DWR-NR-G-01-Stream Mitigation Guidelines-05202019

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TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF WATER RESOURCES
NATURAL RESOURCES UNIT

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Statutes, Regulations, Polices and Guidelines

Compensatory mitigation is subject to one or more of the following statutes, regulations, policies, and guidelines:

Federal Regulations and Guidance

a. Clean Water Act (33 U.S.C. §§ 1251, et seq.)

b. Memorandum of Agreement (MOA) Between the Department of the Army and the Environmental Protection Agency: The Determination of Mitigation Under the Clean Water Act ("CWA") Section 404(b)(1) Guidelines (February 6, 1990)

c. Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material (40 C.F.R. Part 230)

d. Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. § 403)

e. National Environmental Policy Act ("NEPA") (42 U.S.C. §§ 4321, et seq.)

f. Endangered Species Act ("ESA") (16 U.S.C. §§ 1531, et seq.)

g. Fish and Wildlife Coordination Act (16 U.S.C. §§ 661, et seq.)

h. Regulations of the U.S. Army Corps of Engineers Regulatory Program (33 C.F.R. Parts 320–332)

i. Regulatory Guidance Letter (RGL) 05-01. Guidance on the Use of Financial Assurances, and Suggested Language for Special Conditions for Department of the Army (DA) Permits Requiring Performance Bonds

j. RGL 08-03. Minimum Monitoring Requirements for Compensatory Mitigation Projects Involving the Restoration, Establishment, and/or Enhancement of Aquatic Resources

State of Tennessee Regulations and Guidance

Section 401 of the Clean Water Act: 33 U.S.C § 1341

Tennessee Water Quality Control Act (TWQCA) of 1977: Tenn. Code Ann. §§ 69-3-101 to -147

Rules of the Tennessee Board of Water Quality, Oil, and Gas:

Chapter 0400-40-07 Aquatic Resource Alteration

Chapter 0400-40-03 General Water Quality Criteria (including Rule 0400-40-03-.06, Antidegradation Statement)

Chapter 0400-40-04 Use Classification for Surface Waters

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1. Introduction

Commercial, residential and agricultural land development, construction of linear transportation and utility systems, and other activities requiring State and Federal permits have the potential to impact and degrade Tennessee's streams. These impacts often result in loss of aquatic resource values, including stream length, hydrology, available habitat, species composition, and other beneficial ecological and physical characteristics. Mitigation for certain stream impacts in Tennessee have been required since the passage of the *Tennessee Water Quality Control Act* by the Tennessee General Assembly in 1977. In July 2000, the Tennessee Water Quality Control Board adopted rules that more clearly specified the requirement that permits for the alteration of streams must not result in a net loss of water resource value, and established mitigation requirements. These Rules were further revised by the Board in October 2018.

The U.S. Army Corps of Engineers (USACE) and Tennessee Department of Environment and Conservation (TDEC) Division of Water Resources (Division) currently require compensatory mitigation for certain permitted impacts to Tennessee's streams. The Division may require compensatory mitigation to off-set unavoidable adverse impacts resulting in an appreciable permanent loss of aquatic resource value. The Division cannot issue an individual ARAP, with or without mitigation, unless an applicant has first demonstrated that there are no practicable alternatives to the proposed activity that would have less adverse impact on resource values, so long as the alternative does not have other significant adverse environmental consequences.

Resource values are the benefits provided by the water resource that help maintain classified uses. These benefits, including, but not limited to sufficient quality and adequate quantity of water and habitat for fish, other aquatic life, and wildlife can be evaluated, in part, through quantitative analysis of stream function. Stream functions are defined as the physical, biological, and chemical processes that occur in lotic ecosystems. Therefore resource value losses can be quantified by measuring the chemical, physical, and biological stream functions.

Tennessee's ARAP rules establish the Division's mandatory requirements for mitigation. Rule 0400-40-07-.04(7), modified in 2018, requires mitigation sufficient to compensate for the loss of resource values from existing conditions. The rule prioritizes mitigation methods as follows: restoration, enhancement, preservation, creation, or other effective measures. The rule further prioritizes mitigation as close to the impact location as practicable, but does not express a preference for the type of mitigation provider. The rule provides that all mitigation for impacts to jurisdictional streams must occur in Tennessee. Finally, Rule 0400-40-07-.04(7)(b) establishes the following additional performance requirements for stream mitigation:

> Mitigation for impacts to streams must be developed in a scientifically defensible manner approved by the Division that demonstrates a sufficient increase in resource values to compensate for permitted impacts. At a minimum, all new or relocated streams must include a vegetated riparian zone, demonstrate lateral and vertical channel stability, and have a natural channel bottom. All mitigation watercourses must maintain or improve flow and classified uses after mitigation is complete.

Permit applicants must comply with all applicable legal requirements, and these documents represent the Division's reasoned interpretation of these requirements. The Division preference is to evaluate mitigation in terms of functional feet of stream. The Tennessee Stream Quantification Tool (TN SQT) and the Tennessee Debit Tool were created to assist applicants with these calculations. Permit applicants may apply alternative methodologies only if they demonstrate to the Division that these methodologies are scientifically defensible and comply with all applicable legal requirements.

Stream compensatory mitigation projects provide functional lift to offset permitted impacts. These projects should be designed to improve the resource value and function in streams that are currently not supporting their designated uses, or otherwise demonstrated to be significantly degraded. Restoring a stream's ability to support its designated uses provides the maximum benefit and value to the citizens of Tennessee. Stream compensatory mitigation projects should have goals to re-establish and improve stream resource values and functions to their natural, best attainable condition. Not every compensatory mitigation project can fully restore all resource values and functions. However, the expected goals for mitigation project design and implementation should target re-establishing a stream and attendant riparian area with self-sustaining productive habitat, and improvements to water quality, biology, and overall ecosystem services where possible. This is commonly achieved through the replacement, restoration, and/or enhancement of degraded stream channels utilizing fluvial geomorphological principles, natural channel design, bioengineering techniques, and other scientifically defensible approaches based on natural stream processes. Preservation of threatened, unique, or ecologically significant streams or rivers and their riparian area may be included as a component of compensatory mitigation in consultation with the Interagency Review Team (IRT), TDEC, or the USACE as applicable.

Please note that USACE may require compensatory mitigation for unavoidable impacts to aquatic resources to ensure that an activity requiring a Section 404 permit complies with the Section 404(b)(1) Guidelines. Compensatory mitigation may also be required to ensure that an activity requiring authorization under Section 404 of the Clean Water Act and/or Sections 9 or 10 of the Rivers and Harbors Act of 1899 is not contrary to the public interest.

Additionally, for activities authorized by a USACE general permit, compensatory mitigation may be required to ensure the impacts are no more than minimal both individually and cumulatively. Thresholds, limits, regulatory authority limits, and other factors described above may result in different or additional USACE mitigation requirements. For impacts authorized under section 404, compensatory mitigation is not considered until after all appropriate and practicable steps have been taken to first avoid and then minimize adverse impacts to the aquatic ecosystem pursuant to 40 CFR part 230 (i.e., the CWA Section 404(b)(1) Guidelines).

The intent of this document is to replace the 2004 Stream Mitigation Guidelines and provide stakeholders with new guidance on determining the amount of resource value loss associated with commonly authorized impacts and functional lift associated with compensatory mitigation of streams: this document does not apply to loss associated with or compensatory mitigation of wetlands. Historically, the Division employed a ratio driven credit and debit system based on the activity or work proposed to determine stream resource value loss and lift. The new system is a quantitative assessment method and uses two primary tools: (1) The Tennessee Debit Tool which focuses on stream functional loss and (2) The Tennessee Stream Quantification Tool which focuses on stream functional lift of stream restoration projects. These quantitative assessment methodologies calculate loss and lift of stream function, and therefore resource value, in terms of functional feet. Therefore, credits and debits are described as an amount of functional foot lift (credits) or functional foot loss (debits). It is the intent of the Division to use the same quantitative methodology to calculate functional lift and loss (debits and credits) to ensure impacts to water resource values are sufficiently offset by compensatory mitigation.

In addition, this document provides guidance for preparing compensatory mitigation and monitoring plans and includes references to federal and state regulations and policies, and definitions of terms pertinent to, or utilized within, this document.

This guidance was prepared by the Division in collaboration with the IRT. The IRT is composed of representatives from USACE, U.S. Environmental Protection Agency (EPA), U.S. Fish and Wildlife Service (FWS), Tennessee Valley Authority (TVA), Natural Resources Conservation Services (NRCS), and the Tennessee Wildlife Resources Agency (TWRA). It has also benefitted from significant public stakeholder outreach and input. This document reflects years of prior experience in the evaluation and oversight of mitigation proposals, implementation, evaluation of various mitigation practices, and the current professional judgment of these resource managers regarding aquatic resource impacts associated with certain alterations. These guidelines are intended to be defensible, transparent, fair, and

flexible and are subject to periodic revision and update as the science and regulations associated with stream processes, values, and functions evolve.

Please note that TDEC and the USACE regulatory programs operate under different authorities, rules, and regulations, and therefore activities that require permits and mitigation from one agency may not require permits or mitigation from the other. Questions about specific permitting and mitigation requirements should be directed to the appropriate agency, and coordination with both agencies early in the development of projects is encouraged.

2. Resource Types and Designations

In order for TDEC to determine compensatory mitigation requirements, the status of the impacted water feature(s) will first be established. Projects that propose an impact to a water feature may first require a Hydrologic Determination (HD). Projects proposing activities that will result in greater than *de minimis* degradation to an unassessed jurisdictional stream will require a water quality assessment to determine the antidegradation status. The current status of assessed waterbodies in Tennessee can be found on the Division's online water resources data and map viewers, or by contacting the Division.

2.1 Wet Weather Conveyance and Stream Determinations

Where the jurisdictional status of a watercourse is in question, a Hydrologic Determination should first be performed unless the applicant chooses to treat a watercourse as a jurisdictional stream. The identification of wet weather conveyances and jurisdictional streams is performed using a consistent and standardized methodology as outlined in the Act and the Board of Water Quality, Oil and Gas's Rules and the Division's Guidance. Compensatory mitigation is not required by the Division for features formally determined to be a wet weather conveyance. For more information, go to TNHDT.org, or the Division's water quality training webpage. However, aquatic resources determined to be federally jurisdictional may require compensatory mitigation in accordance with federal regulations.

2.2 Classified Uses and Antidegradation Designations

Tennessee's water quality standards establish classified uses for all streams in Rule Chapter 0400-40-04. It is the purpose of Tennessee's standards and the ARAP rules to fully protect all applicable classified uses, which include:

- Domestic and industrial water supply;
- Propagation and maintenance of fish and other aquatic life;
- Recreation in and on the waters, including the safe consumption of fish and shellfish;
- Livestock watering and wildlife;
- Irrigation; and

- Navigation.

Streams in Tennessee are determined to be supporting or not supporting their classified uses as determined by existing water quality and promulgated water quality criteria. A stream is determined to have *available parameters* if actual water quality is better than applicable water quality criteria. If water quality is at, or fails to meet, applicable water quality criteria, the stream has *unavailable parameters*. The Antidegradation Statement specifically applies parameters for habitat to ARAPs for habitat alterations. Streams may also be identified by the Division as Exceptional Tennessee Waters (ETWs) or by the Board as Outstanding National Resource Waters (ONRW).

Some physical alterations may significantly degrade a stream's ability to support its classified uses. Such impacts would be considered pollution. Regardless of the antidegradation category of a stream, the Division may not issue ARAPs that authorize pollution, or an overall net loss of resource values after accounting for compensatory mitigation. As defined in the *TWQCA*, pollution means alteration of the physical, chemical, biological, bacteriological, or radiological properties of waters of the state including, but not limited to, changes in temperature, taste, color, turbidity, or odor of the waters that will:

1. Result or will likely result in harm, potential harm or detriment of the public health, safety, or welfare;
2. Result or will likely result in harm, potential harm or detriment to the health of animals, birds, fish, or aquatic life;
3. Render or will likely render the waters substantially less useful for domestic, municipal, industrial, agricultural, recreational, or other reasonable uses; or
4. Leave or likely leave the waters in such condition as to violate any standards of water quality by the board.

For projects that propose an appreciable permanent loss of resource values to a stream with available parameters for habitat or ETWs, the applicant must either provide compensatory mitigation in-system to ensure no more than *de minimis* degradation or demonstrate economic or social necessity and a lack of practicable alternatives for the proposed project. For ETWs, if the proposed project (*i.e.*, the impact and any in-system compensatory mitigation) would result in more than *de minimis* degradation, then the Division must first make a determination of economic or social necessity, which may be challenged through a petition for declaratory order, before issuing a permit.

For projects that propose an appreciable permanent loss of resource values to a stream with unavailable parameters for habitat, compensatory mitigation must result in no "significant degradation." No "significant degradation" is the minimum requirement for all ARAPs for habitat alterations, and means that the permitted activity, including mitigation,

must result in no overall net loss of resource values. The federal Section 404(b) guidelines similarly prohibit significant degradation. For projects that propose an appreciable permanent loss of resource values in a stream designated as ONRW, compensatory mitigation must occur within the ONRW.

3. Stream Impacts Requiring Compensatory Mitigation

The Division has the responsibility and legal authority to ensure that impacts to surface waters that are not wet weather conveyances do not result in a net loss of water resource values. No individual ARAP shall be issued unless the applicant has first demonstrated through an alternatives analysis that there is no practicable alternative to the proposed activity that would result in less adverse impact on resource values, so long as the alternative does not have other significant adverse environmental consequences. TDEC achieves no net loss of resource values when permitted impacts either (1). do not cause an appreciable permanent loss of resource values, or (2). If compensatory mitigation is provided to fully offset any such loss of resource values.

In making a decision on any ARAP application, the Division determines the loss of resource values from existing conditions associated with a proposed impact and the increase in resource values of any proposed mitigation, including the following factors (as per Rule 0400-40-07-.04(6)(c))

1. Direct loss of stream length, flow, or wetland area due to the proposed activity;
2. Direct loss of in-stream or wetland habitat due to the proposed activity;
3. Impairment of stream channel stability due to the proposed activity;
4. Diminishment in species composition in any stream or wetland due to the proposed activity;
5. Direct loss of stream canopy due to the proposed activity;
6. Whether the proposed activity is reasonably likely to have cumulative or secondary impacts to the water resource;
7. Conversion of unique or high quality waters as established in Rule 0400-40-03-.06 to more common systems;
8. Hydrologic modifications resulting from the proposed activity;
9. The adequacy and viability of any proposed mitigation including, but not limited to, quantity, quality, likelihood of long term protection, and the inclusion of riparian buffers;
10. Quality of stream or wetland proposed to be impacted;
11. Whether the stream or wetland is listed on the § 303(d) list; whether the proposed activity is located in a component of the National Wild and Scenic River System, a State Scenic River, waters designated as Outstanding National Resource Waters, or

waters identified as high quality waters as defined in Rule 0400-40-03-.06, known as Tier II waters; whether the activity is located in a waterway which has been identified by the Department Division as having contaminated sediments; and whether the activity will adversely affect species formally listed in State and Federal lists of threatened or endangered species; and

12. Any other factors relevant under the Act.

Specific activities that cumulatively or individually may result in an appreciable permanent loss of resource values include, but are not limited to:

- pipes;
- culverts;
- stream fill and replacements;
- bank armoring;
- impoundments;
- loss of stream length;
- significant loss of streambank vegetation and canopy;
- channel modifications, include deepening, straightening, widening, disconnection with floodplains, removal of in-channel vegetation or bedload; other activities that result in an unstable geomorphic and/or hydraulic condition; and;
- other changes that may alter the physical characteristics of the stream, including but not limited to changes to the physical habitat, water quality, and/or aquatic fauna such that the amount of degradation results in a loss of resource value.

Activities eligible for coverage under the Division's General Permits do not cause an appreciable permanent loss of resource values, and thus do not require compensatory mitigation. Therefore if the proposed activity can be covered under a General Permit from the Division, these guidelines are not used. Conversely, compensatory mitigation may not be utilized to qualify an activity for general permit coverage. Activities that involve permanent degradation and functional loss of water resources in excess of a general permit limit typically require compensatory mitigation to ensure no net loss. However, the Division has not issued general permits for every impact type, so it is possible for a proposal to require an individual permit but not require mitigation. The nature and scale of the required mitigation is informed by the list of considerations provided above, including existing conditions of the impacted resource, an evaluation of cumulative and secondary effects of associated impacts, and the guidance on debit determination provided later in this document.

USACE compensatory mitigation requirements will be implemented in accordance 33 CFR 320.4(r), 33 CFR Part 332, 40 CFR 230.70-77, 40 CFR 1508.20 and 40 CFR 1502.14. In overall terms, the objective of compensatory mitigation is to offset environmental losses resulting

from unavoidable impacts to waters of the United States authorized by Department of the Army permits. In particular it should be noted that the evaluation of impacts to resource functions and requirements for compensatory mitigation is significantly different in the USACE Nationwide Permits (as compared to TDEC General ARAPs). Mitigation may in fact be required under a NWP in order to ensure an activity will result in no more than minimal individual and cumulative adverse environmental effects, which is the standard for an activity to be authorized under the NWPs.

3.1 Cumulative Impacts

TDEC regulations require the Division to evaluate "whether the proposed activity is reasonably likely to have cumulative or secondary impacts to the water resource." Cumulative impacts may be broadly described as effects that result from the incremental impact of the proposed activities when added to other past, present, and reasonably foreseeable impacts within the same stream and/or waterbody resulting from a Common Plan of Development (CPD). A Common Plan of Development is defined as a contiguous area in where multiple separate and distinct areas of disturbance may be taking place at different times on different schedules, but still under a single plan. The cumulative impact from previous and proposed impacts within a CPD may result in an appreciable permanent loss of water resource values, even where each discreet impact does not when considered individually. Where a single impact might only require coverage under a general permit, multiple impacts of the same scale over time in the same waterbody may subsequently require coverage under an individual permit and compensatory mitigation. Similarly, large scale projects often encompass multiple impacts at once that may, collectively result in a loss of water resource values if compensatory mitigation is not provided to offset impacts. Therefore, TDEC will review applications from larger or ongoing activities that propose multiple impacts comprehensively to ensure that there is no net loss of resource value from both individual and cumulative impacts.

For activities that are considered CPDs, understanding the totality of the impacts associated with the entire project is critical for TDEC to assess if the impacts, past and present, represent a net loss of water resources values requiring the applicant to propose adequate mitigation. The evaluation of cumulative impacts associated with a CPD does not take into account other impacts in the watershed attributable to other, unassociated activities (*i.e.*, existing conditions), nor should an evaluation of existing conditions for any specific new impact include degradation from previous impacts directly associated with the same CPD.

Example:

To determine if a CPD has exceeded the threshold for requiring mitigation, the Division will review the CPD based on two broad categories: (1) linear, public transportation projects, or (2) non-linear projects.

For linear public transportation projects, TDEC will use the logical termini as defined by the Federal Highway Administration (for the purpose of environmental reviews) to determine the extent of the CPD. Logical termini for project development are defined as (1) rational end points for a transportation improvement, and (2) rational end points for a review of the environmental impacts. Cumulative impacts for a linear public transportation project (from logical termini to logical termini) will be assessed by evaluating total impacts on each individual stream tributary. Individual stream tributaries can be traced from the system's headwaters down the valley to an adjoining stream. When two individual streams join, the larger of the two systems, as determined by drainage area, is considered the main stem. The main stem continues as the same stream before and after the confluence with a smaller stream. The smaller stream terminates at the confluence with the main stem.

For all other CPD activities, TDEC will assess cumulative impacts utilizing a Waterbody Unit scale. The Waterbody Catalog Unit, (also referred to as a Stream Segment) is the scale the Division utilizes in its biannual report to the EPA which evaluates overall use support of Tennessee's water resources ("305(b) report").Years of detailed data evaluation at this scale highlights these systems' responsiveness to cumulative activities within the watershed, which are reflected in the overall condition of that Waterbody. This is also the scale at which TDEC reports the impairment status of water resources to the EPA (such as in the 303(d) list). Where unavoidable impacts from a CPD represent an appreciable permanent loss of water resource values in a given Waterbody, they will require compensatory mitigation. Locations and information about Waterbody IDs can be found on the Division's data and map viewers available on the Division's website.

The amount of compensatory mitigation needed to offset cumulative resource losses within a CPD will be calculated independently for each affected individual stream tributary or Waterbody, as applicable to the project type. For example, if impacts from a multi-phase residential development, including road infrastructure and all other attendant features, result in an appreciable permanent loss of resource values in one Waterbody, but not in another Waterbody, compensatory mitigation would be required only in the first Waterbody.

3.2 Other Considerations

There may be specific types of impacts that cannot be offset by a typical compensatory mitigation practice. These may include, but are not limited to: waters with exceptional or rare ecological communities; waters supporting a specific rare, threatened, or endangered species;[1] waters that support significant recreational activities; or activities that otherwise significantly degrade a water resource value not typically offset by standard compensatory mitigation practices. The Division cannot authorize any such impact unless the applicant proposes a site-specific compensatory mitigation package sufficient to ensure no overall net loss of resource values.

4. Determining Resource Value Loss (Debits)

Stream alterations present a range of impacts, from minimal to significant loss of resource values. Impacts also occur in water resources whose existing conditions may span a wide range of current water resource values and functions.

4.1 Impact Severity Tiers

The impact Severity Tier is a categorical determination of the amount of adverse impact to stream functions, ranging from no loss to total loss from a proposed activity. These tiers are needed to determine the condition of the stream after the impact occurs. Impact Severity Tier categories were developed by evaluating the affects a particular activity would have on stream habitat conditions and the likely amount of loss that would result from an impact regardless of the stream conditions existing prior to the impact. These activities were then grouped by activities with similar functional loss. The amount of functional loss a specific Impact Severity Tier has directly correlates to an Impact Factor, which is used to calculate stream functional loss.

Impact Severity Tiers range from 0 – 6 where 0 represents no appreciable permanent loss of stream functions and therefore would not require compensatory mitigation, while a 6 would result in significant loss requiring compensatory mitigation.

Some impact project proposals may have impacts with activities that fall into different tiers depending on the magnitude of the impact. For example, a small bank stabilization project may be a Tier 1 impact if only riparian vegetation and/or lateral migration parameters are

[1] The Division is not empowered to authorize harm to state or federally-listed threatened or endangered species, and ARAPs do not provide protection from incidental take. If such species are present at a proposed impact site, the permit applicant should contact TWRA and USFWS to determine what, if any, additional requirements apply. If state-listed threatened or endangered plant species are present, the Division will coordinate with TDEC's Division of Natural Areas to determine appropriate conditions.

impacted. However, if the project is large enough to impact physicochemical and/or biological functions, then the project would be at least a Tier 3 impact.

Mitigation is not required for all activities described in an Impact Severity Tier. Some activities may never require compensatory mitigation; therefore calculating loss is not required. Others must cross a threshold of an appreciable, permanent loss of resource values based on scale and complexity before mitigation is required and therefore, debits are calculated. Further, if any activity, regardless of Impact Severity Tier, improves the functional condition of a stream, no compensatory mitigation will be required.

Table 1: Impact Severity Tiers and descriptions. *Function-based parameters being impacted are in bold.

Tier	Functional Loss Description (Impacts to stream resource values)*
0	No appreciable permanent loss of stream functions individually or cumulatively at any scale.
1	Minimal loss of stream functions. Impacts to **reach runoff, lateral migration** and/or **riparian vegetation.** Minor impacts to water quality, and macroinvertebrate and fish communities. **Activities in this tier represent an 11% functional loss.**
2	Partial loss of stream functions. Impacts to **reach runoff, lateral migration, bed form diversity,** and **riparian vegetation**. Minor impacts to water quality, and macroinvertebrate and fish communities. **Activities in this tier represent a 20% functional loss.**
3	Permanent loss of some of stream functions. Impacts to **reach runoff, floodplain connectivity, lateral migration, riparian vegetation, and bed form diversity.** May also include impacts to **large woody debris**. Minor impacts to **water quality** and **moderate impacts to macroinvertebrate and fish communities**. **Activities in this tier represent an 48% functional loss.**
4	Permanent loss of most stream functions. Impacts to **reach runoff, floodplain connectivity, lateral migration, riparian vegetation, and bed form diversity**. May also include impacts to **plan form and/or large woody debris**. Significant impacts to **water quality and macroinvertebrate and fish communities. Activities in this tier represent an 68% functional loss.**
5	Permanent loss of most of stream functions. Removal of all aquatic functions except for hydrology. **Activities in this tier represent an 88% functional loss.**
6	Total and permanent loss of all stream functions. **Activities in this tier represent a 100% functional loss.**

4.2 Impact Types and Descriptions

Permittees may use the following list of impact descriptions to assist in Impact Severity Tier selection. Please be advised that impacts must individually or cumulatively result in an appreciable permanent loss of resource values before compensatory mitigation is required. Activities covered under a general Aquatic Resource Alteration Permit (ARAP) would not be required to determine resource value (or functional) loss as detailed in this document. ARAPs covered under a general permit have been determined to constitute no appreciable permanent loss of resource value. If an activity is part of a larger, Common Plan of Development (CPD) and cumulatively exceeds the threshold for general permits, compensatory mitigation may be required for the newly proposed activity and all other activities within the CPD.

Tier 0 – This tier represents no appreciable permanent loss of stream function individually or cumulatively at any scale. Examples include, but are not limited to:

- **Span Bridge:** These bridges are clearly outside of the floodplain of stream and span the valley. No support structures are associated with the stream bed, bank, or 50 foot buffer zone. Some support structures may be on the floodplain. Woody and herbaceous vegetation grows unencumbered under these structures. No riprap is located within the stream bed, bank or buffer zone.

- **Vegetative Stabilization:** Activities that reshape the bank for stabilization of the channel with living vegetation and large woody debris, fascines, live stakes, soil lifts, brush mattresses, or toe wood. No hard armoring or weirs are used with these practices. Extensive use of jetties, barbs, or similar in-channel structures would move the tier classification for these activities to Tier 1.

Tier 1 - Activities in this tier represent an 11% functional loss. Activities impact reach runoff, lateral migration, and/or riparian vegetation with minor impacts to water quality and macroinvertebrate and fish communities. Examples include, but are not limited to:

- **Single or Multi Span Bridge with or without piers, bents or similar:** The termination of these bridges (individually or cumulatively that exceed 200 linear feet) are clearly outside of the floodplain of stream. No bents or piers associated with the structure are in the stream bed. Some piers or bents may be within the 50 foot buffer zone. Woody and herbaceous vegetation can grow under these structures. Riprap may be associated with the piers or bents.

- **Vegetative stabilization with in-stream structures:** These activities commonly reshape the bank for stabilization of the channel with living vegetation and large woody debris. Other similar practices including fascines, live stakes, soil lifts, brush mattresses, toe wood can be used. Some hard armoring (<300 linear feet per 1000 feet of streambank) associated with jetties, barbs, cross vanes or weirs are generally not subject to mitigation. Activities that exceed 1000 linear feet total may be subject to compensatory mitigation.

Tier 2 - Activities in this tier represent a 20% functional loss. Activities impact reach runoff, bed form diversity, lateral migration, and riparian vegetation with minor impacts to water quality and aquatic communities. Examples include, but are not limited to:

- **Single or Multi Span Bridge with or without piers, bents or similar:** These bridges (individually or cumulatively that exceed 200 linear feet) do not encapsulate the *stream channel and floodway but terminate in the floodplain.* Piers or bents may impact the bed and within the 50 foot buffer zone but not banks of the channel. These bridges have the potential to disrupt generation of natural bed forms. Piers or bents typically have associated riprap. Woody and herbaceous vegetation can grow under these structures but may be managed. This activity alters bed form diversity, riparian vegetation and has minor impacts to aquatic communities.

- **Single Bank- Riprap (with or without Instream Structures), Mechanically Stabilized Earth, Geogrids, Gabion Baskets or Turf Reinforced Mat or any combination thereof:**
  These activities only affect a single stream bank and not the bed of the channel, and include bank armoring that cumulatively exceeds 300 linear feet along a single bank OR is in conjunction with a road crossing structure that cumulatively exceeds 200 linear feet.. Activities typically do not include bank reshaping for floodplain connectivity but may occur for armoring placement. Intake and outfall structures, launching ramps, and utility line crossings may be associated with this impact description. Note that even though these activities do not directly impact bed form diversity, the effects to lateral migration, water quality, and aquatic communities are greater than other activities in this tier and therefore, functional loss is comparable.

- **Gravel bar mining:** Removal of accumulated gravels from in-channel benches and bars of sufficient extent to significantly impact sediment transport processes during flow events which impact the bed form diversity.

Tier 3 - Activities in this tier represent a 48% functional loss. These activities impact reach runoff, floodplain connectivity, lateral migration, riparian vegetation, and bed form diversity. These activities result in minor impacts to water quality and moderate impacts to macroinvertebrates and fish communities. Activities may also impact the recruitment and habitat value from large woody debris. Examples include, but are not limited to:

- **3-Sided Box Culvert, Arch Culvert, Single or Multi-Span Bridges with Bents and/or Abutments:** These crossings encapsulate the stream for greater than 200 linear feet either cumulatively or individually. These structures are clearly outside of the channel and include wingwalls and all components attached to the crossing structure unless the wingwalls have no impact on and do not disturb the stream channel walls during or after installation. All wingwalls that have a concrete apron or bottom are included. *Side wall of box, culvert, span or arch with or without abutments, bents, or piers are outside of the channel for a distance at least ½ the width of the channel on the right and left bank.* Limitations of this floodprone zone spanning the channel will make the crossing a Tier 4. Structures may have riprap along abutments, bents, or piers. These structures have footers that were dug outside the bank/bed interface with no disruption or disturbance of the natural channel wall during and/or after construction. Piers or bents may impact the bed of the channel and disrupt generation of natural bed forms. This activity may require reshaping the channel at the crossing approach (transition zone) making the stream wider and potentially deeper. This activity effects stream resource values and functions including riparian vegetation, macroinvertebrates and fish communities, water quality, floodplain connectivity, natural bed forms and lateral migration and diminishes hydrologic contributions from reach runoff. Herbaceous vegetation may grow under these structures. Riprap along the channel bank beneath the structure is permissible. If extensive riprap is required, then the impact is in Tier 4.

- **Double Bank- Riprap, Mechanically Stabilized Earth, Geogrids, Gabion Baskets or Turf Reinforced Mat or any combination thereof:** Affects the channel cumulatively for 200 linear feet or greater, OR is in conjunction with a road crossing structure that cumulatively exceeds 200 linear feet.. No treatments are placed in the bed of the stream. Use of bank treatment prevents growth of woody and herbaceous vegetation stream side, often underlain by geotextile or has a very limited amount of soil/substrate available for plant colonization. It also can modify natural sediment transport disrupting the generation of natural bed forms. It impacts water quality and significantly impacts macroinvertebrate and fish communities. It often includes riparian vegetation removal outside of channel in the

buffer zone. This activity may be in conjunction with utility line crossings or culverts that cumulatively represent an appreciable permanent loss of resource values.

- **Grade Control and Bank Armoring:** Concrete weirs, sheet piling, check dams and any other structure spanning the channel and ponding water for up to 500 feet, may be used in conjunction with riprap along both banks of the channel, and may include removal of riparian vegetation outside of channel in buffer zone. The in-channel structures do not prevent aquatic organism passage. This activity significantly impacts bed form diversity and alters floodplain connectivity. It also alters and moderately impacts aquatic communities and suppresses riparian vegetation.

- **Riparian Removal on Both Banks:** This activity includes complete removal and suppression of woody vegetation on both banks for 400 linear feet or more. This also affects the buffer zone. Large scale suppression of riparian vegetation can affect the water quality and aquatic communities. It promotes excessive lateral migration, channel erosion, alters floodplain connectivity when bank failures occur, and has the potential to diminish natural bed forms.

Tier 4 - Activities in this tier represent a 68 % functional loss. These activities impact reach runoff, floodplain connectivity, lateral migration, riparian vegetation, and bed form diversity. Activities result in a significant impact to water quality and macroinvertebrate and fish communities. Activities may also include impacts to channel plan form and/or large woody debris. Examples include but are not limited to:

- **3-Sided Box Culvert, Arch Culvert, Single or Multi-Span Bridges with Bents and/or Abutments:** These crossings encapsulate the stream for greater than 200 linear feet either cumulatively or individually. Structure includes wingwalls and all components attached to the crossing structure. *These box culverts, arches, spans, or other bridge types (including the bents, abutments or similar) affect the channel walls, have footers that were dug into bank/bed interface, or otherwise disrupted or disturbed the natural channel wall during and/or after construction.* However, these structures may affect the channel at the crossing approaches (transition zone) when the activity requires reshaping this zone making the stream wider and potentially deeper. Riprap (not to exceed the width of the bridge) may be placed along banks beneath the crossing in association with these structures. Riprap along bents and abutments (or similar) is permissible. Riprap lining the bed in conjunction with these culverts would make the impact a Tier 5. This activity significantly impacts stream resource values and functions including riparian vegetation,

macroinvertebrates and fish communities, water quality, floodplain connectivity, natural bed forms and lateral migration and eliminates hydrologic contributions from reach runoff.

- **Grade Control:** Concrete weirs, sheet piling, check dams and any other structure spanning the channel and ponding water for up to 500 feet, may be used in conjunction with riprap along both banks, and may include removal of riparian vegetation outside of channel in buffer zone and along the banks of the channel. This activity significantly impacts bed form diversity and alters floodplain connectivity. It also alters and moderately impacts aquatic communities and suppresses riparian vegetation. These structures do represent barriers to aquatic organism passage and may impound water for a significant distance.

- **Bed and bank armoring:** Riprap of the bed and banks for distances greater than 200 linear feet individually and cumulatively. This activity may include reshaping of banks and potentially the bed of the stream. This activity may be in conjunction with utility line crossings or culverts that cumulatively represent an appreciable permanent loss of resource value. Use of bank treatment commonly prevents growth of woody and herbaceous vegetation stream side, often underlain by geotextile or has a very limited amount of soil/substrate available for plant colonization. It eliminates the generation of natural bed forms, significantly impacts water quality and macroinvertebrate and fish communities. It includes riparian vegetation removal often outside of the channel in the buffer zone.

- **Channels Designed for Flood Control:** These activities seek to contain flood flows through re-grading and over-widening of channels or construction of levees. Activities significantly limit natural channel conditions. These designs may have countersunk weirs to prevent further bed degradation. These impacts alter floodplain connectivity, affect large woody debris recruitment for habitat, and significantly affect macroinvertebrate and fish communities, riparian vegetation, sediment transport, and bed form diversity.

Tier 5 – This tier represents an 88% functional loss. These activities result in a significant functional loss to most if not all stream resource values. Examples include but are not limited to:

- **Pipe or 4-Sided Box Culvert:** These pipes encapsulate the stream for greater than 200 linear feet either cumulatively or individually. Includes wingwalls, any energy dissipation device, u-shaped endwalls. All components attached to the pipe structure itself. This does not include riprap. Riprap at the upstream or downstream

section of a pipe is calculated using the bed and/or bank armoring descriptions by tier. These structures may affect the channel at the crossing approaches when the activity requires reshaping this zone making the stream wider and potentially deeper. This activity eliminates most stream resource values and functions including riparian vegetation, macroinvertebrates and fish communities, water quality, floodplain connectivity, natural bed forms and lateral migration and eliminates hydrologic contributions from reach runoff.

- **Channelization or Full Channel Armoring:** Affects both banks for a cumulative distance of 200 feet or greater. Channels are lined along the bed and banks with concrete, grouted riprap, or concrete articulated mats. These streams are incised and alterations most likely include channel bank and potentially bed reshaping. The bed material is not suitable substrate for aquatic colonization and these channels will most likely be maintained in their current state. Vegetation in the near buffer zone is restricted and routinely eliminated.

Tier 6 – This tier represents 100% stream functional loss. Examples include but are not limited to:

- **Stream Length Loss:** Stream length loss due to culverts, fill, channelization, or similar. This includes stream relocations (channels completely filled, then replaced within a new footprint), where the replacement stream channel does not meet the minimum requirements in Rule 0400-40-07-.04(7)(b)..

If any proposed activity improves the existing condition of a stream, regardless of impact severity tier, the activity would be considered not impactful and zero percent functional loss. In some cases, applicants will be required to demonstrate no functional loss through monitoring of the site post project. Depending on the scale and complexity of the activity, monitoring may take place for three to seven years.

It is important to note that specific mitigation threshold lengths for selected impact activities described in the above Tiers may apply only to the Division. Activities at these lengths and greater, individually or cumulatively, have been determined by the Division to have an appreciable loss of water resource values. Please note that impact thresholds requiring compensatory mitigation for the USACE may differ.

4.3 Stream Fill and Replacement or Relocations

Some activities do not fit well into tiered categories. Stream fill and replacement projects (otherwise known as relocations) are one of these activities. Although a stream fill can be categorized as a Tier 6 impact, the subsequent replacement may be considered a

compensatory mitigation project separate from the fill, depending on the scale of fill and quality of replacement channel. In order to streamline this process the following recommendations should be followed for all stream fill and replacement projects.

Stream replacement (or relocation) means to fill an existing stream channel and reconstruct it in a new location to allow for an authorized project to be constructed in the stream's former location. These activities at a certain scale are generally high risk and have the potential to disconnect a feature from their source of hydrology, including elimination of groundwater connections for sustained baseflow. The Division does not typically authorize stream replacements for development, flood control, or other land improvement purposes. However, if after avoidance, minimization, and a thorough alternatives analysis, a stream fill and replacement proposal is the least impactful practicable alternative, the Division may authorize the relocation with an appropriate mitigation and monitoring plan to offset the potential lost resource value and ensure success.

It is important to note that although stream relocations may be an improvement from the original feature, these systems **may not generate additional credit** to offset impacts outside of the relocation itself unless the relocation "demonstrates a sufficient increase in resource values to compensate for permitted impacts" (Rules 0400-40-07-.04(7)(b). Stream relocations may only generate compensatory mitigation credit to offset impacts beyond the stream fill when the resulting stream meets the criteria established for typical compensatory mitigation projects that generate credits. This requires a stream fill and replacement project must function well in two broad stream categories, channel hydraulics and geomorphology, which is standard criteria for any project generating stream credits. Specifically, this includes floodplain connectivity, riparian vegetation, lateral migration, and bedform diversity. They also will require a 12-point mitigation plan, and have perpetual site protection.

Rule 0400-40-07-.04(7)(b)[2] establishes the following additional performance requirements for stream relocations:

> Mitigation for impacts to streams must be developed in a scientifically defensible manner approved by the Division that demonstrates a sufficient increase in resource values to compensate for permitted impacts. At a minimum, all new or relocated streams must include a vegetated riparian zone, demonstrate lateral and vertical channel stability, and have a natural

[2] This rule was adopted in October 2018. As of the date of this publication, this rule is not yet in effect.

channel bottom. All mitigation watercourses must maintain or improve flow and classified uses after mitigation is complete.

Stream relocations that generate credits beyond those needed to offset the filled channel may only use the generated credits to offset impacts within the permitted activity. Therefore, permittees may not bank credits to use on other projects not authorized under the same 401 Water Quality Certification permit.

Stream fill and replacement within the limits of a project is often feasible, and if done with proper planning and design can be an adequate replacement of the stream eliminated during the relocation. We do not promote any specific design techniques, however, data driven methods using aspects of a natural channel design are strongly encouraged. Therefore, the Division requires a detailed plan that documents consideration of elements such as watershed hydrology, channel hydraulics, sediment transport, lateral site constraints and morphological reference conditions within the ecoregion.

Designers should consult credible sources like the Natural Resource Conservation Services National Engineering Handbook (Part 654) Stream Restoration Design, or the Tennessee Department of Transportation Design Division Drainage Manual, Chapter 11, Natural Stream Design for design guidance if needed. In addition, designers may consult the Division's Compensatory Mitigation website for Ecoregion based stream regional curves for reference channel dimensions. These resources can provide valuable assistance in the development of a plan. Just as importantly, designers should take the time to evaluate the stream itself, assessing the channel longitudinally and noting any departures from reference conditions, bank instabilities, channel bars, benching, and riparian vegetation. Consideration of current conditions, potential impacts of proposed activities, and stream response to the relocation are key to a successful project.

4.3.1 Submittal Guidelines for Stream Fill and Replacements:

In general, stream fill and subsequent replacement varies in significance and severity based on impact length, stream channel dimensions, drainage area, and quality. Therefore, for relocations greater than 200 feet the Division requires a standard 12-point mitigation plan (33 CFR 332) (outlined in section 5.2.2 of this document) that includes documenting the stream's existing condition, proposed condition, and monitoring requirements commensurate with the alteration proposed. All jurisdictional streams will be required to demonstrate through monitoring that they maintain or improve hydrology and meet the definition of a stream by state, and in some cases, federal standards. Replacement channels will need to be vegetated, have a natural channel bottom, and designers must ensure channel stability, both laterally and vertically, throughout the monitoring period. The length of monitoring and detailed success criteria are based on the length of the replacement stream and the pre-existing site conditions.

All replacements greater than 25 linear feet will have performance standards and monitoring commensurate with the impact length.

Replacements on shorter stretches of stream have less inherent risk and impact to habitat. Therefore, the Division will generally not require a 12-point mitigation plan or evaluation using a detailed functional assessment as part of a monitoring plan (although the USACE may). Regardless, permittees will have to determine existing conditions and demonstrate no net loss of resource values has occurred at the end of the monitoring period. Offsetting replacements less than 200 linear feet in stream length must not be unstable, either vertically or laterally, must have a natural channel bottom, and must be revegetated. Any loss of channel length will require compensatory mitigation commensurate with the resource values lost. Permittees will be required, at a minimum, to monitor the channel for three years. Performance standards will include (but are not limited to) bank stability and channel hydrology. These replacements may include structural transition zones approaching culverts. These are the zones where the stream transitions from a natural channel to flow either into or out of a culvert or bridge from a natural stream. Occasionally, designers must modify, or slightly change a channel alignment for proper flow into, or out of the installed culvert or bridge. For very short structural transitions (25 feet or less) located directly upstream and downstream of culverts, the Division will not require monitoring or performance standards.

Offsetting stream relocation projects that range from 200 linear feet to 500 linear feet in length require more oversight, design and performance standards. Therefore, the Division will require a 12-point mitigation plan and recommends the use of the TN SQT (see section 8 of this document) or other approved quantitative assessment method for use during the monitoring period. Permittees will have to determine existing conditions and demonstrate no net loss of resource value has occurred at the end of the monitoring period (usually three years for the Division). Stream relocation projects will not be approved where the proposed condition will be lower than the existing condition at the end of the monitoring period unless additional compensatory mitigation is provided. At a minimum, channels must have stable configuration laterally and vertically. The channel bottom must have a natural substrate and a riparian zone must be revegetated, preferably with species native to the region of Tennessee. In-stream structures to help maintain the slope are permissible. Signage, indicating zones of “no mowing” should be placed along the protected riparian and stream corridor. Deviation from these criteria and/or loss of hydrology could result in additional corrective action or compensatory mitigation.

Offsetting stream relocation projects for channels greater than 500 linear feet require a 12-point mitigation plan and must use the TN SQT or other scientifically defensible and

approved method to determine functional loss and lift of the project. This information should be submitted with the mitigation plan. The plans should provide scores for and monitor the following parameters: floodplain connectivity, lateral migration, riparian vegetation, and bed form diversity. Stream relocation projects will not be approved where the proposed condition will be lower than the existing condition at the end of the monitoring period unless additional compensatory mitigation is provided. Furthermore, parameters for floodplain connectivity and lateral migration should be functioning at the end of the monitoring period. In-stream structures to help maintain vertical stability are permissible. The channel bottom must have a natural substrate and a riparian zone must be revegetated, preferably with species native to the specific region of Tennessee. Signage, indicating zones of "no mowing" should be placed along the protected riparian and stream corridor. A minimum of five years of monitoring for hydrology, geomorphic stability, and vegetation is required. Deviation from these criteria and/or loss of hydrology could result in additional corrective action or compensatory mitigation.

Some stream fill and replacement activities will not meet the minimum relocation requirements established by Rule. These requirements state that at a minimum, all new or relocated streams must include a vegetated riparian zone, demonstrate lateral and vertical channel stability, and have a natural channel bottom. All mitigation watercourses must maintain or improve flow and classified uses after mitigation is complete. For scenarios where these requirements cannot be met, the length of fill will be considered a Tier 6 impact, and permittees will be assessed debits based on existing condition and length.

All stream fill and replacements greater than 25 feet are considered to cause an appreciable permanent loss of resource values until the relocation project has been determined to be successful at the end of the monitoring period. In most cases, any offsetting relocation greater than 500 linear feet will require a site-specific biological and habitat assessment utilizing the approved TDEC SOP, or other scientifically defensible method as approved by the Division. Proposed fill and replacement (compensatory mitigation) sites that support fish and aquatic life use designation prior to the impact must achieve that status at the end of the monitoring period to ensure no appreciable permanent loss of resource values. If the stream does not maintain or improve flow and classified uses at the end of the monitoring period, the site will not be considered successful. In this case, corrective action or additional compensatory mitigation may be required. However, if degradation of water quality occurs and the permittee can demonstrate the condition was caused by factors outside of their control, the Division will take this into consideration when evaluating project success.

4.4 Temporal Loss

TDEC rules require that to the extent practicable, compensatory mitigation shall occur before or concurrently with authorized stream impacts, and provide that the Division will account for temporal loss of resource values. Therefore, where compensatory mitigation is physically completed more than one year post-impact, the Division may use a multiplier to account for temporal loss of resource values. Compensatory mitigation occurring concurrent with impacts, or the purchase of mitigation bank credits, would not require a temporal loss factor. It should be noted that the USACE may use different procedures to account for temporal loss.

4.5 Proximity of Compensatory Mitigation

TDEC rules state that compensatory mitigation for impacts to Tennessee streams must occur in Tennessee, and provide that the Division will use a watershed prioritization approach to evaluate proposed mitigation sites. Mitigation should occur as close to the impact location as practicable. The Division prioritizes project locations as follows:

- projects providing an increase in resource values to degraded streams on-site or within the immediate impact area;
- projects providing an increase in resource values to degraded streams or wetlands within the HUC-12 in which the impact is located;
- projects providing an increase in resource values to degraded streams or wetlands within the HUC-8 in which the impact is located;
- projects providing an increase in resource values to degraded streams or wetlands outside the HUC-8 in which the impact is located; or
- Any combination of any of the above activities.

Where appropriate the Division may use a multiplier of up to 2:1 for offsetting compensatory mitigation projects, including credits purchased from a third party provider, that do not occur within the same HUC-8, or within a third-party provider's service area as approved by the IRT.

This multiplier will be based either on an IRT-approved formula, or as follows:

- One HUC-8 away (adjacent) = 1.25:1 multiplier
- Two HUC-8's away (adjacent) = 1.5:1 multiplier
- Three HUC-8's away (adjacent) = 2:1 multiplier

For In-Lieu Fee Service Areas that encompass multiple HUC-8 watersheds, because the location of the future offsetting mitigation project is unknown, the proximity calculation will be based on the most distant HUC-8.

It should be noted that the USACE may use a different methodology to assess a proximity factor for mitigation distant from impacts.

4.6 Common Encountered Scenarios /Frequently Asked Questions

1. The Division allows for the placement of clean rock fill material within 25 linear feet upstream and 25 linear feet downstream of existing or proposed structures. For existing structures this can be done through a no-notification General Permit. In both cases applicants are not required to provide compensatory mitigation if the placement of rock fill does not exceed a cumulative total of 50 linear feet (25 feet on each end), regardless of the structure length. If greater than this amount of armoring or rock fill is proposed, riprap totals, in conjunction with structure length will be factored into the total amount of cumulative resource loss potentially requiring compensatory mitigation. Any installation of riprap upstream or downstream of culverts must be embedded in the stream channel to prevent becoming a barrier to aquatic organism passage.
2. The Division recognizes the importance of maintaining proper hydraulics through installed structures. The Division allows for slight realignment of stream channels within 25 linear feet upstream and 25 linear downstream of proposed structures without requiring compensatory mitigation, as with larger scale fill and replacement projects. Projects that propose more than 25 linear feet of stream realignment upstream or downstream of a structure are considered stream fill and replacement. Realignments greater than 25 linear feet will be reviewed and approved on a case-by-case basis. Channel realignments from 25 – 200 linear feet will be considered no net loss of resource value after demonstrating, through monitoring; the condition of the channel has been maintained.
3. Evaluation of resource loss should be based on existing conditions at the time of CPD initiation. Impacts predating the CPD are part of existing conditions. However, even if early activities related to the CPD result in only minimal impacts, later impacts must be evaluated cumulatively with the earlier CPD impacts to determine whether compensatory mitigation is required, and if so, how much. The age of the existing impact is not a consideration for when mitigation is required, only whether the impact was part of the CPD. Thus, multiple minimal impact activities within a CPD may result in required mitigation, even if the individual activities would not. In this case, mitigation will be required to offset all impacts associated with the CPD.
4. The Division considers structures within 50 linear feet of each other along the same stream channel to be contiguous. Contiguous impacts are totaled cumulatively, even when contiguous impacts are not part of a common plan of development and are proposed by different applicants. When contiguous impacts result in a significant loss of aquatic resource, they require compensatory mitigation, however, in these non-CPD,

contiguous impact scenarios only the new, currently authorized impacts will require mitigation (as opposed to cumulative impacts within a CPD).

5. The Division requires mitigation for the loss of stream length when there is an appreciable permanent loss of resource values, thus, any relocated channel must fully compensate for the stream fill. If additional impacts (hard armoring, culverts, etc.) are proposed for the newly constructed channel that reduces the value and function of the on-site mitigation below that which was lost through fill, additional mitigation will be required to compensate for this loss.
6. Mixed impact types (*e.g.*, culvert, stream fill and replacement, and hard armoring) that are contiguous or within a Common Plan of Development will be totaled cumulatively. If mixed impacts cumulatively result in an appreciable permanent loss of resource values, compensatory mitigation will be required to offset all proposed impacts.

5. Providing Resource Values and Functional Lift

Compensatory mitigation may be achieved through the purchase of compensatory mitigation credits from a mitigation bank or an in-lieu fee (ILF) program, or through completion of permittee-responsible mitigation. The USACE's preference hierarchy for compensatory mitigation is banks, ILF programs, and then permittee-responsible (33 CFR 332.3(b)(2)-(6)). The Division's Rules do not specifically ascribe to the same federal hierarchy for compensatory mitigation projects. Therefore, depending on the site, the Division may prefer a closer proximity, ecologically preferable, permittee-responsible mitigation site. All in-lieu fee programs and mitigation banks provide mitigation to applicants as a third party provider and are overseen by the IRT. Mitigation banks and in-lieu fee programs are subject to the required components of this document and all applicable USACE regulations, guidance, and policy and may have alternative credit release schedules, reporting responsibilities, and performance standards established in the mitigation bank or in-lieu fee Instrument. Applicants may choose to purchase credits from third party providers. This shifts the legal liability to the third party service provider once credits are purchased and the Commissioner and District Engineer (USACE) have received documentation confirming the sponsor has accepted the responsibility for providing the required compensatory mitigation. Permittees that purchase credits from third party providers will provide proof of purchase to the Division within sixty (60) days of permit issuance. Where permittee-responsible mitigation is utilized, the legal liability for compensatory mitigation success remains with the permittee until the mitigation is determined to be complete and successfully offsets lost resource values and stream functions.

5.1 Descriptions of Common Mitigation Practices

All compensatory mitigation projects, at a minimum, will address floodplain connectivity, riparian vegetation, and lateral migration. Depending on site constraints and geology some

projects may have to address bed form diversity and in-channel habitat provided by large woody debris. At the end of the project monitoring period, the above parameters should be functioning. Under rare circumstances, or in highly urban areas, this level of success may not be feasible. The Division may award credits in these situations if the practitioner can provide justification why limited success is acceptable, prove the site has reached the maximum functional potential possible, and can demonstrate that the site is stable. Common mitigation practices can improve stream parameters, and therefore generate credit. However, the Division no longer awards credit based on proposed work. Instead, the Division will award credit based on the amount of resource value and functional lift mitigation activities will have on a stream.

Vegetated Riparian Buffer

A protected, riparian buffer, both woody (trees and shrubs) and herbaceous species, should be a part of every compensatory mitigation proposal where the mitigation stream does not have an established, appropriately vegetated riparian buffer, except in certain circumstances, such as urban areas, where a full riparian buffer may not be feasible. Projects that solely propose enhancing and/or establishing a stream buffer for credit may not be approved if the stream is unstable, entrenched, or otherwise disconnected from the floodplain. This includes sites that would require more extensive stream bed and/or bank restoration to achieve a self-sustaining system. The amount of credit received is based on the existing condition of the buffer and the amount of functional lift proposed. All compensatory mitigation projects are required to assess the riparian area and propose functional lift where needed. More information on reference standards, lift of riparian areas, and assessment methods can be found on the TDEC Mitigation website.

Performance standards for vegetated riparian buffers can be found in the Performance Standards section of this document.

Re-establishment of Natural Channel Geomorphology

Stream mitigation projects often involve an approach designed to restore natural channel geomorphology, which consists of returning a severely degraded, disturbed, or altered stream, including adjacent riparian buffer and flood-prone area, to a natural stable condition based on reference conditions or other appropriate standards. Successful projects should result in a channel transporting water and sediment load in dynamic equilibrium, and produce productive habitat components that are self-sustaining long-term.

These projects may involve restoring a relocated stream channel to its former natural location, restoring sinuosity, incorporating in-stream habitat and bed form complexity, establishing stable channel dimensions (width/depth ratio), and/or reconnecting

abandoned side channels or meanders that were artificially cutoff, blocked, or filled where functionally appropriate (more typical of western Tennessee). It does not include the fill and relocation of a stream channel to accommodate a project in the stream's former location. The amount of credit received is based on the existing condition of the channel geomorphology and floodplain connectivity and the amount of functional lift proposed. All compensatory mitigation projects are required to assess the floodplain connectivity and lateral migration parameters of a project and propose functional lift where needed. These parameters are required to be functioning at the end of the monitoring period. More information on reference standards, lift of these parameters, and assessment methods can be found on the TDEC Mitigation website.

Livestock Exclusion

Livestock exclusion involves removing or excluding existing livestock from the stream and riparian buffer using fencing, or some other means. Livestock exclusion is a required component of a compensatory mitigation projects. The stream and riparian buffer will be protected from future livestock impacts utilizing appropriate long-term protection measures.

The eligibility of a site proposing livestock exclusion does not apply to sites where land use is or will soon be converted due to land development. For example, construction of a subdivision on land formerly grazed by cattle does not generate compensatory mitigation credit simply for livestock exclusion. The amount of credit received is based on the existing condition of the channel parameters and the amount of functional lift proposed. Applicants may propose to lift water quality or biology parameters; however, this is not a requirement of compensatory mitigation, and would need to be addressed with appropriate monitoring. Livestock crossings, if properly designed to avoid "wallowing" areas, may be compatible with livestock exclusion credits.

Dam and Culvert Removal

Dam and culvert removal is another acceptable form of stream mitigation that can produce measurable lift to stream value and function. Dams and culverts adversely affect and fragment stream systems by altering the movement of aquatic organisms, water, sediment, organic matter, and nutrients, thereby creating physical alterations in both tailwaters and downstream riparian buffers and biological effects both upstream and downstream of the dam. Dam or culvert removal, if done properly, can improve natural stream functions provided that other functions such as riparian buffers, bed form diversity, and geomorphic equilibrium are taken into account in conjunction with the removal. Without sufficient evaluation, dam or culvert removal may result in bed and bank instability, upstream migration of headcuts, and increased sediment loads.

Vegetative Bank Stabilization

Streams with severely degraded stream banks may provide opportunities as compensatory mitigation projects. Severely degraded stream banks are the result of unstable geomorphic or hydrologic conditions, have an accelerated rate of erosion well beyond natural rates, and typically have little or no woody riparian vegetation. Vegetative bank stabilization may incorporate bioengineering techniques to slow erosive near-bank velocities and protect easily erodible soils, and may also require bank re-sloping or other geomorphic and riparian zone restoration. Armoring banks with riprap or other hard artificial structures will not produce an overall lift in stream value or function eligible for mitigation credit. Any proposal incorporating vegetative bank stabilization should address the overall condition of the stream reach. If the stream is disconnected from the floodplain and experiencing lateral or vertical degradation the project may not be approved since localized repairs in an unstable system will not likely succeed long term.

Other Mitigation Activities

In consultation with the other resource and regulatory agencies, the Division will determine the net benefit of any mitigation actions that produce quantifiable improvements to stream value and function. These may include, but are not limited to, actions such as retrofitting storm water detention facilities; restoration of stream flow where flow has been captured by sewer lines, construction of off-channel storm water detention facilities in areas where runoff is accelerating stream bank erosion, and other watershed protection practices. Any mitigation proposal should include elements that go beyond existing regulatory requirements such as existing local storm water requirements.

Urban Projects

Other factors that may have a positive effect on the credits generated include projects concentrated in urban areas. Urban areas, for the purpose of this document, are defined as MS4 Phase I communities. Urban stream restoration projects may receive an additional 15% increase in overall generated credits for mitigation required by TDEC only. This percentage increase is only authorized on projects where TDEC alone has required compensatory mitigation. To be eligible for this credit increase, the applicant must develop a publicly accessible environmental education and outreach component of the project. It is recommended that applicants coordinate with their local MS4 program, TDEC, and environmental educators for development of these materials.

Unlike traditional compensatory mitigation projects, urban restoration may not achieve functional lift in all stream parameters. For typical compensatory mitigation, including stream relocations, the actual stream conditions for floodplain connectivity, lateral migration, riparian vegetation, and bedform diversity should reach a functioning state at the end of the monitoring period. This ensures the project can and will offset permanent,

permitted losses to aquatic resources. However, urban projects are unique, and due to site constraints may not achieve a functioning score for all required stream parameters. Yet, overall stream condition may be vastly improved. Therefore, the Division reserves the ability to review urban projects on a case-by-case basis to determine if awarding credit to projects that have not achieved the prescribed lift is warranted.

Preservation

Preservation of a threatened, unique, or ecologically significant aquatic resource may serve as compensatory mitigation, but only in conjunction with, or as a component of, a larger, more comprehensive project. The preservation should complement and provide additional benefits to reaches proposed for restoration. Further, these features should be hydrologically adjacent to restored streams. As with all compensatory mitigation, preservation components of a project require long-term protection that restricts alterations to the watercourse and land use within the riparian buffer. Where site protection is required to protect other aspects of mitigation treatments (such as riparian buffers), those areas of preservation do not qualify for additional mitigation credit.

Preservation may be used to provide compensatory mitigation for Section 404 permits and Section 401 certifications when all of the following criteria are met:

1. The existing condition of the resource should be high. When using the TN SQT this should be, at minimum, a 0.6 overall existing condition score.
2. The length of stream for preservation can generate credits equal to 10% of the functional foot score of the resource existing condition.
3. The preserved features shall be in conjunction with a larger restoration and/or enhancement project.
4. The resources to be preserved provide important physical, chemical, or biological functions for the watershed.
5. The resources to be preserved contribute significantly to the ecological sustainability of the watershed.
6. Preservation is determined by the permitting agencies to be appropriate and practicable.
7. The resources are under threat of destruction or adverse modifications from activities other than the proposed actions of the applicant or landowner. Examples may include property where the mineral or logging rights are severed from the deed.
8. The preserved site will be permanently protected through an appropriate real estate or other legal instrument (e.g., easement, title transfer to state resource agency or land trust).

5.2 Components of Compensatory Mitigation

It is the responsibility of the applicant or third-party mitigation provider to identify suitable mitigation sites, establish appropriate performance standards, and develop a compensatory mitigation plan that will adequately offset proposed or authorized impacts. It is expected, that after the successful achievement of performance standards, a project be inherently self-sustaining long-term. In most cases this requires project designs that result in a channel that maintains dynamic, natural equilibrium and supports a healthy riparian corridor, provides diverse in-stream habitat, allows for lateral migration without excessive erosion and instability, and maintains floodplain connectivity. The proposed mitigation plan should, at a minimum, be consistent with the guidance for project proposal, quantitative evaluation methods, and monitoring requirements set forth in this document. Some projects, due to their size and complexity, will require additional information as part of the performance standards and mitigation plan. These projects, where both the USACE and TDEC require compensatory mitigation, should follow joint guidance issued by TDEC and the USACE. It is provided as an appendix in this document and on the TDEC Mitigation website, or through the USACE. All mitigation plans and methods must be reviewed and approved by state and federal regulatory agencies prior to permit issuance and mitigation implementation.

5.2.1 Stream Mitigation Site Considerations

Stream compensatory mitigation may be accomplished through the restoration, re-establishment, enhancement, or preservation (in conjunction with other mitigation activities) of the water resource values, functions, and designated uses of currently degraded streams. The Division Rules outline a preference for mitigation to occur as close to the impacts as is feasible. Tennessee statute and the Division's overarching mission to abate existing pollution and restore polluted waters, establishes priority should be given to significantly degraded stream reaches near the impact site and within Waterbodies assessed as impaired by TDEC (i.e. "303(d)-listed"). This provides a means to alleviate the causes or sources of water quality and/or habitat impairment.

The impaired or degraded condition of stream segments not currently assessed or listed by the Division should be scientifically documented by a trained practitioner as in need of improvement to be eligible as a compensatory mitigation project. In most cases this will require the completion of a TN SQT assessment workbook, including a site-specific biological and habitat assessment utilizing the approved TDEC SOP, or other scientifically defensible method as approved by the regulatory agencies. Proposed mitigation sites that are documented to be currently meeting their designated use for Fish and Aquatic Life will have to maintain that status at the end of the monitoring period to receive any credit as a compensatory mitigation project. Stream segments that currently exhibit a level of biologic

integrity well above the minimum use support level in most cases will not be approved as a compensatory mitigation site. Stream segments that historically met, but as a result of the compensatory mitigation, currently fail to meet use support, will be required to provide corrective action. Not only will these sites fail to be approved as compensatory mitigation, they may be deemed a condition of pollution and considered a loss of resource value needing to be offset.

Common mitigation activities that may accomplish the goal of functional lift include re-establishment of natural channel morphology of previously channelized streams, removal of existing culverts, vegetative rehabilitation of excessively eroding banks, re-establishment of riparian buffers, establishment of natural in-stream habitat, livestock exclusion, significant removal of non-point source pollutants especially in urbanized areas, reversal of adverse hydrological modifications, and any combination thereof. Minimization of conflicting site constraints, long-term protection of mitigation projects, watershed connectivity, and achieving inherently self-sustaining natural functions are vital considerations in selecting viable mitigation site which result in a lift in stream function sufficient to compensate for any net losses.

The amount of compensatory offset (or "credit") generated by a mitigation project depends on the hydrologic, hydraulic, geomorphic, water quality and biological lift that results from a mitigation project, as shown through post-project monitoring. Final credit approval for stream mitigation will be determined when the stream mitigation project successfully achieves all stated performance standards and long-term protection has been secured. Mitigation projects that lengthen stream channels in ways inconsistent with natural channel functions will usually not be considered suitable mitigation projects. Stream mitigation should be designed to achieve the maximum level of improvement feasible in a given reach or, in other words, to lift stream function as far as possible towards its most probable natural state, given the individual constraints of the project location and watershed conditions. While site-specific constraints may reduce the restoration potential of mitigation sites (and correspondingly decrease the mitigative potential), the goal of mitigation projects should be to achieve the maximum biological, chemical, and physical integrity possible in the current environment.

Where appropriate and practicable, compensatory mitigation decisions should also be made from a watershed perspective in which the type and location of compensatory mitigation follows from an analytically-based watershed assessment to assure that the proposed compensation furthers watershed goals. This assessment may take the form of a watershed plan, which typically involves an intensive regional planning effort involving many stakeholders. It may also be a less formal watershed approach involving the analysis of available data concerning regional environmental issues, efforts to inventory historic

trends in aquatic resource condition, and the prioritization of aquatic resource restoration opportunities.

Both the USACE and the Division have regulatory mitigation preferences, but also recognize that departure from this preference can be environmentally preferable. The improvement in the resource values and function of wetlands, streams, and other aquatic resources may be designed and situated to address specific regional environmental issues, and to bring the maximum ecological benefit to the watershed.

In some cases, the evaluation of the compensatory mitigation proposal may reveal the proposed activities are not practical, constructible, sustainable, provide adequate functional lift or benefit to resource values, or are otherwise ecologically undesirable, therefore, all determinations involving projects requiring stream mitigation will be made on a case-by-case basis at the discretion of the reviewing agencies.

5.2.2 Mitigation Plan

All mitigation projects, either through PRM or a third party service provider, must provide a mitigation plan commensurate with the scale and complexity of the project. Mitigation plans are intended to fully illustrate the measures proposed to create, restore, enhance, or preserve a stream. The following components should be included in any final mitigation plan:

1. **Objectives**: A description of the resource type(s) and amount(s) that will be provided, the method of compensation (restoration, establishment, preservation, etc.), and how the anticipated functions of the mitigation project will address watershed needs.

2. **Site selection**: A description of the factors considered during the site selection process. This should include consideration of watershed needs, onsite alternatives where applicable, and practicability of accomplishing ecologically self-sustaining aquatic resource restoration, establishment, enhancement, and/or preservation at the mitigation project site.

3. **Site protection instrument**: A description of the legal arrangements and instrument, including site ownership that will be used to ensure the long-term protection of the mitigation project site. Details on acceptable site protection instruments can be found in the Performance Standards and Monitoring section of this document. Approved templates can be found in appendix E.

4. **Existing condition information:** a description of the ecological characteristics of the proposed mitigation site, in the case of an application for a 404/401 permit, the impact site. This may include descriptions of historic and existing plant communities, historic

and existing hydrology, soil conditions, a map showing the location of the impact and mitigation site(s) or the geographic coordinates for those site(s), and other characteristics appropriate to the type of resource proposed as compensation. The existing condition information should include a delineation of waters of the United States/State on the proposed mitigation site. For stream projects, the existing site conditions can be captured using the TN SQT. Manuals and guidance on how to perform this assessment method is provided in appendix C of this document.

5. **Determination of Credits:** a description of the number of credits to be provided including a brief explanation of the rationale for this determination.
    - For permittee responsible mitigation, this should include an explanation of how the mitigation project will provide the required compensation for unavoidable impacts to aquatic resources resulting from the permitted activity.
    - When using the TN SQT, the tool will calculate the **change** in Functional Feet from an existing to a proposed condition. This total is potentially equal to the amount of credits generated and available to offset proposed impacts. Projects will be required to demonstrate and sustain the proposed site conditions to maintain the projected credit generation. Deviations from the change in functional feet (or credits) generated will be subject to an increase or reduction based on the final monitored condition of the site. Projects using the TN SQT should achieve a functioning status in four stream parameters; floodplain connectivity, lateral migration, riparian vegetation, and bedform diversity. Deviations from these requirements may limit credit potential. Unique sites and urban projects may deviate from this requirement and will be reviewed on a case-by-case basis.

6. **Mitigation work plan:** detailed written specifications and work descriptions for the mitigation project, including: geographic boundaries of the project; construction methods, timing, and sequence; source(s) of water; methods for establishing the desired plant community; plans to control invasive plant species; proposed grading plan; soil management; and erosion control measures. For stream mitigation projects, the mitigation work plan may also include other relevant information, such as planform geometry, channel form (e.g., typical channel cross-sections), watershed size, design discharge, and riparian buffer plantings.

7. **Maintenance Plan:** a description and schedule of the maintenance requirements to ensure the continued viability of the resource once initial construction is completed.

8. **Performance standards**: ecologically-based standards that will be used to determine

whether the mitigation project is achieving its objectives. Details on performance standards can be found in the Performance Standards and Monitoring section of this document.

9. **Monitoring requirements**: a description of parameters monitored to determine whether the mitigation project is on track to meeting performance standards and if adaptive management is needed. A schedule for monitoring and reporting monitoring results will be included in the applicable permits. Spreadsheets and additional reporting requirements, including yearly tracking and monitoring success by parameter, is provided in the TN SQT.

10. **Long-term management plan**: a description of how the mitigation project will be managed after performance standards have been achieved to ensure the long-term sustainability of the resource, including long-term financing mechanisms and the party responsible for long-term management.

11. **Adaptive management plan**: a management strategy to address unforeseen changes in site conditions or other components of the mitigation project, including the party or parties responsible for implementing adaptive management measures.

12. **Financial assurances**: a description of financial assurances that will be provided and how they are sufficient to ensure a high level of confidence that the mitigation project will be successfully completed, in accordance with its performance standards.

Other information: additional information may be required as necessary to determine the appropriateness, feasibility, and practicability of the mitigation project.

6. Performance Standards and Monitoring Requirements

Performance standards are a part of every compensatory mitigation project from a small scale PRM site to a large scale stream mitigation bank. The standards will vary and are site dependent. The following section provides details concerning common performance standards for a variety of project types.

- **Quantitative assessment methods -** Projects that use the TN SQT or other quantitative assessment method to establish existing and proposed conditions for improvement will incorporate the metrics proposed for improvement as performance standards, along with pre-project existing conditions, to document the stream function improvements that will occur as a result of the proposed project. Typically, stream restoration and enhancement projects will focus on hydraulic and

geomorphic functional lift. If project sponsors propose restoration and/or enhancement activities that will improve physiochemical and/or biological functions and are seeking credits for the functional lift, monitoring of the parameters associated with these functions will be required. Alternative performance standards may be proposed by the permittee or third party sponsor. If alternative performance standards are proposed, the Division will review the proposed standards and determine their applicability.

- **Resource values and functional lift** - compensatory mitigation projects, at a minimum, should address and lift floodplain connectivity, riparian vegetation, , and lateral migration if these parameters are not functioning. Depending on site constraints and geology some projects may have to address bed form diversity. At the end of the project monitoring period, the above parameters should be functioning. Under rare circumstances, or in highly urban areas, this level of success may not be feasible. The Division may consider and approve projects in these situations if the practitioner can provide justification why limited success is acceptable, prove the site has reached the maximum functional potential possible, and can demonstrate that the site is stable and will not worsen conditions upstream or downstream.

- **As-built surveys** - Post-construction plans will be submitted for mitigation projects immediately following construction to document post-construction conditions. Projects with in-channel modifications or a high level of complexity and scale will provide as-built surveys that include the following: photo documentation at all cross sections and structures, a plan view survey, a longitudinal profile, and vegetation information (type, number and location of species planted). Also, documentation of compliance with any special permit condition relating to signage or deed restriction shall be submitted. These projects will also provide location data including the upstream and downstream coordinates of the project along with the buffer width. As-built reports (or red-lined drawings) will be submitted within 6 months of project construction. As-built surveys are not required for preservation.

- **Hydrology** - Unless otherwise approved, all compensatory mitigation watercourses must maintain or increase the functional value of their flow regime (including the duration, volume, and frequency of flows) by the end of the monitoring period. For any jurisdictional streams that have been replaced or relocated, a Tennessee Hydrologic Determination will be completed, at a minimum, in year one and three, between February and April 15th, during the monitoring period. The relocated streams must maintain status as a jurisdictional stream throughout the monitoring

period. Failure of the feature to rank as a jurisdictional stream will require corrective action and/or mitigation on the part of the permittee.

- **Visual Inspection -** A visual inspection will be conducted throughout the site including the stream banks during each monitoring event by traversing the entire mitigation site to identify and document areas of low stem density or poor plant vigor, exotic invasive species, beaver activity, herbivory, encroachments, indicators of livestock access, stream instability, or other areas of concern. A brief narrative of the results of the visual assessments will be included in the Annual Monitoring Report. Visual monitoring of the channel is intended to identify potential problems and allow them to be tracked and addressed, if necessary. Any areas of concern shall be annotated on a plan view of the site with GPS coordinates provided in decimal degrees, with photographs, and with the written narrative describing the features and issues of concern. Once a feature of concern has been identified, that same feature shall be reassessed on all subsequent visual assessments. Depending on the nature of the concern, field measurements may be warranted to track conditions as they improve, or decline over time. Photographs should be taken from the same location year to year to document the current condition of the area of concern. In general, repairs will be required when stream stability issues are identified that continue to worsen, pose a threat to other portions of the stream (headcuts, etc.), or are symptomatic of more serious issues with the design and/or construction of the project. If problems continue to persist, repairs may be discontinued and mitigation credits will be adjusted accordingly.

- **Riparian Zones** - Projects requiring riparian zones as part of the project will adhere to the following conditions to qualify as a component of a compensatory mitigation project:
  - Revegetation should be native, both woody (trees and shrubs) and herbaceous species. Stem densities and specific plant communities will be determined on a project by project basis
  - The resultant mitigation plant communities should contain less than 5% areal coverage of species identified on the Tennessee Invasive Exotic Plant List (www.tneppc.org.) throughout the monitoring period. No contiguous areas greater than 200 square feet should be vegetated with more than 50% relative areal coverage of invasive species at the end of the monitoring period. (Implementation of invasive species control measures should be conducted in accordance with the Adaptive Management Plan, and may be required on a case-by-case basis as determined by TDEC.
  - Minimum buffer widths are 50 feet from top of bank on either side of the stream. Variations in buffer width are accepted on a case-by-case basis. More

credit may be awarded for projects where buffer widths can exceed 100 feet in width.
- No species may comprise more than 30% of the total planted trees.
- Planted seedlings/trees must be guaranteed at a 75% survivorship for the duration of the required monitoring period.
- Where livestock are present, riparian buffers must be physically protected from livestock. A fence must be erected and maintained at all times where livestock is present and necessary managed stream crossings and livestock watering facilities should be installed. Livestock watering facilities must be installed outside waters.

- **Biology -** for large scale projects, including stream replacements and relocations, a site-specific biological and habitat assessment utilizing the approved TDEC SOP, or other scientifically defensible method as approved by the Division will be required. Proposed fill and replacement sites or full stream restoration sites that are documented to be currently meeting their designated use for Fish and Aquatic Life will have to maintain that status at the end of the monitoring period to ensure no appreciable permanent loss of resource values. If the system does not maintain or improve flow and classified uses at the end of the monitoring period, the site will not be considered successful. Corrective action or additional compensatory mitigation may be required.

- **Signage -** All permittee responsible mitigation should have signs, Carsonite or similar material, placed approximately every 100 feet, on either side of the stream buffer zone, clearly indicating that the area is a Protected Stream and that no mowing or other disturbance is permitted.

- **Perpetual Site Protection -** Because mitigation is only required for permanent impacts to aquatic resources, and as required by the ARAP rules, all mitigation shall include a permanent restriction on the use of the mitigation site in a form approved by the Division and/or the USACE, including but not be limited to a recorded notice of land use restrictions, conservation easement, or other equivalent mechanism. When a long-term management plan is required, it should include a description of the long-term management needs, annual cost estimates for these needs, and identify the funding mechanism that will be used to meet those needs. Templates and examples of acceptable legal instruments can be found in the appendix of this document, and on the TDEC Mitigation website.

7. Monitoring Requirements

Monitoring is required for all stream mitigation projects. The objective of monitoring is to document and quantify the success of a mitigation project. The success of such projects needs to be documented in annual monitoring reports for a period of three to seven years after completion of the project. Successful mitigation projects result in stream segments that are laterally and vertically stable, have healthy in-stream habitat, do not lower use support, flow, or water quality, and establish a healthy riparian buffer. The size and complexity of a mitigation project will determine the type and length of monitoring required. Specific monitoring requirements and length of the required monitoring will be detailed in the permit and/or mitigation plan.

7.1 Typical Monitoring Periods

Small scale projects, less than 500 linear feet, should not have a reporting period longer than three years unless otherwise deemed necessary by the Division.

Large scale projects, 500 linear feet or greater, should have a reporting period of at least five years and up to seven years, unless otherwise deemed necessary by the Division, for example, low risk enhancement projects that will not affect flow or biology may have a reduced reporting period. Site monitoring for all federal stream compensatory mitigation projects shall occur for a minimum of seven years post-construction, or other such time period as specified in federal rules.

7.2 Monitoring Report Requirements

<u>As-built Report</u>

a. Submitted within six months of channel improvements.
b. As-built surveys or other information demonstrating the work was completed for functional lift towards the proposed stream functional condition score.
c. Real property protection to be recorded on the project site. Evidence that these restrictions have been placed on the property and filed with the county should be submitted as soon as possible, but no later than with the as-built report. Projects that fail to secure real property protections, as indicated in this document, will be deemed unsuccessful and corrective action will be required.
d. A narrative description and photos accurately depicting the stream and riparian condition.
e. Information on any addition performance standards deemed necessary for the report to the Division.

<u>Annual Condition Assessments</u>

a. Detailed information about the pre- and post-project stream condition. This can be demonstrated through the use of TN SQT. Workbooks and manuals can be found on the TDEC website, through the USACE, and in the Appendix of this document.
b. Yearly monitoring of all performance standards, parameters and measurement methods reported and used to demonstrate existing and proposed stream conditions. It is important, when using the TN SQT or any other method, that pre, proposed, and post project condition assessment use the same parameters and measurement methods to determine success. Diverging from this requirement prevents the Division from a proper comparison of stream condition over time.
c. A narrative description and photos accurately depicting the stream and riparian condition.
d. Annual riparian vegetation surveys documenting the survivorship of planted riparian species for all mitigation projects that include a riparian restoration component.

Additional reporting requirements

a. Projects approved between July 1st and December 31st will have a monitoring report due by October 31st of the year following channel improvements.
b. Projects approved between January 1st and June 30th will have a monitoring report due by April 30th of the year following channel improvements.
c. Copies of the monitoring report should be submitted to the permit writer, the local TDEC Environmental Field Office, and the USACE (if applicable).

Monitoring reports are an effective means to demonstrate project success year after year in a consistent manner. Applicants may choose to use the TN SQT. This tool is designed to aid in that effort. Monitoring data worksheets, data summary tables, trackers for functional feet scores over time, and comparisons by reach of proposed conditions vs. as-builts, vs. monitored years are provided for users. This information can aid in determining if a stream project is reaching stated goals and objectives or identify areas of potential issues. These sheets can be provided with monitoring reports as proof of stream condition and confirmation of functional lift. Please note, stream compensatory mitigation projects will often have additional success criteria or other reporting requirements to submit as part of a monitoring report. Information on additional monitoring requirements can be found on the TDEC and USACE websites. Monitoring data worksheets are not used for debit projects unless there is a large-scale stream relocation associated with it. In these instances, the stream fill and replacement (relocation) is considered an independent, permittee responsible, compensatory mitigation project.

8. Tools to Determine Functional Loss and Lift

The Tennessee Stream Quantification Tool (TN SQT) and associated documents were developed and can be used to evaluate the functional change between an existing and proposed stream condition. One of the goals of these tools are to produce objective, verifiable and repeatable results by consolidating well-defined procedures for objective and quantitative measures of defined stream functions.

The Tennessee Debit Tool (TN Debit Tool) is a methodology developed to calculate the functional loss (debit) of permitted impacts to stream ecosystems. The methodology compliments the TN Stream Quantification Tool (TN SQT), which is used to calculate the functional lift (or loss) resulting from various types of stream restoration and stream relocation projects.

The TN SQT was developed to provide an objective, consistent, and transparent method for quantifying the functional lift (or loss) associated with stream mitigation and restoration projects by scoring sites before and after the implementation of restoration activities. Because the TN SQT scores an existing condition and a proposed or post project condition, it can be used to calculate functional lift and loss if both conditions are monitored. The TN Debit Tool operates with the same basic principles. However, the primary challenge with measuring the functional loss caused by a permitted stream impact is long term monitoring of a permitted stream impact condition over time. Unlike compensatory mitigation projects, the Division will not require permittees to monitor a site before and after the impact to determine the change in stream function. Therefore, categorical tiers for the amount of functional loss each impact type will typically have on a stream were developed based on project design documents, modeling, literature reviews, previous post-project evaluations, and best professional judgment.

8.1 Tennessee Debit Tool (TN Debit Tool)

The TN Debit Tool contains an array of spreadsheets that are used to assist a permit applicant determine the debits for their proposed impact activities. Contained within the TN Debit Tool is a Debit Calculator, which is used to estimate the proposed stream condition resulting from an impact activity (this condition is called the Proposed Condition). In addition the tool contains Existing Condition worksheets (similar to SQT worksheets) if an applicant chooses to individually measure the existing site condition when determining functional loss. The Debit Calculator uses an existing condition score coupled with an Impact Factor (based on impact type) and a modeled proposed condition score to determine the functional-foot loss and resulting debits. These three variables, existing condition score, Impact Factor, and proposed condition score, along with the length of the impact will determine the amount of base debits required to compensate for aquatic resource losses.

The Division will base debits, or resource value loss due to stream function loss, on the amount of functional foot loss projected to occur due to proposed activities. This will require applicants to either: (1). determine the existing condition of their site with the Rapid Assessment Method in the TN SQT, (2). Estimate the site existing condition by measuring specific metrics of the TN SQT while unmeasured metrics remain at a standard (functioning) value, or (3). Use a standard existing condition score. These options for establishing an existing condition score will allow an applicant flexibility to best fit the needs of a particular project.

Existing condition scores, functional-foot calculations, and proposed condition scores in the debit tool follow the same form of quantitative evaluation of functional change as functional-lift determinations in the TN SQT. This provides a direct comparison of functional loss and lift. This process helps ensure that the credits provided by mitigation projects adequately offset functional loss (debits) caused by permitted impacts.

8.1.1 Functional Loss Calculations

Functional loss and lift are measured in units of functional feet (FF); where the stream length and the stream reach condition score (CS) multiplied together equal stream functional feet.

$$Existing\ Stream\ FF = Existing\ CS * Existing\ Stream\ Length \quad (1)$$

$$Proposed\ Stream\ FF = Proposed\ CS * Proposed\ Stream\ Length \quad (2)$$

$$\Delta FF = Proposed\ FF - Existing\ FF \quad (3)$$

Functional loss is generated when the proposed condition score is lower than the existing condition score, yielding a negative value (a debit).

8.1.2 Determining Existing Condition Score

Three options are provided for determining Existing Condition Score using the TN Debit Tool (Table 2).

Table 2: Options for determining Existing Condition Score with the TN Debit Tool. Applicants may choose options 1, 2, or 3 to determine the stream reach existing condition score.

TN Debit Tool Option	Existing Condition Score (ECS)	Proposed Condition Score (PCS)	Recommended Use
1	Applicants complete an **existing condition assessment** of all the required parameters and metrics.	Use Debit Calculator	Permit applicants who have the staff and expertise to perform the assessments. Typically used for larger impacts.

2	Applicants **estimate** the **existing condition** score by assessing some, but not all, of the required metrics included in the assessment.	Use Debit Calculator	Permit applicants who only want to assess a subset of the required parameters.
3	Applicants use a **standard existing condition** score (1.0 for ETWs or ONRWs and 0.8 for other waters as a default value)	Use Debit Calculator	Permit applicants who do not want to perform an assessment.

Option 1 requires the permit applicant to establish the **existing condition** of the proposed impact reach and the applicant will quantitatively assess **all** required parameters in an existing condition assessment within the Existing Condition spreadsheet of the Debit Tool using the Rapid Data Collection Methods (TDEC, 2018c) or other agency-approved, scientifically defensible method. Once the rapid assessment is completed and the data are processed, the user will enter the data into the Existing Condition worksheet (tab). The Existing Condition worksheet will calculate the overall existing condition score for the reach.

Option 2 is for permit applicants that do not want to assess **all** of the required parameters shown on the Existing Condition tab of the TN Debit Tool. The applicant will **estimate the existing condition** by selecting the parameters and measurement methods they choose to assess. The applicant will then follow the assessment methodology described in the Rapid Data Collection Methods or use an alternative, agency approved and scientifically defensible method. The applicant then enters the field values into the TN Debit Tool, in the same as Option 1. For all required parameters where measurement methods are not measured, the values for those measurement methods will be a default score of 0.8. Because the metrics are not being assessed, the tool assumes these metrics are functioning. This approach acknowledges it is possible some measurement methods can and often score high where other values may be functioning at a lower capacity. Once the rapid assessment is completed and the data are processed, the user will enter the data into the Existing Condition worksheet (tab). The spreadsheet will calculate the overall existing condition score. The Existing Conditions worksheet will calculate the overall existing condition score for the reach. Please note if the stream is an Exceptional TN Waters (ETW) or Outstanding National Resource Waters (ONRW), the ECS for unassessed parameters is entered as 1.0 on the Debit Calculator worksheet.

Option 3 allows permit applicants to use a standard existing condition score for the stream reach. In most cases, the Division will apply a **standard existing condition** score of 0.80. The 0.8 value assumes that the existing stream is a functioning stream. The exception to this is for ONRWs, or waters designated as ETWs due to exceptional ecology. In these highest quality waters the Division will apply a standard condition score of 1.0.

The ARAP rules require that the determination of existing conditions shall ensure at least minimal protection for all streams notwithstanding prior degradation. **Therefore, for activities that propose impacts to highly degraded streams, the existing condition score will not be assessed as any less than 0.40. This lower limit condition score does not apply to degraded streams proposed for compensatory mitigation and aimed at providing functional lift.** In addition, stream relocations may have an existing condition score lower than 0.4. This lower limit for impacted streams recognizes that even degraded streams have values outside of the functional quantification evaluation that must be offset if lost. Resource values are the benefits provided by a water resource that help maintain the classified uses established under Tennessee's water quality standards regulations. The TN Debit Tool and the TN Stream Quantification Tool measure functions of streams such as the physical, chemical and biological processes that are primarily associated with ecosystem functions. However, a stream's current condition may provide little to no ecosystem function while still providing other resource values that help maintain additional classified uses such as irrigation, recreation, wildlife and livestock watering. In this regard, a permanent loss of stream length or significant loss of resource values must be balanced by compensatory mitigation to ensure an overall no net loss of resource values for Tennesseans.

8.1.3 Determine Existing and Proposed Stream Lengths

Existing Stream Length. Calculate the length of the stream that will be directly impacted by the permitted activity. Stream length should be measured along the centerline of the channel. For example, measuring the channel length of the stream before a culvert is installed.

Proposed Stream Length. Calculate the length of stream channel after the impact has occurred. For pipes, the proposed length is the length of the pipe at a minimum. If the stream will be straightened by the permitted activity, the proposed length will be less than the existing length. Proposed stream lengths should not be longer than the impact length. Streams cannot be lengthened by pipes. Therefore, a 300 foot pipe along 275 feet of stream will only impact 275 linear feet of stream. The debit calculator will highlight the cell if the existing stream length is shorter than the proposed stream length.

It may be common for an impact activity to shorten a stream length. For example, this situation may occur when encapsulation and channel straightening occurs at a meandering

stream channel. This stream length loss has a negative impact on the function of a system and will be accounted for in debit totals.

In some situations, an impact activity may actually lengthen stream footage. Within the TN Debit Tool, it is not appropriate for stream lengths to be increased via impacts to the resource. The proposed stream length should never exceed the existing stream length in the TN Debit Tool. For example, if a project encapsulates 100 feet of stream with a 110 foot pipe, the total existing stream length would be 100 feet, and the total proposed stream length would also be 100 feet within the TN Debit Tool. As another example, if a 100 foot pipe is removed and replaced with 60 feet of open channel and 50 feet of new pipe, the total existing stream length would be 100 feet, and the total proposed stream length would be 100 feet within the TN Debit Tool. This ensures that stream mitigation credit is not awarded for activities that typically do not qualify for mitigation credits.

8.1.4 Determining an Impact Severity Tier

Determination of an impact severity tier is needed to predict a Proposed Condition Score. Applicants will be required to select an impact severity tier based on the proposed activity. The tier is a categorical determination of the amount of adverse impact an activity will have to stream functions, ranging from no loss to total loss of stream function due to an impact. Impact Severity Tier categories were developed by evaluating the affects a particular activity would have on stream habitat conditions and the likely amount of loss that would result from an impact regardless of the stream conditions existing prior to the impact. These activities were then grouped by activities with similar functional loss.

Impact Severity Tiers range from 0 – 6 where 0 represents no appreciable permanent loss of stream functions and therefore would not require compensatory mitigation, while a 6 would result in significant loss requiring compensatory mitigation.

Some impact project proposals may have impacts with activities that fall into different tiers depending on the magnitude of the impact. For example, a small bank stabilization project may be a Tier 1 impact if only riparian vegetation and/or lateral migration parameters are impacted. However, if the project is large enough to impact physicochemical and/or biological functions, then the project would be at least a Tier 3 impact.

Applicants should refer to section 4 for detailed descriptions of impact types and the corresponding impact severity tiers.

Once the Impact Severity Tier has been selected, the Proposed Condition Score and Proposed Functional Feet will automatically calculate in the Debit Calculator. The absolute value of the change in Functional Feet total is equal to the debits required to offset the proposed impacts. Multiple stream impacts can be reported on a single spreadsheet. The

spreadsheet will automatically total the debit sum. In addition, an applicant can assess the existing condition score of multiple stream reaches proposed for impact.

This process does not apply to stream relocations where the replacement stream is being proposed as on-site permittee-responsible compensatory mitigation to offset the stream fill. Where onsite mitigation credit is proposed for stream relocations, applicants should complete the Tennessee Stream Quantification Tool with the existing and proposed condition score based on the end state of the channel to be filled and rebuilt. TDEC may require More information about stream relocations can be found in the Stream Fill and Replacement section of this guidance.

Please note that USACE may require compensatory mitigation for unavoidable impacts to ensure that an activity requiring a section 404 permit complies with the Section 404(b)(1) Guidelines. Compensatory mitigation may also be required to ensure that an activity requiring authorization under section 404 of the *Clean Water Act* and/or sections 9 or 10 of the *Rivers and Harbors Act of 1899* is not contrary to the public interest. Additionally, for activities authorized by a general permit, compensatory mitigation may be required to ensure the impacts are no more than minimal both individually and cumulatively. Thresholds, limits, regulatory authority limits, and other factors described above may result in different USACE mitigation requirements.

Applicants may choose to manually calculate the debits for their project. The following steps outline how these equations are performed.

8.1.5: Manually Calculating the Proposed Condition Score

Once the Impact Severity Tier has been selected the following equations can be used to determine the Proposed Condition score.

Table 3: PCS Equations.

Impact Severity Tier	**PCS Equation**	**Percent Loss**
0	PCS = 1.0 * ECS	0%
1	PCS = 0.89 * ECS	11%
2	PCS = 0.80 * ECS	20%
3	PCS = 0.52 * ECS	48%
4	PCS = 0.32 * ECS	68%

5	PCS = 0.12 * ECS	88%
6	PCS = 0.00 * ECS	100%

Step 1: Manually calculating the Existing Functional Foot (EFF) using the following equation.

EFF = Existing Condition Score X Existing Stream Length.

Note: The Existing Condition Score cannot be lower than 0.40.

Step 2: Manually calculating the Proposed Condition Score (PCS) using the following equation.

Proposed Condition Score = Impact Severity Tier X Existing Condition Score.

Step 3: Manually calculating the Proposed Functional Foot (PFF) using the following equation.

PFF = Proposed Condition Score X Proposed Stream Length.

Step 4: Manually calculate functional loss (debit) using the following equation.

Debits = PFF – EFF.

The absolute value of the change in Functional Feet total is equal to the debits required to offset the proposed impacts.

8.2 Tennessee Stream Quantification Tool

TDEC, along with agency partners including the USACE, EPA, NRCS, TWRA, TVA, and the USFWS have worked with consultants, academics, and statewide stakeholders to develop and regionalize a tool for site evaluation and determination of compensatory mitigation credits (functional feet). TDEC and the USACE have determined that the TN SQT is the preferred quantitative assessment method to calculate credits (functional feet).

The primary purpose of the TN SQT and associated documents is to evaluate the functional change between an existing and proposed stream condition. The agencies intend to use the TN SQT as a component of the project review process and to award credits through determination of functional lift. The TN SQT may also be used as a mechanism to determine the suitability of a project proposal, project goals, objectives and overall project

success over time. This quantitative assessment method produces defensible, repeatable, and predictable results. Detailed information concerning how to collect the required data, input the information into the tool, access to the tool itself, and resources for monitoring project success are provided in the appendix of this document and can be downloaded from the TDEC Compensatory Mitigation webpage. While the TN SQT is the quantifiable assessment method the state prefers to determine credits, it is not the only tool for determining the amount of credit a project may generate.

The TN SQT is based on the original Stream Quantification Tool (SQT) developed for North Carolina by Stream Mechanics, LLC. This tool has been regionalized for use in Tennessee. The benefits of using the SQT for evaluating stream restoration include:

1. Establishes a calculator to determine the numerical differences between an existing (degraded) stream condition and the proposed (restored or enhanced) stream condition. This numerical difference is known as functional lift or uplift. It is part of the Tennessee stream credit determination method as defined by the 2008 Federal Mitigation Rule.[3]
2. Provide a method to review how restoration activities change or improve stream functions and resource values. This is done through focusing on parameters and measurement methods that directly relate to stream functions and can easily be assessed by stream restoration practitioners and regulators.
3. Links restoration goals to restoration potential. Encourages assessments and monitoring that matches the restoration potential.
4. Incentivizes high-quality stream mitigation by calculating functional lift associated with physicochemical and biological improvements.

8.2.1 Uses for the TN SQT

The TN SQT **can assist** in mitigation site selection, determining project specific function-based goals and objectives, understanding the potential for functional lift at a site, determining success criteria, and developing a monitoring plan. However, the TN SQT is **not** a prescriptive design tool. The primary purpose of the TN SQT (and Debit Tool) is to calculate functional loss and lift associated with stream impact and restoration projects. This tool may also be useful when developing Total Maximum Daily Load (TMDL) models or organizing volunteer restoration activities. The potential uses of the TN SQT are described below:

1. Restoration Potential – The tool can assist in determining the level of restoration a project can achieve through evaluation of site constraints, watershed stressors, and selection of reach-based parameters for functional lift..

[3] Compensatory Mitigation for Losses of Aquatic Resources, 33 C.F.R. § 332.

2. Watershed Stressors – The Watershed Assessment form can be used to determine factors that limit the potential stream functional lift that can be achieved by a restoration project, including for the purpose of compensatory mitigation.
3. Site Selection – The tool can help determine if a site can benefit from a restoration project and if the site has significant limitations that would inhibit a project from being successful. Site selection is critical to determine whether a proposed stream restoration project can achieve enough functional lift to meet project goals and objectives. Rapid field assessment methods coupled with the Watershed Assessment form can be used to assess and select a site at the development phase of a project.
4. Function-Based Goals and Objectives – The tool can be used to describe project goals that match the restoration potential of a site. Quantifiable objectives and performance criteria can be developed that link restoration activities to measurable changes in stream functional categories and function-based parameters assessed by the tool.
5. Functional Lift – The tool can quantify functional lift from a proposed or active stream restoration project. Lift is estimated during the proposal, design or mitigation plan phase and is calculated for each post-construction monitoring event.
6. Functional Loss – Functional loss can be determined with the TN Debit Tool, a separate workbook from the TN SQT. The debit tool workbook uses the same logic as the SQT but predicts proposed condition scores based on existing conditions and modeled functional loss based on the effect of typical impact activities.
7. Compensatory Mitigation – The tool can be applied to on- or off-site compensatory mitigation projects. These include in-lieu fee mitigation, permittee responsible mitigation, and mitigation banks. The tool can help determine if the proposed mitigation activities will provide sufficient functional lift to offset unavoidable adverse impacts to streams. It can also be used to develop monitoring plans and gauge a project's success against established reference standards.
8. Stormwater Best Management Practices (BMPs) in Conjunction with Stream Restoration The TN SQT was developed with careful consideration to how stream restoration projects using BMPs to treat adjacent runoff could achieve lift. However, the TN SQT should not be used for projects that only install stormwater BMPs and do not include stream restoration (in-channel) work.

8.2.2 Credits and the TN SQT

In the TN SQT, credits are calculated in functional feet and are determined by establishing the existing site conditions and the proposed site conditions along the stream. The TN SQT worksheet automatically calculates Functional Feet (FF) once these conditions are input into the spreadsheet. A functional foot is produced by multiplying a condition score by the stream length. Since the condition score must be 1.00 or less, the functional foot score is always less than or equal to the actual stream length.

Example: A stream restoration project proposes to restore a channel to a more functioning condition. The current stream is on a cattle farm, and is highly impacted and disconnected from the floodplain. The existing condition score, on 3,000 linear feet of stream, may be a 0.21. The straightened channel has no riparian buffer, low water quality and biology, the banks are eroding, and impaired for siltation. The proposal will reduce erosion, improve the buffer, create in-channel habitat, and reconnect the channel to a floodplain. The proposed condition score will be a 0.53, and the newly meandering channel will be 3,500 feet long. The credits generated will be 1,225 functional feet.

- 3,000 linear feet of stream (x) existing condition score of 0.21 = 630 existing functional feet
- 3,500 linear feet of restored stream (x) proposed condition score of 0.53 = 1,855 proposed functional feet
- Credits = proposed functional feet (1,855) – existing functional feet (810)
- Total credits for project = 1,225 functional feet

This scenario does not take in to account any biological or water quality lift. If the biology, pre-project, had a Total Macroinvertebrate Index (TMI) score of 22 and the practitioner monitored biology for potential lift, and raised the TMI to 30, this would raise the overall proposed condition score from 0.28 to 0.63. Using the same scenario, the project would yield more credits.

- 3000 linear feet of stream (x) existing condition score of 0.28 = 840 existing functional feet
- 3,500 linear feet of restored stream (x) proposed condition score of 0.63 = 2,205 proposed functional feet
- Credits = proposed functional feet (2,205) – existing functional feet (840) = 1,365 functional feet.
- Total credits for project = 1,365 functional feet.
- This scenario resulted in 140 additional credits for increasing biology to a functioning at-risk condition, and nearly fully supporting condition.

These examples are provided as TN SQT workbooks on the Division's Compensatory Mitigation webpage.

Although a project may propose functional lift, the project will not be deemed to have generated functional lift until it is demonstrated through monitoring. Actual credit generation may vary through time based on-site performance. Permittee responsible mitigation projects may be required to perform corrective action or additional mitigation, if at the end of the monitoring period, the stream condition does not adequately offset the resource value lost. This may occur if the projected lift as originally proposed was never fully achieved, therefore reducing the amount of actual functional feet of stream generated. Bank and ILF projects will be awarded credits based on performance and

success determined by the USACE in conjunction with the IRT. At a minimum, any channel proposing to produce credits to offset permanent impacts to water resources should be functioning in four primary stream parameters; floodplain connectivity, riparian vegetation, lateral migration, and bedform diversity. This includes stream relocation projects. Urban projects and unique sites that deviate from this list will be evaluated on case by case basis.

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Appendix A - Definitions

Appreciable permanent loss of resource values - a reduction in resource values that is expected to continue without fundamental change and is large enough to be observed and measured as resulting in more than minimal adverse effects.

Bankfull- a water stage or elevation on a channel bank that corresponds to a point in the channel at which water begins to spill out on a flood plain. This also corresponds to a discharge (typically 1.5 yr), at which channel maintenance is most effective, that is, the discharge at which moving sediment, forming or removing bars, forming or changing bends and meanders, and generally doing work that results in the average geomorphic characteristics of channels.

Bankfull Flow - channel forming flow; flow that is most effective at transporting sediment, forming or removing bars, forming or changing bends and meanders, working towards average morphological characteristics of channels (Dunne and Leopold 1978). Bankfull flow is the point at which flooding may begin to escape the stream channel and enter the floodplain. Bankfull flows occur with sufficient regularity and force to establish and maintain a stream's morphology.

Bioengineering Techniques - techniques that combines structural, biological, and ecological concepts to repair and reconstruct stable vegetated stream channels that mimic natural habitat in both composition and structure for erosion prevention and sediment control. It is intended to compliment a natural stream's ability to dissipate energy and provide a stable and productive habitat. It includes methods that facilitate the stream bank recovery process by retaining or re-establishing native plant communities and re- establishing naturally stable bank morphology.

Buffer Zones or Riparian Area - strip of dense undisturbed perennial, native vegetation, either original or reestablished, that borders streams and rivers, ponds, lakes, wetlands, and seeps. This vegetated area along aquatic resources provides canopy, bank stabilization, pollution buffering, and wildlife habitat.

Channelization - the alteration of stream channels including but not limited to straightening, deepening, widening, or enlarging.

Channel Morphology - The study of the channel pattern and the channel geometry at several points along a river channel, including the network of tributaries within the drainage basin.

Common Plan of Development – A Common Plan of Development or sale is broadly defined as any announcement or documentation (including a sign, public notice or hearing, sales pitch, advertisement, drawing, permit application, zoning request, computer design) or physical demarcation (including boundary signs, lot stakes, surveyor markings) indicating construction activities may occur on a specific plot. A common plan of development or sale identifies a situation in which multiple areas of disturbance are occurring on contiguous areas. This applies because the activities may take place at different times, on different schedules, by different operators.

Examples include:

1) Phased projects with multiple filings or lots, even if the separate phases or filings/lots will be constructed under separate contract or by separate owners (e.g., subdivision). For example, if a developer buys a 20-acre lot and builds roads, installs pipes, and runs electricity with the intention of constructing homes or selling lots to other builders (per the site plan), this would be considered a common plan of development or sale.
2) A development plan that is phased over multiple years, but is still under a consistent plan for long-term development (e.g., phased condo development).
3) Neighboring lots being built according to a plat application showing an intention to build homes (or otherwise disturb more than an acre).
4) Projects in a contiguous area that may be unrelated but still under the same contract, such as construction of a building extension and a new parking lot at the same facility.

Compensatory Mitigation - refers to the restoration (re-establishment or rehabilitation), establishment (creation), enhancement, and/or in certain circumstances preservation of streams for the purpose of offsetting unavoidable adverse impacts that remain after all appropriate and practicable avoidance and minimization has been achieved.

Credit - a unit of measure (e.g., a functional or areal measure or other suitable metric) representing the accrual or attainment of aquatic functions at a compensatory mitigation site. The measure of aquatic functions is based on the resources restored, established, enhanced, or preserved.

Cumulative Impacts - the impact on resource values which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions.

Dam – a barrier built across a watercourse to impound or divert water. A barrier that obstructs, directs, retards, collects, confines, or stores the flow of water. A structure built to hold back a flow of water.

De minimis Degradation of Habitat - Habitat alterations authorized by an Aquatic Resource Alteration Permit (ARAP) are de minimis if the Division finds that the impacts, individually and cumulatively, are offset by impact minimization and/or in-system mitigation, provided however, in ONRWs the mitigation must occur within the ONRW.

Degradation - The alteration of the properties of waters by the addition of pollutants, withdrawal of water, or removal of habitat, except those alterations of a short duration.

Dynamic Equilibrium - a condition in which a stream and its floodplain maintain their natural dimension pattern and profile over time, neither aggrading nor degrading (eroding).

Ecoregion - An area defined by similarity of climate, landform, soil, potential natural vegetation, hydrology, or other ecologically relevant variables.

Enhancement - the improvement to one or more of the structural or functional attributes of a stream.

Establishment (creation) - the manipulation of the physical, chemical, or biological characteristics present to develop an aquatic resource that did not previously exist at an upland site. Establishment results in the gain in aquatic resource area and functions.

Existing Conditions - the biological, chemical, bacteriological, radiological, and physical condition of a stream or wetland.

Existing Condition Score - the biological, chemical, bacteriological, radiological, and physical conditions of a stream or wetland at the time the project is proposed as measured by a quantitative assessment tool or other defensible scientific method as approved or determined by the Division.

Fill - material placed in waters of the U.S. where the material has the effect of either replacing any portion of a water of the U.S. with dry land or changing the bottom elevation of any portion of water

Fluvial Geomorphology- the study of landforms associated with river or stream channels and the processes that form them.

Functional Feet – The product of a condition score and stream length.

- Existing FF = Existing Functional Feet. Calculated by measuring the existing stream length and multiplying it by the existing condition score.
- Proposed FF = Proposed Functional Feet. Calculated by measuring the proposed stream length and multiplying it by the proposed condition score.

Functions - the physical, chemical, and biological processes that occur in ecosystems.

General Permit - a permit issued under the Tennessee Water Quality Control Act of 1977 and Rule Chapter 0400-40-07 authorizing an alteration to state waters within the state for a specified category of activities that are substantially similar in nature.

Hydrologic determination - The decision based on site specific information of whether a particular watercourse is a stream or a wet weather conveyance. It is synonymous with "stream determination" and "wet weather conveyance determination."

Hydrologic Unit Code (HUC) - the hydrologic unit code assigned by the United States Geological Survey.

Impact Factor a multiplier used to predict the amount of functional loss an activity will have on a stream with a given existing condition. The factors were developed through evaluation and modeling of functional loss based on impact types on a range of stream conditions.

Impact Severity Tier- a categorical determination of the amount of adverse impact to stream functions, ranging from no loss to total loss from a proposed activity

Impoundment - a reservoir formed by confining flowing water upstream of a dam or other barrier.

Individual Permit - a permit issued by the Division to a specified person to conduct specified activities at a specified location. This type of permit does not authorize an activity by a class of persons or the public in general.

In-Lieu Fee Program- In-lieu fee programs involve the restoration, establishment, enhancement, and/or preservation of aquatic resources through funds paid to a governmental or non-profit natural resources management entity to satisfy compensatory mitigation requirements for 404/401 permits. Similar to a mitigation bank, an ILF program sells compensatory mitigation credits to permittees whose obligation to provide compensatory mitigation is then transferred to the in-lieu program sponsor.

In-stream Habitat- natural structures or structures constructed using natural materials within stream channels that provide habitat for aquatic life.

In-system Mitigation - mitigation for habitat alterations sufficient to result in no overall net loss of resource values, if provided in the same eight-digit hydrologic unit code as the alteration, or in another area proximate to the alteration as approved by the Division to offset the loss of resource values in the area. In system mitigation may not occur within a different major river drainage basin as the alteration (i.e., Tennessee River, Cumberland River, Mississippi River).

Interagency Review Team (IRT) - an interagency group of federal, tribal, state, and/or local regulatory and resource agency representatives that reviews documentation for, and advises the district engineer (DE) on, the establishment and management of a mitigation bank or an in-lieu fee (ILF) program.

Mitigation - the restoration, creation, enhancement, and/or preservation of aquatic resources to compensate for unavoidable impacts as provided by paragraph (7) of Rule 0400-40-07-.04.

Mitigation Bank- A mitigation bank is a site, or suite of sites, where resources such as streams are restored, established, enhanced, and/or preserved for the purpose of providing compensatory mitigation for impacts authorized by 404/401 permits. In general, a mitigation bank sells compensatory mitigation credits to permittees whose obligation to provide compensatory mitigation is then transferred to the mitigation bank sponsor.

Mitigation Banking Instrument- means the legal document for the establishment, operation, and use of a mitigation bank.

Natural Channel Design - a methodology that addresses the entire stream system based on principles of fluvial geomorphology to achieve a channel configuration that is in dynamic equilibrium, neither aggrading nor degrading.

Performance Standards - observable or measurable physical (including hydrological), chemical and/or biological attributes that are used to determine if a compensatory mitigation project meets its objectives.

Permittee Responsible Mitigation- Compensatory mitigation provided by the permittee subject to the terms of an individual permit. The permittee retains responsibility for the implementation and success of the mitigation project.

Preservation - the removal of a threat to, or preventing the decline of, aquatic resources by an action in or near those aquatic resources. This term includes activities commonly associated with the protection and maintenance of aquatic resources through the implementation of appropriate legal and physical mechanisms. Preservation does not result in a gain of aquatic resource area or functions.

Re-establishment - the manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former aquatic resource. Re- establishment results in rebuilding a former aquatic resource and results in a gain in aquatic resource area and functions.

Reference Conditions – streams with functioning conditions based on ecomorphological reference sites that represent a least disturbed, stable, functioning state.

Reference Reach - A stable stream reach generally located in the same physiographic ecoregion, climatic region, and valley type as the project that serves as the blueprint for the dimension, pattern, and profile of the channel to be restored.

Regional Curve – a regression of the relations among drainage area, selected cross-sectional parameters, and streamflow.

Rehabilitation - the manipulation of the physical, chemical, or biological characteristics of a site with the goal of repairing natural/historic function to a degraded aquatic resource. Rehabilitation results in a gain in aquatic resource function, but does not result in a gain in aquatic resource area.

Resource Values - are the physical, chemical, and biological properties of the water resource that help maintain classified uses. These properties may include, but are not limited to, the ability of the water resource to:

(a) filter, settle and/or eliminate pollutants;
(b) prevent the entry of pollutants into downstream waters;
(c) assist in flood prevention;
(d) provide habitat for fish, aquatic life, and wildlife;
(e) provide drinking water for wildlife and livestock;
(f) provide and support recreational and navigational uses; and
(g) provide both safe quality and adequate quantity of water for domestic water supply and other applicable classified uses.

Restoration- the manipulation of the physical, chemical, or biological characteristics of a significantly degraded, disturbed, or totally altered stream, including adjacent riparian zone

and flood-prone area, to a natural stable condition based on reference conditions with the goal of returning the natural/historic functions to the aquatic resource. Restoration will typically include rebuilding the appropriate channel pattern, profile, dimensions, and riparian zone to the extent that watershed conditions will allow.

Standard Condition Score - The overall condition score reflective of a standard, functioning stream, or a standard functioning score for any specific measurement method. Using the TN SQT, which normalizes all condition scores to a range of 0 – 1.0, a score of 0.8 is considered functioning standard condition score.

Stream Function - The physical, chemical, and biological processes that occur in (stream) ecosystems. (*see* 33 CFR 332.2)

Waters With Unavailable Parameters - streams in which water quality is at, or fails to meet, the levels specific in water quality criteria in Rule 0400-40-03-.03, even if caused by natural conditions.

Watershed - a land area that drains to a common waterway, such as a stream, lake, estuary, wetland, or ultimately the ocean.

Watershed plan - a plan developed by federal, tribal, state, and/or local government agencies in consultation with relevant stakeholders, for the specific goal of aquatic resource restoration, establishment, enhancement, and preservation. A watershed plan addresses aquatic resource conditions in the watershed, multiple stakeholder interests, and land uses, and may also identify priority sites for aquatic resource restoration and protection.

Appendix B – Tennessee Debit Tool

Tennessee Debit Tool- Microsoft Excel workbook used to calculate debits.

Appendix C - Photo Examples of Impact Severity Tiers

Photographic examples of Impact Types by Severity Tier may be found on the Division's **Compensatory Mitigation** website.

Appendix D – Tennessee Stream Quantification Tool Resources

- **Tennessee Stream Quantification Tool –** Microsoft Excel workbook
- **Tennessee Rapid Methods manual** – Outline of the rapid assessment method and data collection sheets for the TN SQT and the TN Debit Tool. The TN Debit Tool only requires the use of this manual and does not require detailed data collection and analysis

- **Tennessee Data Collection and Analysis manual** - Describes how to collect data and calculate input for the TN SQT in detailed manner
- **Tennessee Stream Quantification User manual** **-** Describes the TN SQT and all calculations performed by the workbook

Appendix E - List of Tools and Resources

- **Tennessee Stream Quantification Tool List of Metrics** **-** A comprehensive list of Function-Based Parameters with measurement methods, reference standards, stratification methods, and references.
- **Tennessee Ecoregionally Based Regional Curves** - reference information and tools stakeholders can use to evaluate streams proposed for impact and/or mitigation.
- **Permittee Responsible Mitigation Checklist** -a joint US Army Corps and TDEC document developed to cover all information an applicant needs to develop a mitigation plan for large scale compensatory mitigation projects.
- **Tennessee Stream Quantification Tool and Debit Tool Examples** - Populated versions of the TN SQT and Debit Tool provided as examples

Appendix F – Real Property Protection Document Templates

Real Property Protection -List of documents that cover property type, ownership, and minimum requirements for perpetual protection or real property

Real property protection is often required as part of a compensatory mitigation project. This includes on-site, in-system mitigation and stream relocations. TDEC and the USACE attorneys have developed a list of approved templates applicants can use for compensatory mitigation projects. The type of property protection, easement holders, and restrictions should be finalized in the mitigation plan. The following list of templates can be found on the **TDEC Compensatory Mitigation** website or through the USACE.

- Property Disclosure for State-Owned Properties
- Conservation Easement Deed
- Property Assessment and Warranty – provides summary and explanation of each recorded or unrecorded lien, encumbrance, or interest in the protected property.
- Land Use Restriction
    - State-owned property
    - Private property

Appendix G – Alternate Methodologies for Determining Compensatory Mitigation Credits and Debits

While these Tennessee Stream Mitigation Guidelines provide information for the preferred methodologies for determining compensatory mitigation credits and debits that will satisfy the State requirements found in Statute and Rule, alternate methodologies may be proposed and utilized upon approval from the Division. Any such proposed alternative will be expected to satisfy the following basic criteria:

- Ensure at least minimal protection for all streams notwithstanding prior degradation
- Utilize an appropriate quantitative assessment or other defensible scientific method
- Demonstrate a sufficient increase in resource values to compensate for permitted impacts
- Result in no overall net loss of resource values from existing conditions
- Accurately evaluate both resource loss and resource lift using similar methodologies
- Is based on valid reference data, regionalized to stream type and ecologic setting where appropriate
- Accurately and precisely assess stream resource value and condition, allowing evaluation the resource function's degree of departure from reference
- Provides repeatable and consistent assessment results
- Assesses a sufficient range of conditions or metrics to evaluate overall resource function
- Allows for a consistent and accurate prediction of post-impact resource loss
- Has transparency sufficient to be subject to external review if needed

REVISION HISTORY TABLE

Revision Number	Date	Brief Summary of Change
0	05/20/19	Initial issuance of Guidance