Evaluating Avoidance, Minimization, Stream Restoration Projects and Compensatory Mitigation Plans

3.1 Introduction

When evaluating a permit under Section 404, the district engineer must conclude that the proposed discharge complies with the requirement (40 CFR part 230) that the permit applicant has taken all appropriate and practicable steps to avoid and minimize adverse impacts to waters of the United States. Similarly, projects whose purpose is stream restoration or re-habilitation must also demonstrate their end result will heighten, intensify, or improve specific stream function(s) or return natural/historic functions. Through several development phases of the Stream SOP, the Galveston District has developed a process for demonstrating how proposed impacts to stream functions have been avoided or minimized. In addition, the Galveston District has established a qualitative method for evaluating a stream's condition, based on its stability, to track if the proposed project will result in a net gain in aquatic resource function.

3.2 Avoidance and Minimization

Stream stability is morphologically defined as the ability of the stream to maintain, overtime, its dimension, pattern and profile in such a manner that is aggrading or degrading and is able to effectively transport the flows and sediment delivered to it by its watershed. The Corps must make a determination that the potential impact to streams, which have been identified in 33 CFR 332 as a difficult to replace resource, have been avoided altering this stability to the maximum extent practicable; remaining unavoidable impacts to stability will then be mitigated to the extent appropriate and practicable by requiring steps to minimize impacts to stability, and, finally, compensate for aquatic resource values lost by. The Level 1 stream condition assessment may be used to demonstrate avoidance and minimization similarly to how the Galveston District uses their wetland functional assessments.

3.2.1 Avoidance

Many projects located in streams do not result in the loss of area of the water of the U.S. but rather result in a reduction of its function by reducing stream stability. In accordance with the 404(b)(1) Guidelines, the applicant must demonstrate the proposed project has been designed to avoid adverse impacts to stream function to the greatest extent practicable. For the purposes of assessing streams, a project that will not affect the streams stability is considered to have avoided impacts to stream function. Demonstration of this avoidance starts with using Level 1 to assess the current condition of the stream's functions to establish a baseline for comparison. Once this baseline has been established, and verified by the Corps, the investigator may then assess the post-project impacts using the Level 1 Condition Assessment. This assessment shall include project plans that clearly demonstrate the proposed project's post-construction plan and profile of the stream as well as planting schedules for the riparian buffer, if appropriate. While project design components may be included to improve avoidance of loss of stream functions, best management practices required to offset temporary impacts resulting from construction may not be included as avoidance. Assessment of avoidance using the

Level 1 assessment will focus on stream channel condition and anthropogenic modification as well as buffer and in-stream habitat loss. However it may be appropriate to demonstrate further avoidance using quantitative measures not included in the Level 1 assessment. Other methods demonstrating avoidance will be assessed on a case-by-case basis. It is recommended, although not required, that the applicant provide an avoidance analysis for inclusion in a public notice.

3.2.2 Minimization

Once the Corps has concluded that the potential impacts to stream function have been avoided to the maximum extent practicable, the remaining unavoidable impacts shall be minimized to the extent appropriate and practicable. For the purpose of assessing streams, a project that will affect stream stability but has incorporated design features that will maintain stability after normalization is considered to have minimized impacts. Similar to demonstrating avoidance, the Level 1 condition assessment is used to establish a baseline condition of stream function. Once a baseline has been established, appropriate and practicable steps to minimize the adverse impacts through project modifications and permit conditions may also be assessed using the Level 1 assessment. Subpart H of the 404(b)(1) Guidelines describes several (but not all) means of minimizing impacts of an activity. It is recommended that on-site and off-site alternatives described in the Guidelines be assessed using the Level 1 assessment. It is recommended, although not required, that the applicant provide an avoidance analysis for inclusion in a public notice.

3.3 Stream Restoration & Re-establishment

Restoration projects evaluated by the Corps must have the goal of returning natural/historic functions to a former or degraded aquatic resource. This is often construed as returning a stream to a pristine or to pre- disturbance condition. However, many of the systems along the Texas coastal plains have had their sediment and flow regime, as well as many other variables, significantly altered in the watershed, making the return of a stream to a pristine condition not possible.

There are two factors to evaluate on a proposed stream restoration project; 1) the current condition of the stream's functions and 2) the proposed restoration method. The first factor allows the evaluator to assess the stream condition so as to conclude if any proposed work is warranted. Stream restoration projects may be proposed for a variety of reasons, but the underlying purpose and need for the project must be restoration for consideration under this section.

3.3.1 Assess Current Stream Condition for Restoration and Re-establishment.

Demonstrating a stream's need for restoration is important; we should not assume a stream has impaired function based on a visual inspection that lacks the understanding of fluvial or hydrogeomorphology of the stream segment. The first step in demonstrating the streams condition starts with using Level 1 to establish a baseline for comparison. Once this baseline has been established, and verified by the Corps, the investigator may then assess the post-project improvement using the Level 1 Condition Assessment. This assessment shall include project plans that clearly demonstrate the proposed project's

restoration plan and profile of the stream as well as planting schedules for the riparian buffer.

3.3.2 Assessing Restoration & Re-establishment Projects

Property owners and local and state agencies restore streams for many reasons, like repairing damage from bridge and dam construction or runoff from farms, subdivisions and parking lots or historic flood management practices. The damage is visible in reduced water quality, damage to habitats, declines in fish, reduced recreational and aesthetic value and other problems. However, these groups often design projects without fully understanding the waterways they want to restore and without paying enough attention to what happens to the chemical, physical and biological function of the stream after a project is finished. Therefore, restoration projects should focus project designs, using natural channel stream design, on creating landforms and water flows that streams can maintain naturally that focus on the restoration of the chemical, physical and biological functions.

Hydrologist Dr. Dave Rosgen, of Wildland Hydrology, developed natural channel stream design restoration priorities which evaluators shall use to help them identify and address deficiencies in stream functions and track improvements through restoration projects. These priorities are based on the project's ability to reconnect the stream to the floodplain. Many historic projects resulted in the straightening of stream channels and disconnecting it from the floodplain. These activities resulted in increases in the force of floods because they resulted in an increase in the slope of the channel and the velocity of the water. Sediment is not dispersed on the floodplain but stays in the water, further increasing its erosive force and damaging fish habitat. The periodic cycling of nutrients from floodplain vegetation to stream channel is lost. The productive backwaters that are refuge and nursery to young fish and other aquatic life are gone. The connections between groundwater and surface water are altered or severed locally. Focusing restoration and re-establishment projects on reconnecting a stream to a natural channel design that includes a floodplain can produce benefits that include: reducing flooding downstream; reducing sediment load; raising the water table; lowering water temperature; and enhancing in-stream habitat for fish and wildlife.

Floodplains are defined as the lateral components of alluvial river systems and are not synonymous with flood hazards mapped by FEMA. Healthy floodplains are critical for healthy streams. Because a floodplain is only flooded when a stream overflows its banks, it is easy to forget the important work a healthy floodplain does for a stream. Floodplains are viewed as critical for maintaining river productivity, biotic diversity, and for providing many chemical, physical and biological services of direct benefit to humans. By definition, floodplains are transitional environments between terrestrial and aquatic ecosystems and hydrology is a key factor in determining the type and functional nature of floodplains.

3.3.2.1 Restoration and Re-Establishment Priorities

Rosgen's first priority for restoration involves the re-establishment of a stable C or E channel type on the original floodplain by constructing a new channel or using a relic channel if available. This is a complex restoration project that results in improvements to the chemical, physical and biologic functions of the stream system as well as an increase in aquatic area, as required in a re-establishment project. Relocation of the stream and construction of a vegetated buffer assures the proper dimension, pattern, and profile characteristics will be established for a stable stream. Stream restoration projects involving relocation of a historic channel into a new channel shall not be used for a stream channelization or relocation project purpose.

Rosgen's second priority for restoration involves creating a stable C or E channel type and re-establishment of a new floodplain at the existing channel level or higher but not at the original level. Although the stream channel is not relocated in this type of restoration project, the new channel shall be designed and constructed with the proper dimension, pattern, and profile characteristics for a stable stream. Assuring the stream is re-established may be difficult when the project site is laterally contained by limitations on the belt width. Common examples of limitations are utilities, infrastructure, and other floodplain encroachments. If the appropriate sinuosity cannot be established, the stream will not be considered restored.

Rosgen's third priority is the modification to existing channels and floodplains at the current elevation to create a stable B or Bc stream type. While natural channel design recognizes this as a restoration priority, Corps regulatory definitions provide limited availability to incorporate this design into restoration and re-establishment projects. The best use of this restoration priority is in stream projects that have historic and contemporary purposes associated with flood management. These sites present difficulties in reestablishing a sinuous pattern because they are laterally contained or have limitations in available belt width. This is often caused by utilities, infrastructure, and other floodplain encroachments. Such physical constraints often favor the creation of step/pool bed morphology with less sinuosity (associated with Priority 3) over riffle/pool bed morphology with greater sinuosity (associated with Priorities 1 & 2).

Regardless of the level of priority the restoration project has or what channel type will be produced, the channel restoration must involve establishing proper dimension, pattern, and profile.

Information the evaluator shall consider includes, but is not limited to: 1) available belt width; 2) the slope of the proposed stream; and 3) the dimension, pattern, and profile of the restored stream.

The difference between projects that are credited as R-establishment and projects that are credited as Enhancement is whether or not changes are necessary to address the current channel's dimension, pattern, and profile, as described for each of the Priorities, to produce a stable channel. All three geomorphic variables are required to be addressed,

with noted pattern limitations for Priority 3, in order to be considered stream restoration or to be credited with stream re-habilitation. Enhancement credit is given in all other situations when only two geomorphic variables are addressed to produce a stable channel.

3.3.2.2 Restoration and Re-Establishment Project Plans

Stream restoration and re-establishment projects shall establish clear goals and objectives based on a geomorphic and hydraulic analysis of the current stream condition so that the appropriate functional improvement, or lift, can be identified. This analysis will identify the cause of the stability issues which will lead to designs that focus on solving problems rather than just addressing the streams dimension, pattern and profile.

To provide a predictable and easily reviewable restoration or re-establishment plan, the *Natural Channel Design Review Checklist* published by the U.S. Fish and Wildlife Service, Chesapeake Bay Field Office and U.S Environmental Protection Agency, Office of Wetlands, Oceans and Watersheds should be used. The Checklist provides guidance on important considerations when designing and reviewing a natural channel stream design for restoration and re-establishment projects. By providing the information described in the checklist in your project plan, including a completed checklist identifying the location of these items in the plan, the reviewer will be able to streamline the review and evaluation process of a proposed project.

3.4 Assessing Enhancement Projects

The purpose of this mitigation type is to provide compensation for small projects and/or to improve the chemical, physical and/or biological function of streams that do not qualify for restoration or re-establishment. Given the numerous man-made alterations to streams, there are plenty of opportunities to enhance streams that are not full degraded in our District. In addition, a project requiring a small mitigation plan to offset minor loss in function may be best suited for stream enhancement project rather than stream re-establishment projects. To provide a predictable and easily reviewable enhancement plan, the *Natural Channel Design Review Checklist* may be an invaluable tool. However, the amount of detail and planning for an enhancement project shall be commensurate with the project. At a minimum, a baseline condition of the stream should be assessed as well as a demonstration of the functional lift resulting from the proposed mitigation plan.