1 Introduction

1.1 Project Description and Background

Fuss & O'Neill, Inc. (Fuss & O'Neill), in coordination with the Rhode Island Department of Environmental Management (RIDEM) and project partners, has prepared this Stormwater Site Planning, Analysis, and Design Narrative (Stormwater Control Plan) for proposed fish passage improvements at the Main Street Dam and Slater Mill Dam on the Blackstone River in Pawtucket, Rhode Island.

The Blackstone River forms in Worcester, Massachusetts and flows approximately 48 miles downstream in a southeasterly direction where it becomes tidal and joins the Seekonk River which eventually flows into Narragansett Bay. While the Blackstone River system is home to over 30 species of freshwater fish, including resident and diadromous species, one of the major impediments to anadromous fish passage in the Blackstone River is the number of dams preventing upstream passage and overall river connectivity to Narragansett Bay.

The State of Rhode Island has made it a priority to restore fish passage for a variety of rivers within the state according to *RI Executive Order 03-16*. Previous assessments have noted that restoration of the entire Blackstone River in Rhode Island is expected to result in 1,100,000 River herring and 22,000 American shad upon full restoration of the system, based on the 1,400 acres of available habitat upon implementation of fish passage facilities at all barriers along the main stem of the Blackstone River from the Main Street Dam including the Abbott Run Tributary and the Branch River systems (*Blackstone River Fisheries Restoration Plan, May 2002*). Restoration of fish passage at all of the dams along the entire stretch of the Blackstone River in Rhode Island, which would entail a significant undertaking with funding and collaboration amongst governmental and community stakeholders, is key to achieving these restoration goals.

The current project evaluated alternative approaches and implemented one or more approaches that provide passage through both sites. Based on the results of evaluations for alternatives conducted by Fuss & O'Neill, the Linear Vertical Slot Fishway providing volitional passage from below Main Street Dam to above Slater Mill Dam has been identified as the preferred alternative. This current project is being led by RIDEM, The Nature Conservancy (TNC) and technical review assistance from the U.S. Fish & Wildlife Service (USFWS).

1.2 Purpose of Project

The project will construct a linear vertical slot fishway and associated public water access improvements along the east bank of the Blackstone River between the Main Street and Slater Mill dams. These structures are major barriers to anadromous fish migrating from Narragansett Bay and have been identified in state and regional restoration plans as priority sites for restoring passage. The proposed fishway alignment remains largely along the existing river wall, with localized entrance and exit structures at the river interface. This project includes construction of associated public water access features between the Main Street Dam and Slater Mill Dam that will improve public access to the river as well as allow long-term operation and maintenance access for the operation of the fishway.

1.3 Watershed and Basin Characteristics

The project reach lies within the lower portion of the Blackstone River watershed, a 475-square-mile (304,000-acre) basin extending from Worcester, Massachusetts to the tidal confluence with the Seekonk River in Pawtucket. The watershed is one of the most historically urbanized and industrialized in New England, with dense development, mill infrastructure, and engineered banks that strongly influence channel form, hydrology, and sediment dynamics.

Within downtown Pawtucket, the Blackstone flows through a highly confined corridor bounded by masonry mill walls, roadway infrastructure, and filled embankments. The reach has limited access to natural floodplain surfaces, and channel geometry is largely fixed by historic development. Upstream of the Main Street Dam, the river behaves as a free-flowing freshwater system, whereas downstream water levels are influenced by tidal backwater from the Seekonk River. See *Appendix A* for the Site Location Map.

As this site drains directly into the Blackstone River at the extreme downstream end of the river and into the tidally influenced Seekonk River, stormwater runoff from the site will have no impact on peak flows and flooding in this river.

1.4 Regulatory Context

This Stormwater Control Plan has been prepared in accordance with the Rhode Island Stormwater Design and Installation Standards Manual and the Rhode Island Water Quality Regulations. The analyses and design presented herein address the applicable minimum standards for this project, including Standard 3 (Water Quality), Standard 4 (Conveyance and Natural Channel Protection), Standard 5 (Overbank Flood Protection), and Standard 8 (Land Uses with Higher Potential Pollutant Loads), as applicable.

Construction-phase stormwater will be managed under the RIPDES Construction General Permit, and the stormwater controls described in this document are intended to support issuance of a CRMC Asset B Certification and a Section 401 Water Quality Certification for the proposed work.

2 Existing Conditions

2.1 Existing Drainage Patterns

The project area encompasses approximately 12 acres along the east bank of the Blackstone and River upstream and the Seekonk River downstream between the Main Street Dam and Slater Mill Dam. Drainage across the site is entirely driven by overland flow toward the river because:

I. There are no engineered drainage systems within the limits of disturbance.
II. Existing runoff flows directly over paved, gravel, and vegetated surfaces toward the river wall

Under existing conditions, nearly all stormwater on site drains directly to the river without treatment or detention. This condition will not change under the proposed design. The Seekonk River is also tidal and as a result, water surface elevations in the river are influenced by tidal conditions.

2.2 Hydrology and Hydraulics

Hydraulic behavior in the reach is dominated by Blackstone River flows and tidal influence below the Main Street dam. Given the fact that this site is located at the bottom of the Blackstone River watershed and also drains into a tidally influenced river, this site does not impact peak flows or water surface elevations in the river.

2.3 Soils and Groundwater

According to the Bedrock Geologic Map of Rhode Island, bedrock within the project area is classified as belonging to the Pennsylvanian Period Narragansett Bay Group, and more specifically, the Rhode Island Formation. The Rhode Island Formation consists of stratified gray to black, fine- to coarse-grained quartz arenite, litharenite, shale, and conglomerate, with minor beds of anthracite and meta-anthracite. Geotechnical Assessment Reports were prepared by ECS for both the Main Street Dam and the Slater Mill Dam in July and August 2008. According to ECS the project area is underlain by a sandstone (quartz arenite) unit of the Rhode Island Formation. The strength and stress deformation characteristics of the rock mass present at the project area were considered to be mean properties for the predominate rock type of the area, the sandstone. Narragansett Bay Group rocks tend to be less resistant to erosion and glacial scour in comparison to other rock formations in Rhode Island.

The soils in the vicinity of the project area are predominantly derived from glacial outwash parent material deposited by melted waters following glacial recession. These areas typically consist of well sorted sands and gravels that may or may not be overlain by finer, wind deposited eolian material. In addition, some areas immediately adjacent to the river are overlain by more recent alluvium material associated with flood deposits.

The Natural Resources Conservation Service (NRCS) maps the entire area of the property as being within the Merrimac-urban land complex soil series, a non-hydric soil that is generally indicative of upland features. However, field investigations of the soil at the site were not entirely consistent with the NRCS mapping. Additional information regarding existing soil conditions can be found in *Appendix B*, Soil Investigation Results.

2.4 Receiving Waterbody Characteristics and Impairments

Stormwater from the project area ultimately discharges to two receiving waterbodies: the Blackstone River (freshwater) upstream of the Main Street and Slater Mill Dams, and the Seekonk River (tidal estuarine) downstream of the Main Street Dam.

Blackstone River (Waterbody ID: RI0001003R-01B)

The Blackstone River is a warmwater, 4th-order river system and a major tributary to the Narragansett Bay estuary. This segment is listed on the Rhode Island 303(d) Impaired Waters List for cadmium, iron, enterococci, fecal coliform, mercury in fish tissue, and PCBs in fish tissue, reflecting a long history of legacy pollutant loading within the industrialized watershed. A TMDL has also been completed for fecal coliform, lead, cadmium, enterococci, and copper. The Blackstone River watershed is flood-prone, with rapid stage response during storm events due to urban impervious cover and channel constriction. Existing drainage

from the project area flows directly toward the river either through overland flow paths or through limited storm drain connections, with no known discharge to priority outfalls.

Seekonk River (Waterbody ID: RI0007019E-01)

Downstream of the Main Street Dam, the Blackstone transitions to the Seekonk River, a tidally influenced estuarine waterbody. This segment is listed on the 303(d) Impaired Waters List for dissolved oxygen, total nitrogen, and fecal coliform, consistent with nutrient enrichment and tidal mixing limitations in the upper estuary. The Seekonk River is also within a flood-prone watershed, reflecting the low-lying topography and tidal backwater conditions during storm events. No TMDLs currently apply to this segment for the listed impairments.

3 Proposed Conditions

3.1 Proposed Drainage Patterns

Proposed drainage patterns under post-construction conditions are consistent with existing site hydrology. All stormwater will continue to flow toward the Blackstone River and Seekonk River, following natural topography and the existing riverbank configuration. No new concentrated flow paths, piping, channels, or engineered discharge points are proposed as part of the fishway construction. Instead, stormwater from finished "hard-scape" surfaces used for public and equipment access will be directly infiltrated by using permeable materials (e.g. porous pavers, porous concrete, permeable pavement, articulated concrete block) for those surfaces. This will allow stormwater to infiltrate or disperse across the ground surface rather than concentrating into discrete flow paths. Because the project does not alter site grading in a manner that would redirect drainage or modify watershed boundaries, post-construction runoff behavior will remain unchanged.

3.2 Hydrologic Changes

A formal H&H analysis has not been completed for the following reasons. The basis for this determination is as follows:

- Site drainage characteristics will remain unchanged and all new accessways and "hard-scape" surfaces will be constructed with permeable materials.
- The project results in no meaningful increase in impervious area
    - Only 0.07 acres of IC added from the top of new retaining walls
    - Total IC on site increases from 0.33 acres to 0.40 acre
    - Addition of fishway adds 0.22 acres of IC along the channel bottom, but this is not anticipated to generate additional stormwater runoff so has been excluded from our IC totals. Even if included, the IC remains a marginal increase
- The IC/Site Area ratio remains low
    - Increase from 0.04 to 0.05 from pre-to-post construction conditions, below the WQV ratio threshold of <0.2
- No new stormwater conveyance systems are proposed.

Hydraulic behavior in the reach will continue to be dominated by Blackstone River flows and tidal influence. No change to peak discharge, flow timing, or WSEs is anticipated. See *Appendix C* for additional information on IC and site calculations.

3.3 Stormwater Management System

A structural stormwater management system is not proposed as part of the fishway project because the project does not generate any meaningful increase in stormwater runoff or impervious area. The post-construction impervious surface totals, excluding the bottom of the fishway, are approximately 0.40 acres, an increase of only 0.07 acres over existing conditions, resulting in a post-construction impervious cover ratio of 0.05. This additional impervious surface consists only of the tops of walls and other minor features such as stone sitting platforms that cannot be directly infiltrated. Considering the bottom of the fishway itself results in an additional 0.22 acres of impervious area. However, the fishway bottom tis submerged and hydraulically connected to the waterbody and typically would not generate stormwater runoff because precipitation falling on it goes directly into the water, not into the stormwater system.

This project maintains the existing drainage patterns, with all stormwater continuing to flow toward the Blackstone River and Seekonk River. No new point discharges, conveyance systems, drainage structures, or concentrated outfalls are created. The stormwater management system consists solely of maintaining existing hydrology, installing temporary erosion and sedimentation controls during construction, and restoring disturbed areas with pervious materials following completion of work.

4 Minimum Stormwater Standards

4.1 Standard 3: Water Quality

With the use of pervious materials for proposed access improvements and “hardscape” surfaces, the project introduces only a minimal increase in impervious surface (0.07 acres) consisting of the top of walls and other de-minimis site features and will directly recharge the water quality volume. Runoff from adjacent landscaped areas will also drain onto these proposed pervious surfaces and will also be recharged. As a result, no additional structural stormwater BMPs are proposed.

4.2 Standard 4: Conveyance and Natural Channel Protection

This project does not introduce any new stormwater conveyance systems, nor does it modify existing drainage pathways or increase runoff volume. All runoff from the site will continue to flow into the adjacent Blackstone River and Seekonk River, as it does under existing conditions.

Further, the Blackstone River is classified as a fourth-order waterbody, and under the RISDISM, channel protection requirements do not apply to discharges into rivers of this size or larger. The project does not change the frequency, magnitude, or duration of stormwater discharges and does not concentrate flow. For these reasons, hydraulic controls or channel protection BMPs are not proposed.

4.3 Standard 5: Overbank Flood Protection

Standard 5 requires control of peak discharge rates for the 10-year, 24-hour storm unless a project demonstrates that no hydrologic changes will occur. In this case, the project introduces no change in

hydrologic conditions, peak flows, or runoff volume. The increase in impervious area is negligible and does not generate additional stormwater at a scale that would influence flood elevations.

4.4 Standard 8: Land Uses with Higher Potential Pollutant Loads

The project area is identified by RIDEM as a State Hazardous Waste Site (SHWS) and is subject to an Environmental Land Use Restriction (ELUR) (Site ID: SR-26-1720A). In addition, RIDEM's Office of Land Revitalization and Sustainable Materials Management (OLRSMM) identifies the site as containing known or suspected releases of hazardous materials. Based on these conditions, the project is classified as a Land Use with a Higher Potential Pollutant Load (LUHPPL) in accordance with Standard 8 of the RISDISM.

Because the site is LUHPPL, the use of subsurface infiltration-based stormwater practices is restricted unless specifically approved by the assigned RIDEM OLRSMM project manager. As there are not any Stormwater BMPs proposed for this project, the project is in accordance with Standard 8. If any subsurface infiltration is proposed in the future, OLRSMM must determine whether the site qualifies as Red, Yellow, or Green status per RISDISM Section 3.2.8 (Subsurface Contamination Guidance), and written approval would be required. No such infiltration is included in the current design.

5 Summary

No increase in peak flow, runoff volume, or pollutant loading will occur as this project will only create a de-minimis increase in impervious area largely consisting of tops of walls Stormwater from accessways will be managed by using permeable surfaces in those areas. As a result, Minimum Standards 4, 5, and 8 are satisfied.