratory testing prior to transportation with off-site reuse and disposal options dictated by contaminant concentrations. Excess soil and sediment to be transported off-site for disposal will be managed in accordance with applicable regulatory requirements.

4.18.4.2 Operational Effects

Operation of the Build Alternative would not have any long-term adverse effects related to hazardous materials. The Build Alternative would reduce the likelihood of exposure to or potential contamination from hazardous materials and waste through removal of structures (which contain asbestos and LBP), as well as excavation and off-site disposal of contaminated soils. Overall, the Build Alternative would provide long-term benefits by removing and reducing hazardous materials within the Study Areas.

MassDOT will adhere to applicable laws and regulations governing the handling, storage, monitoring, transportation, and disposal of hazardous materials for any future bridge and roadway maintenance activities.

4.18.5 Mitigation

4.18.5.1 Construction Effects

As discussed in **Section 4.18.4.1**, construction of the Build Alternative would be managed in accordance with applicable federal and state regulations regarding the use, storage, handling, disposal, and transport of hazardous materials. The following mitigation measures will be implemented to protect construction worker safety, prevent public exposure to hazardous materials during construction, and protect the surrounding environment in accordance applicable regulatory requirements and MassDOT Contract Specifications. With these measures in place, the Build Alternative would not have the potential for significant adverse effects related to OHM during construction.

MassDOT Responsibilities

- Phase I Environmental Site Assessments will be conducted before acquiring each property to evaluate the potential presence of OHM in building materials in accordance with American Society for Testing and Materials Practices and Standards. Phase II Environmental Site Assessments will be conducted to further evaluate the extent of these contaminants, as warranted by findings of the Phase I assessments.
- Pre-demolition hazardous building materials surveys will be completed to evaluate the presence of ACM, LBP, PCBs, and other hazardous materials. Based on survey results, abatement will be conducted before demolition. Any building materials, equipment, or utilities containing suspect PCBs, LBP, mercury and/or ACM will be properly contained and disposed of in accordance with the applicable regulatory requirements.
- A Sediment Sampling and Analysis Plan will be prepared and submitted to MassDEP for approval in accordance with the permitting requirements under the 401 Water Quality Certification regulations.[15] The Sediment Sampling and Analysis Plan will outline procedures for collecting sediment samples from specific locations within Cape Cod Canal, including sampling methods, analysis techniques to be used on those samples, quality assurance measures, and safety protocols. Laboratory sampling analyses will determine the concentration of contaminants present in the sediments and inform the need for special management considerations to ensure the protection of human health, safety, and the environment during construction.
- MassDOT will provide oversight of the contractor and the contractor's Licensed Site Professional (LSP) to ensure hazardous materials are being managed cost effectively and in accordance with all state and federal requirements.

[15] 401 Water Quality Certification. 314 Code of Massachusetts Regulations 9. https://www.mass.gov/regulations/314-CMR-9-401-water-quality-certification

Contractor Responsibilities

- Site-specific Environmental Health and Safety Plans will be developed and implemented to identify, evaluate, and control health and safety hazards resulting from any on-site chemical contamination present in air, soil, water, and sediment during construction and provide for emergency response, as needed. Health and safety procedures will comply with applicable regulations that address employee working conditions and protection of sensitive receptors.
- A Soil and Groundwater Management Plan will be developed and implemented to manage soil, sediment, and groundwater that may be affected by OHM during construction. The Soil and Groundwater Management Plan will detail soil sampling and management techniques that will be performed under the direction of an LSP, including measures to avoid and/or reuse contaminated media in accordance with applicable regulatory requirements.
- Any work occurring within the boundaries of a known MassDEP release site will be performed under the direction of an LSP to ensure proper management according to the Massachusetts Contingency Plan. Any new areas of contamination encountered during construction will be coordinated with an LSP to determine the appropriate regulatory pathway under the Massachusetts Contingency Plan.
- A Lead Abatement Plan will be developed to specify work practices and procedures to remove LBP during construction. LBP abatement will be performed according to the Occupational Safety and Health Administration's, Lead in Construction Regulations,[16] including containment, worker training, air quality monitoring, collection, and disposal of contaminated debris.
- Asbestos Abatement Work Plans will be developed to specify work practices and procedures related to removing ACM during construction. ACM abatement will be conducted using Massachusetts-licensed professionals according to MassDEP's Asbestos Regulations.[17]
- A Spill Prevention, Containment, and Control Plan will be developed to describe planning, prevention, and control measures to minimize impacts resulting from accidental spills or releases of OHM during construction, if on-site storage of oil or oil products exceeds applicable regulatory thresholds.[18]
- If dewatering of affected groundwater is necessary during construction, the contractor will be required to manage and discharge water according to all applicable regulatory requirements. The contractor will perform preliminary testing as required to support any necessary permitting.

---

[16] 29 Code of Federal Regulations (CFR) 1926. https://www.osha.gov/laws-regs/regulations/standardnumber/1926/1926TableofContents

[17] 310 Code of Massachusetts Regulations 7.15. https://www.mass.gov/doc/310-cmr-715-massdep-asbestos-regulation/download

[18] Overview of the Spill Prevention, Control, and Countermeasure (SPCC) Regulation. 40 CFR 112. https://www.epa.gov/oil-spills-prevention-and-preparedness-regulations/overview-spill-prevention-control-and

- If relocation or removal of a UST is necessary during construction, the contractor will ensure that removal and relocation operations are conducted according to MassDEP's UST regulations.[19]

MassDOT and other regulatory agencies will review and approve the construction management mitigation plans prepared by the contractor, as necessary, before implementation.

[19] 310 Code of Massachusetts Regulations 80.00. https://www.mass.gov/regulations/310-CMR-8000-underground-storage-tank-ust-systems