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April 27, 2023 (Revised May 11, 2023)

Mr. Steve Masalin, PE, Public Works Director  
Town of Ledyard, Mayor's Office  
741 Colonel Highway  
Ledyard, CT 06339

**Re: Proposal – Whitford Brook Watershed Infrastructure Improvements  
Ledyard, Connecticut  
SLR #141.12174.P0011**

Dear Steve,

In accordance with your request, SLR International Corporation (SLR) is pleased to submit herein our proposal to assist you in preparing surveys, hydrologic analyses, design plans, permit applications, and construction-phase services for the repair/reconstruction of Long Pond Dam, Bush Pond Dam, Bush Pond Dike, Lantern Hill Road culvert, and the Hyde Mill Pentway culvert. These dams and culverts are located close together on Whitford Brook, which generally demarcates the boundary between the town of Ledyard and the town of North Stonington. This revised proposal includes an Add Alternate for the design of a new culvert/bridge to convey water under Lantern Hill Road between Long Pond and Bush Pond.

We understand that the project will include a significant hydrologic analysis to determine flows throughout the watershed beginning at Wolf Neck Road in Stonington and continuing upstream to Lantern Hill Pond.

The following scope of services is for the Whitford Brook watershed infrastructure improvements.

## **SCOPE OF SERVICES**

### **Task 1.0 – Kickoff, Coordination, and Public Meetings**

Throughout the course of this project, the project manager will coordinate project tasks; perform project-related managerial tasks; receive and execute directions from the Town of Ledyard (Town) and project partners; schedule work; maintain project records, technical data, drawings, reports, and financial records; and coordinate with the Town and project partners. The following specific tasks are proposed:

- 1.1 Kickoff Meeting – Project team members will attend an initial kickoff meeting with the Town and project partners.

- 1.2 Coordination Meetings – Project team members will attend project coordination meetings with the Town, project partners, and other interested parties during this phase of the design and permitting phases of work.
- 1.3 Public Meetings – Project team members will participate in up to three public meetings to present the progress of the project to the public and solicit their comments.
- 1.4 Conference Calls – Project team members will participate in conference calls throughout this phase and the design and permitting phases of work as needed and/or requested by Town staff.

#### **Task 2.0 – Data Collection**

- 2.1 Existing Data Collection and Review – Collect and review available data and resource information on file with project stakeholders, the Town, state agencies, and other sources. This information may include bridge and dam inspection reports, past studies, watershed history, information regarding abutting property owners, threatened or endangered species, existing archaeological or historical reports, mapping of the project area, aerial photographs, natural resource information, geologic data and mapping, hydrologic data and analysis, fisheries data, United States Geological Survey (USGS) gauging station data, and sediment data.
- 2.2 Sensitive Species Review – A review of the Connecticut Department of Energy & Environmental Protection (DEEP) Natural Diversity Data Base for endangered species in the area. This scope of services assumes that the proposed project will not require CEPA or NEPA study. If this is not the case and an additional level of effort is required, an amendment will be provided for these services.
- 2.3 Sensitive Historical/Archaeological Resources – As the project will require several permits, coordination with the Connecticut State Historic Preservation Office will be undertaken to determine potential project impacts to sensitive historical or archaeological sites. For this proposal, it is assumed that each entity will issue a finding of no significant impact to historical/archaeological resources and that no additional coordination, surveys, or mitigation will be required. If review by any of these entities determines that an additional level of effort is required, an amendment will be provided for these services.

#### **Task 3.0 – Survey**

- 3.1 Perform a topographic survey and limited Class D boundary survey to establish the property boundaries in the vicinity of the dams, dike, and culverts. The culvert between Long Pond and Bush Pond will also be surveyed to provide input data for the hydrologic modeling. The surveying will include topography of the dams and dike, including the upstream embankment below the waterline, downstream channel, location of wetland flags, and the spillway. The watercourse channel upstream and downstream of the two culverts will be surveyed as well as the geometry

of the road over the culverts. Channel cross sections will be surveyed in the vicinity of the two culverts for modeling purposes.

- 3.2 Develop electronic base mapping of existing conditions at the dam site using *AutoCAD* at a scale of 1" = 10' or 1" = 20'.

#### **Task 4.0 – Hydrologic Modeling**

- 4.1 A detailed hydrologic model will be prepared of the entire Whitford Brook watershed upstream of the parallel crossings at Wolf Neck Road (Bridge #137002 and #137003). The Hydrologic Engineering Center – *Hydrologic Modeling System* (HEC-HMS) will be used to determine design flows at Long Pond Dam, Bush Pond Dam and dike, Hyde Mill Pentway culvert, and Lantern Hill Road culvert/bridge located on Whitford Brook 420' downstream of Long Pond Dam. Our Hydrologic Model will be used to model various storm events including the 50-year, 100-year, and 500-year storm events. The rainfall amounts for these storms will be obtained from the NOAA Atlas 14. An additional model will use the rainfall total from the March 2010 storm that hit southeast Connecticut. Additionally, we will use the model to investigate redirecting the flood flows from Long Pond Dam to a new emergency spillway at Bush Pond Dam. This will include sizing the new Bush Pond Dam spillway with a slightly higher elevation than the existing spillway at Long Pond Dam, thereby maintaining the normal water surface elevation in Long Pond and Bush Pond.

#### **Task 5.0 – Geotechnical Engineering**

- 5.1 Conduct a subsurface exploration program at both bridge crossings and the two dams and dike to establish subgrade conditions. The principal objective at the two culvert/bridges is to provide soils data necessary for bridge foundation and pavement design, including soil type and consistency, frost susceptibility characteristics, and ledge and/or groundwater depth. Borings at the dams will determine water elevations in the dam embankment and the subsurface soil conditions needed to perform a stability analysis and design work. The program will include the following:
- 5.2 A boring program to undertake up to ten Type B drilled borings. Two borings will be drilled at each of the following locations – the Lantern Hill Road bridge, the Hyde Mill Pentway culvert, Long Pond Dam, and Bush Pond Dam and dike.
- 5.3 Contact local utility providers and request available mapping of existing facilities in the vicinity of the proposed drilling. Utilities will be depicted on the survey base map based on best available information. Retain the services of a private utility locator to clear boring locations of underground utilities.
- 5.4 Prepare a bid package for obtaining quotes from soil boring contractors.

- 5.5 Stake out the boring locations and observe the soil borings.
- 5.6 Coordination of the services of the boring contractor to execute the program. Borings drilled on dams will be grouted upon completion so as not to create a preferential seepage path.
- 5.7 Collect semicontinuous split-spoon samples from the borings extending to bedrock or firm grade.
- 5.8 Laboratory testing of the samples for grain size in order to establish frost susceptibility.
- 5.9 If bedrock is encountered, coring to a depth of 5 feet and establish rock quality designation (RQD).
- 5.10 Geotechnical analyses and recommendations for bridge support, pavements, and subgrade drainage.
- 5.11 Geotechnical analyses and recommendations for design of spillway structures and stability of the dam.
- 5.12 Prepare a geotechnical report summarizing the results of the subsurface exploration, lab testing, and design recommendations.

Note: The cost of the soil boring contractor is included in our fee.

#### **Task 6.0 – Preliminary Engineering**

- 6.1 Delineation of Wetland Resources – A wetland scientist will identify, characterize, and flag resource areas subject to the provisions of the local and state wetland regulations and Section 404 of the Clean Water Act. Delineate the limit of federal and state-regulated wetlands within 200 feet of the five structures to be repaired and the cross culvert between the two ponds. Wetlands will be delineated using the methodology provided in the U.S. Army Corps of Engineers (USACE) *Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region*. Resource area boundary flags will be surveyed using a handheld Global Positioning System (GPS) with submeter accuracy, and the resource flags will be incorporated into the design plans.
- 6.2 Wetland Delineation Technical Memorandum – Following wetland delineation, our wetland scientists will prepare a technical memorandum describing the identified wetland resource areas within the project site. This memorandum will include a detailed description of the characteristics of each identified resource area, a brief qualitative assessment of wetland functions, and representative photographs. The purpose of this report is to support the project permitting process.

- 6.3 Ecological Characterization – A wildlife biologist will conduct a field-based assessment of the area surrounding the structures to be repaired to identify important physical and biological habitat characteristics. Prior to the field investigation, existing project materials provided by the Town and publicly available data sources will be reviewed to develop a preliminary assessment of the site's ecological communities. This landscape analysis will be used to guide a ground-based ecological characterization consisting of a single field visit to evaluate the project site's physical and biological habitat characteristics. The field survey will consist of a survey throughout the project area with an emphasis on areas identified during the landscape analysis with the greatest potential to support wildlife habitat.

Detailed field notes and photographs of the site's habitats will be taken as appropriate. Following the completion of the field survey, we will prepare a brief technical memorandum presenting the results of the analysis and ecological characterization. The report will include an introduction, brief descriptions of the methodology and results, and a discussion.

- 6.4 Sensitive Historical/Archaeological Resources – As the project will require several permits, coordination with the Connecticut State Historic Preservation Office will be undertaken to determine potential project impacts to sensitive historical or archaeological sites. For this proposal, it is assumed that each entity will issue a finding of no significant impact to historical/archaeological resources and that no additional coordination, surveys, or mitigation will be required. If review by any of these entities determines that an additional level of effort is required, an amendment will be provided for these services.
- 6.5 Existing Conditions Hydraulic Modeling – Utilize base mapping prepared in Task 3.0 above to develop an existing conditions hydraulic model using the USACE's Hydraulic Engineering Center – *River Analysis System* (HEC-RAS) software. Input the peak flows computed from the HEC-HMS analysis and calibrate the model's roughness coefficients based upon the field investigation. The HEC-RAS model will be prepared for a short distance upstream and downstream of the two culverts.
- 6.6 Proposed Conditions Hydraulic Modeling – Develop a bridge replacement alternative to the extent necessary to model proposed conditions and evaluate potential changes in velocity and water surface elevation. Modeling will assess predicted water depths, velocities, shear, and water surface elevations.
- 6.7 Sediment, Bed, and Bank Stability Assessment – Following characterization of channel bed material through grain-size analysis and pebble counts, utilize the results of proposed conditions HEC-RAS output to evaluate shear stress and develop a comparison table to compare against the resistance and competency of the existing and anticipated postconstruction bed material.

- 6.8 Bridge Scour Analysis – The proposed bridge footings will be evaluated for their susceptibility to scour, and countermeasures will be designed, if necessary. Scour will be evaluated using the proposed hydraulic modeling and will be performed following the guidelines set forth in the current Federal Highway Administration (FHWA) Document HEC-18 "Evaluating Scour at Bridges."
- 6.9 Preliminary Engineering Report – The findings of the previous assessments (geomorphic, hydrologic, and hydraulic) will be documented in a report for submittal and review.

#### **Task 7.0 – Preliminary Design – Dams**

- 7.1 Develop conceptual designs and cross sections for the proposed dam, including a brief letter report describing a preliminary engineering opinion of probable construction costs as well as the potential environmental impacts.
- 7.2 Develop a set of preliminary design plans (30% completion). The plans will depict proposed improvements, site access, water control methodologies, and sediment and erosion controls. The design will be developed based on hydrologic and hydraulic information developed in the tasks above.
- 7.3 Prepare a stability analysis based on the soil borings and geometry of the dam.
- 7.4 Prepare a preliminary design report detailing the design basis for the proposed improvements to the two existing dams and the dike.
- 7.5 Submit two copies of the preliminary design plans for your review.
- 7.6 Meet with the engineers from the DEEP Dam Safety Unit to review the preliminary plans.

#### **Task 8.0 – Final Design (100% Design) and Permit Applications – Dams**

- 8.1 Revise the project plans based on comments from the DEEP. Final design plans will be prepared at a scale of 1" = 10' or 1" = 20'. Plans will include a sediment and erosion control plan in accordance with the *Connecticut Guidelines for Soil and Sediment Control*. The final plans will include typical construction details, cross sections, and dewatering methods as necessary.
- 8.2 Provide an engineer's opinion of probable construction costs.
- 8.3 Prepare an application to DEEP for a Dam Safety Repair and Alteration Permit. This will also include the following:

- 8.3.1 Sequence of construction
- 8.3.2 Water Handling Plan
- 8.3.3 Operation and Maintenance Plan
- 8.3.4 Emergency Action Plan During Construction
- 8.4 Submit two sets of the draft final drawings, cost opinions, and regulatory permit applications to you for final review and comment. SLR will revise the project plans and permit applications based on comments from the Town and the stakeholders.
- 8.5 Contact USACE to identify the level of permit application appropriate for the proposed dam repair work. At this time, it is assumed that the project will fall into the Category I Nationwide Permit, and no application to USACE will be required. Only the Category I Nationwide Permit is included in this proposal. If a Category II or individual permit is necessary, we will perform this work on an hourly basis or for an agreed-upon lump sum fee.
- 8.6 Submit the plans to the Ledyard and North Stonington Inland Wetland Agencies for informational purposes only. Dam construction projects that are regulated by DEEP are exempt from local inland wetland jurisdiction.
- 8.7 Revise plans if requested by the regulatory agencies and coordinate with them to obtain final approval.

**Task 9.0 – Preliminary Design – Bridges (Two Locations)**

- 9.1 Prepare a Bridge Type Study memorandum that will evaluate two cost-effective bridge structure alternatives with options for parapets and railing systems.
  - 9.1.1 Prepare a brief memorandum summarizing the project alternatives, impacts, and costs. Embedded within the report will be a structure type study evaluating the design alternatives. The memorandum shall include the following:
    - 9.1.1.1 Schematic plan, elevation, and typical section for each alternative, including railing and parapet treatments
    - 9.1.1.2 Construction cost opinions for each alternative studied
    - 9.1.1.3 Summary of project requirements and impacts for each alternative to address construction cost, constructability, impacts to utilities/necessary relocations, rights-of-way needs, maintenance requirements, regulatory permit requirements, and public concerns
    - 9.1.1.4 Recommendation for a preferred alternative

- 9.2 Submit memorandum for review and comment. Meet with Town staff to discuss the report and recommendations and solicit design direction.
- 9.3 Develop preliminary design plans to include the following:
  - 9.3.1 Roadway general plan and profile indicating localized storm drainage improvements, potential utility relocations, and treatment of properties along the right-of-way, including anticipated taking requirements
  - 9.3.2 Water handling plan
  - 9.3.3 Traffic detour plan
  - 9.3.4 Typical roadway cross section and critical cross sections
  - 9.3.5 Preparation preliminary plan, cross section, and elevation for the proposed bridge
- 9.4 Prepare quantity and construction cost opinion.
- 9.5 Provide a list of property impacts.
- 9.6 Submit the above information to the Town for review and comment.
- 9.7 Prepare written responses to design review comments prior to proceeding with final design.

**Task 10.0 – Final Design – Bridges (Two Locations)**

- 10.1 Based upon the approved Preliminary Design and agreed revisions, incorporate the review comments and prepare final design (90% Completion) plans and specifications to include the following:
  - 10.1.1 Roadway plan and profile indicating storm drainage improvements and roadside barriers and utility plans indicating municipal relocation, construction details, and details for treatment of affected properties within the work areas. Incorporate utility relocation plans prepared by private utilities.
  - 10.1.2 Pavement marking and signage plans
  - 10.1.3 Maintenance and protection of traffic plans or detour plans
  - 10.1.4 Sedimentation and erosion control plans
  - 10.1.5 Structure plans for the bridge, including structure layout plan, elevation, typical cross section, foundation plans, and structure details
  - 10.1.6 Boring logs
  - 10.1.7 Details for stream bank/channel restoration and scour countermeasure
  - 10.1.8 Title Sheet and Miscellaneous Details



- 10.2 Perform structural calculations and load rating analysis in support of the bridge design. The load rating analysis shall be performed using *AASHTOWare Bridge Rating Software* and shall be in accordance with the latest Connecticut Department of Transportation (CTDOT) *Bridge Load Rating Manual* using the Load and Resistance Factor Rating (LRFR) methods.
- 10.3 Prepare final quantity estimate, cost opinion, and calendar day chart.
- 10.4 Submit 90% Completion plans, estimate, and calculations for review.
- 10.5 Meet with Town staff to discuss the final design. Respond to review comments in writing.
- 10.6 Incorporate final review comments and prepare final plans.
- 10.7 Submit final plans for review.

**Task 11.0 – Lantern Hill Road over Long Pond Bridge Design (Add Alternate)**

- 11.1 Prepare a Bridge Type Study memorandum that will evaluate two cost-effective bridge structure alternatives with options for parapets and railing systems.
- 11.2 Prepare a brief memorandum summarizing the project alternatives, impacts, and costs. Embedded within the report will be a structure type study evaluating the design alternatives. The memorandum shall include the following:
  - 11.2.1 Schematic plan, elevation, and typical section for each alternative, including railing and parapet treatments
  - 11.2.2 Construction cost opinions for each alternative studied
  - 11.2.3 Summary of project requirements and impacts for each alternative to address construction cost, constructability, impacts to utilities/necessary relocations, rights-of-way needs, maintenance requirements, regulatory permit requirements, and public concerns
  - 11.2.4 Recommendation for a preferred alternative
- 11.3 Perform two borings per Task 5.0 above.
- 11.4 Prepare a geotechnical report summarizing the results of the subsurface exploration, lab testing, and design recommendations.
- 11.5 Submit memorandum for review and comment. Meet with Town staff to discuss the report and recommendations and solicit design direction.
- 11.6 Develop preliminary design plans to include the following:

- 11.6.1 Roadway general plan and profile indicating localized storm drainage improvements, potential utility relocations, and treatment of properties along the right-of-way, including anticipated taking requirements
- 11.6.2 Water handling plan
- 11.6.3 Traffic detour plan
- 11.6.4 Typical roadway cross section and critical cross sections
- 11.6.5 Preparation of preliminary plan, cross section, and elevation for the proposed bridge
- 11.7 Prepare quantity and construction cost opinion.
- 11.8 Provide a list of property impacts.
- 11.9 Submit the above information to the Town for review and comment.
- 11.10 Prepare written responses to design review comments prior to proceeding with final design.
- 11.11 Based upon the approved Preliminary Design and agreed revisions, incorporate the review comments and prepare final design (90% Completion) plans and specifications to include the following:
  - 11.11.1 Roadway plan and profile indicating storm drainage improvements and roadside barriers and utility plans indicating municipal relocation, construction details, and details for treatment of affected properties within the work areas. Incorporate utility relocation plans prepared by private utilities.
  - 11.11.2 Pavement marking and signage plans
  - 11.11.3 Maintenance and protection of traffic plans or detour plans
  - 11.11.4 Sedimentation and erosion control plans
  - 11.11.5 Structure plans for the bridge, including structure layout plan, elevation, typical cross section, foundation plans, and structure details
  - 11.11.6 Boring logs
  - 11.11.7 Details for stream bank/channel restoration and scour countermeasure
  - 11.11.8 Title Sheet and Miscellaneous Details
- 11.12 Perform structural calculations and load rating analysis in support of the bridge design. The load rating analysis shall be performed using *AASHTOWare Bridge Rating Software* and shall be in accordance with the latest Connecticut Department of Transportation (CTDOT) *Bridge Load Rating Manual* using the Load and Resistance Factor Rating (LRFR) methods.
- 11.13 Prepare final quantity estimate, cost opinion, and calendar day chart.
- 11.14 Submit 90% Completion plans, estimate, and calculations for review.

11.15 Meet with Town staff to discuss the final design. Respond to review comments in writing.

11.16 Incorporate final review comments and prepare final plans.

11.17 Submit final plans for review.

## SCHEDULE

The estimated time required to complete Tasks 1.0 through 10.0 is as follows.

Task 1.0 – Kickoff, Coordination, and Public Meetings .....	Through the project
Task 2.0 – Data Collection .....	1 month
Task 3.0 – Survey .....	2 months
Task 4.0 – Hydrologic Modeling .....	1 to 2 months
Task 5.0 – Geotechnical Engineering .....	1 month
Task 6.0 – Preliminary Engineering .....	2 months
Task 7.0 – Preliminary Design - Dams .....	2 months
Task 8.0 – Final Design and Permit Applications – Dams .....	2 months
Task 9.0 – Preliminary Design – Bridges (Two Locations) .....	3 months
Task 10.0 – Final Design – Bridges (Two Locations) .....	4 months
Task 11.0 – Lantern Hill Road over Long Pond Bridge Design (Add Alternate) .....	7 months

Note: Several of the above projects will be worked on simultaneously such as Survey and Data Collection, Hydrologic Modeling and Geotechnical Engineering, etc. However, the coordination meetings and delays arising from the interests of the various stakeholders are unknowns at this time.

## PROFESSIONAL FEES

We will perform the services listed above for the following lump sum fees plus direct expenses (i.e., printing, mileage, etc.):

Task 1.0 – Kickoff, Coordination, and Public Meetings .....	29,000
Task 2.0 – Data Collection .....	\$17,000
Task 3.0 – Survey .....	\$18,000
Task 4.0 – Hydrologic Modeling .....	\$56,000
Task 5.0 – Geotechnical Engineering .....	\$62,000
Task 6.0 – Preliminary Engineering .....	\$63,000
Task 7.0 – Preliminary Design – Dams .....	\$87,000
Task 8.0 – Final Design and Permit Applications – Dams .....	\$81,000

Task 9.0 – Preliminary Design – Bridges (Two Locations) .....	\$58,000
Task 10.0 – Final Design – Bridges (Two Locations) .....	\$63,000
Task 11.0 – Lantern Hill Road over Long Pond Bridge Design (Add Alternate) .....	<u>\$75,000</u>
<b>Total .....</b>	<b>\$609,000</b>

## EXCLUSIONS/LIMITATIONS

Please note that in submitting this proposal we cannot guarantee that the proposed project will receive all necessary approvals. The following services are not included in this proposal:

1. Biological assessments or environmental impact studies, including hazardous waste assessments
2. Detailed archaeologic studies
3. Design of offsite improvements
4. Preparation of specifications and bid documents
5. Construction-phase services or the preparation of "as-built" plans
6. Easement mapping, legal descriptions, or property negotiations
7. Assistance with Connecticut Diversion Permit application
8. Permit fees

Should the above items or any additional services be required, they can be provided on an hourly basis or for an agreed-upon lump sum fee.


We would be honored by an opportunity to work with the Town of Ledyard to develop this project. If we can provide you with any additional information, please do not hesitate to contact either of the undersigned (thart@slrconsulting.com, 203.206.9838; kpatel@slrconsulting.com, 203.278.1764).

Sincerely,

## SLR International Corporation



Edward A. Hart, PE  
Principal Civil Engineer  
Associate Manager of Engineering



Kishor Patel, PE  
Principal Structural Engineer

Enclosure

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## 2023 US PREFERRED RATE SCHEDULE

<b><u>PROFESSIONAL SERVICES</u></b>	<b><u>Hourly Rate</u></b>
Senior Advisor	\$300
Senior Principal	\$250
Principal 2	\$230
Principal 1	\$215
Senior 2	\$205
Senior 1	\$200
Associate 2	\$190
Associate 1	\$185
Project 2	\$170
Project 1	\$165
Staff 2	\$145
Staff 1	\$140
Chief Inspector	\$180
Senior Inspector	\$155
Inspector	\$135
Senior Draftsperson/Technician	\$130
Draftsperson/Technician	\$115
Party Chief	\$135
Survey Crew Member	\$105
Administrative 2	\$95
Administrative 1	\$90

Note: Time will be billed to the nearest ¼ hour

**REIMBURSABLE EXPENSES**

	<b><u>Rate</u></b>
Bond Prints	\$ 2.00 Each
Large Bond Prints	\$ 3.00 Each
Fixed Line Mylars	\$75.00 Each
Color Plots/Mylars	\$30.00 Each
Large Color Plots/Mylars	\$45.00 Each
Photocopies – 8½ x 11	\$ 0.12 Per Copy
Photocopies – 11 x 17	\$ 0.24 Per Copy
Color Copies – 8½ x 11	\$ 1.25 Per Copy
Color Copies – 11 x 17	\$ 2.25 Per Copy
Binding 0-200 pages	\$ 6.00 Per Bound Copy
201 or more pages	\$ 7.50 Per Bound Copy
Board Mounting	\$25.00 Each
Each FedEx – \$0-\$25	\$25.00 Per FedEx
FedEx – Over \$25	Cost Per FedEx
Mileage	IRS Rate Per Mile

**OTHER DIRECT CHARGES**

	<b><u>Rate</u></b>
Subcontractors, vendors, and other expenses	Actual cost + 15%
Administrative charge	3% of labor charges
Expert witness testimony services (court and mediation)	50% labor surcharge