

6 December 2021

**Ms. Harmony Wilson, Chair, Haverhill Conservation Commission
Haverhill City Hall, Room 300
4 Summer Street
Haverhill, MA 01830**

**Subject: Response to Comments Letter Dated November 17, 2021 from PGC
Engineering, PLLC
216 River Street Riverbank Stabilization Project
Haverhill, Massachusetts
Conservation Commission Filing #33-1515**

Dear Ms. Wilson and members of the Conservation Commission:

On November 17, 2021, Geosyntec Consultants, Inc. (Geosyntec) received a letter from PGC Engineering PLLC with comments (Comment Letter) on the proposed bank stabilization project planned at 216 River Street in Haverhill, MA (Site). Geosyntec has prepared this letter in response to those comments on behalf of the applicant, Fugere LLC. The Comment Letter identified three categories of comments which are repeated below followed by a response.

Comment #1: Permanence of proposed stabilization. We now question the permanence of the presently proposed stabilization without extension onto the property at 210 River Street. If that extension was once necessary to protect the integrity of the Bank Stabilization at 216 River Street why is it now not necessary?

Response to Comment #1:

The proposed stabilization project provided in the Notice of Intent application for 216 River Street includes a combination of riprap revetment and vegetative measures to reduce potential for future erosion of the riverbank at 216 River Street. The design period used for the bank stabilization is 25 years. The design was based on our recent and relevant experience working on bank stabilization projects on the Merrimac River as well as techniques and guidance from established design manuals in stream restoration design including:

- General Design Guidance. National Engineering Handbook, Stream Restoration Design, Part 654 (USDA-NRCS-HEH-654, August 2007).
- Technical Supplement 14I, Streambank Soil Engineering, Part 654 National Engineering Handbook
- Bank Stabilization Design Guidelines, Report Number SRH-2015-25. Bureau of Reclamation.

The previous iteration of the design (prior to submission with the NOI) extended the stabilization approximately 10 to 15 feet onto the adjacent property at 210 River Street. The initial intent of extending the stabilization onto the adjacent parcel was primarily to replace an existing corrugated metal pipe chute that crosses the property line with a riprap lined downchute for stormwater management as well as flatten the existing riverbank slope in the vicinity of the property line (**Figure 1** below – note the approximate property line is represented by the green long dash, triple short dash line).

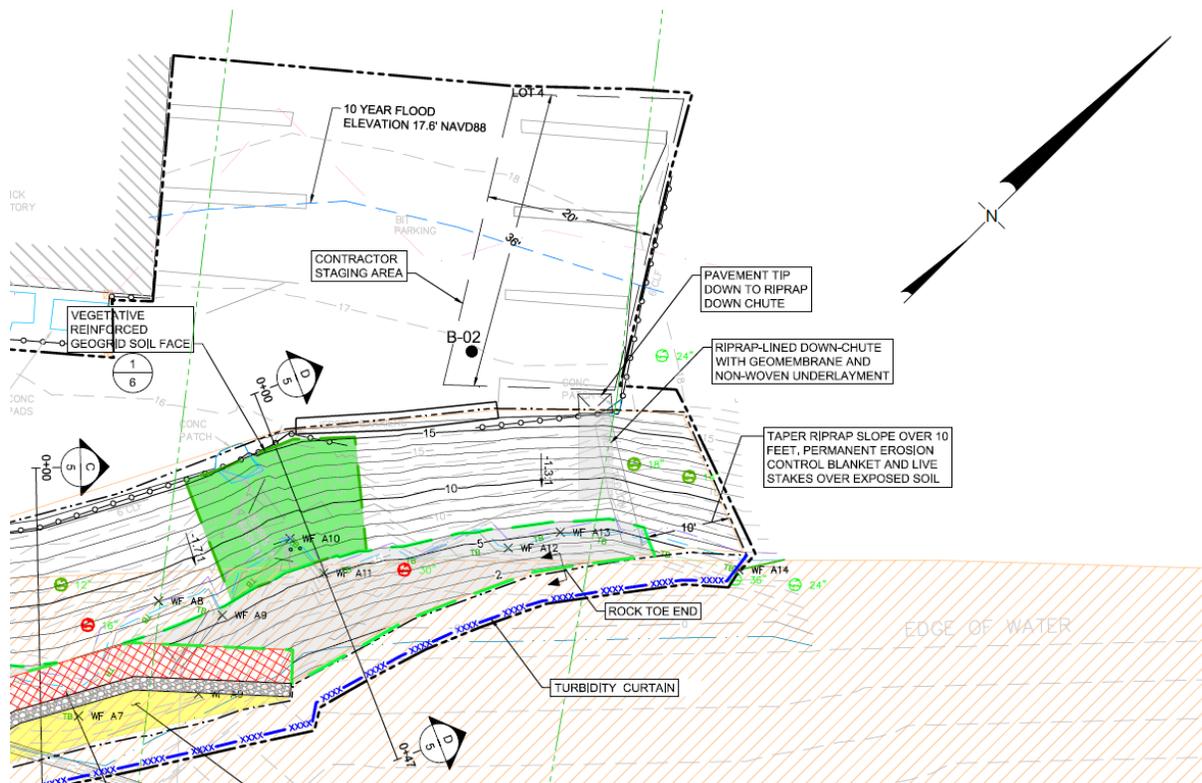


Figure 1. Previous design iteration of slope stabilization extending on 210 River Street.

As shown on **Figure 1**, the proposed grades generally mimic the existing conditions on the majority of the grading on 210 River Street and is not necessary for the stabilization proposed on 216 River Street. After further observations of Site drainage during precipitation events, stormwater runoff from this portion of existing parking lot drains southerly toward the existing concrete blocks and onto the slope. Based on these observations, the proposed stormwater down chute was relocated to the south and there is no longer a need to replace the corrugate metal pipe which can be left in place. Therefore, there is no longer a need to extend the stabilization onto 210 River Street.

Comment 2: Downstream erosion caused by Bank Stabilization. Bank stabilization projects often cause problems to downstream properties that have not been stabilized. This

potential issue should be addressed by the applicant.

Response to Comment #2:

Erosion in the Merrimack River is a natural process which is accelerated by anthropogenic activities including upstream development. The U.S. Forest Service ranks the Merrimack River watershed as the most threatened in the country due to the development of forest lands. This development will result in downstream impacts including erosion of the riverbank. Climate change and increased precipitation events, which have recently been observed, also can result in accelerated erosion to the riverbanks. Other factors include river ice coverage, thickness and duration, wind, and vessel-generated waves. The proposed stabilization project provided in the Notice of Intent application for 216 River Street includes a combination of riprap revetment and vegetative measures to reduce potential for future erosion of the riverbank at 216 River Street. As referenced in Response to Comment 1, the design was based guidance from established design manuals in stream restoration. The proposed design includes vegetative transition zones on the upstream and downstream boundaries of the riprap armoring. These vegetative transition zones are intended to protect the edges of the riprap armor as well as transition flow from adjacent to the armor to the adjacent vegetated existing banks both upstream and downstream (as the river is tidal in the vicinity of the Site). Downstream erosion often occurs when the longitudinal protection is placed on a concave bank and does not extend sufficiently downstream (Lagasse et al, 2009¹, USACE, 1981²). The bank stabilization project at 216 River Street is not on a concave bank of the River where this would be a concern. Further, the proposed stabilization activities were modelled in a hydraulic model to evaluate changes in velocity. The result as presented in the Project Report provided with the Notice of Intent shows no increase in velocity resulting from the stabilization.

Comment 3: Construction details in plans [for the purposes of this response letter, the comments are reproduced in the Response to Comment 3 below]:

Response to Comment #3: Comment #3 includes 16 individual comments related to the permit-level drawing set submitted with the Notice of Intent. The permit-level drawing set has provided to the Commission to show the proposed activities and their potential impacts to resource areas protected by Part II, Chapter 253. Per Part II, Chapter 253, “[t]he permit application shall include such information and plans³ which follow the Commission's submittal guidelines as contained in

¹ Lagasse, P.F., Clopper, P.E., Pagán-Ortiz, J.E., Zevenbergen, L.W., Arneson, L.A., Schall, J.D., Girard, L.G. 2009. *Bridge Scour and Stream Instability Countermeasures: Experience, Selection, and Design Guidance*. FWHA Rep. No. NHI-09-12, HEC-23, 3rd Ed, Vol. 2. Federal Highway Administration, Arlington, VA.

² U.S. Army Corp of Engineers (USACE), 1981. *The Streambank Erosion Control Evaluation and Demonstration Act of 1974, Section 32 Public Law 93-251: Final Report to Congress*, Main Report and Appendices A through H.

³ Plans are defined at Chapter 253: Any such data, maps, engineering drawings, calculations, specifications, schedules and other materials, if any, deemed necessary by the Commission to describe the site and/or work, to determine the applicability of the chapter or to determine the impact of the proposed work upon the interests identified in the chapter.

the Commission's procedural regulations to describe the proposed activities and their effects on the resource areas protected by this chapter.” The drawing set was prepared to show sufficient detail to allow the agencies to review relative to resource area impacts and permitting.

Comment: On sheet 6 of 8 of the submitted plans in both detail B/5 and D/5 the Vegetated Reinforced Geogrid is referred to as detail 1/6. There isn't any detail 1/6. It appears the proper reference should be 1/5.

Response: The detail call outs are explained on Drawing 1 of 8 as shown in Figure 2 below. Detail 1/6 is correct and represents detail 1 which is first referenced on Drawing 6.

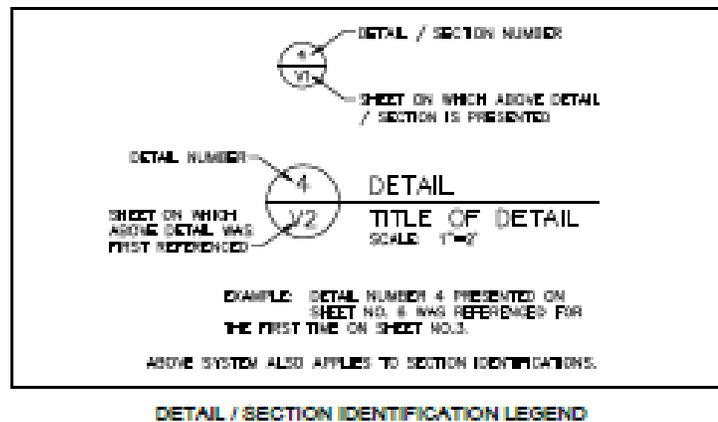


Figure 2: Detail symbology for plan set.

Comment: Profiles A/5 and C/5 provide for proposed stabilization on slopes of 1.6:1 and 1.7:1. However the proposed slope adjacent to 210 River Street is 1.3:1. A separate Profile and construction detail should be provided for that area

Response: The profiles included in the drawing set are representative of the slope stabilization to provide the Commission information relative to resource area impacts. Construction documents including technical specifications will be provided to the contractor for construction and are not necessary to evaluate resource area impacts during permitting. The profile most representative to the slope adjacent to 210 River Street is Profile A.

Comment: The following four comments are related to use of geogrid in the vegetated reinforced soil slope. A combined response follows the four comments below:

- The Geogrid specified for slope stability should in all cases be specified. Is it pervious or impervious? What is the required tensile strength? Without proper definition of the product to be used slope failure could occur.
- How will the slope be prepared? Since the geogrid cannot be placed upon existing vegetation, what vegetation is to be removed? What topsoil is to be removed?

- How will the geogrid be secured to the bank?
- What is the horizontal length of the geogrid? In detail 1/5 the geogrid is approximately 4.5 times longer than the proposed 18 inch lift or close to 7 feet in length. Is it the intent to cut 7 feet horizontally into the banking to accomplish the work shown in detail 1/5?

Response to Comment #3 Related to use of Geogrid in the slope stabilization: There are multiple comments related to the use of geogrid. The geogrid is not necessary for the slope stability and was included as additional conservatism in the design. The geogrid has been removed from the detail 1/5 on Drawing 6 of 8.

Comment: Has a slope soil stability calculation been done by the applicant for the work shown in detail 1/5? Global failure, sliding failure? Will the weight of vehicles in the parking lot effect the slope stability of the improvements proposed in detail 1/5? Have the weight of the vehicles been accounted for in the selection of the geogrid?

Response: The design included in the Notice of Intent was result of a yearlong process of inter-agency collaboration, engineering analysis and coordination with the applicant. The engineering analysis included a geotechnical investigation including two borings (reference Appendix E of the Project Report provided with the Notice of Intent) and a slope stability analysis using SLIDE software. The final configuration presented in the drawings represents Alternative 7, Hybrid B (see Section 2 of the Project Report included with the Notice of Intent) that was selected balancing impacts to potential critical habitat in the River, slope stability, and existing use of the property including delivery traffic. The results of the slope stability analysis in terms of safety factor are presented in Table 1 of Section 2 of the Project Report. Note, the slope stability analysis was based on long term condition of the slope (i.e., does not include temporary erosion control blanket).

Comment: Not all Erosion Control Blankets can be used on steep slopes. The Erosion Control Fabric to be used should be specified.

Response: Construction documents including technical specifications documenting the erosion control blanket minimum requirements will be provided to the contractor for construction and are not necessary to evaluate resource area impacts during permitting. However, the drawings, specifically Detail 1 on Drawing 8, have been updated with minimum erosion control blanket requirements for a blanket suitable for up to 1 horizontal (H):1 vertical (V) slopes: a 36-month, biodegradable double such as the North American Green C700BN or equivalent.

Comment: The type of "Vegetative Support Material" should be specified since the calculations for proposed stability cannot be made without knowledge of soil type, and the proper "Erosion Control Mat" cannot be specified without knowing the contemplated stresses.

Response: Construction documents including technical specifications documenting the minimum requirements of vegetative support material will be provided to the contractor for construction and are not necessary to evaluate resource area impacts during permitting. The slope stability analysis included vegetative support material using a typical value for topsoil. Drawing 6 has been updated

to define the minimum requirements of vegetative support material.

Comment: Detail 1/5 shows a new area of asphalt over the Vegetive Support Material. If that material is compressible as most loam like materials would be it is not suitable for a subbase under pavement.

Response: Detail 1/5 on Drawing 6 has been revised to be more site-specific. The intent of the design is not to pave over the fill to expand the parking lot, rather to rebuild the slope in significantly eroded areas with vegetated reinforced soil slopes up to the elevation of the existing parking lot.

Comment: As shown on sheet 3 of 8 of the drawing set a metal trough which drains water from the parking lot extends onto the property at 210 River Street. Will the trough be removed? Will the parking lot be repaved to direct water away from the trough?

Response: See response to Comment 1.

Comment: There isn't any detail on the plans that shows the construction of the two proposed Riprap lined down chutes. The details are needed.

Response: Detail has been added to the drawings.

Comment: The repaving and regrading of the parking lot necessary to divert the parking lot drainage down the chutes needs to be shown on the plan?

Response: See also response to Comment 1. The parking lot is not going to be regraded as part of this project. Areas of concentrated flow will be collected in tip-downs and conveyed via a riprap down chute to the River. Other areas of overland flow will flow onto the vegetated slope prior to discharge to the River.

Comment: Will stormwater treatment be required on the parking lot drainage flow?

Response: See also response to Comment 1. The parking lot is not going to be regraded as part of this project. Areas of concentrated flow will be collected in tip-downs and conveyed via a riprap down chute to the River. Other areas of overland flow will flow onto the vegetated slope prior to discharge to the River.

Comment: An asphalt cut line and new asphalt location should be shown on sheet 5 of 8 to reflect the work required by detail 1/5

Response: Detail 1/5 on Drawing 6 has been revised to be more site-specific.

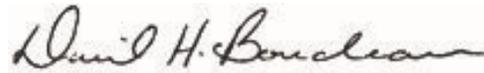
Comment: Soil stockpile locations and material storage locations should be shown on the plans.

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Response: The contractor staging areas are shown on Drawing 4 of 8 of the Drawings.

Thank you very much for your consideration in this matter and we look forward to discussing the project during the public hearing. If you have any questions, please feel free to contact me at (508) 472-9538.

Sincerely,
Geosyntec Consultants, Inc.



Daniel Bourdeau, P.E. (MA)
Principal Engineer

Attachment:
Revised Drawings Revision B, dated November 2021