

Section E: Inundation Hazards: No Adverse Impact Development Standards, 2018 Model Bylaw

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E. Inundation: (Flood Hazard Area Overlay (FHO) District/Flood Hazard Area)

I. Statement of Purpose for Managing Inundation Hazards

- A. To allow for the wise use of floodplain lands in a way that minimizes potential damage to existing structures and development located within this hazard zone.
- B. Provide an adequate means of protecting the beneficial functions of undeveloped floodplains and development that is already located within floodplains.
- C. Avoid encroachments in flood hazard areas that may result in cumulative degradation of natural floodplain function leading to increased flood elevations, velocities, and river instability.
- D. To protect infill and redevelopment from inundation hazards.
- E. To discourage new encroachments on undeveloped property within the (FHO/Flood Hazard Area) that provide for floodwater and sediment storage.

II. Lands to Which this Bylaw Applies

A. Special Flood Hazard Areas

This bylaw shall apply to the Special Flood Hazard Areas (SFHAs, hereafter referred to as “flood hazard areas” or “FHAs”) in the Town/City/Village of _____, Vermont as described below. Flood Hazard Areas are identified in and on the most current flood insurance studies and maps¹ published by the Department of Homeland Security, Federal Emergency Management Agency (FEMA), National Flood Insurance Program (NFIP), as provided by the Secretary of the Agency of Natural Resources (ANR) pursuant to 10 V.S.A. § 753, which are hereby adopted by reference and declared to be part of this bylaw.

Establishment of (the FHO District/Flood Hazard Areas)

For towns w/ zoning: The FHO is an overlay district. All other requirements of the underlying district or another overlay district such as the River Corridor Overlay District, shall apply in addition to the provisions herein, unless it is otherwise so indicated. If there is a conflict with another such district, the stricter provision shall apply. The flood hazard area, as delineated by FEMA, may contain two parts; the floodway where limited development may be permitted and the remaining part of the flood hazard area (outside of the floodway) called the flood fringe. Within the flood hazard area, the inundation risk and type of

¹ Where Flood Insurance Rate Maps have not been published, this includes Special Flood Hazard Areas identified on Flood Hazard Boundary Maps produced by the Federal Insurance Administration.

damages may differ according to the type of flooding that occurs. Therefore, the identified FHO district is separated into different sub-districts to provide protection based upon flooding type:

1. The floodway - The floodway is depicted on the Flood Insurance Rate Maps/Flood Boundary and Floodway Maps for this community².
2. The flood fringe - identified as the area of the FEMA Special Flood Hazard Area (labeled as Zone A, AE, A1-30, AH, AO) outside of the floodway on the most current NFIP maps.

Unless one of these sub-districts is specifically named, reference to the FHO District Includes both.

For Towns w/o zoning: The flood hazard area, as delineated by FEMA, may contain two parts; the floodway where limited development may be permitted and the remaining part of the flood hazard area (outside of the floodway) called the flood fringe. Within the flood hazard area, the inundation risk and type of damages may differ according to the type of flooding that occurs. Therefore, the identified flood hazard area is separated into different zones to provide protection based upon flooding type:

1. The floodway - The floodway is depicted on the Flood Insurance Rate Maps/Flood Boundary and Floodway Maps for this community³.
2. The flood fringe - identified as the area of the flood hazard area (labeled as Zone A, AE, A1-30, AH, AO) outside of the floodway on the most current NFIP maps.

Unless one of these zones is specifically named, reference to the Flood Hazard Area Includes both sub-zones.

B. Base Flood Elevations and Floodway Limits

1. Where available, base flood elevations and floodway limits provided by the NFIP and in the Flood Insurance Study and accompanying maps shall be used to administer and enforce this bylaw.
2. The floodway, as adopted by this community, shall consist of the channel of a river or other watercourse and the adjacent land areas that shall be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one foot at any point.
3. In the (FHO District/Flood Hazard Area) where base flood elevations and/or floodway limits have not been provided by the NFIP in the Flood Insurance Study and accompanying maps, it is the applicant's responsibility to develop the necessary data, as

² Please note that the floodway may be shown on a separate map panel entitled "Flood Boundary and Floodway Map" for maps made in 1986 or earlier. Maps can be accessed online at <https://msc.fema.gov>

³ Please note that the floodway may be shown on a separate map panel entitled "Flood Boundary and Floodway Map" for maps made in 1986 or earlier.

specified in **Section C [Administration]**. Where available, the applicant shall use data provided by FEMA, or state or federal agencies to administer this bylaw.

C. **Jurisdictional Determination and Interpretation**

1. The information presented on any maps, or contained in any studies, adopted by reference, is presumed accurate.
2. If uncertainty exists with respect to the boundaries of the **(FHO District/Flood Hazard Area)**, the location of the boundary shall be determined by the Administrative Officer (AO). The AO may require additional topographic or base flood elevation information if necessary to make such determination. If available, the AO shall use a FEMA Letter of Map Amendment (LOMA) or Letter of Map Revision (LOMR) in making a determination. Once issued, the LOMA or LOMR shall constitute proof of the **FHO/Flood Hazard Area** boundary and whether the proposed development is within the **FHO/Flood Hazard Area**.⁴.
3. A FEMA Letter of Map Revision based on Fill (LOMR-F) that has been issued after the effective date of this bylaw shall not be used to remove lands from the jurisdiction of this bylaw.
4. When the AO deems a property is within the **(FHO District/Flood Hazard Area)**, an applicant seeking to challenge such determination shall have 15 days from the date of receiving the AO's determination to notify the AO of his or her intent to seek proof of the boundary. Upon timely filing of such notification letter by the applicant, the application for the zoning permit shall not be considered complete until the AO has received a LOMA or LOMR issued by FEMA or any other evidence identified in such notice.

III. Development Classifications and Permit Requirements in the (FHO District/Flood Hazard Area)

A. **Exempted Activities**

The following activities do not require a permit under this section of this bylaw:

1. The removal of a building or other improvement in whole or in part, so long as the ground elevations under and adjacent to the removed structure remain unchanged. Please be aware that for damaged structures where FEMA mitigation funds may be used, the damaged structure may be required to remain in place until funds are granted.
2. Routine maintenance of existing buildings in the usual course of business required or undertaken to conserve the original condition, while compensating for normal wear and tear. Routine maintenance includes actions necessary for retaining or restoring a piece of equipment, machine, or system to the specified operable condition to achieve its maximum useful life and does not include expansions or improvements to development.
3. Interior improvements to existing buildings that cost less than 500 dollars.
4. Maintenance of existing sidewalks, roads, parking areas, or stormwater drainage; this does not include expansions.

⁴ <https://www.fema.gov/letter-map-amendment-letter-map-revision-based-fill-process>

5. Maintenance of existing bridges, culverts, and channel stabilization activities; this does not include expansions.
6. Streambank armoring and stabilization, retaining walls, and abutment work that do not reduce the cross-sectional flow area of the river or stream channel and have coverage under a Stream Alteration Permit, if required, under 10 V.S.A. Chapter 41 and the rules adopted thereunder.
7. The following activities are exempt from municipal regulation, but may require a permit under the State's "Vermont Flood Hazard Area and River Corridor Rule" (Environmental Protection Rule, Chapter 29):
 - a. State-owned and -operated institutions and facilities.
 - b. Forestry operations and silvicultural (forestry) activities conducted in accordance with the Vermont Department of Forests and Parks Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in Vermont or other accepted silvicultural practices, as defined by the Commissioner of Forests, Parks and Recreation.
 - c. Agricultural activities conducted in accordance with the Vermont Agency of Agriculture Food and Market's Required Agricultural Practices (RAPs). Prior to the construction of farm structures, the farmer shall notify the AO in writing of the proposed activity. The notice shall contain a sketch of the proposed structure including setbacks.
 - d. Public utility power generating plants and transmission facilities regulated under 30 V.S.A. § 248.
 - e. Telecommunications facilities regulated under 30 V.S.A. § 248a;
8. Planting projects which do not include any construction or grading activities in accordance with 24 V.S.A. § 4424(c).
9. Subdivision of land that does not involve or authorize development.

B. Permits

Except as provided in Section E.III.A [Exempted Activities], a permit is required from the AO for all development that is located within the (FHO District/Flood Hazard Area). Development that requires conditional use approval or a variance from the Zoning Board of Adjustment (ZBA)/Development Review Board(DRB) under this bylaw must have such approvals prior to the issuance of a permit by the AO.

1. All permits shall require that a permittee have all other necessary permits from state and federal agencies before work may begin.

C. Administrative Review; Permitted Development

The following development activities in the (FHO District/Flood Hazard Area) meeting the Development Standards in Section E.IV, require an administrative review from the AO and may receive a permit from the AO without review by the ZBA/DRB:

1. Within the entire (FHO District/Flood Hazard Area):
 - a. Above grade development located on ground, which has not been elevated by the placement of fill, that is one foot above base flood elevation and documented with

field-surveyed topographic information certified by a registered professional engineer or licensed land surveyor.

- b. Open fencing and signs elevated on poles or posts that create minimal resistance to the movement of floodwater.
 - c. At-grade parking or other at-grade/below grade development that will not create an obstruction to flood flows.
 - d. Municipal transportation infrastructure improvements designed and constructed by the Vermont Agency of Transportation that have written confirmation from the ANR Regional Floodplain Manager that the project is designed to meet or exceed the applicable standards in this bylaw.
 - e. River and floodplain restoration projects, including dam removal, that restore natural and beneficial floodplain functions and include written confirmation from the ANR Regional Floodplain Manager that the project is designed to meet or exceed the applicable standards in this bylaw.
2. Within the Flood Fringe Sub-district:
- a. Improvements or repairs from damage to structures that do not expand the existing footprint and do not meet the definition of “substantial improvement” or “substantial damage”.
 - b. Accessory structures not greater than 500 square feet.
 - c. Development related to on-site septic or water supply systems.
 - d. Building utilities.
 - e. Recreational vehicles or travel trailers.
 - f. New fill for existing associated transportation and utility networks or to accommodate a replacement on-site septic system, if it can be demonstrated that no other practicable alternative is available.

D. Prohibited Development

Except as provided in Section E.III.A [Exempted Activity], the following is prohibited:

1. Within the entire (FHO District/Flood Hazard Area):
 - a. Fully enclosed areas below grade on all sides, including below grade crawlspaces and basements.
 - b. New critical facilities.
2. Within the Floodway Sub-district:
 - a. New accessory structures.
 - b. New encroachments, except for minor improvements⁵ to existing structures or relating to bridges, culverts, roads, stabilization projects, public utilities, river and/or floodplain restoration projects, or health and safety measures.

⁵ Minor improvements are those that would not affect base flood elevations, consistent with the provisions of FEMA P-480; Desk Reference for Local Officials: https://www.fema.gov/pdf/floodplain/nfip_sg_unit_5.pdf

- c. Changes to existing structures where the footprint of the structure is proposed to expand laterally into the floodway greater than 500 square feet.
- d. Storage of materials or junk yards.

E. Conditional Use Review

In accordance with 24 V.S.A. § 4414, conditional use review and approval by the ZBA/DRB is required prior to the issuance of a permit by the AO for any activity in the (FHO District/Flood Hazard Area) that is not exempt or eligible for administrative review.

F. Non-Conforming Structures and Uses

- 1. A nonconforming structure in the FHO District/Flood Hazard Area that has been substantially damaged or destroyed may be reconstructed in its original location only if it is rebuilt to comply with all requirements of the National Flood Insurance Program and this bylaw;
- 2. Nonconforming structures and uses shall be considered abandoned where the structures or uses are discontinued for more than 12 months. An abandoned structure shall not be permitted for re-occupancy unless brought into compliance with this bylaw. An abandoned use shall not be permitted unless brought into compliance with this bylaw.

IV. Development Standards

The criteria below are the minimum standards for development in the (FHO District/Flood Hazard Area). If the floodway or flood fringe is not specified, the standard applies to the entire (FHO District/Flood Hazard Area). Where more than one district is involved, the most restrictive standard shall take precedence.

A. Floodway Sub-district

Within the floodway sub-district, the following standards apply:

- 1. New encroachments are prohibited within the floodway, except for the following, which also shall comply with Section E.IV.A.2, below:
 - a. changes to existing structures where the footprint is proposed to expand horizontally into the floodway less than 500 square feet;
 - b. new encroachments relating to bridges, culverts, roads, stabilization projects, public utilities, functionally dependent uses, and river or floodplain restoration projects;
 - c. new encroachments relating to health and safety measures, such as replacement of pre-existing on-site septic and water supply systems, if no other practicable alternative is available;
- 2. For all proposed new encroachments and above-grade development, a hydraulic analysis is required to be provided for review. The analysis should be performed in accordance with standard engineering practice, by a registered professional engineer, certifying that the proposed development will:
 - a. Not result in any increase in flood levels during the occurrence of the base flood;
 - b. Not increase base flood velocities; and

- c. Not increase any risk to surrounding properties, facilities, or structures from erosion or flooding.
 - 3. For development that is either below grade or will not result in any change in grade, the hydrologic & hydraulic analyses may be waived, where the applicant will provide pre- and post-development elevations demonstrating that there will be no change in grade, and that the development will be adequately protected from scour.
 - 4. For any new encroachment that is proposed within the floodway sub-district where a hydraulic analysis is required, the applicant may provide a FEMA Conditional Letter of Map Revision (CLOMR)⁶, in lieu of a hydraulic analysis, to demonstrate that the proposed activity will not have an adverse impact.
- B. No Adverse Impact (NAI) Standard within the Flood Fringe

Within the flood fringe, the following standards apply:

 - 1. Compensatory Flood Storage

New development or redevelopment shall not decrease flood storage capacity. Therefore, except as noted in subsection E.IV.B.2 [Compensatory Flood Storage Requirement Exceptions] below, development that displaces floodwater storage in the flood fringe shall provide compensatory storage to offset the impacts of the proposal. This is required when the development will cause an increase or will contribute incrementally to an increase in the horizontal extent and level of flood waters during peak flows up to and including the base flood discharge.

 - a. Volumetric analyses⁷ and supporting data, demonstrating compensatory storage to offset the impacts of the proposal, shall be provided by the applicant and certified by a registered professional engineer.
 - i. An applicant may submit a hydraulic analysis that demonstrates that a project will not increase flood elevations and velocities on floodwaters in lieu of a NAI volumetric analysis.
 - b. Compensatory flood storage designs shall not materially impact adjacent landowners or structures.
 - i. If the design may create an undue adverse impact to adjacent landowners or structures, a hydraulic analysis shall be required to verify that a proposed development will not increase base flood elevations and velocities. Hydraulic analyses and supporting data shall be provided by the applicant and certified by a registered professional engineer
 - 2. Compensatory Flood Storage Requirement Exceptions
 - a. The NAI compensatory storage requirement may be waived for proposed designs that have no more than a minimal effect on floodwater storage and will not result in diverting floodwaters onto an adjacent property or structure. Examples of designs that have a minimal effect on floodwater storage include an open foundation design; utility work that is largely or completely located below grade; minor above

⁶ <https://www.fema.gov/conditional-letter-map-revision>

⁷ For more information on volumetric analysis, please refer to ANR's Compensatory Flood Storage guide at <http://dec.vermont.gov/watershed/rivers/river-corridor-and-floodplain-protection/state-permits>

ground improvements such as fences or poles that minimally displace or divert floodwaters; and development that will not result in any change to the pre-development ground elevations. A determination to waive the NAI compensatory storage requirement shall include written concurrence from the ANR regional floodplain manager, that the project will have only a minimal effect on floodwater storage.

- b. For remediation of properties with contaminated soils, such as Brownfields sites, the NAI compensatory storage requirement may be waived, if hydraulic analysis demonstrates that the remediation will not increase flood elevations and velocities. Hydraulic analyses and supporting data shall be provided by the applicant and certified by a registered professional engineer.
- c. The NAI compensatory storage requirement may be waived for a replacement structure if:
 - i. There is no increase in the structure's footprint, or
 - ii. An open foundation design is used. Examples include using compliant flood vents or openings, or elevating the structure on post, piers, or pilings with no structural foundation walls below the design flood elevation.
- d. The NAI compensatory storage requirement may be waived for associated transportation and utility networks⁸ and replacement on-site septic system proposals, if the applicant demonstrates that the placement of fill cannot be mitigated.

C. The FHO District/Flood Hazard Area (Zones A1-30, AE, AH, AO)

Within the FHO District/Flood Hazard Area, the following standards apply:

1. *All development*, except development that is exempt under Section E.III.A, shall be:
 - a. Reasonably safe from flooding.
 - b. Designed (or modified) and adequately anchored to prevent flotation, collapse, release, or lateral movement of the structure.
 - c. Constructed with materials resistant to flood damage.
 - d. Constructed by methods and practices that minimize flood damage.
 - e. Constructed with electrical, heating, ventilation, plumbing and air conditioning equipment and other service facilities that are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding.
 - f. Adequately drained to reduce exposure to flood hazards.
 - g. Required to elevate or floodproof any fuel storage tanks to at least two feet above the base flood elevation. This can be achieved by:

⁸ These do not include state transportation networks or power generation and transmission utility networks subject to the Public Utility Commission jurisdiction, as those are exempt from municipal regulation and are regulated under the State Flood Hazard Area & River Corridor Rule;

<http://dec.vermont.gov/sites/dec/files/documents/wsmd-fha-and-rc-rule-adopted-2014-10-24.pdf>

- i. Elevating the fuel storage tank a minimum of two feet above the BFE and securely anchoring the tank to prevent flotation. The tank shall be located on the land-ward or downstream side of the building and all inlets, fill openings, line connections, and vents shall be elevated to two feet above the BFE. Any structure or platform used to elevate the tank shall be designed to withstand anticipated flood loads and forces;
 - ii. In places where elevation of the fuel storage tank is not possible due to the location of existing fuel hookup/fuel lines into an existing building:
 - A. The tank shall be securely anchored to prevent floatation while protecting it from flood forces and debris. Any structure or platform used to anchor and protect the tank shall be designed to withstand anticipated flood forces and debris. The tank vent pipe/valve shall be located at a minimum two feet above the BFE; or
 - B. Storage tanks may be placed underground, if securely anchored and certified by a qualified professional and are protected from flood forces such as scour, erosion, velocity flow, and buoyancy (uplift) force.
- 2. For any new structure, replacement structure, substantially improved structure, or structure that has experienced substantial damage, outdoor utilities (electrical, heating, ventilation, plumbing, and air conditioning equipment) and other service facilities (such as sewer, gas, and water systems), shall be located on the landward or downstream side of the building and/or behind structural elements, and located and constructed to minimize or eliminate flood damage.
- 3. In Zones AE and A1 – A30 *where floodway limits have not been determined*, development shall not be permitted unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated encroachment, will not increase the base flood elevation more than one foot at any point within the community. The demonstration shall be supported by technical data that conforms to standard hydraulic engineering principles and certified by a registered professional engineer (see Section C – Administration for more information about application submittal requirements).
- 4. For new, replacement or substantially improved structures, or for structures that have incurred substantial damage, fully enclosed areas below grade on all sides (including below grade crawlspaces and basements) are prohibited.
- 5. Recreational vehicles, equipment and boat trailers, portable toilets, construction trailers, and other travel trailers shall:
 - a. Be currently registered, licensed and ready for highway use; or
 - b. Be on site for fewer than 180 consecutive days; or
 - c. Meet the requirements for structures in Sections E.IV.A, E.IV.B, and E.IV.C, as appropriate.
- 6. Water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the system.

7. Sanitary sewage systems shall be designed to minimize or eliminate infiltration of flood waters into the systems and discharges from the systems into flood waters.
8. On-site waste disposal systems shall be located to avoid impairment to them or contamination from them during flooding.
9. The flood carrying capacity within any altered or relocated portion of any watercourse shall be maintained, any alteration or relocation shall not result in any decrease of stream stability.
10. Bridges, culverts and channel management activities, which by their nature shall be placed in or over the watercourse, shall have a Stream Alteration permit from the Agency of Natural Resources, if required.
11. Subdivisions and Planned Unit Developments shall be accessible by dry land access outside of any (FHO District/Flood Hazard Area).
12. Structural Standards
 - a. New structures, existing structures to be substantially improved or replaced, or that have incurred substantial damage shall be located such that the lowest floor is at least two feet above base flood elevation. This shall be documented in the proposed and as-built condition with a FEMA Elevation Certificate.
 - b. New non-residential structures, and non-residential structures to be substantially improved, replaced, or that have incurred substantial damage shall:
 - i. Meet the standards of Section E.IV.C.12.a, above; or
 - ii. Have the lowest floor, including basement, together with attendant utility and sanitary facilities, designed so that two feet above the base flood elevation the structure is dry floodproofed, meaning watertight with walls substantially impermeable to the passage of water and with structural components having the capability of resisting hydrostatic and hydrodynamic loads and effects of buoyancy.
 - iii. A permit for dry floodproofing shall not be issued until a registered professional engineer or architect has reviewed the structural design, specifications, and plans, and has certified that the design and proposed methods of construction are in accordance with accepted standards of practice for meeting the provisions of this subsection;
 - iv. Dry floodproofing measures used to meet the above floodproofing standard shall work without the use of human intervention at the time of flooding. Exceptions to this standard are when the facility is adequately staffed at all hours with people trained and able to deploy the facility's floodproofing measures, or if the structure is located in a floodplain that has a National Weather Service flood forecast stream gauge that provides adequate advanced warning of potential flooding for the deployment of the floodproofing system.
 - c. New structures, or existing structures to be substantially improved or replaced, or that have incurred substantial damage in Zone AO shall have the lowest floor, including basement, elevated above the highest adjacent grade, at least two feet above the depth number specified on the community's FIRM, or at least three feet if no depth number is specified.⁹

⁹ E.IV.C.12.c is not required unless the community has AO zones on the community's Flood Insurance Rate Map.

- d. Critical facilities that are to be replaced, substantially improved, or meet the definition of substantial damage shall be constructed so that the lowest floor, including basement, shall be elevated or dry-floodproofed at least one foot above the elevation of the 0.2% annual flood height (500-year floodplain), or three feet above base flood elevation, whichever is higher. A critical facility shall have at least one access road connected to land outside the 0.2% annual chance floodplain that is capable of accommodating emergency services vehicles. The top of the access road shall be no lower than six inches below the elevation of the 0.2% annual chance flood event.
- e. For historic structures that would meet the definition of substantial improvement or substantial damage if not for their historic structure designation, the improved or repaired building shall meet the following mitigation performance standards for areas below the base flood elevation:
 - i. Any future damage to enclosures below the lowest floor shall not result in damage to the foundation, utility connections, or elevated portions of the building or nearby structures;
 - ii. Utility connections (e.g., electricity, water, sewer, natural gas) shall be protected from inundation and scour or be easily repaired;
 - iii. The building foundation shall be structurally sound and reinforced to withstand a base flood event;
 - iv. The structure's historic designation shall not be precluded;
 - v. The likelihood of flood waters entering the structure during the base flood is reduced; and
 - vi. There shall be no expansion of uses below base flood elevation except for parking, storage, building access, or, in the case of non-residential buildings, where the space is dry floodproofed.
- f. Fully enclosed areas that are above grade, below the lowest floor, below BFE, and subject to flooding, shall:
 - i. Be solely used for parking of vehicles, storage, or building access, and such a condition shall clearly be stated on any permits; and
 - ii. Be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters. Such designs shall be certified by a registered professional engineer or architect, or meet or exceed the following minimum criteria: A minimum of two openings on two walls having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding shall be provided. The bottom of all openings shall be no higher than one foot above adjacent grade. Openings may be equipped with screens, louvers, valves, or other coverings or devices provided that they permit the automatic entry and exit of floodwaters; and
 - iii. Include a signed non-conversion agreement from the owner of the structure with the permit application stating that the enclosed area below the BFE will not be converted to another use not listed above in Section E.IV.C.12.f.i and that the community would have the ability to inspect the exterior and

interior of the enclosed area in compliance with the standards laid out in the non-conversion agreement.

- g. A small accessory structure of 500 square feet or less need not be elevated to the base flood elevation, provided the structure is placed on the building site so as to offer the minimum resistance to the flow of floodwaters and shall meet the criteria in Section E.IV.C.12.f above.