The Nebraska Division of the FHWA approved this appendix for use on the National Highway System and other federal projects on December 19, 2018.

Floodplain Management Guidelines – Compliance for Impacts to Floodplains

A.1 Introduction

This guidance pertains to floodplain considerations in the design of federal-aid projects, along with cross-references to the National Environmental Policy Act (NEPA) (Ref. 1), https://ceq.doe.gov/) documentation requirements satisfied by the **Nebraska Department of Transportation** (**NDOT**) **Bridge Division** (**Bridge**) in coordination with the **NDOT Environmental Section** in the **Project Development Division** (**PDD**). Additional information regarding floodplains may be found in other **NDOT** manuals and guidance documents (e.g. the Environmental Procedures Manual, the Nebraska Categorical Exclusion Guidance) found in the **NDOT Environmental Sections'** "Environmental Guidance Library" (Ref. 2) (Environmental Guidance Library - NDOT).

The purpose of this guidance is to provide **NDOT's** process for the location and hydraulic design of highway encroachments on floodplains for **NDOT** and local projects using federal-aid funds. These guidelines contain an introduction to floodplains and floodways, an overview of the laws applicable to **NDOT** regarding floodplains and floodways, the **Professionally Qualified Staff** (**PQS**) memo procedure for documenting location hydraulic studies required by 23 Code of Federal Regulations (CFR) 650.111 (Ref. 3) (https://www.law.cornell.edu/cfr/text/23/part-650), and the floodplain certification process completed by **NDOT Hydraulics Staff** for the submittal of the floodplain development permit.

It is the policy of **NDOT** to follow **Federal Highway Administration** (**FHWA**) floodplain regulations as set forth in 23 CFR 650A (Ref. 3) whenever federal-aid funds are involved. However, issues relating to floodplains quickly become complex due to the existence of other applicable laws, regulations, and guidance documents, including those provided by the **Federal Emergency Management Agency** (**FEMA**) (Home | FEMA.gov) and the **Nebraska Department of Water, Energy, and Environment** (**DWEE NE**) (https://dwee.nebraska.gov/). For the benefit of the design practitioner, this guidance provides reference to **FEMA** and **DWEE NE** regulatory considerations, in addition to **FHWA** requirements, when applicable.

A.2 Floodplain/Floodway Discussion

Various statutes, regulations, and guidance documents exist from different state and federal agencies pertaining to floodplains, each having their own definitions of terms relevant to floodplain analysis. What follows is **NDOT's** synopsis of various terms and brief explanations regarding the interplay between the agencies' regulatory schemes.

Floodplains are hydrologically important, environmentally sensitive, and ecologically productive areas that perform many natural functions. Flooding occurs naturally along rivers and coastal areas. Flood waters can carry nutrient-rich sediments which contribute to a fertile environment for vegetation. Floodplains are beneficial for wildlife by creating a variety of habitats for fish and other animals. Additionally, floodplains are important in providing storage and conveyance for flood water, protection of water quality, and recharge of groundwater.

A **floodplain** is defined by **FEMA** to be *any land area susceptible to be inundated by water from any source* (44 CFR 59.1) (Ref. 4) (https://www.law.cornell.edu/cfr/text/44/part-59). In more general terms, a floodplain has been described as an area of land adjacent to a stream or river or a low-lying area which experiences flooding during periods of high discharge.

The National Flood Insurance Program (NFIP) (Ref. 5) (Flood Insurance | FEMA.gov) is a **FEMA** program of flood insurance coverage and floodplain management administered pursuant to CFR Title 44/Part-60/Subpart-B (Ref. 6) (https://www.law.cornell.edu/cfr/text/44/part-60).

FHWA's 23 CFR 650A (Ref. 3), **FEMA's** NFIP (Ref. 5), and **DWEE NE's** minimum standards regulate the one percent annual chance (100-year storm event) floodplain which is usually mapped as the Special Flood Hazard Areas (SFHAs) on **FEMA's** Flood Insurance Rate Maps (FIRMs) (Ref.7) (Flood Insurance Rate Map (FIRM) | FEMA.gov) or, in older (pre-1986) studies, Flood Hazard Boundary Maps (FHBMs). **DWEE NE** also maps the one percent annual chance floodplain on their Work Maps and calls them Flood Awareness Areas (FAAs). FAAs are used if no FIRM maps are available and if there are previously unmapped areas that are shown as mapped in the FAA which are pending **FEMA** approval.

The **base flood** is *the flood having a one percent chance of being equaled or exceeded in magnitude in any given year*. The **base floodplain** is *the area that is subject to the base flood* (23 CFR 650.105) (Ref. 3). **FEMA** defines the base flood elevation (BFE) as the elevation to which floodwater is anticipated to rise during the base flood. The BFEs are shown on FIRMs and on the flood profiles.

On both FIRMs (Ref. 7) and the older FHBMs, **FEMA** designates SFHAs without base flood elevations as Zone A. On FIRMs with associated base flood elevations or depths, **FEMA** designates SFHAs as either Zone AE, A zones A1-30, AH, and AO. FIRMs designate a shaded Zone X as the area, including the base floodplain, which is subject to inundation from a flood having a 0.2 percent chance of being equaled or exceeded in any given year (some older FIRMs used the term Zone B to reflect this Zone X area); **FEMA** will also occasionally designate areas of one percent annual chance flood with average depths less than one-foot or with drainage areas less than one square mile as Zone X floodplains. A summary of the types of Zones that may be found on the FIRMS is given in the definitions.

Development in floodplains (generally Zone A, AH, and AO) is typically allowed as long as it is demonstrated that the cumulative effect of the proposed development when combined with all other existing and anticipated new construction or substantial improvement will not increase the water surface elevation of the base flood more than one-foot at any location along the watercourse, see 44 CFR 60.3(d)(2) (Ref. 6). **FHWA's** floodplain encroachment policy requires longitudinal encroachments to be avoided where practicable. Generally, any increase in the 100-year water-surface elevation produced by a longitudinal encroachment on an NFIP floodplain should not exceed the one-foot allowed by the Federal NFIP standards. Transverse encroachments shall be supported by an analysis of design alternatives. Design alternatives should include consideration of a design that is consistent with the Federal NFIP standard, which allows a one-foot rise in the 100-year water surface elevation. Additional guidance can be found in **FHWA's** "Guidance for Implementing the One-foot Standard for Encroachments on NFIP Floodplains" (Ref. 5).

Most Zone AEs include a **regulatory floodway**. The regulatory floodway is *the portion of the floodplain that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height* (23 CFR 650.105(m), (Ref. 3). The floodway limits are determined through a hydrologic and hydraulic engineering analysis (H&H) that applies encroachments in the flood plain to a surcharge of no more than one-foot, per **FEMA** regulations 44 CFR 60.3(d)(3) (Ref. 4) and 23 CFR 650.111 (Ref.3). An **encroachment** *is an action within the limits of the base floodplain* (23 CFR 650.105(e), Ref. 3). Typically the floodway is the most hazardous portion of the floodplain where the fastest flow of water occurs. Development in the regulatory floodway is only allowed if it is demonstrated that no rise in the base flood elevation will occur anywhere along the base flood profile; a Memorandum of Understanding (MOU) exists between **FHWA** and **FEMA** which allows an exception for piers as having "a very minor effect on the floodway water surface elevation". See MOU, *Procedures for Coordinating Highway Encroachments on Floodplains with FEMA* and *Additional Guidance on 23 CFR 650A* (Ref. 8) (Attachment 2 - Additional Guidance on 23 CFR 650A - Hydrology & Floodplains - Hydraulics - Bridges & Structures - Federal Highway Administration (dot.gov)).

The **flood fringe** is *the area within the SFHA, outside of the floodway, that usually contains slow-moving or standing water during a base flood event* (**FEMA**, *Managing Floodplain Development through NFIP)*. Because the floodway has been calculated to pass the base flood, NFIP minimum standards allow development in the flood fringe without the need for further assessment of the impact on flood heights unless it is required by local regulation. Development in the flood fringe must also comply with the State Minimum Standards for Floodplain Management (Nebraska Administrative Code (NAC) Title 455, Chapter 1 (Ref. 9) (STATE OF NEBRASKA)) or more restrictive local standards, and must be permitted by local floodplain administrators. These approved local floodplain management regulations may contain more restrictive standards that can take precedence over the NFIP minimum criteria for NFIP administration, 44 CFR 60.1(d) (Ref. 6).

For federal-aid projects **FHWA** regulations apply to all base floodplains, including **FEMA** regulated floodplains. The **FEMA** FIRM maps (Ref. 7) and **DWEE NE** work maps are used to determine if any portion of a proposed project is within the SFHA and floodway; any action within the SFHA is subject to the provisions of local, state, and federal floodplain management regulations. See Section A.2.4 for guidance regarding circumstances when irreconcilable conflicts arise between **NDOT** and **DWEE NE** or local floodplain management agencies regarding the application of a state or local floodplain standard to a federal-aid highway project.

See **Figure 1.1** for a floodplain schematic.

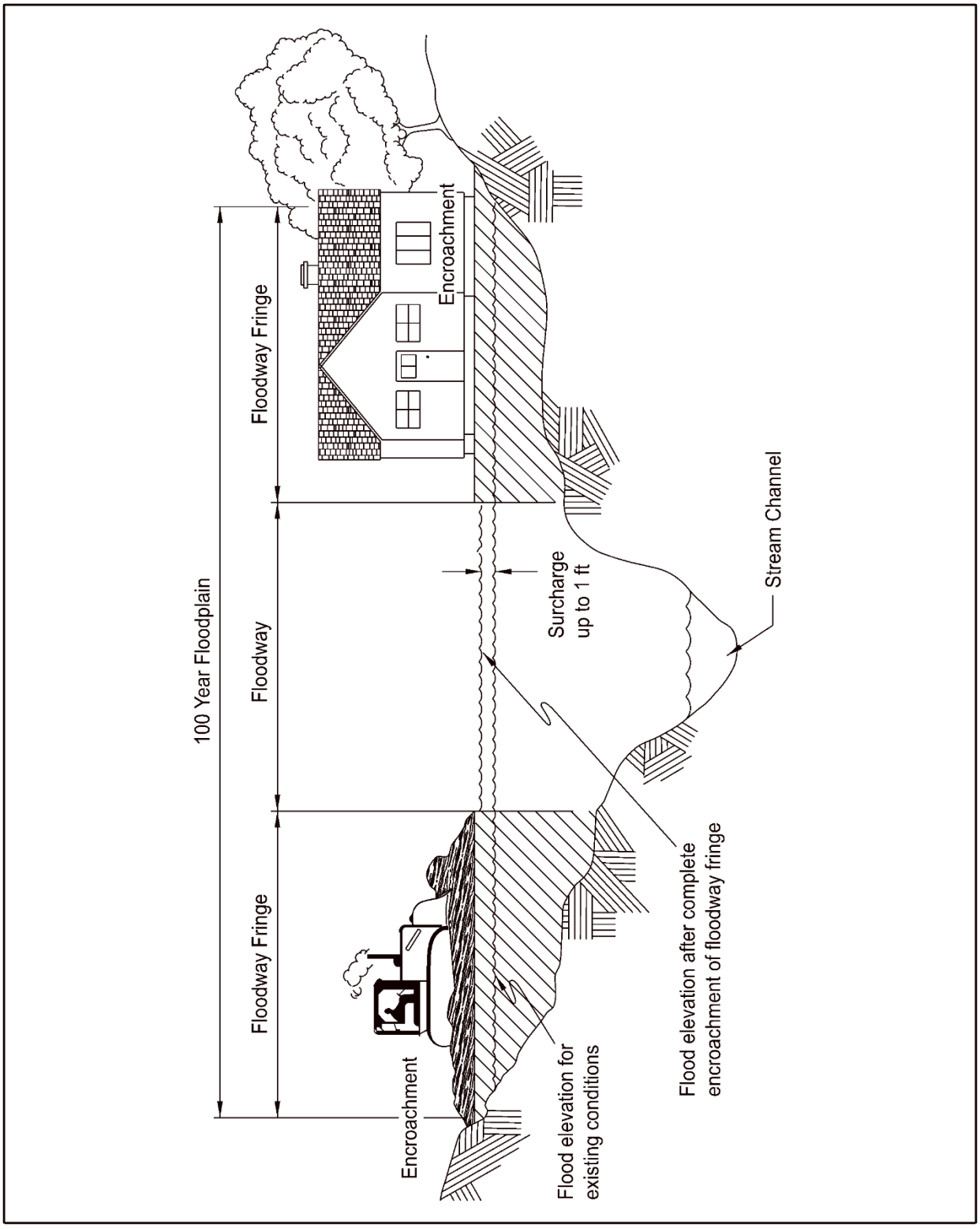

Figure 1.1 100-Year Floodplain Schematic

B.1 Statutes and Regulations

Each federal agency is required by Executive Order (EO) 11988 (Ref. 10) (Executive Order 11988 Floodplain Management | FEMA.gov) to take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities.

B.1.1. Executive Order 11988 Summary

EO 11988 (Ref. 10) requires federal agencies to avoid to the extent possible the long and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. In accomplishing this objective, *"each agency shall provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by flood plains in carrying out its responsibilities"* for the following actions:

- acquiring, managing, and disposing of federal lands and facilities
- providing federally-undertaken, financed, or assisted construction and improvements
- conducting federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulation, and licensing activities

This mandate applies to all federally-approved actions, including but not limited to highway construction, reconstruction, rehabilitation, repair, or improvement projects.

B.1.2. FHWA Implementation of Executive Order 11988

The implementation of EO 11988 (Ref. 10) in transportation projects is addressed by 23 CFR 650 Subpart A (Ref. 3), entitled “Location and Hydraulic Design of Encroachment on Floodplains”. **FHWA** floodplain regulations pertain to planning, NEPA documentation, design, construction, and other aspects of program and project delivery on **NDOT** and local federally funded transportation projects.

B.1.3. Location Hydraulic Studies (23 CFR 650.111)

For federally funded or administered actions, 23 CFR 650.111 (Ref. 3) provides for the completion of a location hydraulics study, including analysis and the discussion of the practicability of alternatives to longitudinal encroachments.

National Flood Insurance Program Maps (NFIP) (Ref. 11) (https://www.fema.gov/flood-insurance), or information developed by the highway agency if NFIP maps are not available, are used to determine whether a highway location alternative will include an encroachment. Local, state, and federal water resources and floodplain management agencies may be consulted to determine if the proposed highway action is consistent with existing watershed and floodplain management programs and to obtain current information on development and proposed actions in the affected watersheds.

A longitudinal encroachment is an action within the limits of the base floodplain that is parallel to the direction of flow, and floodwaters are being conveyed parallel to the highway (e.g. a highway that runs alongside a river or stream and the highway fill slope extends laterally into the

floodplain). Longitudinal encroachment should be avoided where practicable where encroachments are parallel or nearly parallel to the base flood elevation (23 CFR 650.103(b), Ref. 3). From a hydraulics perspective, the term parallel/longitudinal encroachment is generally not applied to highway crossings of floodplains where the depth of flow is governed by the crossing structure, typically a culvert or bridge, which is known as a transverse encroachment.

On federal-aid projects involving an alternative alignment, location studies will include evaluation and discussion of the practicability of alternatives to any longitudinal encroachments. The study will evaluate alternative locations that would result in lesser impacts to the floodplain or reduce or eliminate a longitudinal encroachment.

For all alternatives containing encroachments, the location hydraulic study must also include a discussion *commensurate with the risk or environmental impact* (23 CFR 650.111(c), Ref. 3) of:

1. *The risks associated with implementation of the action,*
2. *The impacts on natural and beneficial flood-plain values,*
3. *The support of probable incompatible flood-plain development,*
4. *The measures to minimize floodplain impacts associated with the action, and*
5. *The measures to restore and preserve the natural and beneficial floodplain values impacted by the action.*

FHWA definitions for the terms “Action”, “Encroachment”, “Natural and Beneficial Floodplain Values”, “Risk” and other relevant terms are provided in 23 CFR 650.105 (Ref. 3). As defined in 23 CFR 650.105(q), *a **“significant encroachment”** shall mean a highway encroachment and any direct support of likely base flood-plain development that would involve one or more of the following construction-or flood-related impacts*:

(1) A significant potential for interruption or termination of a transportation facility which is needed for emergency vehicles or provides a community’s only evacuation route,
(2) A significant risk, or
(3) A significant adverse impact on natural and beneficial flood-plain values.

Location hydraulic studies will also include discussion of the practicability of alternatives to significant encroachments or support of incompatible floodplain development (23 CFR 650.111(d), Ref. 3). Additional guidance is available for reference in the *Significant Encroachment Minute Memo*. Significant encroachments are addressed in more detail in Section C.1.6 of this document.

Location Hydraulics Studies are documented by a PQS Floodplain Memo, which is also included in environmental review documents prepared pursuant to 23 CFR Part 771 (Ref. 12) (Revision of National Environmental Policy Act Regulations Interim Final Rule). The PQS Floodplain Memo is described in more detail in Section A.3 of this document.

B.1.4. National Flood Insurance Program (NFIP) Regulations

Congress established the NFIP as part of the National Flood Insurance Act of 1968 (42 USC 4001) (Ref. 13) (National Flood Insurance Act of 1968). The NFIP was established to designate SFHAs in order to help reduce flood losses and disaster relief costs by guiding development away from the SFHAs. It also provided flood insurance to those living in the SFHAs and required communities to implement flood regulations. Since 1968 it has been refined by congress several times:

- Flood Insurance Protection Act of 1973
- National Flood Insurance Reform Act of 1994
- Bunning-Bereuter-Blumenauer Flood Insurance Reform Act of 2004
- Biggert-Waters Flood Insurance Reform Act of 2012
- Homeowners Flood Insurance Affordability Act (HFIAA) of 2014

National Flood Insurance Program Regulations are published in Title 44 of the Code of Federal Regulations, Chapter 1, Subchapter B (https://www.law.cornell.edu/cfr/text/44/chapter-I).

NDOT must comply with 23 CFR 650A (Ref. 3) on state and local highway projects that utilize federal-aid funds. This includes designing encroachments in a manner consistent with standards established by **FEMA**, **State**, and **Local** governmental agencies for the administration of the NFIP (23 CFR 650.103(g), Ref. 3). The NFIP requires that all development undertaken by **NDOT** (federally funded or state funded) in a federally identified SFHA within a given jurisdiction (**County** or **Municipality**) comply with the respective locally-adopted floodplain regulations (44 CFR 60.12) (Ref. 6). **NDOT** is required to meet federal minimum NFIP standards if local floodplain standards do not exist. Local floodplain management regulations are reviewed by both **DWEE NE** and **FEMA** to ensure they meet state and federal requirements before being adopted. These approved local floodplain management regulations may contain more restrictive standards that can take precedence over the NFIP minimum criteria for NFIP administration (44 CFR 60.1(d), Ref. 6). **NDOT** will coordinate with **FHWA Nebraska Division** in situations where there is an irreconcilable conflict between a **NDOT** and **DWEE NE** or **Local Floodplain Management Agencies** regarding the application of a local floodplain standard to a federal-aid highway project.

The **State of Nebraska** has communities that participate in the NFIP, as well as non-participating communities. **Nebraska** also has mapped and unmapped communities. A participating community participates in the NFIP program and has completed the application, adopted a resolution of intent to participate and cooperate with **FEMA**, and has adopted and submitted a floodplain management ordinance that meets or exceeds the minimum NFIP and **State** criteria. Within participating communities the **Federal Government** makes flood insurance available throughout the community. Communities participating in the NFIP can be found in the Community Status Book, (Community Status Book | FEMA.gov) (Ref. 14) on **FEMA's** website (Home | FEMA.gov).

A mapped area means that **FEMA** has published a flood map for the area, whereas unmapped areas do not have a **FEMA** published flood map. **Nebraska** currently has 16 counties that are unmapped by **FEMA**. **DWEE NE's** online floodplain interactive map includes **FEMA** and **DWEE NE** mapped locations (paper and digital) and it also includes the incorporation of Letter of Map Revisions (LOMR) (Ref. 15) (Interactive Maps | DWEE NE).

B.1.5. State of Nebraska Floodplain Statutes and Regulations

The Nebraska Legislature passed the Nebraska Floodplain Regulations Act in 1967 (updated in 1983 and 1993) which can be found in *Nebraska Revised Statutes*, Chapter 31,Sections 1001 to 1023 (as amended) (Ref. 16) (Nebraska Legislature - Revised Statutes Chapter 31). In response to statutory directive, **DWEE NE** implemented the Nebraska Minimum Standards for Floodplain Management Program (the State Minimum Standards), found at NAC Title 455, Chapter 1 (Ref. 9). **DWEE NE** looks to **FEMA** for its primary regulatory interpretations and guidance (44 CFR 60.1(d), Ref. 6) in addition to requirements provided by State law. **NDOT** should also be mindful of the potential for additional restrictions that may be set forth in locally adopted floodplain regulations.

In **Nebraska**, if local regulations are not in place, any development on state-owned land by a state agency or which is state-financed must also meet the **DWEE NE** State Minimum Standards.

The purpose of the "Nebraska Floodplain Regulations Act" is set forth in Nebraska Revised Statutes, Section 31-1001 (Ref. 16):

> *"(1)The Legislature finds that recurrent flooding in various areas of the state presents serious hazards to the health, safety, welfare, and property of the people of the state, both within and outside such areas. The hazards include loss of life, loss of and damage to private and public property, disruption of lives and of livelihoods, interruption of commerce, transportation, communication, and governmental services, and unsanitary and unhealthy living and environmental conditions. The wise use of land subject to flooding is a matter of state concern. The Legislature further finds that the establishment of improved floodplain management practices and the availability of financial assistance to citizens of the state whose property is damaged during times of flooding are essential to the health, safety, and general welfare of the people of Nebraska*"

DWEE NE's duties as described by statute include mapping floodplains, providing technical assistance, and coordinating the NFIP at the state level. More specifically, Nebraska Revised Statutes Section 31-1017 (Ref. 16) authorizes **DWEE NE** to:

- *Coordinate floodplain management activities of local, state, and federal agencies*
- *Receive federal funds intended to accomplish flood plain management objectives*
- *Prepare and distribute information and conduct educational activities which will aid the public and local units of government in complying with the purposes of sections 31-1001 to 31-1023*
- *Provide local governments having jurisdiction over flood-prone lands with technical data and maps adequate to develop or support reasonable flood plain management regulation*
- *Adopt and promulgate rules and regulations establishing minimum standards for local flood plain management regulation. In addition to the public notice requirement in the Administrative Procedure Act, the department shall, at least twenty days in advance, notify by mail the clerks of all cities, villages, and counties which might be affected of any hearing to consider the adoption, amendment, or repeal of such minimum standards. Such minimum standards shall be designed to protect human life, health, and property and to preserve the capacity of the flood plain to discharge the waters of the base flood and shall take into consideration (a) the danger to life and property by water which may be backed up or diverted by proposed obstructions and land uses, (b) the danger that proposed obstructions or land uses will be swept downstream to the injury of others, (c) the availability of alternate locations for proposed obstructions and land uses, (d) the*

opportunities for construction or alteration of proposed obstructions in such a manner as to lessen the danger, (e) the permanence of proposed obstructions or land uses, (f) the anticipated development in the foreseeable future of areas which may be affected by proposed obstructions or land uses, (g) hardship factors which may result from approval or denial of proposed obstructions or land uses, and (h) such other factors as are in harmony with the purposes of sections 31-1001 to 31-1023. Such minimum standards may, when required by law, distinguish between farm and non-farm activities and shall provide for anticipated developments and gradations in flood hazards. If deemed necessary by the department to adequately accomplish the purposes of such sections, such standards may be more restrictive than those contained in the national flood insurance program standards, except that the department shall not adopt standards which conflict with those of the national flood insurance program in such a way that compliance with both sets of standards is not possible

- *Provide local governments and other state and local agencies with technical assistance, engineering assistance, model ordinances, assistance in evaluating permit applications and possible violations of flood plain management regulations, assistance in personnel training, and assistance in monitoring administration and enforcement activities*
- *Serve as a repository for all known flood data within the state*
- *Assist federal, state, or local agencies in the planning and implementation of flood plain management activities, such as flood warning systems, land acquisition programs, and relocation programs*
- *Enter upon any lands and waters in the state for the purpose of making any investigation or survey or as otherwise necessary to carry out the purposes of such sections. Such right of entry shall extend to all employees, surveyors, or other agents of the department in the official performance of their duties, and such persons shall not be liable to prosecution for trespass when performing their official duties*
- *Enter into contracts or other arrangements with any state or federal agency or person as defined in section 49-801 (Nebraska Legislature - Revised Statutes Chapter 49) as necessary to carry out the purposes of sections 31-1001 to 31-1023 and*
- *Adopt and enforce such rules and regulations as are necessary to carry out the duties and responsibilities of such sections*

Nebraska Revised Statutes, Sections 31-1019 to 31-1023 (Ref. 16), describe **NDOT's** responsibilities with regard to floodplains as well as the interplay between **DWEE NE** and **Local Floodplain Administrators**. Section 31-1023 requires **State Agencies**, **Boards**, and **Commissions** to take preventive action to minimize flood hazards and losses in connection with state-owned and state-financed buildings, roads, and other facilities, and to take steps necessary to ensure compliance with the **DWEE NE** State Minimum Standards when such facilities are to be located or constructed in areas where no **Local Government** is enforcing floodplain management regulations. When **Local Governments** are enforcing floodplain management regulations, **NDOT** will comply with the respective locally adopted floodplain regulations, seeking assistance from **FHWA** in the event of a major disagreement affecting a federally funded transportation project. A list of local floodplain managers can be found on **DWEE NE's** website (Welcome | DWEE NE).

NAC, Title 455, Chapter 1, Section 004.01 (Ref. 9) states that no new construction, substantial improvements, or other obstruction (including fill) shall be permitted unless it is demonstrated that the cumulative effect of the proposed new construction, when combined with all other existing and anticipated new construction or substantial improvement, will not increase the water surface elevation of the base flood more than one-foot at any location.

According to NAC, Title 455, Chapter 1 (Ref. 9), Section 002.16, an "Obstruction" shall mean any wall, wharf, embankment, levee, dike, pile, abutment, projection, excavation (including the alteration or relocation of a watercourse or drainway), channel rectification, bridge, conduit, culvert, building, stored equipment or material, wire, fence, rock, gravel, refuse, fill, or other analogous structure or matter which may impede, retard, or change the direction of the flow of water, either in itself or by catching or collecting debris carried by such water, or that is placed where the natural flow of the water would carry such structure or matter downstream to the damage or detriment of either life or property.

NAC, Title 455, Chapter 1 (Ref. 9), Section 005 provides State Minimum Standards governing location of obstructions or substantial improvements in the floodway. NAC, Title 455, Chapter 1, Section 005.01 states that no new construction, substantial improvements, or other obstruction (including fill) shall be permitted within the floodway unless it has been demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the proposed new construction would not result in any increase in the water surface elevations along the floodway profile during occurrence of the base flood.

B.1.6. Floodplains and Clean Water Act Permitting

Undeveloped floodplain land provides many natural resources and functions of considerable economic, social, and environmental value. Floodplains often contain wetlands and other important ecological areas as part of a total functioning system that benefits the quality of the local environment. The movement of water through ground and surface systems, floodplains, wetland, and watersheds is perhaps the greatest indicator of the interaction of natural processes in the environment.

When construction activities will impact jurisdictional waterways the **Technical Resources Unit** (**TRU**) in the **Environmental Section** of **PDD** is consulted to determine **US Army Corps of Engineers** (**Corps**) permitting requirements. Floodplain impacts are also reviewed for projects that require **Corps** permit to meet the Clean Water Act Section 404 (Ref. 17) (Overview of Clean Water Act Section 404 | US EPA) or Section 401 (Ref. 18) (Section 401 of the Clean Water Act | US EPA) requirements, as the **Corps** is also required to consider EO 11988 as part of its public interest review when an application is received requesting authorization to impact waters of the U.S. that also has the potential to increase the BFE.

For projects requiring Section 401, 404 or 408 (Ref.19) (Section 408 (army.mil)) approvals, the roadway designer should contact **TRU** to obtain the necessary permits and approvals.

A **U.S. Coast Guard** Section 9 Bridge Permit (Ref. 20) (Bridge Permit Application Process) may be required for new bridges over commercially navigable waters, but these types of permits are uncommon; in **Nebraska** the only identified navigable water is the Missouri River. When a Section 9 Bridge Permit is required, the **U.S. Coast Guard** requires completion of floodplain coordination prior to issuing a permit. Contact **TRU** for assistance with Section 9 permits.

C.1. Floodplain Analysis/PQS Floodplain Memo (23 CFR 650.111)

When the proposed action for a federally funded transportation improvement project lies within a base floodplain a PQS Floodplain Memo is prepared, which includes a location hydraulic study in accordance with 23 CFR 650.111 (Ref.3). The 650.111 minimum documentation requirements, including the review requirements for NEPA found at 23 CFR 771 (Ref. 12), are met by the preparation of a PQS Floodplain Memo (or Floodplain Memo).

The PQS Floodplain Memo (Appendix L of the Roadway Design Manual (*RDM*) (Ref. 21) Roadway Design Manuals - NDOT) addresses each of the criteria set forth in 23 CFR 650.111 (Ref. 3) for Location Hydraulic Studies (see Sections C.1.1 – C.1.6 of this document). **Local**, **State**, and **Federal Floodplain Management Agencies** may be consulted to determine if the proposed highway action is consistent with existing watershed and floodplain management programs and to obtain current information on development and proposed actions in the affected watershed.

The PQS Floodplain Memo is prepared by designers/engineers based on site specific information. It is reviewed by the projects' **Roadway Design** or **Local Assistance Division Project Unit Head** (**Unit Head**) and approved by **NDOT PQS** in **Bridge Hydraulics**. The **PQS** must be a registered Professional Engineer with hydraulic expertise. Appendix L of the *RDM* (Ref. 21) provides additional information.

The PQS Floodplain Memo is submitted to the **PDD Environmental Documents Unit** (**EDU**) **NEPA Specialist**, who incorporates the information into the environmental review documentation in accordance with 23 CFR part 771 (Ref. 12). The **Highway Programs Unit** in the **Communications Division** is notified when a project has been identified as having adverse impacts to floodplains, defined as the anticipation of either a rise greater than one-foot in the base flood elevation or a LOMR. The PQS Floodplain Memo documenting the 23 CFR 650.111 (Ref. 3) Location Hydraulic Study provides the minimum documentation necessary regarding analysis of floodplain encroachment impacts and is also utilized as part of the Plan-in-Hand process.

C.1.1. Documentation of Floodplain and/or Floodway Encroachments

The first section of the Floodplain Memo documents whether the project has an encroachment. Seven different scenarios may occur; the designer/engineer identifies which scenario applies for each project. The seven scenarios are:

1. Project is located within a Mapped and Participating Community and crosses or overlaps upon Base Floodplains.
2. Project is located in a Mapped and Participating Community and crosses or overlaps upon Base Floodplains and Regulatory Floodways.
3. Project is located in a Mapped and Participating Community and does not overlap upon any Base Floodplain or Regulatory Floodway.
4. Project is located in a Mapped but Non-Participating Community and crosses or overlaps upon Base Floodplains.
5. Project is located in a Non-Mapped and Non-Participating Community and crosses or overlaps upon Potential Base Floodplains.
6. Project is located in a Non-Mapped and Non-Participating Community and does not overlap upon Potential Base Floodplain.
7. Project entails scope that does not meet the criteria for Development – See the **FEMA** definitions for definition of Development.

C.1.2. Documentation of Floodplain and/or Floodway Impacts

For each project, the Floodplain Memo documents whether the project will cause a rise in the BFE greater than one-foot, an increase in the potential for property loss and hazard to life, or any rise in a regulatory floodway. Based on the scope of the project, three determinations may be made. They are:

1. No floodplain certification or permit will be required.
2. The project will be certified to meet floodplain regulations. It is not anticipated to cause greater than one-foot of rise in the BFE within a Base Floodplain, increase the potential for property loss and hazard to life, or any rise in the BFE within a Regulatory Floodway.
3. It is anticipated that the project will require a conditional letter of map revision (CLOMR) and a letter of map revision (LOMR) following construction and will require further coordination with **FEMA**. Notify the **Highway Programs Unit**.

Projects may require the issuance of a LOMR or CLOMR. The project **PQS** with hydraulic expertise will provide more guidance if/when that process is required. Coordination with **FEMA** must occur when:

- Floodplain studies indicate that a proposed encroachment on a regulatory floodway (BFE increase) would require an amendment to the floodway map (however, it is not likely that any increase would be allowed by **FEMA**), or
- A proposed encroachment on a floodplain where a detailed study has been performed but no floodway designated and the maximum one-foot increase in the base flood elevation would be exceeded

Map revisions are a complex process. It is recommended that **DWEE NE** and/or **FEMA** be contacted for technical assistance at the outset and throughout this process. A basic outline of the information needed is listed below:

- Flood Insurance Study (FIS) backup data (hydrology, hydraulics and mapping) from **FEMA** for pre-project hydraulic model
- Pre-project survey of existing cross-sections of the stream or watercourse at the proposed project site
- The design must meet **Local**, **State**, and **FEMA** criteria and all other permit requirements
- Original FIS models (HEC-2, HEC-RAS or WSPRO, etc.) must be rerun with new data to reflect the new base floodplain boundaries

Map revision data (LOMR) must be submitted to **FEMA** within 6 months of project completion. However, the coordination/consultation for the revisions should begin during the design phase of a project (CLOMR).

C.1.3. Documentation of floodplain encroachments other than functionally dependent use

The project designer/engineer will determine if the project has a base floodplain that overlaps the project at locations other than culverts and/or bridges. It will be determined whether the project scope results in a floodplain encroachment other than functionally dependent uses.

For transportation projects, functionally dependent use has been described as bridges or any water conveyance structures or actions that facilitate the use of open space use (e.g. recreational trails, bicycle and pedestrian paths). Functionally dependent uses also include embankment, culverts, grading and guardrails, and other associated appurtenances or required work to support or protect a bridge or culvert.

If there are no base floodplains that overlap the project then documentation will reflect that there are no base floodplain encroachments.

If there are no locations along the project that possibly or potentially overlap a floodplain outside of culverts, bridges, and adjacent embankment or other activities listed above, and all overlapping areas are located at culverts or bridges and are considered a functionally dependent use of the floodplain, then documentation will reflect that there are no floodplain encroachments other than functionally dependent use.

If there are locations along the project that overlap a floodplain and are not considered functionally dependent, it will be documented that there are floodplain encroachments other than functionally dependent use. Source information will also be documented and will contain the Panel Number and the Effective Date of the map (for example, FIRM, FHBM). If a digital work map from **DWEE NE** was used, this will also be documented.

C.1.4. Documentation of evaluation and discussion of practicability of alternatives to any longitudinal encroachments (23 CFR 650.111(b), Ref. 3)

The designer/engineer will evaluate and discusses the practicability of alternatives to any longitudinal encroachments. For all projects, the longitudinal encroachment will be described, and consideration will be given to whether there are alternatives to the encroachment. For example, for a project on existing alignment or a maintenance project, which typically has an asset preservation scope, there would be no alternative that would have less impact on the longitudinal encroachment.

If there are no longitudinal (parallel) encroachments located along the project, there are no longitudinal encroachments to evaluate or discuss.

For reconstruction or new construction on existing alignment projects, language about replacement on alignment will be included. For reconstruction or new construction on any portion of the project on new alignment, a discussion regarding the alternative analysis and selection of the alignment will be included.

C.1.5. Documentation of the discussion of risks associated with implementation of the action, the impacts on natural and beneficial flood-plain values, the support of probable incompatible flood-plain development, the measures to minimize flood-plain impacts associated with the action, and the measures to restore and preserve the natural and beneficial flood-plain values impacted by the action for all alternatives containing encroachments and for those actions which would support base floodplain development (23 CFR 650.111 (c), Ref. 3)

The designer/engineer will include discussion of the following items, commensurate with the significance of the risk or environmental impact, for all alternatives containing encroachments and for those actions which would support base flood-plain development (23 CFR 650.111(c)):

1. The risks associated with implementation of the action,
2. The impacts on natural and beneficial flood-plain values,
3. The support of probable incompatible flood-plain development,
4. The measures to minimize flood-plain impacts associated with the action, and
5. The measures to restore and preserve the natural and beneficial flood-plain values impacted by the action.

Risk is defined as "*the consequences associated with the probability of flooding attributable to an encroachment. It shall include the potential for property loss and hazard to life during the service life of the highway*." (23 CFR 650.105(o)). Therefore, from the reverse perspective, if a project will not, or will minimally increase the potential for loss of life or property, and will not or will minimally increase the consequences associated with the probability of flooding attributable to the encroachment, it would not be considered a significant risk. See C.1.6 for additional information.

Natural and beneficial floodplain values are defined in 23 CFR 650.105(i), including but not limited to, *fish, wildlife, plants, open space, natural beauty, scientific study, outdoor recreation, agriculture, aquaculture, forestry, natural moderation of floods, water quality maintenance, and groundwater recharge.* When analyzing the significance of the risk or environmental impacts on natural and beneficial floodplain values, coordination should occur with relevant subject matter experts in the **PDD Environmental Section**. The Floodplain Memo documents the discussion of risk or environmental impacts to natural and beneficial floodplain values *commensurate with the significance of the risk or environmental impact* (23 CFR 650.111(c)).

It is the policy of **FHWA** to avoid support of incompatible floodplain development (23 CFR 650.103(f)); support of base floodplain development means to encourage, allow, or otherwise facilitate additional base floodplain development. Direct support results from an encroachment, while indirect support results from an action out of the base floodplain (23 CFR 650.105(r)). The Floodplain Memo documents whether the proposed improvements for a project will maintain local and regional access to existing rural and agricultural areas, or whether it will create new access to undeveloped lands.

The Floodplain Memo documents what *measures were taken to minimize flood-plain impacts associated with the action, commensurate with the significance of the risk or environmental impact, for all alternatives containing encroachments and for those actions which would support base flood-plain development* (23 CFR 650.111(c)).

The Floodplain Memo documents what measures were taken to restore the natural and beneficial flood-plain values along the project. For example, for projects that have temporary soil disturbance activities during construction, sediment and erosion control best management practices will be utilized during construction and disturbed areas will be seeded following construction.

C.1.6 Documentation of an evaluation and discussion of the practicability of alternatives to any significant encroachments or any support of incompatible flood-plain development. (23 CFR 650.111(d), Ref. 3)

As defined in 23 CFR 650.105, a *"significant encroachment" shall mean a highway encroachment and any direct support of likely base floodplain development that would involve one or more of the following construction or flood-related impacts:*

(1) A significant potential for interruption or termination of a transportation facility which is needed for emergency vehicles or provides a community's only evacuation route.
(2) A significant risk. or
(3) A significant adverse impact on natural and beneficial flood-plain values.

Documentation will reflect if a project results in a significant potential for interruption or termination of a transportation facility which is needed for emergency vehicles or a community's only evacuation route. Documentation will also reflect whether the project scope results in a significant risk of increase in potential for loss of life or property, a substantial adverse impact on natural and beneficial flood-plain values, and whether the project supports any incompatible floodplain development.

According to 23 CFR 650.113, *a proposed action which includes a significant encroachment shall not be approved unless FHWA finds that the proposed significant encroachment is the "only practicable alternative". This finding shall be included in the final environmental document (final environmental impact statement or finding of no significant impact) and shall be supported by the following information:*

(1) The reasons why the proposed action must be located in the flood plain,
(2) The alternatives considered and why they were not practicable, and
(3) A statement indicating whether the action conforms to applicable State or local flood-plain protection standards.

D. Design Standards (23 CFR 650.115, Ref. 3)

NDOT follows general design standards consistent with State and Federal law. Design standards established by 23 CFR 650.115 are:

(a) The design selected for an encroachment shall be supported by analyses of design alternatives with consideration given to capital costs and risks, and to other economic, engineering, social and environmental concerns.
- *(1) Consideration of capital costs and risks shall include, as appropriate, a risk analysis or assessment which includes:*
  - *i. The overtopping flood or the base flood, whichever is greater, or*
  - *ii. The greatest flood which must flow through the highway drainage structure(s), where overtopping is not practicable. The greatest flood used in the analysis is subject to state-of-the-art capability to estimate the exceedance probability.*
- *(2) The design flood for encroachments by through lanes of Interstate highways shall not be less than the flood with a 2 percent chance[1] of being exceeded in any given year. No minimum design flood is specified for Interstate highway ramps and frontage roads or for other highways.*
- *(3) Freeboard shall be provided, where practicable, to protect bridge structures from debris- and scour-related failure.*
- *(4) The effect of existing flood control channels, levees, and reservoirs shall be considered in estimating the peak discharge and stage for all floods considered in the design.*
- *(5) The design of encroachments shall be consistent with standards established by the FEMA, State, and local governmental agencies for the administration of the National Flood Insurance Program for:*
  - *i. All direct Federal highway actions, unless the standards are demonstrably inappropriate, and*
  - *ii. Federal-aid highway actions where a regulatory floodway has been designated or where studies are underway to establish a regulatory floodway.*

(b) Rest area buildings and related water supply and waste treatment facilities shall be located outside the base flood plain, where practicable. Rest area buildings which are located in the base flood plain shall be floodproofed against damage from the base flood.

(c) *Where highway fills are to be used as dams to permanently impound water more than 50 acre-feet[2] in volume or 25 feet deep[2], the hydrologic, hydraulic, and structural design of the fill and appurtenant spillways shall have the approval of the State or Federal agency responsible for the safety of dams or like structures within the State, prior to authorization by the Division Administrator to advertise for bids for construction.*

Although the minimum design for Interstate highway ramps and frontage roads or for other highways is not given in 23 CFR 650.115, design guidance can be found in **EXHIBIT 1.3** in Chapter One: Drainage of this manual. Also, see 23 CFR 650.117 for the content of design studies. *Design Standards for Highways in National Flood Insurance Program Mapped Floodplains* is also available as guidance from **FHWA**.

[1] 2 percent chance is often referred to as a 50-year design storm
[2] Metrics removed

E. Floodplain Considerations during the Phases of an NDOT Project

During the Program Phase (Activity 5100) of an **NDOT** project, **PDD** determines the presence of a floodplain and/or floodway within the project area. Floodplain identification is accomplished by referencing the **DWEE NE** floodplain interactive map and/or the **FEMA** Flood Map Service Center (Ref. 22) (FEMA Flood Map Service Center | Welcome!); these sources provide the best available current information since they are updated as necessary by those agencies. **Project Development** documents the findings within the NDOT Form 73 – Highway Improvement Programming Request and Scoping Report.

Following the Program Phase, the project enters the Planning Phase (Activity 5200), where it becomes the responsibility of the roadway designer to determine whether the extent of the project footprint results in an encroachment on a floodplain or floodway. At the end of the Planning Phase the presence of floodplains/floodways is documented within the meeting minutes of Project Coordination Meeting 20 (PCM 20, Clarity Task 5290). See the Design Process Outline (*DPO*) (Ref. 23) (https://dot.nebraska.gov/business-center/design-consultant/) for more information regarding PCMs.

The Design Phase (Activity 5300) follows the Planning Phase. The PQS Floodplain Memo will be completed prior to the Plan-in-Hand process during this phase. As noted above, the PQS Floodplain Memo is included with the environmental documentation for the next project phase, the Environmental Approval Phase.

The Plan Details phase follows the Environmental Approval Phase, and it is here that the floodplain certification is completed by the **Bridge Hydraulics Staff** for submittal to the **Local Floodplain Administrators** for the floodplain development permit. (See Section F of this document regarding floodplain certification).

When a project is located in a floodplain, it is the responsibility of the roadway designer and their **Unit Head** to be aware of the restrictions on increases to the base flood elevation. Changes in culvert pipe sizes, culvert flow lines, embankment fill, channel shape, bridges, and pavement elevation increase can cause increases in the base flood elevation of a floodplain. Designers should also be mindful of the fact that local governments occasionally have more restrictive requirements for development in a floodplain that may need to be taken into consideration during design.

The **Bridge Hydraulics Staff** will support the roadway designer on understanding the program, use of resources for identifying floodplains and floodways, and identifying encroachments.

F. NDOT Floodplain Certification Process

Projects which may affect base flood elevations are investigated, analyzed, and certified to meet floodplain regulations prior to requesting a permit from the **Local Floodplain Administrator**. Once the final limits of construction have been determined they are compared to the limits of the floodplain/floodway to start the certification process.

Upon identification of floodplain/floodway encroachment by a project, **Bridge Hydraulics** engages in additional evaluation and analysis of impacts and ultimately certifies that the improvement meets requirements for work within a floodplain/floodway. Projects being accomplished under a consultant contract require the **Consultant** to follow the same process as internal projects when evaluating floodplain/floodway impacts and providing certification. Certifications completed by **Consultants** are reviewed by **NDOT PQS/Hydraulics Staff** and documentation is placed in the project file.

Projects with construction occurring in a floodplain, whether crossing or parallel to that floodplain, require **NDOT** to certify that:

- Where construction occurs in base floodplains it does not increase, cumulatively, the floodplain base flood elevation by more than one-foot, and
- Where construction occurs in regulatory floodways, there is no increase to the base flood elevation

The certification will document that the project meets State regulations, causing neither an increase in the floodway nor an increase in the base flood elevation by more than one-foot in a floodplain. In the case of a **Community** with stricter standards, **NDOT** will certify that the project meets those stricter local regulations.

Certification are provided by the **Bridge Hydraulics Staff** or by **Consultants**, if they meet PQS requirements as a registered Professional Engineer with hydraulic expertise. Roadway designers (or their **Unit Head**) should request a certification once limits of construction and final design have been completed. This occurs prior to the submittal of the Roadway Design Details (Clarity Task 5508).

NDOT produces a project memo for the **Local Floodplain Administrator** describing the project location/bounds (including Section, Township, and Range), work being done, a short paragraph explaining impacts for each floodplain encroachment and the work's effect on the BFE or water surface elevations, and a statement that the work meets the floodplain requirements. A certification for each floodplain encroachment (with Engineer's stamp and signature) is provided, as well as a set of floodplain maps showing encroachment locations and a general location map. **NDOT** retains and stores H&H analysis with the design files and submits the memo, certifications, and mapping to **TRU** for inclusion in the Floodplain Development Permit Application. The technical data, if available, will be provided to **Local Floodplain Administrators** upon request.

G. Certification Guidelines

The level of analysis required for floodplain certifications can differ. Below are several scenarios that **NDOT** commonly encounters.

G.1: Case 1 - No Changes to Roadway Elevations or Culverts

On projects with no changes to the roadway elevation and no culvert replacements or extensions, floodplain documentation typically involves a "Letter of No Impact" to the **Local Floodplain Administrator(s)**. These types of projects include, but are not limited to, mill and fill projects with no grade raise and no grading outside of the shoulder hinge point, concrete pavement repair, armor coat, fog seal, micro-surfacing, diamond grinding, bridge painting, applying surface sealers, joint sealing, curb ramps, etc. Crack-filling and striping projects are activities that fall outside of the definition of development as defined by NFIP; **NDOT** has a letter from **DWEE NE** that states that crack sealing and paint striping are activities that fall outside of the definition of development and do not require a Floodplain Development Permit.

These types of work fall within the category of minor projects, described in **FEMA's** "Managing Floodplain Development through NFIP" (Manage Floodplain Risk | FEMA.gov) guidance document which states that some projects are too small to warrant an engineering study and encroachment certification. A determination has been made that these projects will not block flood flows.

The "Letter of No Impact" describes the project location and work involved. The letter further states that the project will have no impact on the floodplain/floodway and **NDOT** does not believe a floodplain permit is required; no H&H analysis is required. If the **Local Administrator** so chooses, she/he may contact **NDOT** and request a permit application. In that situation, **NDOT** will provide permitting information as requested.

G.2: Case 2 - Changes to Roadway Elevation, Bridges, or Culverts in Floodplains/Floodways

In cases where the project will result in changes to the roadway elevation or embankments (e.g. an overlay with a grade raise or a widening project involving changes to the ditch or backslope) and/or culvert replacements or extensions, the effort required to evaluate the impacts and for certification increases. For these projects the **Bridge Hydraulics Section** completes an investigation and H&H evaluation (see description below) for each non-bridge size and bridge size structure and for roadway embankment floodplain impacts. The H&H analysis, when a hydraulic model is required, focuses on the 100-year event and, for Zone A, compares the pre-project conditions to the post-project conditions; for Zone AE the comparison is between the current NFIP BFE vs. the post project BFE. The profile of the base flood elevations is reviewed upstream and downstream of the highway.

The investigation also includes checking for risks to improved properties, even if the analysis shows the project meets floodplain regulations. When the project work increases the BFE(s) over the acceptable limits or investigation shows risk to improved property, adjustments to the culvert/bridge/roadway design are warranted and coordinated with **Roadway Design** prior to certification.

The H&H analysis will follow standard **NDOT** procedures. If a **FEMA** study exists it will be used to determine impacts on the base floodplain and regulated floodway as appropriate. **NDOT** uses the Rational Method to compute peak discharges for drainage areas less than 640 acres or 1 sq. mile and the NRCS curve number method for drainage areas from 1 to 10 sq. miles. Regression equations are used to determine peak discharges for drainage areas greater than 10 sq. miles. For most floodplain certifications, **NDOT** uses basic hydraulic procedures for determining the highway project's impacts on the floodplain encroachment(s), e.g. HY-8 for the culvert crossings and normal depth Manning's Equation calculations for channel impacts and parallel encroachments. **NDOT** typically reserves the use of HEC-RAS or other **FEMA**-approved models for analysis of bridge replacements within the floodplain or for cases where backwater from changes due to the highway project could reasonably impact upstream buildings. Investigation of encroachments includes checking for impacts to improved real estate, even if analysis shows the requirements of the floodplain regulations are met.

For more information regarding H&H calculation methods see Chapter One: Drainage in this manual and **NDOT's** Bridge Hydraulic Analysis Guidelines (Ref. 25) (Bridge - NDOT).

G.3: Case 3 - No Floodplains Encroached

On projects where no floodplains are encroached **NDOT** generates a courtesy email to **NDOT** project stakeholders (e.g. **Wetlands Biologist**, **NEPA Specialist**) stating that no floodplains are encroached upon. The information is also documented in Clarity within the floodplain comments. Official documentation of the absence of floodplain encroachment is captured by the PQS memo, which is kept in the project file.

G.4: Case 4 - Non-Mapped Communities

NDOT certifies floodplains to meet State Minimum Standards for Floodplain Management (Ref. 9) on projects where the community does not have **FEMA** floodplain mapping. The existence of State Minimum Standards Potential Base Floodplains is determined by analysis of drainage basins using USGS quad maps and aerials. The work effort on State Minimum Standards Potential Base Floodplains, once their existence is established, is similar to the cases stated above in cases 1 and 2.

In currently unmapped communities **NDOT** will provide floodplain certifications for projects that drain more than 1 sq. mile (640 acres). Watersheds greater than 1 sq. mile will be treated as Potential Base floodplains and the project area will then be evaluated based on the requirements listed above for Base floodplains. They will be certified, but no permit is requested from these **Non-Participating Communities** (See Ref. 14).

G.5: Case 5 - Non-Mapped Counties located with Nebraska Sandhills

There are 16 counties in **Nebraska** that do not have **FEMA** Floodplain mapping and do not participate in the NFIP. There may be communities within these counties that are mapped. For counties that are completely unmapped floodplain development permits are not required, however certifications may still be required as explained below. Verify participating and/or mapped communities by looking it up through **FEMA**.

As a topographic region, the Nebraska Sandhills is characterized by well-watered grass-stabilized dunes of predominantly sandy soils. The combination of highly permeable soils (which limit surface runoff and enhance infiltration) and thick, permeable, subsurface deposits (which facilitate percolation and recharge the groundwater supply) have infiltration rates a hundred times higher than in the clayey loams found in the Platte Basin and other like river basins around the state. Sandhill streams are fed by groundwater, streamflow in the region is predominantly from subsurface percolation instead of surface runoff (See the Atlas of the Sand Hills, Ref. 24) (https://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1843&context=conservationsurvey). Traditional methods of determining drainage areas by topographic maps and determining peak flows of surface runoff are not applicable in these areas; precipitation in the region rarely results in overland runoff that reaches streams. Instead it quickly infiltrates porous soils and moves according to subsurface groundwater gradients. Aerial inspection and contour maps also reveal that the typical patterns of sheet flow runoff which coalesces into concentrated overland flow and channels are not present in this area.

Perennial or intermittent streams located within the Sandhills are characterized by nearly constant flows that are typical of streams fed almost entirely by groundwater seepage. These streams do not experience the extreme high discharges or low discharges that are typical of streams being fed by surface runoff. As a result floodplain maps that are associated with a present flooding risk have not been completed for these areas and potential Base floodplains cannot be identified.

When a project is located within an unmapped county with unmapped communities, does not involve a stream crossing, and lies within the Sandhills topographic regions roadway embankment and culvert locations (non-bridge sized structures) will be identified as areas where there are no potential Base floodplains. Therefore no certifications are required for these locations. If there is a stream crossing, see the paragraph below.

For roadway embankments, culverts, and bridges located at stream crossings the project will be certified based on the information available. Methods can include calculations from regression equations, flow gauge data, **NDOT** developed data for Nebraska Counties, flood flow frequency prediction equations developed for the Sandhills region in Nebraska, historical high-water data, **NDOT's** Bridge Hydraulic Analysis Guidelines, or any other data available. Hydrology and hydraulics calculations within the Sandhills vary and best engineering judgement will be used to determine 100-year flows at a stream crossing located at a bridge structure.

H. Floodplain Permitting

Projects meeting the definition of development and which encroach within a mapped SFHA as shown on a FIRM (Ref. 7) will be submitted to the local floodplain administrators for a floodplain development permit. Development is defined by **FEMA** as *any man-made change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations or storage of equipment or materials* (44 CFR 59.1, Ref. 4). However, according to **FHWA**, *support base flood-plain development shall mean to encourage, allow, serve, or otherwise facilitate additional base flood-plain development. Direct support results from an encroachment, while indirect support results from an action out of the base flood plain* (23 CFR 650.109(r), Ref. 3). Currently, **NDOT** has a letter from **DWEE NE** that states that crack sealing and paint striping are activities that fall outside of the definition of development and do not require a Floodplain Development Permit. As noted above, **NDOT** will coordinate with **FHWA Nebraska Division** in situations where there is an irreconcilable conflict between **NDOT** and **DWEE NE** or **Local Floodplain Management Agencies** regarding the application of a local floodplain standard to a federal-aid highway project.

Certifications of compliance with floodplain regulations, once completed, will be placed in the project file and forwarded to **TRU** so a floodplain permit can be requested from the regulating community (**County** or **City**). Certifications of compliance for projects located in communities not regulating floodplains and based on Minimum State Standards are provided to the **TRU** and placed in the project file to show compliance with environmental regulations.

I. Floodplain Mitigation

FEMA defines flood mitigation as *any sustained action that reduces or eliminates long-term risk to people and property from the effects of floods*. Flood mitigation reduces the overall risk of a structure experiencing flood damage and reduces the severity of flood damage when it occurs.

There are two types of basic flood mitigation: structural and non-structural. As the name implies, structural techniques seek to build structures in order to change or "control" the physical environment. Common techniques are dams, levees, floodwalls, jetties, or retention ponds. The purpose of non-structural flood mitigation is to change the way that people interact with the floodplain flood risk and also aim to move people away from flood-prone areas. Floodplain mitigation outside of engineered structural mitigation is not addressed in this manual.

Structural floodplain mitigation is more likely to occur when projects cannot be avoided within a floodplain and have impacts on lives, property, and natural and beneficial floodplain values. If there are no practicable alternative sites then **NDOT** must develop measures to minimize the adverse impacts, restore, and preserve the floodplain. The methods used to minimize, restore, and preserve vary in context and intensity depending on the project. **NDOT** coordinates and communicates with **DWEE NE** and other **State** and **Federal Agencies** with regard to structural floodplain mitigation strategies.

APPENDIX – ACRONYMS and DEFINITIONS

BFE	Base Flood Elevation
CLOMR	Conditional Letter of Map Revisions
EO	Executive Order
FAA	Flood Awareness Area
FEMA	Federal Emergence Management Agency
FHBM	Federal Hazard Boundary Map
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
H&H	Hydraulic Engineering Analysis
LOMR	Letter of Map Revision
NAC	Nebraska Administrative Code
NDOT	Nebraska Department of Transportation
DWEE NE	Nebraska Department of Water, Energy, and Environment
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
PQS	Professionally Qualified Staff
SFHA	Special Flood Hazard Area
TRU	Technical Resources Unit in the Environmental Section of the NDOT Planning and Project Development Division
Corps	United States Army Corps of Engineers

FHWA - FAPG 23 CFR 650A (Ref. 3)
Location and Hydraulic Design of Encroachments on Flood Plains Definitions

The following definitions of terms are for the uniform application in the documentation and preparation of location hydraulic studies. Refer to 23 CFR 650.105 for a complete list of definitions.

"Action" shall mean any highway construction, reconstruction, rehabilitation, repair, or improvement undertaken with Federal or Federal-aid highway funds or FHWA approval.

“Base Flood” - The flood or tide having a one percent (1%) chance of being exceeded in any given year (100-year flood).

"Base flood plain" shall mean the area subject to flooding by the base flood.

“Design Flood” - The peak discharge, volume if appropriate, stage or wave crest elevation of the flood associated with the probability of exceedance selected for the design of a highway encroachment. By definition, the highway will not be inundated from the state of the design flood.

"Encroachment" shall mean an action within the limits of the base floodplain.

“Floodproof” - To design and construct a project to keep floodwaters out or to reduce the effects of floodwaters.

“Natural and beneficial Floodplain Values” shall include but are not limited to fish, wildlife, plants, open space, natural beauty, scientific study, outdoor recreation, agriculture, aquaculture, forestry, natural moderation of floods, water quality maintenance, groundwater discharge.

"Practicable" shall mean capable of being done within reasonable natural, social, or economic constraints.

"Preserve" shall mean to avoid modification to the functions of the natural flood-plain environment or to maintain it as closely as practicable in its natural state.

"Regulatory floodway" shall mean the flood-plain area that is reserved in an open manner by Federal, State or local requirements, i.e., unconfined or unobstructed either horizontally or vertically, to provide for the discharge of the base flood so that the cumulative increase in water surface elevation is no more than a designated amount (not to exceed 1 foot as established by the Federal Emergency Management Agency (FEMA) for administering the National Flood Insurance Program). (Since the 1 foot is already accounted for, no increase more than 0.00 feet is allowed.) 23 CFR 650.109(m)

“Restore” shall mean to reestablish a setting or environment in which the functions of the natural and beneficial flood-plain values adversely impacted by the highway agency action can again operate.

“Risk” shall mean the consequences associated with the probability of flooding attributable to an encroachment. It shall include the potential for property loss and hazard to life during the service life of the highway.

Risk Analysis - An economic comparison of design alternatives using expected total costs (construction costs plus risk costs) to determine the alternative with the least expected cost to the public. It shall include probable flood-related costs during the service life of the facility for highway operation, maintenance, and repair, for highway-aggravated flood damage to other property, and for additional or interrupted highway travel.

“Significant encroachment” shall mean a highway encroachment and any direct support of likely base floodplain development that would involve one or more of the following construction-or flood-related impacts:

1) *A significant potential for interruption or termination of a transportation facility which is needed for emergency vehicles or provides a community’s only evaluation route.*
2) *A significant risk, or*
3) *A significant adverse impact on natural and beneficial flood-plain values.*

“Support base floodplain development” shall mean to encourage, allow, serve, or otherwise facilitate additional base flood-plain development. Direct support results from an encroachment, while indirect support results form an action out of the base flood plain.

Federal Emergency Management Agency (FEMA) Definitions
See 44 CFR 59 (Ref. 4) for a complete list of definitions
See Home | FEMA.gov for additional interpretations and guidance:

Backwater: The effect of downstream flow on the water surface profile; the rise in water surface elevation due to encroachment.

Base Flood: *A flood having a 1% chance of being equaled or exceeded in any given year*.

Base Flood Depth (BFD): The depth shown on the Flood Insurance Rate Map (FIRM) (Ref. 7) for Zone AO that indicates the depth of water above the highest adjacent grade resulting from a flood that has a 1% chance of equaling or exceeding that level in any given year.

The **Base Flood Elevation (BFE):** The computed elevation to which floodwater is anticipated to rise during the base flood. BFEs are shown on Flood Insurance Rate Maps (FIRMs) (Ref. 7) and on the flood profiles. The BFE is the regulatory requirement for the elevation or floodproofing of structures. The relationship between the BFE and a structure's elevation determines the flood insurance premium. The BFE is the elevation of surface water resulting from a flood that has a 1% chance of equaling or exceeding that level in any given year. The BFE is shown on the Flood Insurance Rate Map (FIRM) for zones AE, AH, A1–A30, AR, AR/A, AR/AE, AR/A1– A30, AR/AH, AR/AO, V1–V30 and VE.

Community: A political entity that *has the authority to adopt and enforce floodplain management regulations for the area under its jurisdiction*.

Development: *Any man-made change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations or storage of equipment or materials.*

Encroachments: Activities or construction within the floodway including fill, new construction, substantial improvements, and other development. These activities are prohibited within the adopted regulatory floodway unless it has been demonstrated through hydrologic and hydraulic analyses that the proposed encroachment would not result in any increase in flood levels.

Federal Emergency Management Agency (**FEMA**)**:** The Federal agency under which the NFIP is administered. In March 2003 **FEMA** became part of the newly created **U.S. Department of Homeland Security**.

Flood Boundary and Floodway Map (FBFM): A pre-Map initiatives floodplain management map delineates the 100-year (1% annual chance) and 500-year (0.2% annual chance) floodplains, floodway, and cross sections.

Flood Hazard Boundary Map (FHBM): *An official map of a community, issued by the Federal Insurance Administrator, where the boundaries of the flood, mudslide (i.e., mudflow) related erosion areas having special hazards have been designated as Zones A, M, and/or E.*

Flood Insurance Rate Map (FIRM) (Ref. 7): *An official map of a community, on which the Federal Insurance Administrator has delineated both the special hazard areas and the risk premium zones applicable to the community. A FIRM that has been made available digitally is called a Digital Flood Insurance Rate Map (DFIRM).* A FIRM is an official map of a community on which FEMA has delineated the Special Flood Hazard Areas (SFHAs), the Base Flood Elevations (BFEs) and the risk premium zones applicable to the community.

Flood Insurance Study (FIS): *An examination, evaluation and determination of flood hazards and, if appropriate, corresponding water surface elevations, or an examination, evaluation and determination of mudslide (i.e., mudflow) and/or flood-related erosion hazards.* A FIS is a compilation and presentation of flood risk data for specific watercourses, lakes, and coastal flood hazard areas within a community. When a flood study is completed for the NFIP, the information and maps are assembled into an FIS. The FIS report contains detailed flood elevation data in flood profiles and data tables.

Flood mitigation: Any sustained action that reduces or eliminates long-term risk to people and property from the effects of floods.

Floodplain: *Any land area susceptible to being inundated by floodwaters from any source.*

Floodway Fringe (sometimes referred to as the Flood Fringe): The area within the SFHA, the portions of the floodplain beyond the floodway, which usually contains slow-moving or standing water during a base flood event.

Frequency Analysis (also Flood Frequency Analysis): Statistical techniques that estimate the probabilities of a flood event occurring. Flood Frequency is the statistical number of years that takes place before the recurrence of a flood of the same magnitude. (e.g.10-year flood, 50-year flood, 100-year flood)

Functionally Dependent Use: *A use which cannot perform its intended purpose unless it is located or carried out in close proximity to water. This term includes only docking facilities, port facilities that are necessary for the loading and unloading of cargo or passengers, and shipbuilding and ship repair facilities, but does not include long-term storage or related manufacturing facilities.* – **FHWA** has used it as the following: Functionally dependent use has been described as bridges, or any water conveyance structures or actions that facilitate the use of open space use (e.g. recreational trails, bicycle and pedestrian paths). Functionally dependent uses also include embankment, culverts, grading and guardrails, and other associated or required work that are required to support or protect the bridge or culvert.

Letter of Map Amendment (LOMA): An amendment to the currently effective **FEMA** map which establishes that a property is not located in a Special Flood Hazard Area (SFHA). A LOMA is issued only by FEMA.

Letter of Map Revision (LOMR): An official amendment to the currently effective **FEMA** map. It is issued by **FEMA** and changes flood zones, delineations and elevations.

Map Revision: A change in the Flood Hazard Boundary Map (FHBM) or Flood Insurance Rate Map (FIRM) (Ref. 7) for a community which reflects revised zone, base flood or other information.

Mapped Community: A Community (County, City or Village) which has Floodplain Mapping (FHM, FHBM, FIRM, or work maps) (see definition above).

Non-Mapped Community: A Community (County, City or Village) which does not have Floodplain Mapping (see definition above). State Minimum Standards apply within these Communities.

Non-Participating Community: A Community (County, City or Village) which does not participate in the National Flood Insurance Program (NFIP) (Ref. 5). A non-participating community does not regulate development activities that occur in floodplains (mapped or potential) within in its jurisdiction. A list of Non-Participating Communities (Ref. 14) is maintained on the **FEMA** web site.

National Flood Insurance Program (NFIP): The program of flood insurance coverage and floodplain management administered under the Act and applicable federal regulations promulgated in CFR Title 44/Part-60/Subpart-B.

Participating Community: A Community for which **FEMA** has authorized the sale of flood insurance under the NFIP (Ref. 5). A Participating Community regulates development activities, via ordinances and permits, which occur in floodplains (mapped or potential) within in its jurisdiction. A list of Participating Communities (Ref. 14) is maintained on the **FEMA** web site.

Permit for Floodplain Development: A permit is required before construction or development begins within any Special Flood Hazard Area (SFHA). Permits are required to ensure that proposed development projects meet the requirements of the NFIP (Ref. 5) and the community's floodplain management ordinance. A community must also review all proposed developments to assure that all necessary permits have been received from those governmental agencies from which approval is required by Federal or State law.

Regulatory Floodway: The channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height. Communities must regulate development in these floodways to ensure that there are no increases in upstream flood elevations. For streams and other watercourses where **FEMA** has provided Base Flood Elevations (BFEs), but no floodway has been designated, the community must review floodplain development on a case-by-case basis to ensure that increases in water surface elevations do not occur, or identify the need to adopt a floodway if adequate information is available.

Special Flood Hazard Area (SFHA): An area having special flood, mudflow or flood-related erosion hazards and shown on a Flood Hazard Boundary Map (FHBM) or a Flood Insurance Rate Map (FIRM) (Ref. 7) Zone A, AO, A1-A30, AE, A99, AH, AR, AR/A, AR/AE, AR/AH, AR/AO, AR/A1-A30, V1-V30, VE or V. SFHAs are delineated on an NFIP map as being subject to inundation by the base (100-year) flood.

Zone: A geographical area shown on a Flood Hazard Boundary Map (FHBM) or a Flood Insurance Rate Map (FIRM) (Ref. 7) that reflects the severity or type of flooding in the area.

Zone	Description
Moderate to Low-Risk Areas – In communities that participate in the NFIP, flood insurance is available to all property owners and renters in these zones:	
B and X (shaded)	Area of moderate flood hazard, usually the area between the limits of the 100-year and 500-year floods. B Zones are also used to designate the base floodplains of lesser hazards, such as areas protected by levees from 100-year flood, or shallow flooding areas with average depths of less than one foot or drainage areas less than 1 square mile.
C and X (unshaded)	Area of minimal flood hazard, usually depicted on FIRMs as above the 500-year flood level, Zone C may have ponding and local drainage problems that don't warrant a detailed study or designation as base floodplain. Zone X is the area determined to be outside the 500-year flood and protected by levee from 100-year flood.
High Risk Areas – In communities that participate in the NFIP, mandatory flood insurance purchase requirements apply to all of these zones:	
A	Areas with a 1% annual chance of flooding. Because detailed analyses are not performed for such areas; no depths or base flood elevations are shown within these zones.
AE	The base floodplain where base flood elevations are provided. AE Zones are now used on new format FIRMs instead of A1-A30 Zones.
A1-A30	These are known as numbered A Zones (e.g. A14 or A 20). This is the base floodplain where the FIRM shows a BFE (old FIRM format).
AH	Areas with a 1% annual chance of shallow flooding, usually in the form of a pond, with an average depth ranging from 1 to 3 feet. Base flood elevations derived from detailed analyses are shown at selected intervals within these zones.
AO	River or stream flood hazard area, and areas with a 1% or greater chance of shallow flooding each year, usually in the form of sheet flow, with an average depth ranging from 1 to 3 feet.
AR	Areas with a temporarily increased flood risk due to the building or restoration of a flood control system (such as a levee or a dam).
A99	Areas with a 1% annual chance of flooding that will be protected by a Federal flood control system where construction has reach specified legal requirements. No depths or base flood elevations are shown within these zones.
High Risk – Coastal Areas – In communities that participate in the NFIP, mandatory flood insurance purchase requirements apply to all of these zones.	
V	Coastal areas with a 1% or greater chance of flooding and an additional hazard associated with storm waves. No base flood elevations are shown within these zones.
Zone	Description
VE, V1-V30	Coastal areas with a 1% or greater chance of flooding and an additional hazard associated with storm waves. Base flood elevations derived from detailed analyses are shown at selected intervals within these zones.
Undetermined Risk Areas	
D	Areas with possible but undetermined flood hazards. No flood hazard analysis has been conducted.

*Reference – FEMA Map Service Center (FEMA Flood Map Service Center | Welcome!)

Nebraska Administrative Code Title 455 (Ref. 9)
Chapter 1 – Minimum Standards for Floodplain Management Programs Definitions:

"Base flood" shall mean the flood having a one per cent chance of being equaled or exceeded in magnitude in any given year.

"Flood" shall mean the water of any watercourse or drainway which is above the bank or outside the channel and banks of such watercourse or drainway.

"Floodway" shall mean the channel of a watercourse or drainway and the adjacent land areas that are necessary to be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one foot.

"Flood fringe" shall mean that portion of the floodplain of the base flood which is outside of the floodway.

"Floodplain" shall mean the area adjoining a watercourse or drainway which has been or may be covered by floodwaters.

"Floodplain management regulations" shall mean and include zoning ordinances, subdivision regulations, building codes, and Title 455 Chapter 1 - 3 - other applications of the police power which are authorized by law to secure safety from floods and provide for the reasonable and prudent use of floodplains.

"New construction" shall mean obstructions for which the "start of construction" commenced on or after the effective date of the floodplain management regulation adopted by a community and includes any subsequent improvements to such obstructions.

"Obstruction" shall mean any wall, wharf, embankment, levee, dike, pile, abutment, projection, excavation (including the alteration or relocation of a watercourse or drainway), channel rectification, bridge, conduit, culvert, building, stored equipment or material, wire, fence, rock, gravel, refuse, fill, or other analogous structure or matter which may impede, retard, or change the direction of the flow of water, either in itself or by catching or collecting debris carried by such water, or that is placed where the natural flow of the water would carry such structure or matter downstream to the damage or detriment of either life or property. Dams designed to store or divert water are not obstructions if permission for the construction thereof is obtained from the Department of Natural Resources pursuant to The Safety of Dams and Reservoirs Act (Sections 46-1601 to 46-1670 R.R.S., 1943 as amended.)

"Potential Base Floodplain" shall refer to NDOT's policy, developed in partnership with DWEE NE, to meet State Minimum Standards in unmapped communities by identifying watersheds greater than 640 acres as Potential Base Floodplains and evaluating the project's impact to the Base Flood Elevation at that location.

"Structure" shall mean a walled and roofed building that is principally above ground, as well as a manufactured home, and a gas or liquid storage tank that is principally above ground.

"Substantial improvement" shall mean any reconstruction, rehabilitation, addition, or other improvement of an obstruction, the cost of which equals or exceeds 50 percent of the market value of the obstruction before "start of construction" of the improvement. This includes obstructions which have incurred "substantial damage," regardless of the actual repair work performed. The term does not, however, include either (1) any project for improvement of a structure or other obstruction to correct existing violations of state or local health, sanitary, or safety code specifications which have been identified by the local code enforcement official and which are the minimum necessary to assure safe living conditions, or (2) any alteration of an "historic structure," provided that the alteration will not preclude the structure's continued designation as an "historic structure."

"Watercourse" shall mean any depression two feet or more below the surrounding land which serves to give direction to a current of water at least nine months of the year and which has a bed and well-defined banks.

Other General NDOT Terminology:

Floodway Fringe: The portion of the 100-year floodplain that is not within the floodway and in which development and other forms of encroachment may be permitted under certain circumstances.

Location Hydraulic Study: The preliminary investigative study to be made of base floodplain encroachments by a proposed highway action. (This study must be performed by a registered engineer with hydraulic expertise.) For specific requirements, see 23 CFR 650.111 (Ref. 3).

Longitudinal Encroachment: An encroachment that is parallel to the direction of flow. Example: A highway that runs along the edge of a river is, usually considered a longitudinal encroachment.

Risk Assessment: An economic and/or non-economic assessment of the impacts associated with the floodplain encroachment(s). It is meant to be more general in detail than a risk analysis. The format and content of the Summary Floodplain Encroachment Report form is the minimum required for a risk assessment.

REFERENCES

1. National Environmental Policy Act (NEPA)
https://ceq.doe.gov/

2. **NDOT** Environmental Guidance Library
Environmental Guidance Library - NDOT

3. 23 Code of Federal Regulations 650 (23 CFR 650)
https://www.law.cornell.edu/cfr/text/23/part-650

4. 44 Code of Federal Regulations 59 (44 CFR 59)
https://www.law.cornell.edu/cfr/text/44/part-59

5. **FEMA** National Flood Insurance Program (NFIP)
Flood Insurance | FEMA.gov

6. 44 Code of Federal Regulations 60 (44 CFR 60)
https://www.law.cornell.edu/cfr/text/44/part-60

7. **FEMA** Flood Insurance Rate Maps (FIRM)
Flood Insurance Rate Map (FIRM) | FEMA.gov

8. Additional Guidance on 23 CFR 650A
Attachment 2 - Additional Guidance on 23 CFR 650A - Hydrology & Floodplains - Hydraulics - Bridges & Structures - Federal Highway Administration (dot.gov)

9. Nebraska Administrative Code Title 455, Chapter 1 – State Minimum Standards for Floodplain Management
STATE OF NEBRASKA

10. Executive Order 11988
Executive Order 11988 Floodplain Management | FEMA.gov

11. **FEMA** National Flood Insurance Program Maps
https://www.fema.gov/flood-insurance

12. 23 Code of Federal Regulations 771 (23 CFR 771)
Revision of National Environmental Policy Act Regulations Interim Final Rule

13. 42 USC 4001 – National Floodplain Insurance Act of 1968
National Flood Insurance Act of 1968

14. **FEMA** Community Status Book
Community Status Book | FEMA.gov

15. **DWEE NE** -Letter of Map Revisions (LOMR)
Interactive Maps | DWEE NE

16. Nebraska Revised Statutes Chapter 31
Nebraska Legislature - Revised Statutes Chapter 31

17. Clean Water Act Section 404
Overview of Clean Water Act Section 404 | US EPA

18. Clean Water Act Section 401
Section 401 of the Clean Water Act | US EPA

19. Corps of Engineers Section 408
Section 408 (army.mil)

20. United States Coast Guard (USCG) Section 9 Bridge Permit
Bridge Permit Application Process

21. **NDOT** Roadway Design Manual (*RDM*), Current Edition
Roadway Design Manuals - NDOT

22. **FEMA** Flood Map Service Center
FEMA Flood Map Service Center | Welcome!

23. **NDOT** Design Process Outline (*DPO*), Current Edition
https://dot.nebraska.gov/business-center/design-consultant/

24. University of Nebraska-Lincoln, Atlas of the Sand Hills, Bleed and Flowerday, 1998
https://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1843&context=conservationsurvey

25. **NDOT** Bridge Hydraulic Analysis Guidelines
Bridge - NDOT

ADDITIONAL RESOURCES

Federal Emergency Management Agency (**FEMA**)
Home | FEMA.gov

Nebraska Department of Water, Electricity, and Environment (**DWEE NE**)
Welcome | DWEE NE

Design Standards for Highways in National Flood Insurance Program Mapped Floodplains, FHWA, April 21, 1992
Design Standards for Highways in National Flood Insurance Program Mapped Floodplains - Floodplains - Hydrology & Floodplains - Hydraulics - Bridges & Structures - Federal Highway Administration

Flood Disaster Protection Act of 1973
COMPS-1039.pdf

National Flood Insurance Reform Act in 1994
National Flood Insurance Reform of 1994

NDOT Drainage Design and Erosion Control Manual, Current Edition
Roadway Design Manuals - NDOT

Memorandum of Understanding between **FHWA**, **Nebraska Division** and **NDOT** – State Assumption of Responsibility for Categorical Exclusions – 23 U.S.C. §326
326-mou-signed-12-sep-2024.pdf

Nebraska Categorical Exclusion Guidance
Environmental Guidance Library - NDOT

DWEE NE Floodplain Interactive Map
Interactive Maps | DWEE NE

Nebraska Revised Statutes Chapter 49
Nebraska Legislature - Revised Statutes Chapter 49