

# Guidelines for Drainage Studies and Hydraulic Design Update



N.C. DEPARTMENT OF TRANSPORTATION  
**Hydraulics Unit**



# Objective

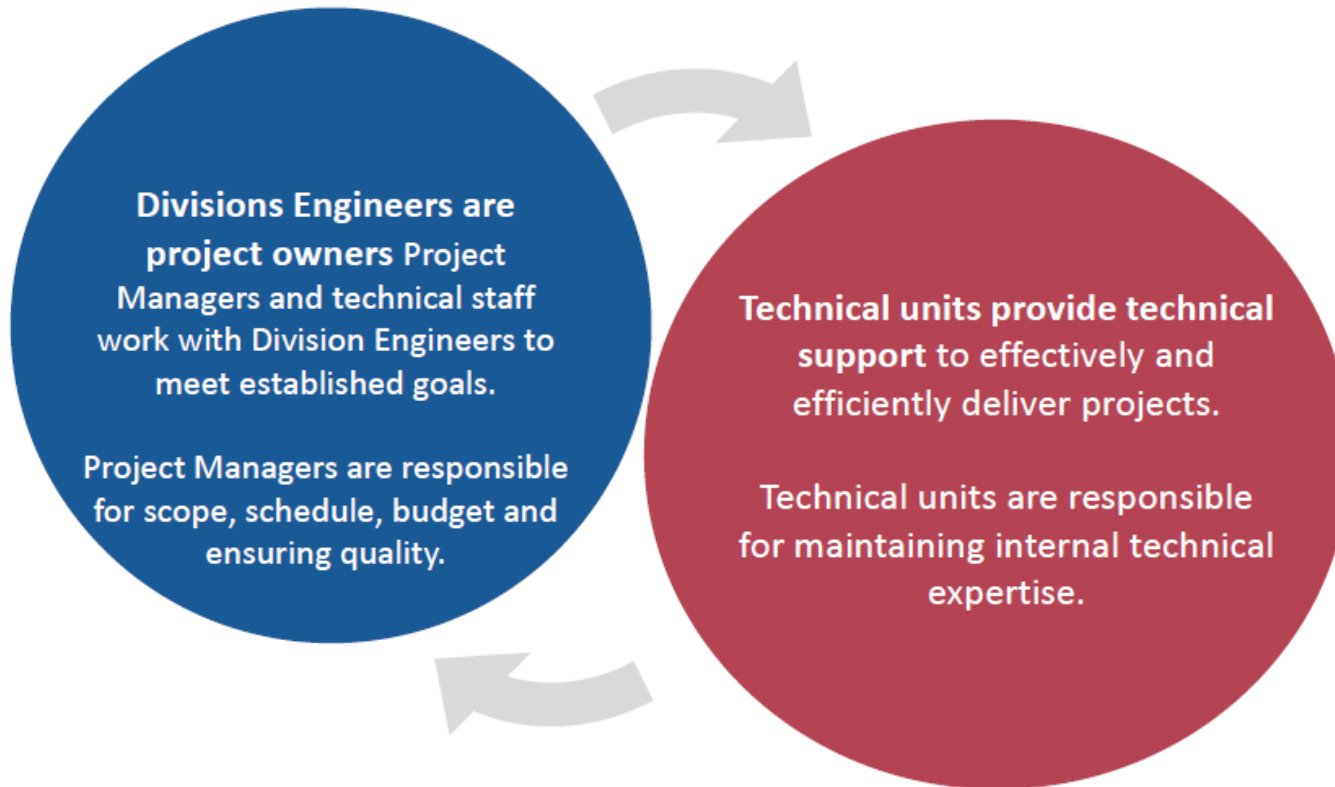
To develop a detailed “roadmap” for comprehensive update of the collective Hydraulics Unit’s library of documents, and to make recommendation to transition the library to more of a “living document” format subject to a cycle of continuous improvement. Tasks included:

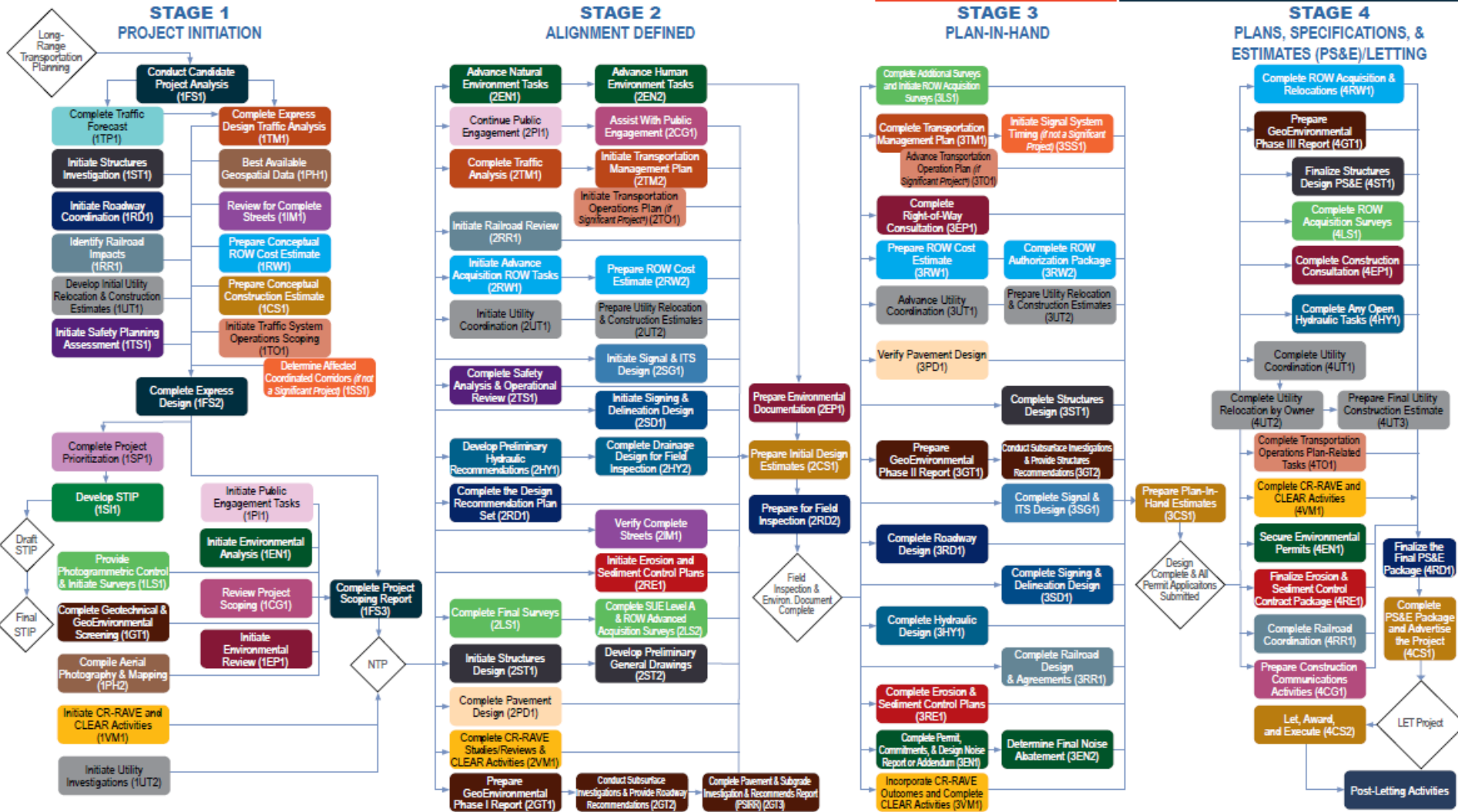
- ❖ Review of Existing Guidance, Protocol and Manuals
- ❖ Detailed Survey to Identify Critical Gaps and Needs in the Existing Guidance; Also Identify any Research or Emerging Technology to Help Improve Guidance
  - NCDOT Staff
  - State Agencies
  - Municipal and Academic
  - Private Engineering Consultants
- ❖ Review of Peer Agencies Documentation for Critical Gaps
- ❖ Ties into the overall Project Delivery Network (PDN)
- ❖ 2022 update is considered a “light” update that re-organizes the Guidelines to better align with the PDN.

# Integrated Project Delivery (IPD) / Project Delivery Network (PDN)

Roles and Responsibilities in Project Delivery

## Integrated Project Delivery Means...





## DISCIPLINE LEGEND



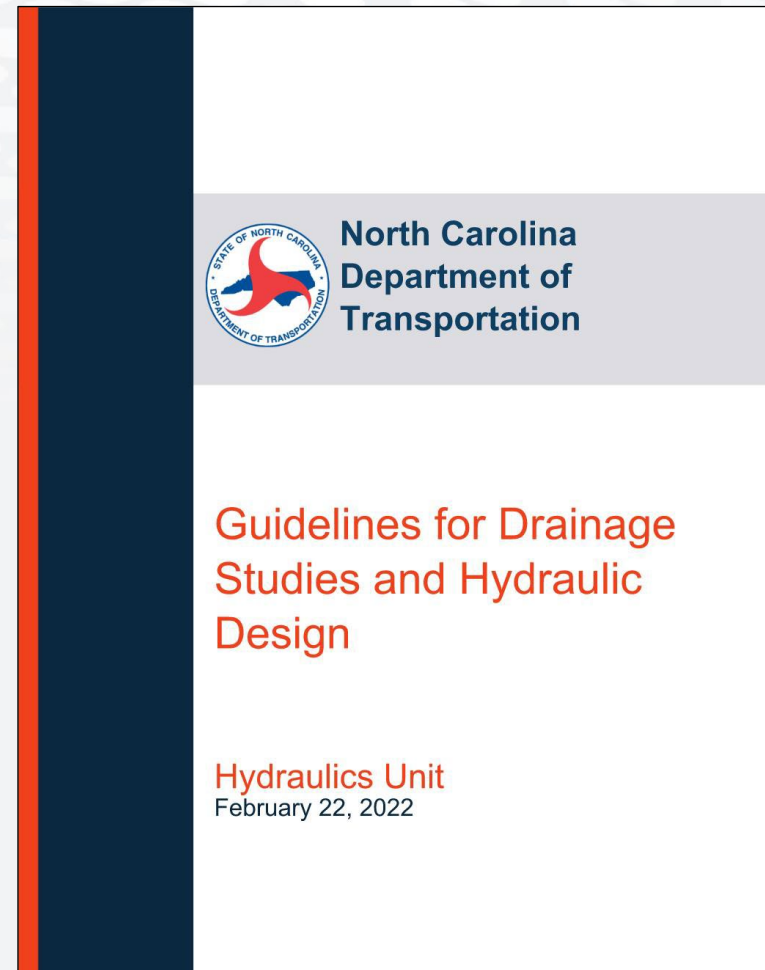
# High Priority Updates – PDN Version 2

- ❖ **3D Series Hydraulic Summary Plan Sheets**
- ❖ **Coastal Guidelines**
- ❖ **Drainage Summary Sheets**
- ❖ **BMP Support Matrix and Summary Table**
- ❖ **Hydraulic Planning Report Template and Guidance**
- ❖ **Guidance to Workflow for 15A-NCAC-04B.0109 Rule**
- ❖ Address Errata from Post-Publication Comments
- ❖ Transfer Any Hydraulic Items Removed from Roadway Design Manual
- ❖ Floodplain Management Reflecting New MOA Requirements
- ❖ Replace Pipe Cover (Appendix H) Tables
- ❖ Preliminary Plan (25%) Review Guidance
- ❖ Permit Drawing Updates
- ❖ How New Information is Integrated into the *Guidelines for Drainage Studies and Hydraulic Design*
- ❖ Interim Guidance for Preliminary Stormwater Master Plan
- ❖ Legal Ramifications for Adjacent Property Owners Obstructing an Outlet within NCDOT ROW or Easement
- ❖ **Concurrence Point (2A/4B) Meeting Guidance**
- ❖ Remove Appendix J
- ❖ Pipe Selection Guide
- ❖ Pipe Rehabilitation Liners
- ❖ Culvert Backfill
- ❖ Major Structure / Stream Crossing Definition
- ❖ BSR / CSR Format



# 2022 Guidelines for Drainage Studies – Major Changes

- ❖ Manual is now online – each Chapter is broken out into a separate document
- ❖ Each Chapter has a Revisions Section to highlight changes made
- ❖ Appendices embedded in relevant Chapters
- ❖ New website design -  
<https://connect.ncdot.gov/resources/hydro/Pages/DrainageStudiesGuidelines.aspx>



# Major Changes – Chapter 3

- ❖ Project Development Planning Phase
- ❖ **New Section – Level of Service Determination and Risk Analysis**
- ❖ Hydraulic Planning Report
- ❖ Determination of a Major Stream Crossing
- ❖ Preliminary Stormwater Management Plan (pSMP)
- ❖ Appendices D & E revised and incorporated into Chapter
- ❖ **New guidance – Merger Concurrence Point 2A Meeting**



North Carolina  
Department of  
Transportation

Chapter 3 Preliminary Hydraulic  
Studies for Planning Document

Hydraulics Unit  
February 22, 2022

# Major Changes – Chapter 4

- ❖ Entire Chapter has been revised
- ❖ Review of Design Recommendations Plan Set (25% Plans)
- ❖ **New Section - Hydroplaning**
- ❖ **New Section – Hydraulics Pre-design meeting**
- ❖ **Updated guidance document for Merger Concurrence Point 4B**
- ❖ Appendix B has been revised and is now included



North Carolina  
Department of  
Transportation

Chapter 4 Preliminary Roadway  
Plans Review and Pre-Design  
Study

Hydraulics Unit  
February 22, 2022



# Major Changes – Chapter 5

- ❖ Old Chapter 6 has been combined with this Chapter
- ❖ Old Section 5.2 (Purpose of Drainage Survey) was incorporated into the Introduction
- ❖ References to Hazardous Spill Basins have been removed
- ❖ **3D Series Hydraulic Summary Plan Sheets**



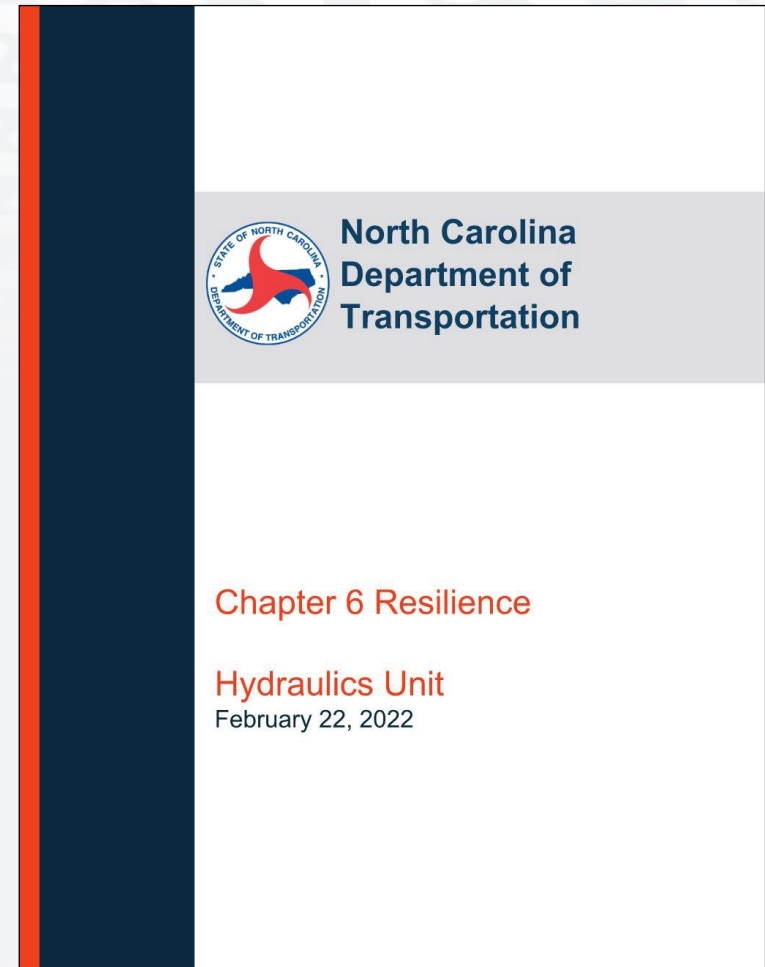
**North Carolina  
Department of  
Transportation**

**Chapter 5 Drainage Plans  
Development**

**Hydraulics Unit**  
February 22, 2022

# Major Changes – Chapter 6

- ❖ **New Chapter – Resilience**
- ❖ Old Section 3.6 has been moved to here
- ❖ Old Section 8.5.2.1 has been moved to here
- ❖ Reserved for future updates



# Major Changes – Chapter 13

- ❖ **Entire Chapter has been revised**
- ❖ Overview of the Highway Stormwater Program & Stormwater Regulations
- ❖ NPDES Post-Construction Stormwater Program
- ❖ Construction Considerations for Post-Construction Stormwater Discharges
- ❖ Maintenance Considerations for Post-Construction Stormwater Discharges
- ❖ Water Quality Standards



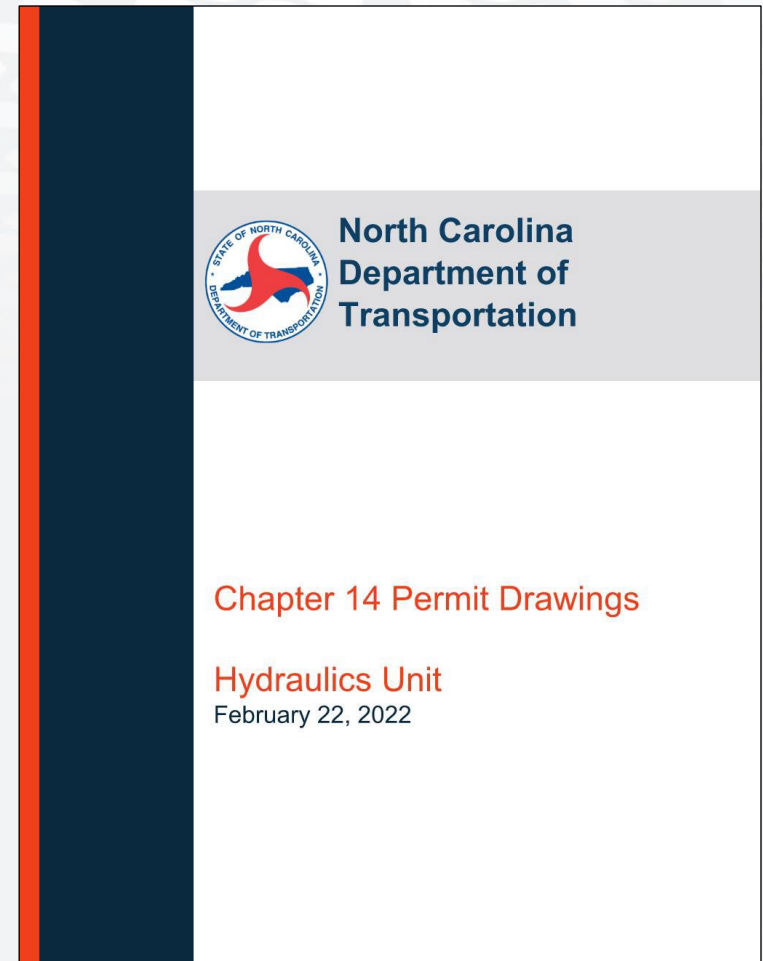
**North Carolina  
Department of  
Transportation**

**Chapter 13 Stormwater  
Management**

**Hydraulics Unit**  
February 22, 2022

# Major Changes – Chapter 14 and Permit Drawing Guidelines

- ❖ Updated guidance document for Merger Concurrence Point 4C
- ❖ Updated Permit Drawing Guidelines



# Major Changes – Chapter 15

- ❖ Entire Chapter has been revised to reflect the updated Memorandum of Agreement (MOA) between NCDOT and NCEM
- ❖ Introduces the Coordination and Compliance Plan (CCP) which provides the guidance and technical aspects required for FEMA Floodplain compliance.



North Carolina  
Department of  
Transportation

Chapter 15 Floodplain  
Management

Hydraulics Unit  
February 22, 2022



# Major Changes – Chapter 16

- ❖ **New Chapter**
- ❖ Coastal Hydraulics Expertise
- ❖ Level of Analysis
- ❖ Sea Level Rise
- ❖ Tidal Datums/Gages
- ❖ Coastal / Tidal Bridge Scour



**North Carolina  
Department of  
Transportation**

**Chapter 16  
Coastal Hydraulic Design**

**Hydraulics Unit**  
February 22, 2022

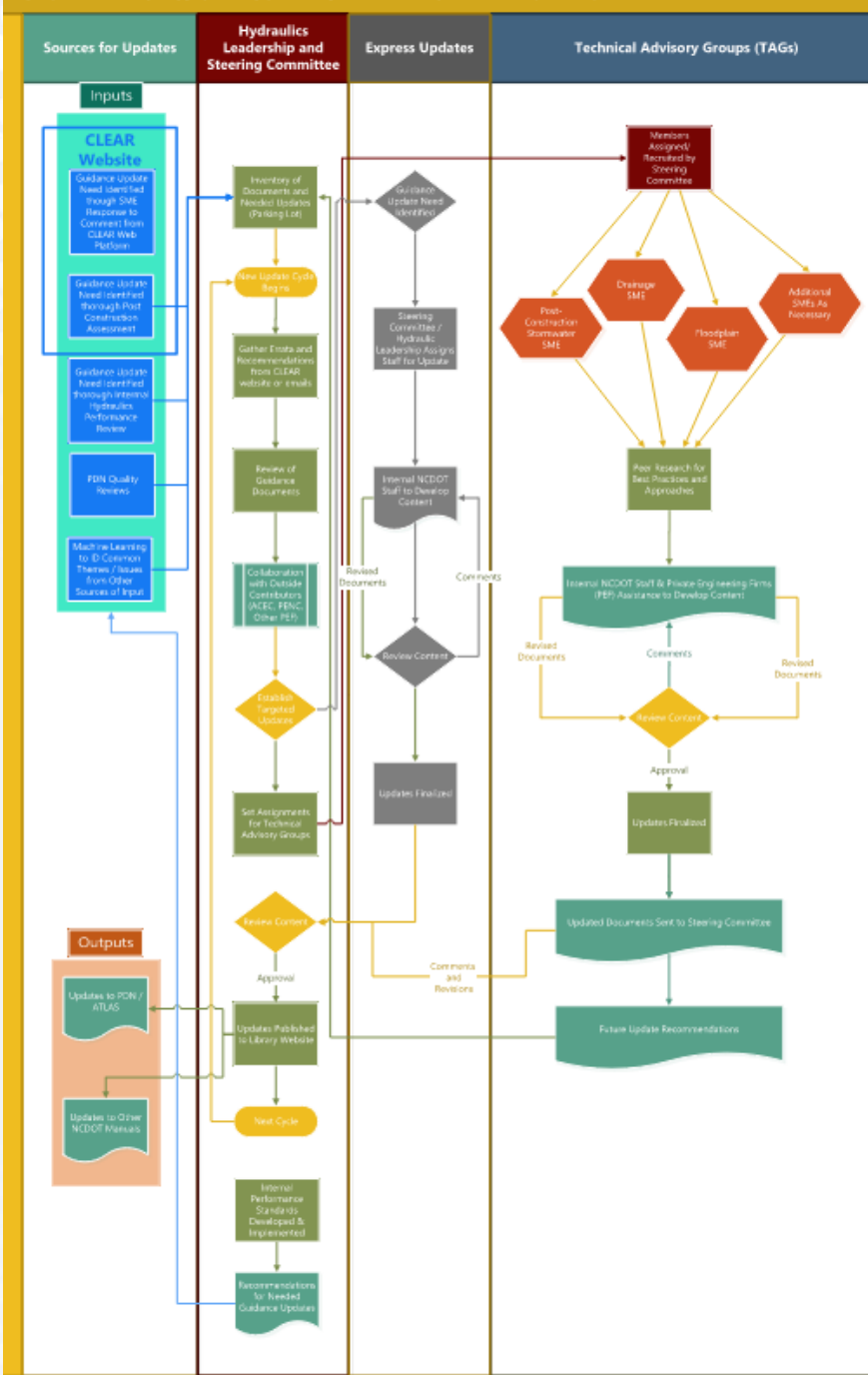
# 2022 Guidelines for Drainage Studies Website

<https://connect.ncdot.gov/resources/hydro/Pages/DrainageStudiesGuidelines.aspx>

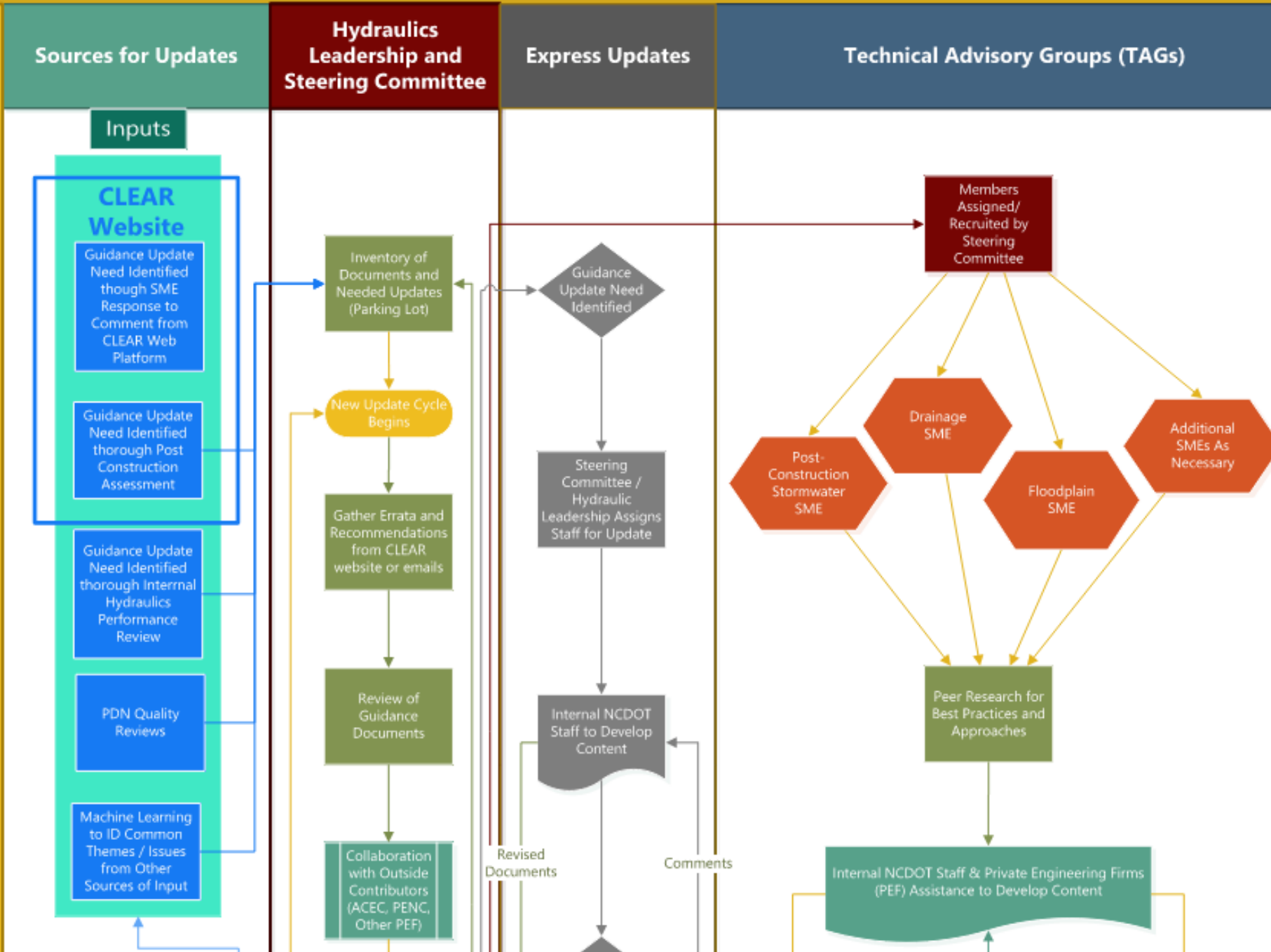
# Future Guidance Updates – Process for Continuous Improvement

- ❖ Updates done on a 2-year cycle
- ❖ Using the CLEAR website for Users to provide comments and feedback
- ❖ Input from Working Groups comprised of Outside Collaborators - ACEC, PENC, Other Member Organizations and Private Engineering Firms (PEF)
- ❖ Technical Advisory Groups with Hydraulics, Roadway, Structures and other NCDOT Discipline Staff to provide input during update cycle
- ❖ Living Document for Continuous Updates

## NCDOT HYDRAULICS UNIT GUIDANCE LIBRARY UPDATE WORKFLOW



NCDOT HYDRAULICS UNIT GUIDANCE LIBRARY UPDATE WORKFLOW







# NCDOT CLEAR Website

<https://connect.ncdot.gov/site/lessons-learned/Pages/default.aspx>

→ Accepted Lessons Learned

→ Accepted Best Practices

→ Knowledge Transfer Best Practices

→ Gatekeepers and Experts

→ Search Lessons Learned & Best Practices


Recent

Connect NCDOT > CLEAR

ClearChange.jpg

Our Implemented Innovation Challenge is Open from July 12<sup>th</sup> to August 13<sup>th</sup>! Please view this short message and submit your great ideas: [Click to view video](#)

Welcome To CLEAR



This is the online submission portal for the CLEAR Program, the Department's Internal Knowledge Management Program. This portal is open to all NCDOT employees with an NCDOT email. If this is your first time here or would like a refresher on how the portal and overall program works, please visit the CLEAR Program Connect Page for overview videos and additional background material: [CLEAR Program \(ncdot.gov\)](#). We aim to have all submission vetted within 30 days. Please contact the CLEAR team at [CLEAR@NCDOT.GOV](mailto:CLEAR@NCDOT.GOV) with any questions. *The practices and ideas shared here represent accepted submissions from NCDOT employees, and do not in any case supersede official procedures, best practices or otherwise approved guidance.*

Search Accepted Lessons Learned and Best Practices Here:

Search

Share Lessons Learned

Share Best Practice/Idea

Request Assistance with an Obstacle

Questions about CLEAR?

Email Clare Fullerton, PE  
[CLEAR@ncdot.gov](mailto:CLEAR@ncdot.gov)

CLEAR SOPs

Clear Videos

How to Submit via Kiosk

Step by Step to submit a Best Practices or Idea

Step by Step to submit a Lessons Learned

Step by Step to submit a Solution Needed

Recent Updates

CLEAR Training

Wondering how the program was built, how it works, and what it can mean to you? Check out the CLEAR training:

Module 1 - Program Development

Module 2 - How to use the portal

Module 3 - Programminna Efforts

