

AVOIDANCE AND MINIMIZATION TECHNIQUES

NCDOT considers the following techniques throughout the project development and design process to avoid and/or minimize impacts to the human and natural environment. The techniques listed represent current practice and do not represent a change in policy or procedure; this documentation is provided as information to staff of NCDOT and other agencies. The techniques are listed by Concurrence Points and other key project activities. The implementation of these techniques is not mandatory; however, these techniques should be evaluated as appropriate within the project context. The use of a technique should not adversely affect safety, maintenance, or cost (both construction and long-term maintenance cost), and be practicable. The techniques listed in this document are to be used to help guide the planning and design of transportation projects. This document is not binding on any agency or their decision-making responsibilities. This document shall not be specifically cited for denying a permit.

Project Scoping to CP-1

- Ensure a purpose and need and study area that allows a range of alternatives to be considered

CP-1 to CP-2 (Functional Design)

- Develop functional designs for a range of alternatives that meet the project's purpose and need and that avoid and/or minimize impacts to the human and natural environment.
- Develop alternatives that retain and upgrade existing facility(ies) if purpose and need are met with these alternatives
- Determine appropriate design speed for the type of facility
- Determine level of control of access for project
- Determine the appropriate typical section
- Determine number and location of proposed interchanges
- Avoid and/or minimize impacts to human environment, including relocations, noise impacts, and community cohesion impacts
- Avoid and/or minimize impacts to parks, historic sites, schools, cemeteries, and other human environment resources
- Cross natural environmental resources at narrowest point
- Proposed roadways should intersect natural environmental resources as perpendicular as possible
- Avoid and/or minimize natural environment and human environment fragmentation
- Avoid and/or minimize ditching in wetlands (e.g. raise grade of roadway to avoid ditches in wetlands)

- Avoid and/or minimize fill through wetlands
- Try to balance earthwork to avoid large borrow and waste pits
- Avoid and/or minimize parallel impacts to streams and wetlands
- Proposed vertical alignments should avoid undercutting streams
- Select corridor widths that allows for future minimization (1000' to 1200' for new location) (400' to 600' for widening)
- Avoid and/or minimize impacts to threatened and endangered species or associated habitat

CP-2 to CP-2A (Preliminary Design)

- Develop preliminary designs for alternatives carried forward that avoid and/or minimize impacts to the human and natural environment.
- Cross natural environmental resources at narrowest point
- Proposed roadways should intersect natural environmental resources as perpendicular as possible
- Avoid and/or minimize natural environment resource and human community fragmentation
- Adjust horizontal alignment to avoid and/or minimize impacts to wetlands
- Adjust vertical alignment to avoid and/or minimize fill and /or ditching through wetlands
- Develop adequate hydraulic structure (bridges and culverts) to ensure integrity of the floodplain
- Try to balance earthwork to reduce need for large borrow pits and waste sites
- Avoid and/or minimize parallel impacts to streams and wetlands
- Discuss possible wildlife crossings
- Discuss type and size/length of hydraulic structure(s) to avoid and/or minimize impacts to resources (e.g., number of bridge spans, bottomless culverts, differential barrel elevations)
- Proposed vertical alignments should avoid undercutting streams
- Proposed horizontal and vertical alignments should avoid and/or minimize relocations and impacts to cohesive communities
- Determine on-site of off-site detours

CP-2A to CP-3 (Public Involvement/LEDPA)

- Select a LEDPA (preferred alternative) based upon a review of the alternatives considered, associated impacts to the human and natural environment, and public comments received at this point in the project development process
- Discuss possible on-site mitigation locations

CP-3 to CP-4A (Review of Preliminary Design)

- Review preliminary designs to ensure that avoidance and/or minimization to human environment and natural environment have been achieved, including, but not limited to:
 - Horizontal alignment adjustments
 - Vertical alignment adjustments
 - Slope adjustments
 - Retaining walls
 - Determine if there are further opportunities to minimize relocations and human environment impacts.
- Discuss seasonal moratoriums for appropriate species
- Discuss possible onsite mitigation locations (e.g., natural stream design)

CP-4A to CP-4B (Begin Final Design/To Hydro Plans)

- Discuss three-sided box culvert (bottomless culvert on rock foundation)
- Discuss appropriate hydraulic structure layout to avoid and/or minimize impacts to the resources, including bridge pier layout, box culvert design, and stream channel integrity preservation, differential barrel elevations
- Discuss construction techniques to avoid and/or minimize impacts to resources (staged construction, causeway, work bridge, top down construction, diversion channels, pile installation practices)
- Avoid and/or minimize ditching in wetlands
- Avoid and/or minimize fill in wetlands (vertical alignment)
- Try to balance earthwork to reduce the need for large borrow pits and waste sites
- Determine fill slope design that is acceptable for long term maintenance while avoiding and/or minimizing wetlands impacts
- Avoid and/or minimize direct discharge of stormwater system into natural resources
- Discuss possible equalizer/overflow pipe locations
- Discuss utility relocation to avoid and/or minimize impacts to resources
- Discuss appropriate hazardous spill containment/storm-water treatment

CP-4B to Final Design Field Inspection

- Determine removal of existing causeways in resources
- Determine appropriate hydraulic structure layout to avoid and/or minimize impacts to the resources, including bridge pier layout, box culvert design, and stream channel integrity preservation, differential barrel elevations
- Determine equalizer/overflow pipe locations
- Determine diversion channels for culvert construction
- Determine construction techniques to avoid and/or minimize impacts to resources (staged construction, causeway, work bridge, top down construction, diversion channels, pile installation, etc.)

- Determine if three-sided box culvert (bottomless culvert on rock foundation) can be used
- Discuss erosion control and sedimentation devices to avoid and/or minimize impact to resources
- Determine bridge demolition to avoid and/or minimize impact to resources
- Discuss construction moratoriums to minimize impacts to resources
- Discuss clearing and grubbing methods to minimize impacts to resources
- Discuss appropriate sedimentation & erosion control (turbidity curtains, etc.)

Final Design Field Inspection to CP-4C

- Incorporate all feasible avoidance and minimization techniques that were discussed at the CP-4B meeting and the final design field inspection into the plans
- Review with agencies the avoidance and minimization techniques that have been implemented within the project (e.g., details of BMPs).
- Review final permit drawings with the agencies