**Appendix B - Stream Permittee Responsible Mitigation/Compensation**

[Include this appendix for stream PRM as compensation, completing the fillable values, text, etc.]

1. **Compensatory Mitigation *–* Permittee Responsible Stream Compensation**

***Standard Conditions***

1. [Ex.: PRM Stream] The permittee shall submit a final compensation plan (Final Plan) to DEQ prior to initiating work in the impact areas authorized by this permit. The Final Plan shall include at minimum all the information provided in the conceptual compensatory mitigation plan (Conceptual Plan). The permittee shall compensate for permanent stream impacts through the on-site stream channel restoration and riparian buffer reforestation along # linear feet of Name and the on-site preservation along both sides of an additional # linear feet of perennial stream channel and # linear feet of intermittent stream channels and the associated riparian buffer (approximately # acres). Stream mitigation activities shall be in accordance with the most recent, DEQ-approved *Final Compensation Plan Name* (Final Plan).
	1. [Include where phased compensation is approved by DEQ - *Review all compensation conditions to ensure none conflict with the intent of phasing.*] This permit authorizes the compensation requirement be met in phases. The permittee shall provide compensation sufficient to mitigate authorized surface water impacts associated with each respective phase prior to initiating construction activities in those surface water impacts. The phased compensation requirement is considered met for the purpose of this condition when the permittee submits the following to DEQ, as applicable:
2. The report documenting the first year of success monitoring and documentation that the compensation site is preserved in perpetuity for # acres or # linear feet of riparian buffer planting, restoration, or enhancement or restoration or enhancement of # linear feet of stream channel, sufficient to compensate for authorized surface water impacts associated with that phase of the project.
3. The permittee shall submit to DEQ by January 10 of any year a summary of the amount of surface water impacts initiated, amount of compensation completed and compensation requirement remaining and status of initiating any remaining surface water impacts and completing any remaining compensation requirement.
4. The permittee is responsible for meeting all of the components of the compensatory mitigation requirements associated with this permit. This responsibility can only be transferred if and when the permit is transferred to another party and then only to the new permit recipient.
5. The Final Plan, as prepared in accordance with this VWP permit, shall be approved by DEQ prior to any construction activity in permitted impact areas. DEQ shall have 60 calendar days to review and either provide written comments to the permittee or approve the Final Plan. The Final Plan as approved by DEQ shall be an enforceable requirement of this permit. Any change to the approved Final Plan must be submitted to DEQ for approval prior to implementing the change.
6. Construction of compensation sites shall be initiated within 180 days of commencing impacts authorized in this permit or Final Plan approval. The activities approved in the Final Plan shall be completed within one (1) year of initiating work in authorized impact areas or DEQ’s approval of the Final Plan.
7. Planting of woody plants shall occur when vegetation is normally dormant, unless otherwise approved in the Final Plan.
8. The vegetation used shall be native species common to the area, shall be suitable for growth in local riparian conditions, and shall be from areas within the same or adjacent U.S. Department of Agriculture Plant Hardiness Zone or Natural Resources Conservation Service Land Resource Region as that of the project site.
9. Herbicides or algicides shall not be used in or immediately adjacent to the compensation site without prior authorization by DEQ. All vegetation removal shall be done by manual means, unless authorized by DEQ.
10. Point sources of stormwater runoff shall be prohibited from entering any compensation site prior to treatment by appropriate best management practices (BMPs). Appropriate best management practices may include sediment traps, grassed waterways, vegetated filter strips, debris screens, oil and grease separators, or forebays.
11. All *nonimpacted surface waters* and designated upland buffers that are within the compensation site limits, that are within fifty feet of any compensation site activities, and that are within the project or right-of-way limits shall be clearly flagged or marked for the life of the construction activity within that area. Open water areas should be marked as practicable. The permittee shall notify all contractors and subcontractors that *no activities are to occur within these marked areas*.
12. DEQ shall be notified in writing within 24 hours or as soon as possible on the next business day when unusual or potentially complex conditions are encountered which require debris removal or involve potentially toxic substances. Measures to remove the obstruction, material, or toxic substance or to change the location of any structure are prohibited until approved by DEQ.

***Compensation Site Construction: Tasks, Monitoring, and Submittals***

1. The permittee shall submit a final stream compensation plan (Final Plan) to DEQ prior to initiating work in the impact areas authorized by this permit.
2. The Final Plan shall include all the information provided in the Conceptual Plan and, at a minimum, the following information:
3. The goals and objectives of the compensation plan, including but not limited to:
	1. the classification of the existing stream being impacted and a description of the existing riparian buffer (age of forested, shrub, and herbaceous strata present, utility easements, existing management (silviculture or other), if applicable);
	2. how the restorative measures are replacing/enhancing/preserving stream functions;
	3. the components of the compensation expressed in linear feet, square footage (for riparian buffer), linear footage (for stream channel), including any proposed riparian buffer communities; linear feet of stream preservation, enhancement, and/or restoration; acreages of riparian buffer restoration/enhancement;
	4. The stream deficiencies to be addressed, including a description of the causes of existing lateral and vertical instability and the methods used to make determinations; and
	5. a summary of geomorphologic measurements of the existing stream, reference stream(s), and the proposed stream (e.g., stream width, spacing and depth of pools and riffles, entrenchment ratio, width-depth ratio, cross-sectional area, bank-height ratio, radius of curvature, belt width, sinuosity, slope, substrate, etc.).
4. Credit analysis to estimate the expected number of Stream Credits that will be generated by the Final Plan. The number of Potential Credits for stream compensatory mitigation will be determined using the Unified Stream Methodology (USM) or the current methodology in use by DEQ and the USACE.
5. Wetland delineation confirmation, data sheets, and survey-located maps for existing surface waters on the compensation site, and any collectible information on reference streams adjacent to or near the compensation site.
6. A location map, including the compensation site boundaries, the latitude and longitude (to the nearest second) at the center of the compensation site, and the watershed name and the fourth order subbasin, as defined by the hydrologic unit boundaries of the National Watershed Boundary Dataset, in which the compensation site is located.
7. A site access plan, including plan to restore any temporary impacts associated with site access and construction.
8. A monitoring plan, with defined goals.
9. Plan views depicting the location of photo-monitoring stations, location of vegetation sampling plots/transects, location and type of in-stream structures (include longitudinal profiles), location and type bank and bed reinforcement, proposed bank grading, stream channel assessment transects, and reference stream(s) (if applicable).
10. Include a structure table for each reach, listing structure type, design methods, invert elevation, bank angle, computed scour depth, footer depth, and justification or reason for the structure in the design. Construction specifications should be included for each type of structure.
11. Include plan-view location of proposed riparian buffer restoration, reestablishment, enhancement, and preservation areas.
12. Stream proposed detailed cross-sections spaced a minimum every 200 linear feet, showing existing grade, proposed grades, example stabilization measures, bankfull stage, and flood prone stage for representative sections within each restoration or enhancement reach. Existing and proposed typical design morphological characteristics for each type of activity and stream type.
13. For areas of proposed stream restoration, provide pre-restoration aquatic macroinvertebrate surveys and water quality measurements. Benthic Macroinvertebrate reporting shall include a table showing the *Stream Condition Index for Virginia Non-Coastal Streams* (VSCI) or *Coastal Plain Macroinvertebrate Index* (CPMI) total score. Water quality measurements include temperature, total dissolved oxygen, pH, and conductivity.
14. For areas of proposed stream preservation downstream of stream restoration or enhancement, provide pre-restoration stream cross sections.
15. For areas of proposed stream restoration or enhancement, a survey of existing typical channel cross section, plan view, and profile indicative of each stream type, classification, and order, and existing geomorphological characteristics data.
16. Hydraulic assessment, including but not limited to, a quantification of discharge, stream stage, depth-averaged velocity, average boundary shear stress, unit stream power, and largest mobile particle size in a representative riffle cross section for each restoration reach, at the 2-year, bankfull, 10-year, and 100-year recurrence intervals. Please list computational tools and techniques used to model stream hydrodynamics and sediment transport.
17. Invasive, nuisance, and undesirable (INU) species inventory map depicting the location (acres) and extent (coverage) of all individual species of INU plants over the entire mitigation site.
18. Any stream crossings, roads, or other structures that will be removed, replaced, or left in place should be identified on the plans. Generally, crossings should be removed; if needed to be left in place, they should be stable and not adversely impact the stream.
19. Defined Performance Standards.
20. An INU abatement and control plan.
21. A planting scheme and schedule for riparian buffers, including:
22. Herbaceous seed mix that includes at least ten (10) native species (as shown for the locality in the Digital Flora of Virginia);
23. Woody species list that includes a minimum of four (4) native species (as shown for the locality in the Flora of Virginia);
24. Wetland indicator status as specified in the current version of the U.S. Army Corps of Engineers National Wetlands Plant List; and,
25. Plant size and spacing.
26. A planting scheme and schedule for streambank vegetation, including but not limited to, plant species, sizing, spacing and location of plantings of each vegetation type proposed along streambanks.
27. A soil preparation and amendment plan addressing both topsoil and subsoil conditions, permeability, compaction amelioration, and the need for soil amendments and/or structural modification (i.e., surface scarification or tilling), if required.
28. If applicable, the location of fencing along adjacent land uses.
29. Grading and Erosion and Sediment Control plans.
30. A construction, recordation and Final Plan implementation schedule.
31. A draft of the intended protective mechanism(s), in accordance with [9VAC25-210-116](https://law.lis.virginia.gov/admincode/title9/agency25/chapter210/section116/) B 2, such as but not limited to, a conservation easement held by a third party in accordance with the Virginia Conservation Easement Act (§ 10.1-1009 *et seq*. of the Code of Virginia) or the Virginia Open-Space Land Act (§ 10.1-1700 *et seq*. of the Code of Virginia), a duly recorded declaration of restrictive covenants, or other protective instrument. The draft intended protective mechanism(s) shall contain the information below:
32. A provision for access to the site; and
33. The following minimum restrictions: no ditching, land clearing, or discharge of dredge or fill material, and no activity in the area designated as compensatory mitigation area with the exception of maintenance; corrective action measures; or DEQ-approved activities described in the approved Final Plan or approved long-term management plan (LTMP).
34. A LTMP and financial assurance plan that identifies a long-term steward and adequate financial assurances for long-term management in accordance with the current standard for mitigation banks and in-lieu fee program sites. The financial assurance plan shall include a cost estimate sufficient to construct, maintain, and replace the Final Plan activities.
35. Photographs of existing conditions shall be taken prior to the commencing activities at the compensation site. Photographs at the compensation site shall not be required until land disturbance or construction activities are initiated on the compensation site.

Photographs shall be taken at a height of approximately five to six feet and from fixed-point stations, preferably at the same location as that of each planned vegetation sampling plot/transect, stream cross-sections, longitudinal profiles, and pattern and bank vegetation monitoring stations. Photographs shall be taken in each of the four cardinal directions (north, east, south, and west). Permanent markers shall be established, as applicable, to ensure that the same locations on the site are used for future monitoring events. Each photograph shall be labeled with the permit number, the name of the compensation site, the photo station number, the photograph orientation, the date and time of the photograph, the name of the person taking the photograph, and a brief description of the photograph subject. If necessary, this information shall be provided as a separate attachment to each photograph.

1. DEQ shall be notified in writing at least ten calendar days prior to the initiation of activities at the compensation site. The notification shall include a projected schedule of activities and construction completion.
2. Photographic monitoring of compensation site construction shall be required at the end of each month during construction to document that construction activities are being performed in manner to prevent impacts to adjacent surface waters.
	1. Photographic monitoring shall be conducted by the following method:

Photographs shall be taken at a height of approximately five to six feet and from fixed-point stations, preferably at the same location as that of each planned monitoring well and stream channel assessment transect. Photographs shall be taken in each of the four cardinal directions (north, east, south, and west). Permanent markers shall be established to ensure that the same locations on the site are used for future monitoring events. Each photograph taken shall be labeled with the permit number, the name of the compensation site, the photo station number, the photograph orientation, the date and time of the photograph, the name of the person taking the photograph, and a brief description of the photograph subject. This information shall be provided as a separate attachment to each photograph, if necessary.

1. For temporary disturbances to surface waters, the permittee shall conduct photographic monitoring after the temporary disturbance activity is complete in order to document that the area has been restored in compliance with these permit conditions.
2. Monitoring of water quality parameters shall be conducted during relocation of any flowing stream through a new channel at [Identify Location - Either by Impact No. Or Other]. Corrective measures and additional monitoring may be required if water quality standards are not met. The permittee shall report violations of water quality standards to DEQ within 24 hours of monitoring. All monitoring data shall be submitted to DEQ within seven calendar days of the monitoring event. The method for monitoring water quality parameters shall be as follows:

(1) One sampling station shall be located upstream of the relocated channel, and one sampling station shall be located immediately downstream of the relocated channel.

* + - 1. At the *upstream* sampling station, temperature, pH, and dissolved oxygen (D.O.) measurements shall be taken immediately *before* opening a new channel, and every 30 minutes thereafter for at least *two* hours.
			2. At the *downstream* sampling station, temperature, pH, and dissolved oxygen (D.O.) measurements shall be taken immediately *after* opening a new channel, and every 30 minutes thereafter until the measurements indicate that the site has stabilized (minimum of *three* hours).
1. Compensation site construction monitoring reports shall be submitted within 30 calendar days of each monitoring event. The reports shall include the project name, permit number, and the following, as appropriate:
2. A summary of construction progress, including any problems encountered and the proposed corrective actions or DEQ-approved corrective actions taken.
3. Properly labeled photographs as detailed in Part I.N.14. The first construction monitoring report shall include the photographs taken at the compensation site prior to commencing land disturbance or construction activities at the compensation site.

***Stream Restoration Performance Standards***

1. The stream compensation site as identified in the Conceptual Plan Conceptual Compensation Plan Name, dated Date, and approved by DEQ on Date, and as identified in any subsequent Final Plan approved by DEQ for this permit, shall meet the following performance standards:
2. Performance standards shall be met across the entire stream restoration reach and associated riparian buffer, as applicable. Riparian buffer vegetative monitoring plots/transects shall be randomly selected monitoring locations, utilizing an appropriate selection means. All means or averages of plot/transect data must apply to a distinctly homogenous areas, with the number of sampling points and frequency of observation sufficient to allow for appropriate statistical inference. In the event that the monitoring does not accurately reflect the conditions of the entire site, additional monitoring will be required.
3. The growing season is defined as the period in which the 24-hour average temperatures are expected to be above 28 degrees Fahrenheit in five (5) out of 10 years. This is the period between Date and Date in County/City; or the period during which the soil temperature in a wetlands in County/City is greater than biological zero(41 degrees Fahrenheit) at a depth of 50 centimeters (19.7 inches), if such data is available.
4. Stream restoration shall meet all of the following performance standards, as applicable based on the defined mitigation type(s):

| **Table 2. Stream Mitigation Performance Criteria** |
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| ***MITIGATION TYPE*** | ***PERFORMANCE CRITERIA*** |
| * **Forested Riparian Buffer**
* **Scrub-shrub Riparian Buffer**
 | A density of 400 woody living stems per acre greater than 12 inches in height in monitoring periods 1 and 2 shall be maintained. |
| * **Forested Riparian Buffer**
* **Scrub-shrub Riparian Buffer**
 | A density of 400 woody living stems per acre and greater than 24 inches in height in monitoring years 3 and 5 shall be maintained. |
| * **Forested Riparian Buffer**
* **Scrub-shrub Riparian Buffer**
 | A density of 400 woody living stems per acre and greater than 36 inches in height in monitoring year 7. |
| **Forested Riparian Buffer** | The 400 woody stems shall be comprised of only native tree and shrub species, of which not less than 50% shall be native tree species. |
| **Scrub-shrub Riparian Buffer** | The 400 woody stems shall be comprised of only native tree and shrub species. |
| * **Forested Riparian Buffer**
* **Scrub-shrub Riparian Buffer**
 | All woody species criteria shall be achieved at minimum in the last two monitoring years without supplemental planting. Woody stem counts include living, vigorous woody stems both planted and volunteer. |
| * **Forested Riparian Buffer**
* **Scrub-shrub Riparian Buffer**
* **Field or Grass Riparian Buffer**
 | Native non-invasive herbaceous plant coverage shall be at least 60% by the end of the first growing season, and at least 80% each monitoring year thereafter. Any seeds used for plant establishment should conform to the Virginia Seed Law (Sections 3.1-262 Code of Virginia) and Virginia Seed Regulations (2 VAC 5-290-10 et seq) and shall be free of tall fescue, Bermuda grass, and other allelopathic turf grass species, as well as plant species on the Virginia Department of Conservation and Recreation’s Invasive Plant Species list. This list of invasive plants may be found at <https://www.dcr.virginia.gov/natural-heritage/invsppdflist>**.** |
| * **Forested Riparian Buffer**
* **Scrub-shrub Riparian Buffer**
* **Field or Grass Riparian Buffer**
 | No more than 5% aerial cover and/or cumulative areas larger than 0.25 acre in size dominated by invasive speciesmay be presentin each cell, field, or block.Invasive species are identified on the Virginia Department of Conservation and Recreation’s Invasive Plant Species list. This list of invasive plants may be found at <https://www.dcr.virginia.gov/natural-heritage/invsppdflist>**.** |
| **Preservation** | * The Width / Depth Ratio Stability Rating (measured Width / Depth Ratio divided by the Year 1 Width / Depth Ratio) shall not be greater than 1.3. If the channel is incising, then the Width / Depth Ratio Stability Rating shall not be less than 0.7.
* The Bank Height Ratio shall not increase by an amount greater than 0.2 of the Year 1 Bank Height Ratio.
* The Entrenchment Ratio (ER) shall be appropriate for the channel type. (Example: For restored C, DA, or E stream types, the ER shall be greater than 2.2. For restored B stream types, the ER shall be greater than 1.4. The ER may not be an appropriate measure for A stream types).
* The Bankfull stream Cross-Sectional Area shall not increase or decrease by an amount greater than 25% of the as-built stream cross-sectional area.
 |
| **Enhancement or Enhancement with Structures** | Stream Enhancement performance standards are required in all stream Enhancement or Enhancement with Structures areas and should be chosen from the performance standards for stream *Restoration* areas. The performance standards should be based on the stream functions that are being enhanced. (Example: If an existing stream lacks stable streambanks and streambank enhancement is undertaken, the applicant/agent chooses from among the appropriate performance standards for lateral stability of Stream Restoration). |
| **Restoration** |  |
| **Flooplain Connectivity** | Applicant/Agent chooses one (1):* The reach-averaged Bank Height Ratio (average of the calculated Bank Height Ratios for all riffle cross-sections within a given reach) shall not increase by an amount greater than 0.2 of the as-built Bank Height Ratio.
* The reach-averaged Entrenchment Ratio (average of the calculated Entrenchment Ratios for all riffle cross-sections within a given reach) shall not decrease by an amount greater than 0.5 from the as-built Entrenchment Ratio, or the Entrenchment Ratio (ER) shall be appropriate for the channel type and/or design approach. (Examples: For restored C, DA, or E stream types, the ER shall be greater than 2.2. For restored B stream types, the ER shall be greater than 1.4. The ER may not be an appropriate measure for A stream types.)
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| **Lateral Stability / Bank Migration** | Required:* The Total Score of Bank Erosion Hazard Index (BEHI) for a reach shall be equal to or less than the previous year’s Total Score, and shall have a Total Score of “Moderate” by monitoring Year 3. For C or E stream types, a Total Score of “Low” or better shall be achieved by monitoring Year 5, and maintained at “Low” or better throughout the remainder of the monitoring period. For B stream type channels, a Total Score of “Moderate” or better shall be maintained throughout the remainder of the monitoring period.
* The numbers of live stakes and woody stems of native tree and shrub species providing bank stabilization from the top of bank to the toe of slope shall be at least 1 living stem per 50 square feet per stream edge along the bank by the end of the first growing season following planting and maintained each monitoring year until canopy coverage is 30% for any identified reach. Canopy coverage shall be at least 30% each monitoring year thereafter.

Applicant/Agent chooses two (2) additional conditions:* The reach-averaged Width / Depth Ratio Stability Rating (average of the calculated Width / Depth Ratio Stability Ratings for all riffle cross-sections within a given reach = Width / Depth Ratio divided by the as-built Width / Depth Ratio) shall not be less than 0.7 or greater than 1.3, or each measured Width / Depth Ratio shall remain within the design conditions.
* The Bankfull stream Cross-Sectional Area shall not increase or decrease by an amount greater than 25% of the as-built stream cross-sectional area.
* The reach-averaged Meander Width Ratio (Meander or Belt Width divided by the Bankfull Width) for a perennial stream in an alluvial valley (C or E stream types) shall be equal to or greater than 3.5, or each measured Meander Width shall remain within the range represented in the design conditions.
* The sinuosity of the stream shall not increase or decrease by an amount greater than 0.1 of the approved as-built sinuosity, or the sinuosity of the stream shall remain within the range represented in the design conditions.
* The reach-averaged Radius of Curvature / Bankfull Width Ratio (average of the calculated Radius of Curvature Width Ratios for the reach) does not increase or decrease by an amount greater than 0.2 of the as-built condition, or each measured Radius of Curvature shall remain within the range represented in the design conditions.
* Native or non-invasive herbaceous plant coverage shall be at least 60% by the end of the first growing season, 80% by the end of the second growing season, and maintained each monitoring year thereafter until canopy coverage is at least 30%. Canopy coverage shall be at least 30% each monitoring year thereafter.
* Bare ground coverage shall be no more than 40% by the end of the first growing season, 20% by the end of the second growing season, and maintained each monitoring year thereafter, until canopy coverage is at least 30%. Canopy coverage shall be at least 30% each monitoring year thereafter.
 |
| **Vertical Stability / Bed Form Diversity** | Applicant/Agent chooses two (2):* **(For perennial streams only)** The reach-averaged Pool-to-pool Spacing Ratio is appropriate for the stream and valley type [Example: The Pool-to-pool Spacing Ratio shall be 4 - 5 in C and E stream types or 2 – 4 in B stream types], or each measured Pool-to-pool Spacing shall remain within the range represented in the design conditions.
* **(Constructed riffles only)** The D50 size particle remains within its approved as-built size class (silt, sand, gravel, cobble, or boulder), or the D50 size particle remains within its design size class (silt, sand, gravel, cobble, or boulder).
* The reach-averaged Max Pool Depth Ratio (Bankfull Max Pool Depth divided by the Bankfull Mean Riffle Depth) shall remain within the typical values for the stream type [Example: The Max Pool Depth Ratio shall be greater than 1.5 in gravel bed C and E stream types, and all B stream types. The Max Pool Depth Ratio shall be greater than 1.2 in sand bed C and E stream types], or each measured Max Pool Depth shall remain within the range represented in the design conditions.
* The average riffle slope of the reach shall not increase or decrease by an amount greater than 0.1 of the approved as-built slope, or the slope of the reach shall remain within the range represented in the design conditions.
* The average bankfull slope of the reach shall not increase or decrease by an amount greater than 0.1 of the approved as-built slope, or the slope of the reach shall remain within the range represented in the design conditions.
 |
| **Structure Stability** | * Absence of collapsed structure or repositioned header rocks.
* Absence of under cutting, washing around, or erosion of the bank or streambed associated with any instream structure that could lead to a collapsed structure or repositioned head rock.
* Maintenance of pool depth immediately downstream of the structure (where appropriate), including absence of excessive scour or deposition in pool immediately downstream of the structure.
* All structures are exposed, unless they are specified as buried rock or log sill structures.
 |
| **Aquatic Habitat** | * **(For perennial streams only)** Habitat Assessment – The Total Score of the Habitat Assessment for each reach shall be 100 or greater at Year 1, and each monitoring year thereafter the Total Score shall be equal to or greater than the previous Year’s Total Score.
 |

1. Final release of the site shall be contingent upon approval by DEQ and USACE of all defined performance standards being met, and the determination that the site has: i) successfully resulted in the preservation/enhancement/restoration of the defined linear footage of stream channel and associated acreage of riparian buffer; ii) site-wide vegetation of relative uniform coverage with trees of sufficient height as to afford a measure of temporal replacement; and iii) a stream channel of relative stability as to not contribute to non-normative bed-loadings downstream.

***Performance Standards Monitoring*** ***Requirements***

1. Monitoring activities shall occur during the growing season, and during the 1st, 2nd, 3rd, 4th, 5th, and 7th monitoring year, and shall adhere to the following:
2. The 1st monitoring period shall be the 1st growing season after the completion of grading and planting.
3. If all performance standards have not been met in any monitoring year, then a monitoring report shall be required for each consecutive year until two sequential annual reports indicate that all criteria have been successfully satisfied. This shall be required regardless of the monitoring year.
4. The monitoring period shall be extended for adherence to all applicable performance standards defined in these permit conditions, to include additional monitoring years if all performance standards are not met the final two monitoring years.
5. For any year in which planting is conducted, monitoring of vegetation shall take place at least six (6) months following planting.
6. For stream chemical and biological monitoring, the monitoring event shall occur consistently in either spring or fall of each monitoring year. Spring sampling shall be conducted between March 1 and May 31. Fall sampling shall be conducted between September 1 and November 30.
7. Visual observations shall be conducted and descriptions provided with each monitoring report in narrative form along with documentation by ground level photographs, taken facing north, south, east and west, from defined photo-monitoring stations located in the vicinity of each vegetation monitoring plot/transect, stream cross-sections, longitudinal profiles, pattern and bank vegetation monitoring stations, and chemical and biological monitoring stations. Permanent markers shall be established to ensure that the same locations (and view directions) are monitored in each monitoring period, as applicable.
8. Vegetative monitoring plots/transects shall assess a minimum of 10% of the mitigation site, and there shall be at least one monitoring plot/transect per resource type/zonation.
	* 1. Transects shall cross the wetland or buffer area with a width not less than five (5) feet for woody plants and one (1) foot for herbaceous species.
		2. Appropriate methods shall be used to randomly locate vegetative monitoring plots/transects within sample areas (transects with random number generators, GIS-randomization methods, etc.).
9. Plots/transects shall be re-established in new random locations each year, unless otherwise authorized by DEQ.
10. Riparian buffer preservation monitoring shall use a methodology that demonstrates compliance with the approved INU treatment plan.
11. At a minimum, preservation areas should be included on an updated INU species Inventory Map for the site that shows the current location and extent of INU species onsite, and takes into account any changes in INU species populations, such as treatment that was performed in the past year.
12. Observations of preservation areas shall include any changes in the buffer condition and photographic documentation of the preservation areas, if they have changed.
13. Visual observations shall be provided with each monitoring report through written discussion of the condition of preservation areas, any changes to the buffer, and photographic documentation, as necessary to further describe the buffer condition.
14. Riparian buffer planting monitoring shall occur as follows:
15. In monitoring years 1, 2, and 3, record the number of living woody stems and species composition of stems greater than or equal to 12 inches.
16. In monitoring years 4 and 5, record the number of living woody stems and species composition of stems greater than or equal to 24 inches.
17. In monitoring year 7, record the number of stems and species of living wood stems greater than or equal to 36 inches.
18. The following parameters shall be calculated based on woody stems (as applicable based on resource type/zonation) that meet prescribed height requirements within a given monitoring year:
19. Percentage of woody stems comprised of volunteers;
20. Number of stems, percentage of herbaceous coverage, and the species composition of for both woody and herbaceous vegetation across all vegetative strata; and an inventory of all dominant vegetation species for woody and herbaceous vegetation;
21. Number, species, and percent cover of invasive plants; and,
22. Number of dead stems total and per species, and estimated survival rate total and per species (as a percentage) of plantings.
23. Bankfull event monitoring for stream enhancement or restoration mitigation activities shall include stream gauge data and documentation of any bankfull events on the site, as recorded by onsite stream gauge(s) and/or onsite or nearby precipitation data.
24. Where performance standards for cross sectioning indicate that channel dimension are to be measured and analyzed (Width/Depth Ratio, Bank Height Ratio, Entrenchment Ratio, Cross-Sectional Area, or others), the following shall occur:
25. Permanent cross-sections shall be established to ensure that the same locations are used each monitoring year. A minimum of one cross-section per 200 linear feet in will be required.
26. In enhancement or restoration reaches, cross-sections should include at least 1 riffle and 1 pool cross-section on each reach, and a proportionate amount of riffle and pool cross-sections on each reach. The total number required will vary depending on project length and complexity. Additional cross sections may be required to show areas where aggradation, degradation, erosion, and mid-channel bars have developed. Cross-sectional measurements shall include streambanks, streambed, water surface, bankfull, and adjacent floodplain.
27. The bankfull elevation in the channel shall be measured at the as-built monitoring station, and the as-built bankfull shall be used as the bankfull elevation in each subsequent monitoring event.
28. When calculating the Entrenchment Ratio, the floodplain may be measured separate from the cross-section during field data collection.
29. Ground level photographs will be taken annually during November or December of the current monitoring year at all cross-sections. These photographs will be taken facing upstream at the cross-section, downstream at the cross-section, and left bank and right bank, showing the riparian buffer area and streambank.
30. All bank pins and scour chains used to monitor bank and channel stability shall be monitored and measured each monitoring year on the frequency detailed in DEQ-approved final compensation plan. Maintenance on bank pins and scour chains shall be conducted within 30 days of each inspection.
31. Where performance standards for longitudinal profiling indicate that channel bed form or vertical stability parameters are to be measured and analyzed (Pool-to-pool spacing, max pool depth, slope, riffle slope, or others), the following shall occur:
32. A surveyed longitudinal profile shall be conducted of the reach in the thalweg of the channel, from 20 feet upstream of the start of the reach to 20 feet downstream of the end of the reach (unless property boundaries, stream confluences, or other constraints are present).
33. Longitudinal profile measurements shall include the locations, depths, and slopes of riffles, runs, pools, and glides, and representative water surface elevation and bankfull surface elevation lines.
34. Where performance standards for patterning indicate that lateral stability or bank migration parameters shall be measured and analyzed (Meander Width Ratio, Sinuosity, Radius of Curvature, Bank Erosion Hazard Index (BEHI), or others), the following shall occur:
35. Permanent pattern monitoring stations shall be established to ensure that the same locations are used each monitoring year. A pattern monitoring station shall be established every 200 linear feet to measure Meander Width Ratio, Radius of Curvature, or BEHI. A minimum of one pattern monitoring station shall be established to measure sinuosity. The total number of monitoring stations required will vary depending on project length and complexity.
36. Sinuosity shall be assessed along a stream reach that is a minimum of 10 bankfull widths in length.
37. When BEHI is conducted, all individual BEHI metrics shall be measured at each permanent station in the field during each monitoring event.
38. Where performance standards indicate that streambank vegetation shall be measured and analyzed (Livestakes, Herbaceous Coverage, Bare Ground Coverage, or others), streambank vegetation plots (10 square feet in size or larger) shall be located on each bank representative permanent cross-section or pattern monitoring stations.
39. Where performance standards indicate that stream bed materials shall be measured and analyzed (D50 particle size, or others), conduct the Wolman pebble count technique within a representative amount of constructed riffles within a reach. Pebble counts may be associated with representative permanent cross-section or pattern monitoring stations, or set up within the longitudinal profile at independent monitoring stations.
40. Where performance standards indicate that structure stability shall be evaluated and analyzed, ground level photographs, documenting the structural integrity and function of each instream structure shall be taken looking upstream at the structure, showing at a minimum the instream structure at the thalweg (or location of buried sill), the upstream and downstream channel, and the immediately adjacent streambanks to bankfull elevation, where possible.
41. Where performance standards indicate that aquatic habitat shall be evaluated and analyzed, a habitat assessment shall be conducted at either each benthic macroinvertebrate monitoring station (as outlined below), or at a minimum, one representative monitoring station per reach. Procedures and forms for habitat assessment can be located in DEQ’s *Biological Monitoring Program Quality Assurance Project Plan for Wadeable Streams and Rivers* (2008), Appendix B (iii), or EPA’s *Rapid Bioassessment Protocol for Use in Streams and Wadeable Rivers* (Barbour et. al, 1999), Chapter 5.
42. In order to identify issues that may need to be addressed in restoration design, to determine realistic expectations for the post-restoration aquatic community, and to inform future stream restoration designs and efforts, the following benthic macroinvertebrate monitoring and reporting shall occur during every monitoring year within stream restoration reaches onsite:
43. Monitoring events shall occur consistently in either spring or fall of each monitoring year. Spring sampling shall be conducted between March 1 and May 31. Fall sampling shall be conducted between September 1 and November 30.
44. Water chemistry and benthic samples shall be collected simultaneously at each of the monitoring locations. The number and location of monitoring stations shall be determined and approved by DEQ on a site-specific basis, and shall remain consistent throughout the monitoring period, but be placed at a minimum every 200 linear feet.
45. Surveys of other biota (e.g. fish, waterfowl, amphibians, etc.) may occur on a case-by-case basis, especially in the case of potential or confirmed presence of rare, threatened, or endangered species.
46. Scientific collection permits for conducting benthic sampling shall be obtained from the Virginia Department of Wildlife Resources (DWR) (<https://dwr.virginia.gov/permits/scientific-and-educational-collection/>). All field sampling as well as laboratory sample processing shall be performed by or under supervision of an aquatic biologist. As required by the collection permit, all sampling data shall be submitted to DWR using their annual reporting protocol, in addition to the reporting requirements within the Final Plan.
47. Temperature, total dissolved oxygen, pH, and conductivity shall be collected at each designated monitoring location site using a multi-probe meter. Detailed information on testing, inspection, and maintenance requirements of all multi-probe meters for measurement of stream physicochemical parameters can be found in Section IV of the *Standard Operating Procedures Manual for the Department of Environmental Quality Office of Water Quality Monitoring and Assessment Program* (2010).
48. A quantitative survey for benthic macroinvertebrates shall be conducted at permanent monitoring locations. Benthic macroinvertebrates shall be identified at least to the genus level. Detailed procedures and methods for biological monitoring, field methods, laboratory methods, and quality assurance can be found in *Biological Monitoring Program Quality Assurance Project Plan for Wadeable Streams and Rivers* (2008). This document shall serve as the basis for the field monitoring and laboratory data collection methods. Two sampling procedures are presented:
49. Single Habitat is used for streams in which riffles or riffle/pool complexes with appropriate substrate (cobble) are available for sampling and are large enough so that at least 1m² of the substrate can be sampled.
50. Multiple Habitat is used in cases where no or few riffles are present, the riffles in the reach are too small and/or too few to sample 1m² of substrate. Multi-habitat sampling is most commonly performed in, but not limited to, low gradient or coastal plain streams.

***Reporting***

1. Performance standards monitoring reports shall be submitted to DEQ by December 31st of the years in which a monitoring report is required, including the final monitoring year, as identified in the approved Final Plan. The reports shall provide all monitoring data and necessary analyses to demonstrate that the site is meeting or has met the defined performance standards.
2. The first report shall include an as-built survey conducted by a licensed surveyor, for the stream compensation area, including the acreage, linear footage, and spot elevations throughout the compensation area, and as defined by Part I.N.19. The permittee shall submit an As-Built survey, including spot elevations, of the stream compensation site within 60 calendar days of compensation site completion. A licensed land surveyor or a licensed professional engineer shall certify the survey. The survey shall include a narrative comparing the As-Built survey with the design plans or reference reach information. DEQ shall have 30 calendar days to review the survey and provide comments to the permittee. The as-built report shall include comparisons of the design plan to the as-built plan, using the following components:
3. Plan view maps of the streams, and adjacent buffers that depict the mitigation site boundaries, as-built topography, all mitigation activities (including buffer activities), and the locations of all monitoring stations (photo stations, anticipated vegetation sampling plots, stream gages, cross-sections, longitudinal profiles, pattern and bank vegetation monitoring stations, chemical and biological monitoring stations, etc.).
4. As-built longitudinal profiles of stream reaches taken from permanent locations, and overlaid with and compared to design longitudinal profiles.
5. As-built cross-sections of stream reaches taken at locations, and overlaid with and compared to design cross-sections.
6. Photographs of the completed construction taken at permanent photo stations.
7. Summary stream geomorphologic data presented in a side by side comparison of the design, reference, and as-built channels.
8. Planting composition, locations, and densities.
9. Revised credit totals. Explain any differences in credits totals from design to as-built plans.
10. The first report and all subsequent reports shall include the following, at a minimum:
11. Title page, including, where applicable, mitigation site name, monitoring year(s), requested actions (adaptive management, etc.), permittee or sponsor identification (name, address, phone number, and email address), report preparer identification (name, address, phone number, and email address).
12. Vicinity Map of the mitigation site, including latitude and longitude at the entrance of the site.
13. A map or drawing, based on the as-built drawings of the site, that depicts topography, all mitigation activities, and the locations of all monitoring stations (permanent photo stations, vegetation sampling plots/transects, stream gauges, precipitation gauges, cross-sections, longitudinal profiles, pattern monitoring stations, etc.).
14. A detailed narrative discussing the objectives of the site and the degree to which the site meets those objectives.
15. A section with all performance standards and monitoring requirements for the site.
16. Overall performance standards Table for the site, showing each plot/transect, cell, or area and how that area met each performance standard during the current monitoring year and each previous monitoring year.
17. Specific performance standards reporting to include:
	* + - 1. Riparian vegetation monitoring: results reported in a manner consistent with Part C above.
				2. Stream gauge data and documentation of any bankfull events on the site will be provided.
				3. Cross-section reporting shall include a graph of the current monitoring year’s cross- section, with the cross sections for all previous monitoring years overlain. Callouts on the graph shall be appropriate for the performance standards, and may include bankfull elevation, bankfull width, bankfull depth, floodprone elevation, floodprone depth, top of bank location and elevation, or others, as appropriate. A table of the appropriate performance standards parameters will be provided, showing all individual cross-section calculations and a reach-averaged calculation, and comparing the as-built to the current year’s monitoring data. Ground level photographs shall be provided with each monitoring report, according to the monitoring requirements.
				4. Longitudinal profile reporting shall include a graph of the current monitoring year’s profile, with the profiles for all previous monitoring years overlain. Callouts on the graph shall be appropriate for the Performance Standards, and may include bankfull elevation, water surface elevation, locations of facets, or others, as appropriate. Pool-to-pool spacing is measured from the top of pool to top of pool. Max pool depth is the pool depth measured from the reach bankfull elevation to the thalweg in the deepest part of the pool. Channel bed slope shall be measured from the top of a riffle to the top of another riffle over a channel length of at least 10 bankfull widths. Riffle slope is measured from the top of riffle to the bottom of the same riffle (top of run). A table of the appropriate Performance Standard parameters will be provided in each monitoring report, showing all individual profile calculations and a reach-averaged calculation, and comparing the as-built to the current year’s monitoring data for each parameter.
				5. Pattern reporting shall include a table of the appropriate performance standards parameters, showing all individual pattern measurements and a reach-averaged calculation or ratio (if applicable), and comparing the as-built to the current year’s monitoring data for each parameter. BEHI reporting shall include providing the current monitoring year’s BEHI worksheet, and a table of the total BEHI score for each monitoring year from as-built to the current year.
				6. Stream vegetation reporting shall include a table of the results of the vegetation surveys, including per plot reporting of the species and number of livestakes or woody stems, extrapolated number livestakes per 50 square feet, estimated herbaceous coverage, and/or estimated bare ground coverage.
				7. Materials reporting shall include a table of the representative D50 of the constructed riffle pebble count for each reach during each monitoring year, and the size class represented by the as-built and current monitoring year D50.
				8. Structures reporting ground level photographs shall be provided with each monitoring report, documenting structure conditions during the current monitoring year. The report shall note any structural failures or issues, as listed in the performance standards.
				9. Habitat reporting shall include providing the current monitoring year’s Habitat Assessment worksheet for each reach. A table shall be provided in the monitoring report that shows the habitat assessment total score for all monitoring years for each reach.
				10. Benthic Macroinvertebrate reporting shall include a table showing the VSCI or CPMI total score for all monitoring years for each reach.

For non-coastal streams, use the resulting benthic macroinvertebrate data to calculate the VSCI (September 2003), found at:

http://www.deq.virginia.gov/Portals/0/DEQ/Water/WaterQualityMonitoring/BiologicalMonitoring/vsci.pdf. An Access database used to calculate VSCI can be provided upon request.

For coastal streams, use the resulting data to generate the CPMI (December 2013), found at:

http://www.deq.virginia.gov/Portals/0/DEQ/Water/WaterQualityMonitoring/ProbabilisticMonitoring/vcpmi.pdf. An Access database used to calculate CPMI can be provided upon request.

* + - * 1. Discussion of observed success of livestock access limiting measures.
				2. Complete maintenance summary for the site since construction, including any adaptive management or corrective action (e.g., supplemental planting, structure repair, invasive treatment, etc.).
				3. A revised summary map and table depicting the total mitigation credits anticipated within the site with final release.
				4. Corrective action plan, if necessary, including the current deficiencies or issues within the site, proposed adaptive management, corrective actions, or maintenance activities, and an estimated schedule for completion.
				5. The following certification statement: “I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.”

***Corrective Action***

1. In the event that any performance standards are not met in any given year, corrective action shall be required. A Corrective Action Plan (CAP) shall be submitted to DEQ for approval prior to or with the next required monitoring report. The CAP shall clearly identify all deficiencies, describe specific corrective actions, and include a schedule of corrective action activities. Once the CAP is approved by DEQ, it shall be implemented within the time frames approved in the CAP.

If supplemental planting, invasive species control, or hydrologic modifications are required at any time after the completion of the 2nd monitoring period, monitoring shall continue for each consecutive year until two annual sequential reports indicate that performance standards have been achieved without corrective action.

1. Significant Corrective Action: In the event that the monitoring identifies a significant failure of the site to meet defined performance standards, DEQ shall be notified within 30 days of the observation and a revised CAP shall be submitted to DEQ within 60 days of the observation for review and approval. In the event that Significant Corrective Action is required, the monitoring term shall begin at Year 1 the following growing season. Significant Corrective action is defined as:
2. Having to replant as a result of greater than 50% mortality of planted woody stems, or the density of woody stems greater than 12 inches in height are less than 200 living stems per acre;
3. If any of the following established stream preservation/enhancement/restoration performance standards are exceeded:
4. A Width / Depth Ratio Stability Rating of less than 0.5 and greater than1.5.
5. The reach averaged Bank Height Ratio shall not increase by an amount greater than 0.4 of the Year 1 Bank Height Ratio.
6. The Bankfull stream Cross-Sectional Area shall not increase or decrease by an amount greater than 35% of the as-built stream cross-sectional area.
7. The reach-averaged Entrenchment Ratio shall not decrease by an amount greater than 0.8 from the as-built Entrenchment Ratio.
8. The Total Score of BEHI for a reach exceeding Total Score of “Moderate” by monitoring Year 3.
9. The reach-averaged Meander Width Ratio (Meander or Belt Width divided by the Bankfull Width) for a perennial stream in an alluvial valley (C or E stream types) less than 3.
10. The sinuosity of the stream shall not increase or decrease by an amount greater than 0.2 of the approved as-built sinuosity.
11. The reach-averaged Radius of Curvature / Bankfull Width Ratio (average of the calculated Radius of Curvature Width Ratios for the reach) does not increase or decrease by an amount greater than 0.4 of the as-built condition.
12. The numbers of live stakes and woody stems of native tree and shrub species providing bank stabilization from the top of bank to the toe of slope is less than 1 living stem per 100 square feet per stream edge along the bank until canopy coverage is 30% for any identified reach.
13. The average riffle slope of the reach shall not increase or decrease by an amount greater than 0.2 of the approved as-built slope.
14. The average bankfull slope of the reach shall not increase or decrease by an amount greater than 0.2 of the approved as-built slope.
15. Constructed riffles only: The D50 size particle shifts greater than one size class (silt, sand, gravel, cobble, or boulder).
16. Collapsed structure or repositioned header rocks.
17. Under cutting, washing around, or erosion of the bank or streambed associated with any instream structure that could lead to a collapsed structure or repositioned head rock.
18. Pool depth immediately downstream of the structure has excessive scour or deposition.
19. All structures are not exposed, unless they are specified as buried rock or log sill structures.
20. If the performance standards specified in the Final Plan or in any CAP are not achieved by the end of the *last* monitoring period, and DEQ determines that additional corrective action cannot sufficiently address the reasons for such failures, then the permittee shall submit to DEQ for review and approval, within 30 days of such determination, a proposal to purchase mitigation bank credits or in-lieu fee program credits to provide compensatory mitigation for # linear feet of stream impact. The permittee shall purchase # mitigation bank credits or in-lieu fee program credits, as approved by DEQ in accordance with this condition, within 30 days.

***Long Term Management and Site Protection***

1. The site shall be protected in perpetuity. The protective instrument shall contain:
2. A provision for DEQ access to the site.
3. The following minimum restrictions: no ditching, land clearing, or discharge of dredge or fill material, and no activity in the area designated as compensatory mitigation area with the exception of maintenance; corrective action measures; or DEQ-approved activities described in the approved Final Plan or approved LTMP.
4. Proof of recordation shall be submitted to DEQ prior to commencing impacts in surface waters [or if phasing preservation: for the phase of project for which the compensation is associated as identified in Part I.N.1 *(refer to condition that outlines the compensation requirement for each phase of the project)*]. The permittee is responsible for ensuring that the survey or plat is in accordance with the application materials. Proof of recordation shall include the recorded survey or plats and a GIS-compatible shapefile(s). The final survey or plat shall be certified by a professional engineer or licensed land surveyor. The recorded easement plat shall be signed and sealed by a Land Surveyor or Professional Engineer licensed in the Commonwealth of Virginia and shall contain a minimum of two (2) coordinate pairs (grid ticks or property / easement corners) per sheet.  The GIS-compatible shapefile(s) shall:
5. be referenced to the Virginia Coordinate System of 1983, North Zone, U.S. Survey Feet (FIPS 4501 or 4502);
6. contain a projections (.prj) file for each shapefile;
7. be closed polygons with attribute data detailing the county of recordation, recorded deed acreage, date of recordation, and protective mechanism number or deed book and page number; or,
8. be as otherwise coordinated with DEQ.
9. Prior to the commencement of initiating impacts to surface waters, Permittee Name shall submit proof to DEQ and USACE that the Financial Assurances have been executed.
10. Prior to the commencement of initiating impacts to surface waters, Permittee Name shall submit the approved LTMP. The Permittee must comply with all requirements as defined in the LTMP, included as a component of the Final Plan.
11. The Permittee must comply with the Financial Assurance Plan as defined in the Financial Assurances component of DEQ-approved Final Plan.