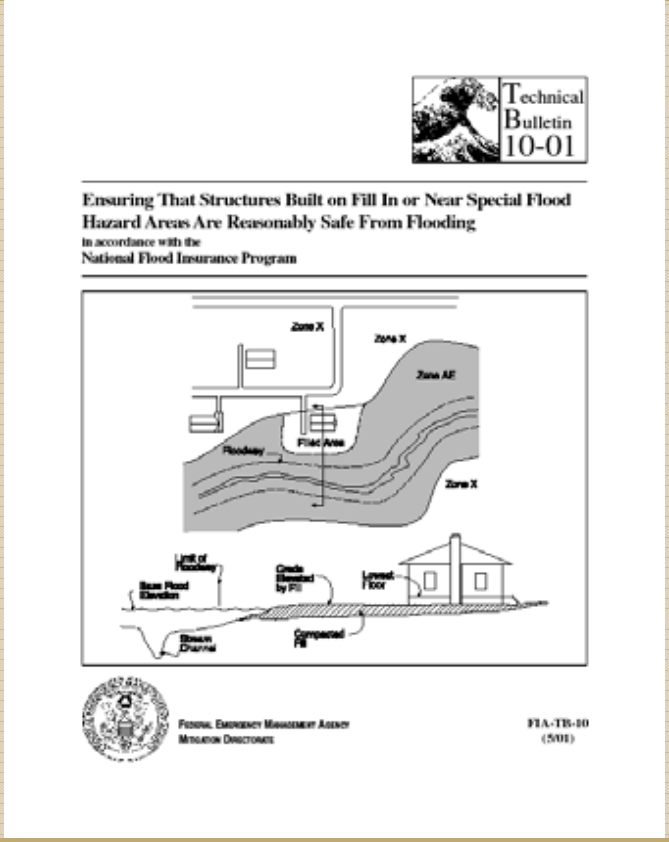
Technical Bulletin 10-01 Requirements and Applications



Presented by:

Derrick Martin, P.E., CFM, CPESC

Regulatory Requirements

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National Flood Insurance Program (NFIP) Regulations State:

- One Minimum Requirement Includes the Following:

  For all proposed development or construction, within a participating community, the community must “Review all permit applications to determine whether the proposed building sites will be reasonably safe from flooding.”

Definitions

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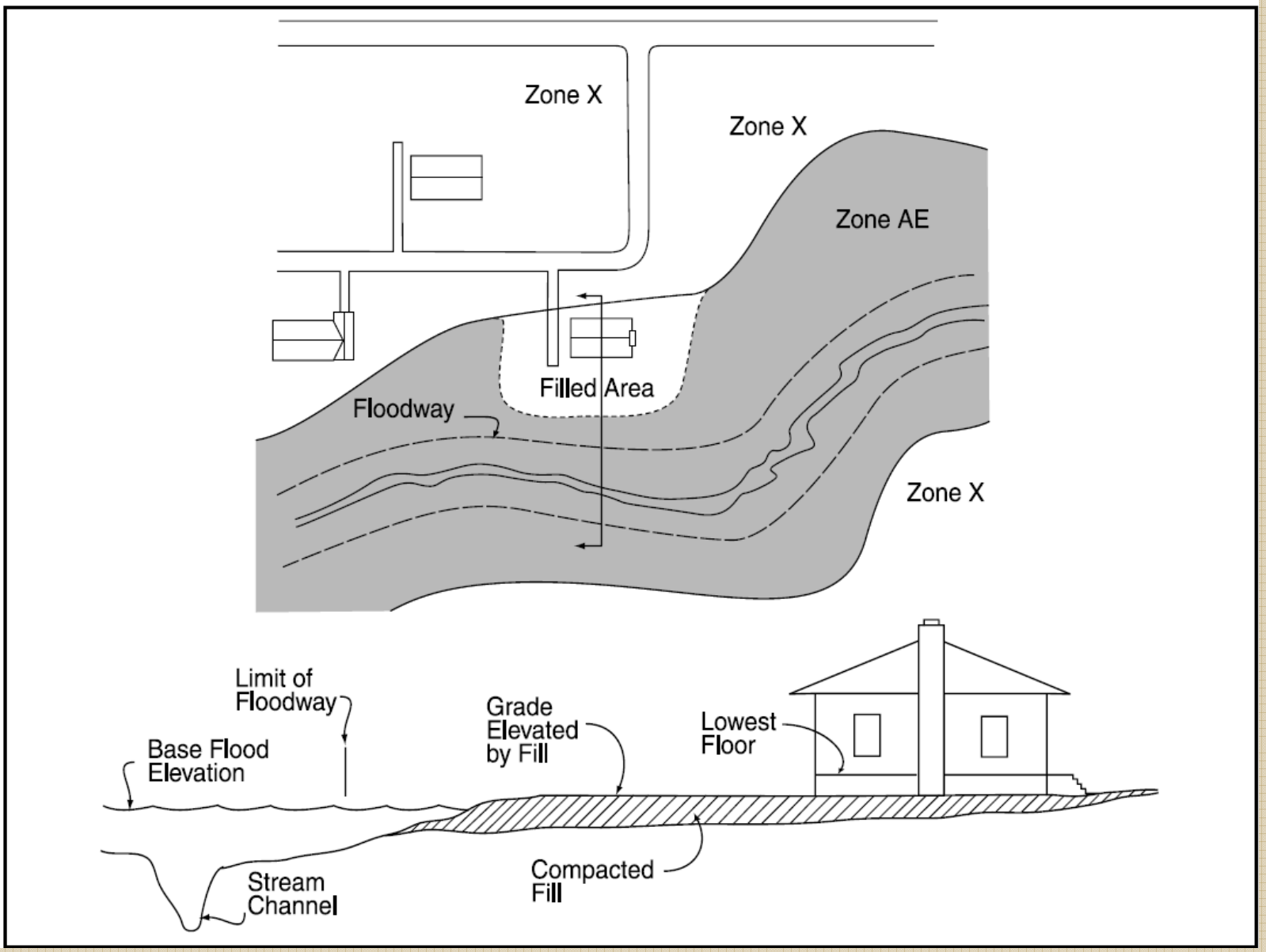
Reasonably Safe From Flooding

- Structure is dry during Base Flood condition
  - Low permeability soils to prevent water infiltration
- Structurally sound during Base Flood condition
  - Foundation walls & slab designed for conditions

44CFR 65.2(c) Definition (MT Forms)

(c) For the purposes of this part, reasonably safe from flooding means base flood waters will not inundate the land or damage structures to be removed from the SFHA and that any subsurface waters related to the base flood will not damage existing or proposed buildings.

Typical Application



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Community Acknowledgement Form (MT-1)

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DEPARTMENT OF HOMELAND SECURITY - FEDERAL EMERGENCY MANAGEMENT AGENCY
COMMUNITY ACKNOWLEDGMENT FORM

O.M.B. NO. 1660-0015
Expires February 28, 2014

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this data collection is estimated to average 1.38 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing and submitting the form. This collection is required to obtain or retain benefits. You are not required to respond to this collection of information unless a valid OMB control number is displayed on this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Department of Homeland Security, Federal Emergency Management Agency, 1800 South Bell Street, Arlington, VA 20598-3005, Paperwork Reduction Project (1660-0015). **NOTE: Do not send your completed form to this address.**

This form must be completed for requests involving the existing or proposed placement of fill (complete Section A) *OR* to provide acknowledgment of this request to remove a property from the SFHA which was previously located within the regulatory floodway (complete Section B).

This form must be completed and signed by the official responsible for floodplain management in the community. **The six digit NFIP community number and the subject property address must appear in the spaces provided below. Incomplete submissions will result in processing delays.** Please refer to the MT-1 instructions for additional information about this form.

Community Number: _____ **Property Name or Address:** _____

A. REQUESTS INVOLVING THE PLACEMENT OF FILL

As the community official responsible for floodplain management, I hereby acknowledge that we have received and reviewed this Letter of Map Revision Based on Fill (LOMR-F) or Conditional LOMR-F request. Based upon the community's review, we find the completed or proposed project meets or is designed to meet all of the community floodplain management requirements, including the requirement that no fill be placed in the regulatory floodway, and that all necessary Federal, State, and local permits have been, or in the case of a Conditional LOMR-F, will be obtained. For Conditional LOMR-F requests, the applicant has or will document Endangered Species Act (ESA) compliance to FEMA prior to issuance of the Conditional LOMR-F determination. For LOMR-F requests, I acknowledge that compliance with Sections 9 and 10 of the ESA has been achieved independently of FEMA's process. Section 9 of the ESA prohibits anyone from "taking" or harming an endangered species. If an action might harm an endangered species, a permit is required from U.S. Fish and Wildlife Service or National Marine Fisheries Service under Section 10 of the ESA. For actions authorized, funded, or being carried out by Federal or State agencies, documentation from the agency showing its compliance with Section 7(a)(2) of the ESA will be submitted. In addition, we have determined that the land and any existing or proposed structures to be removed from the SFHA are or will be reasonably safe from flooding as defined in 44CFR 65.2(c), and that we have available upon request by DHS-FEMA, all analyses and documentation used to make this determination. For LOMR-F requests, we understand that this request is being forwarded to DHS-FEMA for a possible map revision.

Community Comments:

Community Official's Name and Title: (*Please Print or Type*)		Telephone No.:
Community Name:	Community Official's Signature: (required)	Date:

B. PROPERTY LOCATED WITHIN THE REGULATORY FLOODWAY

As the community official responsible for floodplain management, I hereby acknowledge that we have received and reviewed this request for a LOMA. We understand that this request is being forwarded to DHS-FEMA to determine if this property has been inadvertently included in the regulatory floodway. We acknowledge that no fill on this property has been or will be placed within the designated regulatory floodway. We find that the completed or proposed project meets or is designed to meet all of the community floodplain management requirements.

Community Comments:

Community Official's Name and Title: (*Please Print or Type*)		Telephone No.:
Community Name:	Community Official's Signature (required):	Date:

Overview & Concurrence Form (MT-2)

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C. REVIEW FEE

Has the review fee for the appropriate request category been included? ☐ Yes Fee amount: $____

☐ No, Attach Explanation

Please see the DHS-FEMA Web site at http://www.fema.gov/plan/prevent/fhm/frm_fees.shtm for Fee Amounts and Exemptions.

D. SIGNATURE

All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Name:	Company:	
Mailing Address:	Daytime Telephone No.:	Fax No.:
	E-Mail Address:	
Signature of Requester (required):	Date:	

As the community official responsible for floodplain management, I hereby acknowledge that we have received and reviewed this Letter of Map Revision (LOMR) or conditional LOMR request. Based upon the community's review, we find the completed or proposed project meets or is designed to meet all of the community floodplain management requirements, including the requirement that no fill be placed in the regulatory floodway, and that all necessary Federal, State, and local permits have been, or in the case of a conditional LOMR, will be obtained. In addition, we have determined that the land and any existing or proposed structures to be removed from the SFHA are or will be reasonably safe from flooding as defined in 44CFR 65.2(c), and that we have available, upon request by FEMA, all analyses and documentation used to make this determination.

Community Official's Name and Title:	Community Name:	
Mailing Address:	Daytime Telephone No.:	Fax No.:
	E-Mail Address:	
Community Official's Signature (required):	Date:	

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is to be signed and sealed by a licensed land surveyor, registered professional engineer, or architect authorized by law to certify elevation information, hydrologic and hydraulic analysis, and any other supporting data. All documents submitted in support of this request are correct to the best of my knowledge. All analyses have been performed correctly and in accordance with sound engineering practices. All project works are designed in accordance with sound engineering practices to provide protection from the 1% annual chance flood. If "as-built" conditions data/plan provided, then the structure(s) has been built according to the plans being certified, is in place, and is fully functioning. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name:	License No.:	Expiration Date:
Company Name:	Telephone No.:	Fax No.:
Signature:		Date:

Ensure the forms that are appropriate to your revision request are included in your submittal.

Form Name and (Number)	Required if ...
☐ Riverine Hydrology and Hydraulics Form (Form 2)	New or revised discharges or water-surface elevations
☐ Riverine Structures Form (Form 3)	Channel is modified, addition/revision of bridge/culverts, addition/revision of levee/floodwall, addition/revision of dam
☐ Coastal Analysis Form (Form 4)	New or revised coastal elevations
☐ Coastal Structures Form (Form 5)	Addition/revision of coastal structure
☐ Alluvial Fan Flooding Form (Form 6)	Flood control measures on alluvial fans

Seal (Optional)

Preferred Construction Methods

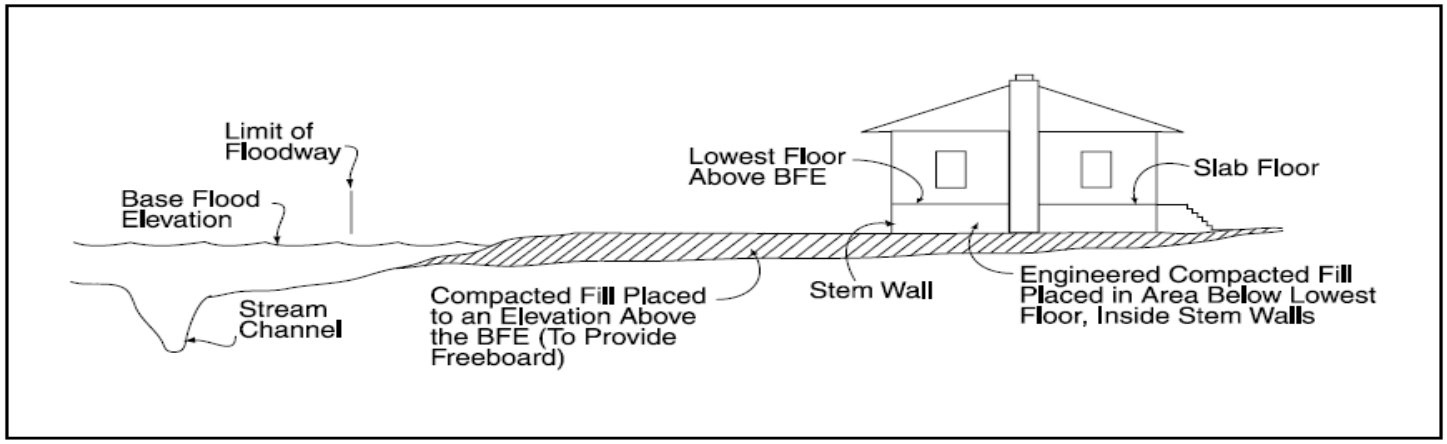

Figure 2 Structure on a stem wall foundation. The lowest floor is raised above the BFE. The space enclosed by the stem walls is filled with engineered compacted fill.

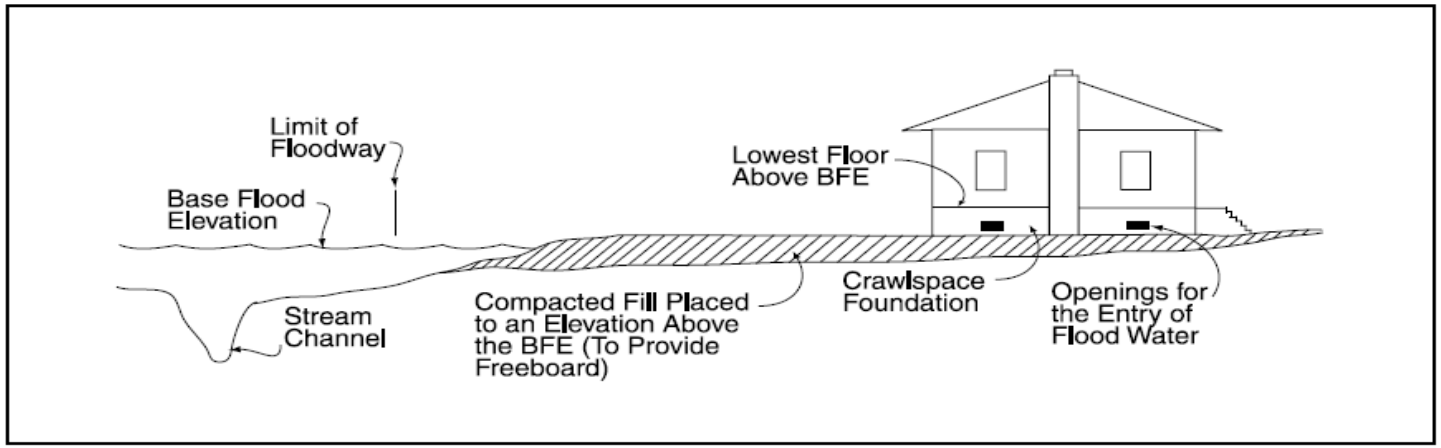

Figure 3 Structure on a crawlspace foundation. The lowest floor is raised above the BFE. Openings in the foundation walls allow water from floods higher than the fill elevation to enter the crawlspace and equalize the pressure on foundation walls.

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Preferred Construction Methods

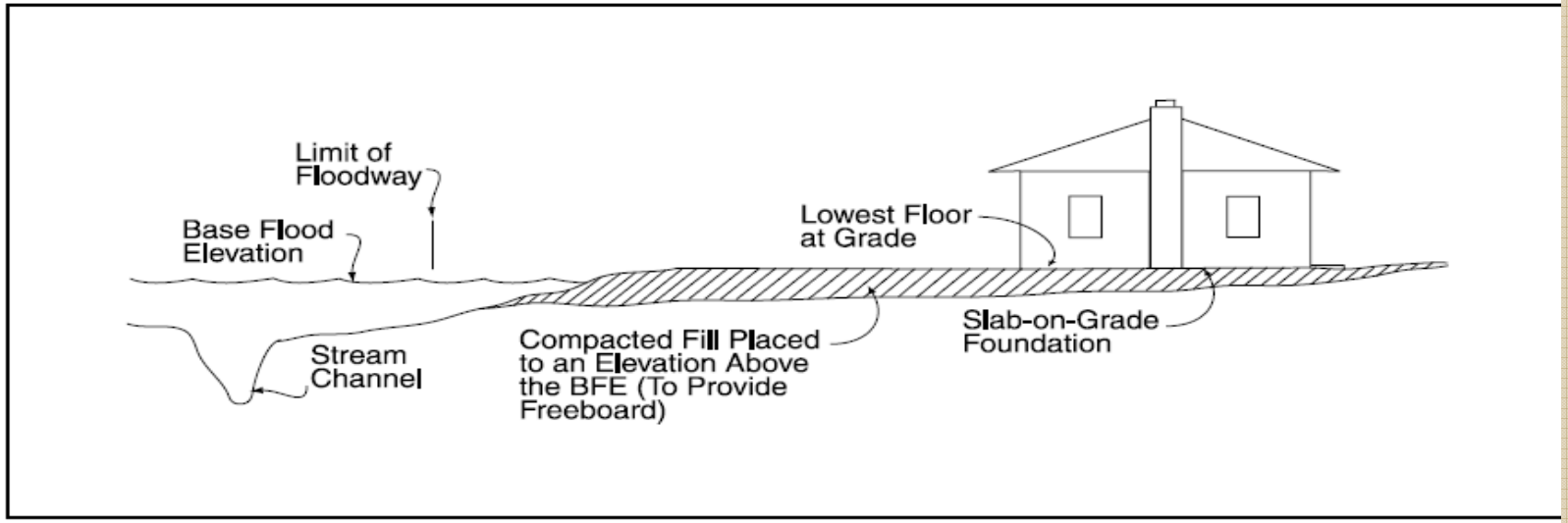

Figure 4 Structure on a slab-on-grade foundation. The lowest floor is typically slightly higher than the surrounding grade.

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What About Basements?

- Generally Not Allowed in SFHA
- Not Recommended for Areas Removed and/or Adjacent to SFHA

Flood Insurance Coverage for Basements

It is extremely important to note that the NFIP offers only limited coverage for basement flooding. First, in order for a claim to be paid, there must be a general condition of overland flooding where floodwaters come in contact with the structure. Secondly, the NFIP does not provide coverage for finished nonstructural elements such as paneling and linoleum in basement areas. Contents coverage is restricted to a limited number of items listed in the flood insurance policy. Contact a local insurance agent for more information.

Basement Construction Methods

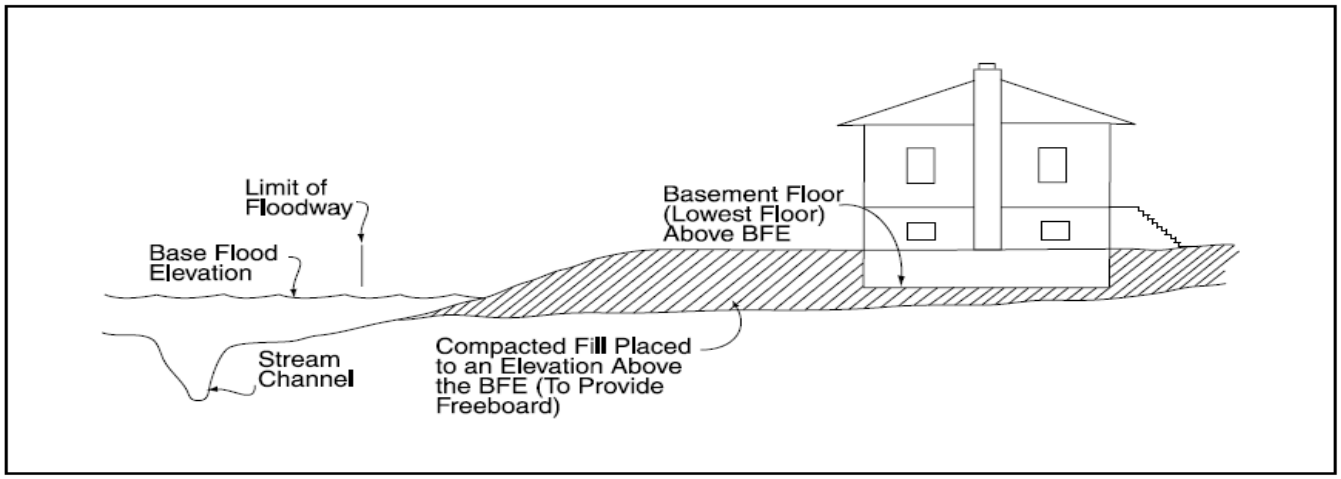

Figure 5 Basement foundation with lowest floor above the BFE. Damage from floods below the BFE is eliminated.

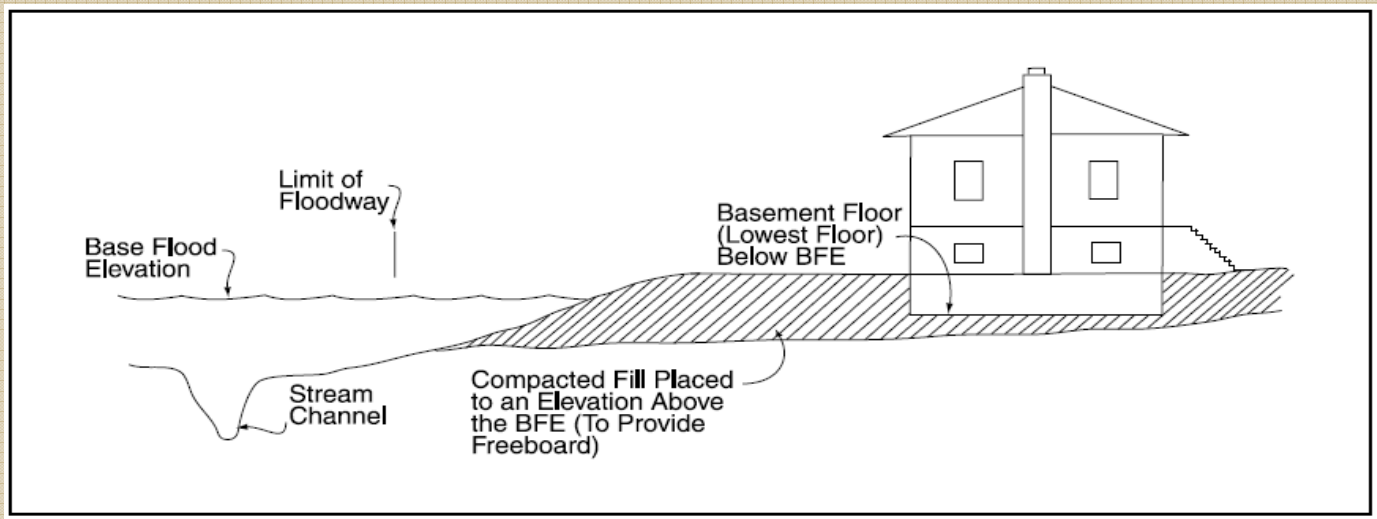

Figure 6 Basement foundation in fill placed above the BFE. The depth of the basement floor below the BFE is less than when no fill is placed.

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Basement Construction Methods

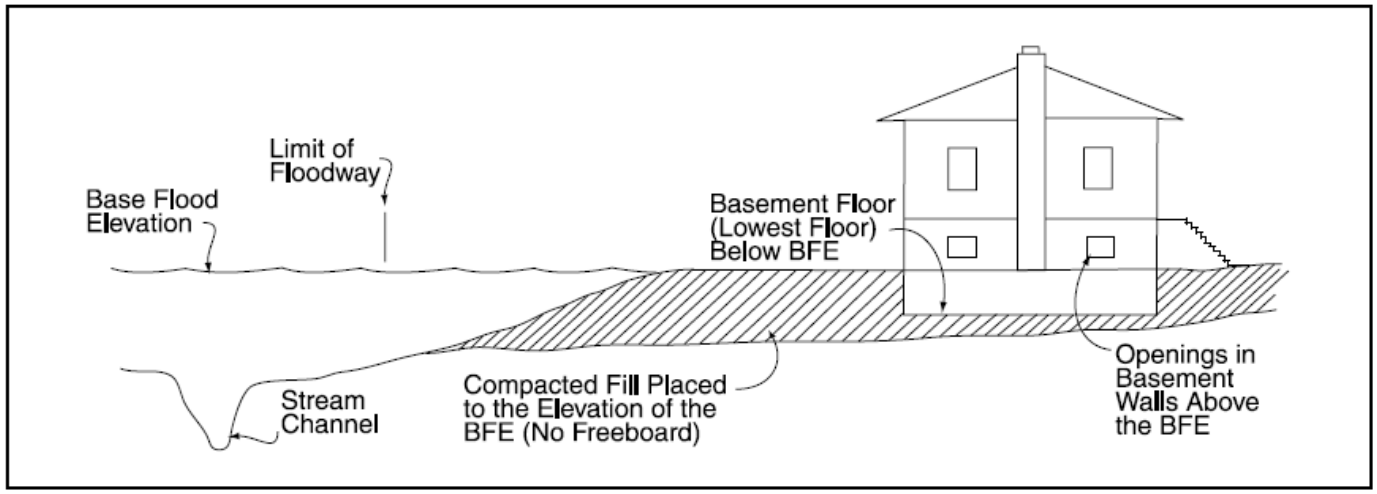

Figure 7 Basement foundation with lowest opening above the BFE. Surface flooding is less likely to enter and inundate the basement.

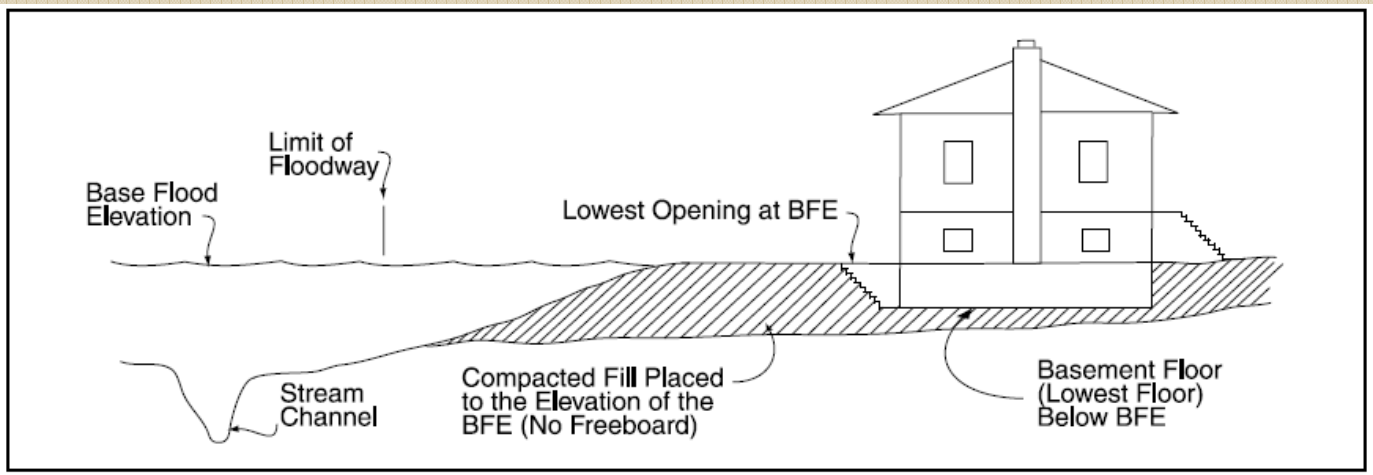

Figure 8 Basement foundation with lowest opening at the BFE. The basement is exposed to flooding from any flood greater than the Base Flood.

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Foundation Flood Risk

Table 1 Flood Risk by Foundation Construction Method

Foundation Flood Risk

Flood Risk During the Base Flood	Fill		Foundation Construction Method											
			Stem Walls		Crawlspace		Slab-On-Grade		Basement					
									Floor Level			Openings		
	Above BFE	At BFE	Above BFE	At BFE	Above BFE	At BFE	Above BFE	At BFE	Above BFE	At BFE	Below BFE	Above BFE	At BFE
Increasing Level of Flood Risk ↓	■		■										
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Reasonably Safe From Flooding

Follow Guidance in This Bulletin To Ensure That Building Is Reasonably Safe From Flooding

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Higher Risk Structures

Two Design Approaches Outlined in Guidance

- Simplified Approach
- Engineered Basement Option

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Simplified Approach

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- Ground At or Above BFE
- 20 Foot Setback
- Properly Compacted Fill That Extends 5 Feet Below Slab
- Generally Homogeneous Material with Low Permeability
- Basement No More Than 5 Feet Below BFE
- ¼ HP Sump Pump with Backup Power Supply Rated at 4X Estimated Seepage
- Discharge Above BFE
- Do Not Apply Building Code Exception for Drainage Systems in Well Drained Soils

Simplified Approach

Design Requirements

If, for a building and building site, **all** the requirements listed below are met (see Figure 10), the building is reasonably safe from flooding. If all of these requirements are not met, the more detailed analysis described under Engineered Basement Option, on page 19 of this bulletin, should be performed to determine whether the building is reasonably safe from flooding.

- ☐ The ground surface around the building and within a defined setback distance from the edge of the SFHA (see next item) must be at or above the BFE.
- ☐ The setback is the distance from the edge of the SFHA to the nearest wall of the basement. The minimum allowable setback distance is 20 feet.
- ☐ The ground around the building must be compacted fill; the fill material—or soil of similar classification and degree of permeability—must extend to at least 5 feet below the bottom of the basement floor slab.
- ☐ The fill material must be compacted to at least 95 percent of Standard Laboratory Maximum Dry Density (Standard Proctor), according to ASTM Standard D-698. Fill soils must be fine-grained soils of low permeability, such as those classified as CH, CL, SC, or ML according to ASTM Standard D-2487, *Classification of Soils for Engineering Purposes*. See Table 1804.2 in the 2000 *International Building Code* (IBC) for descriptions of these soil types.
- ☐ The fill material must be homogeneous and isotropic; that is, the soil must be all of one material, and the engineering properties must be the same in all directions.
- ☐ The elevation of the basement floor should be no more than 5 feet below the BFE.
- ☐ There must be a granular drainage layer beneath the floor slab, and a ¼-horsepower sump pump with a backup power supply must be provided to remove the seepage flow. The pump must be rated at four times the estimated seepage rate and must discharge above the BFE and away from the building. This arrangement is essential to prevent flooding of the basement or uplift of the floor under the effect of the seepage pressure.
- ☐ The drainage system must be equipped with a positive means of preventing backflow.
- ☐ Model building codes (such as the 2000 International Residential Code) also address foundation drainage (IRC Section R405) and foundation walls (IRC Section R404). Model building codes generally allow foundation drains to discharge through either mechanical means or gravity drains. In addition, there is often an exception to the requirement for drainage systems in well-drained soils. However, in or near floodplains, well-drained soils can, in fact, help convey groundwater towards the building foundation. Therefore, this exception should not apply in or near floodplains.

Simplified Approach

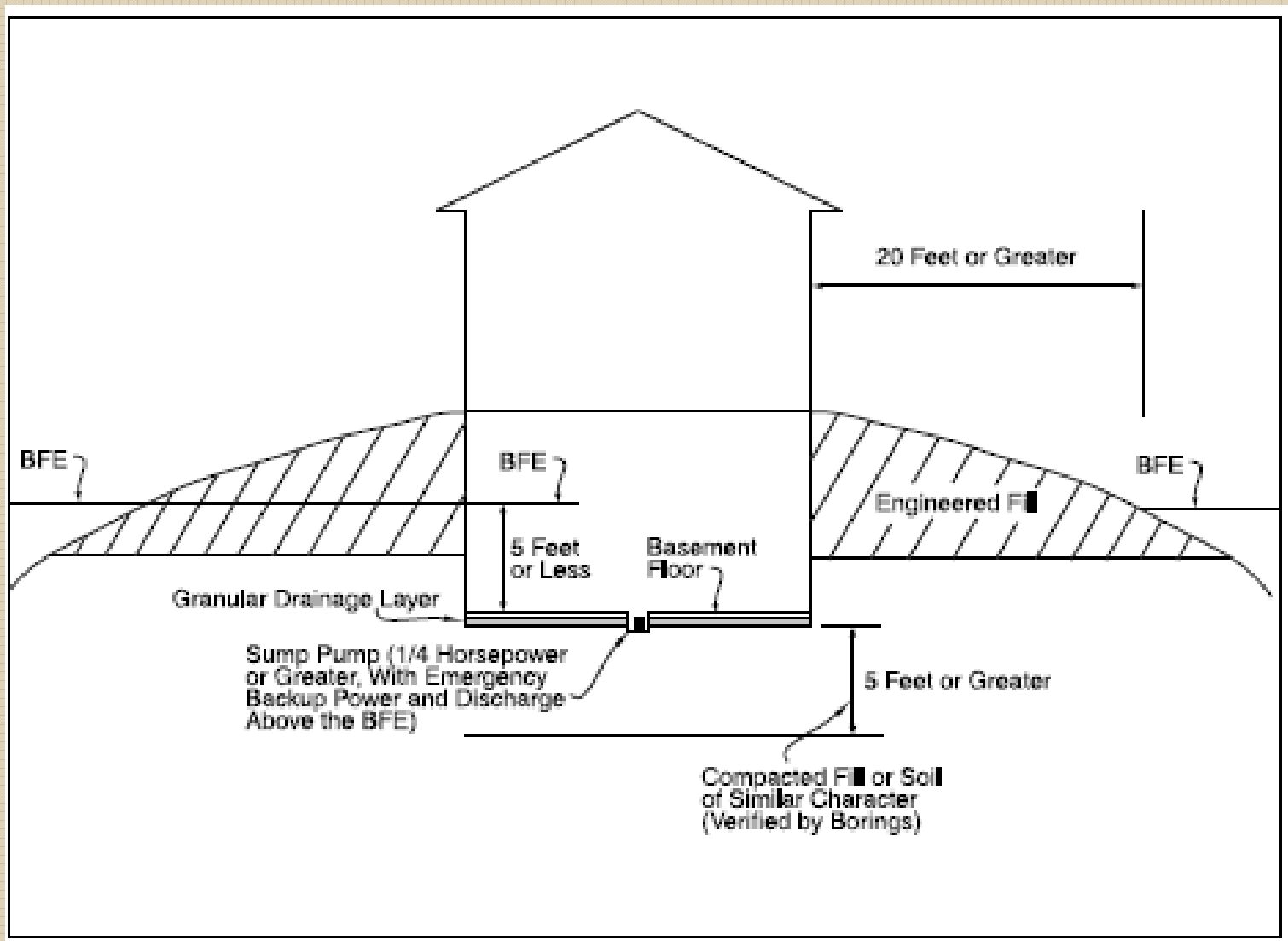

Figure 10 Requirements for use of the simplified approach to basement construction.

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Simplified Approach

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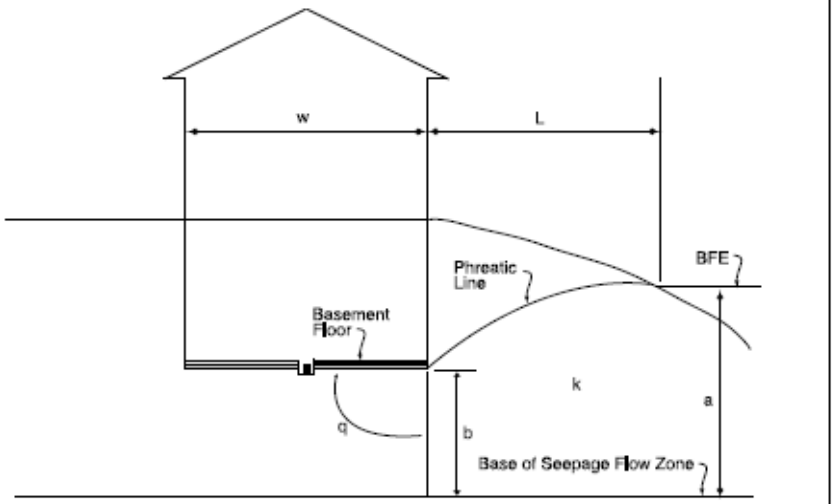
Design Assumptions

- Basement Footprint Less Than 1,200 Sq. Ft.
- Soil is Saturated
- BFE = Tailwater = Groundwater (generally conservative)
- Seepage Flow Zone is Defined
- Seepage Flow Calculated w/ Simplified Method

Simplified Approach



(1) $q = k(a^2 - b^2)/2L$

where: q = flow in cfs for a 1-foot width of seepage zone
k = soil permeability in feet per second
a = head at entry surface in feet
b = head at drain surface in feet
L = length of seepage zone (setback distance) in feet

(2) $Q = Pq$

where: Q = total seepage flow into drain in cfs
P = 2(basement length + width)
(for a square basement, P = 4w)

(3) Required sump pump capacity = 4Q for a safety factor of 4

Figure 11 Method for calculation of seepage flow.

The Dupuit equation for the quantity of seepage flow is:

$$q = k(a^2 - b^2)/2L$$

where: q is the flow in cubic feet per second for a 1-foot width of seepage zone

k is the soil permeability in feet per second (fps) (maximum value of k is 1×10^{-3} fps)

a and b are hydraulic heads in feet $(a < b + 5)$

L is the length of the flow zone in feet $(L > 20$ feet)

Engineered Approach

- Licensed Soils Engineer or Geologist
- More Detailed Look at Depth, Soil Type, & Stratification of Subsurface Soils
- Still Need BFE
- Elevation of Bottom of Basement Floor
- Setback Distance
- Elevation of Groundwater Table & Seasonal Variations
- Borings to a Depth Below Basement Floor that is 2x the Depth from BFE to Floor

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Engineered Approach

- Engineering Classification of Soils
- Evaluation of Subsurface Conditions Landward from Structure
- Information About Basement Wall Penetrations (Utilities)
- Seepage Analysis (Simplified Approach or Flow Net)

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Engineered Approach

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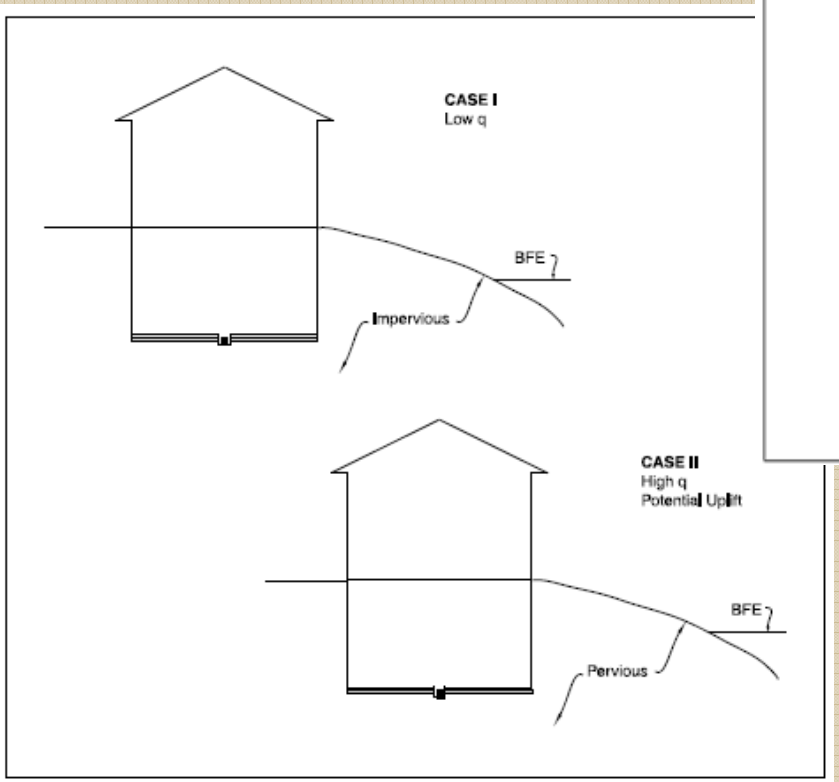


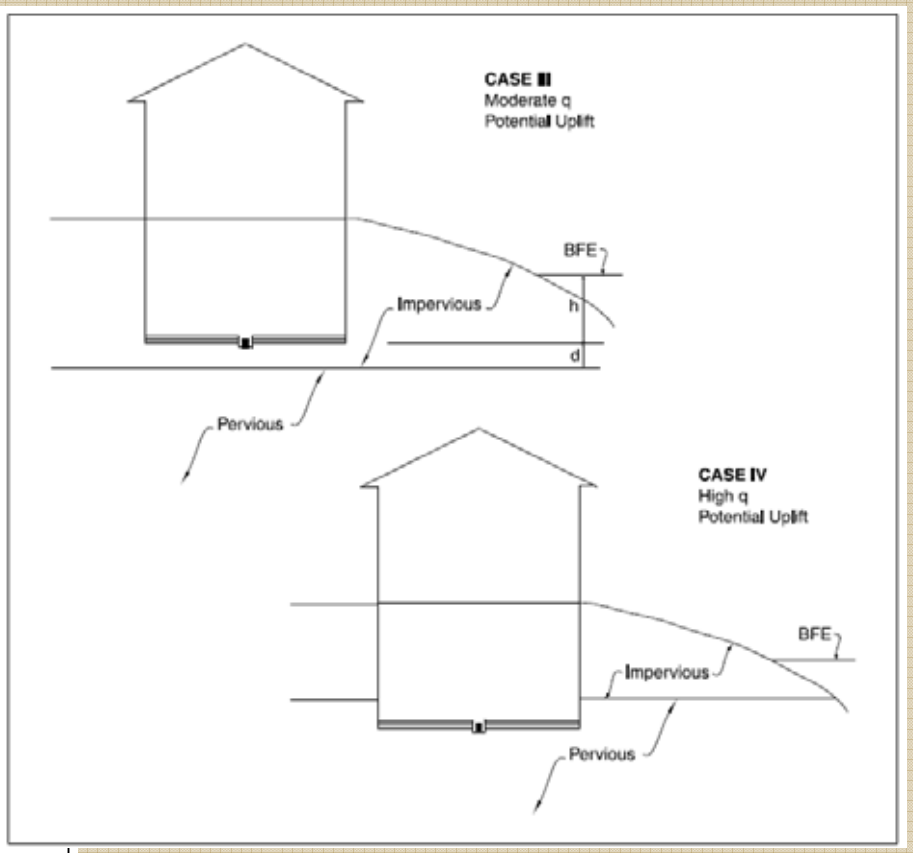
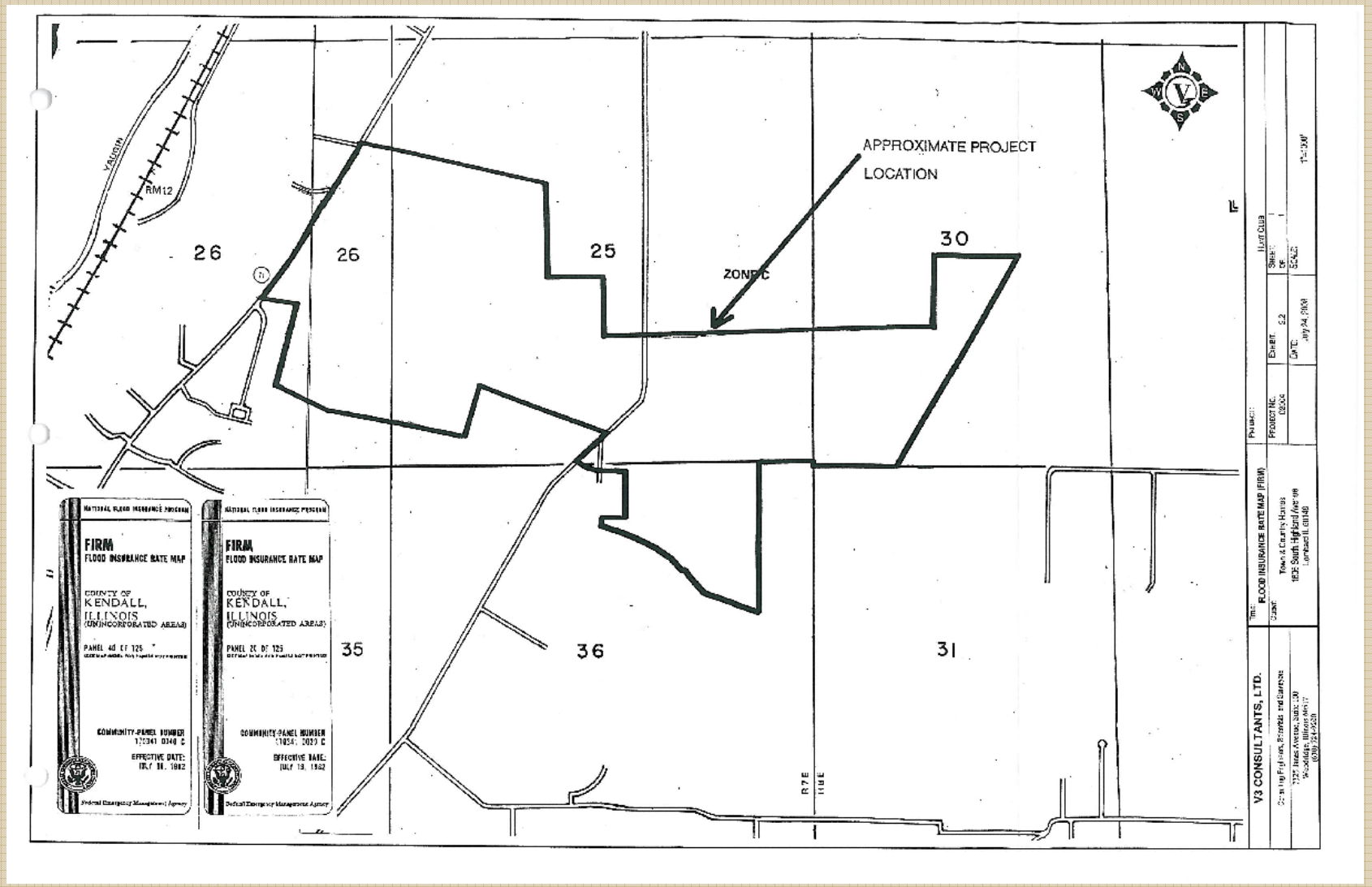


Figure 12 Case I and Case II – homogeneous soil.

Hunt Club LOMR



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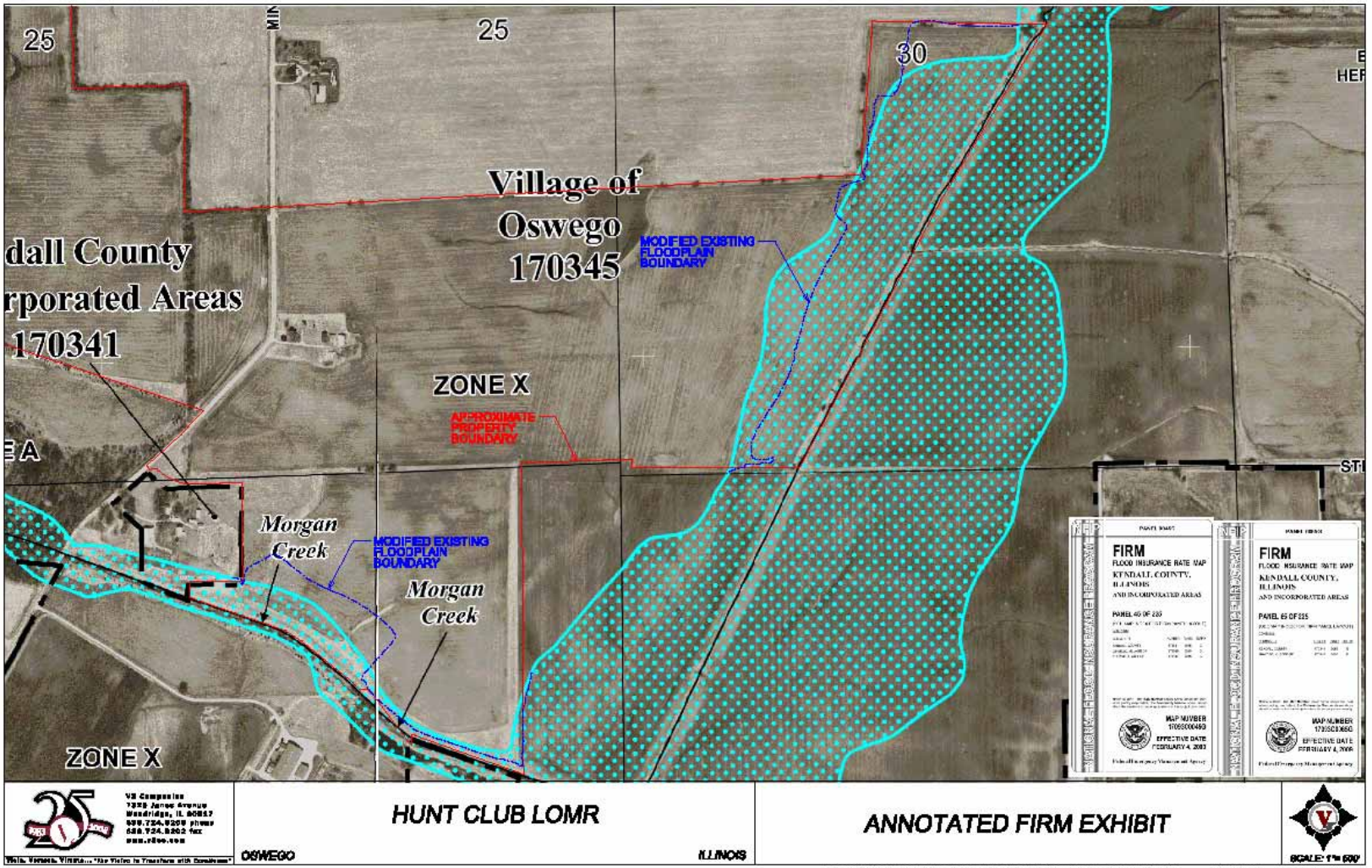
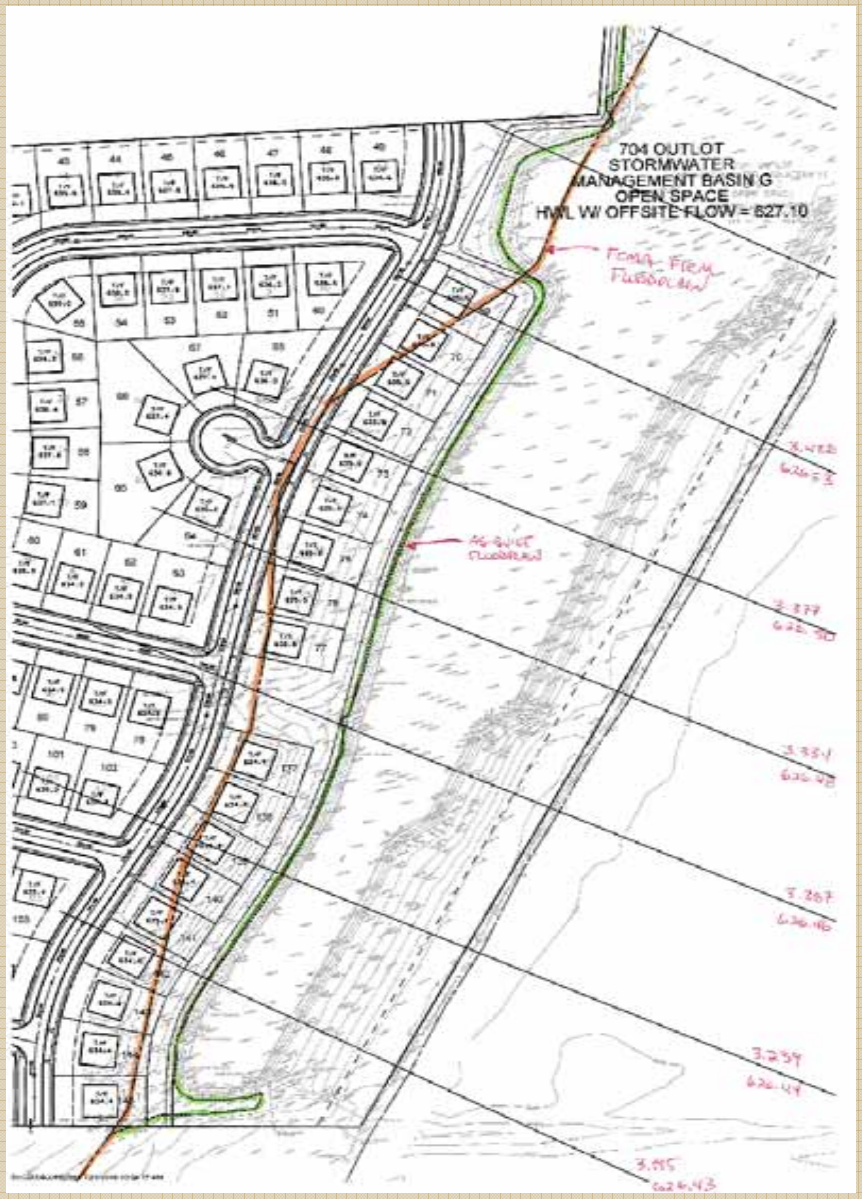
Project History



Project History



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Construction Method

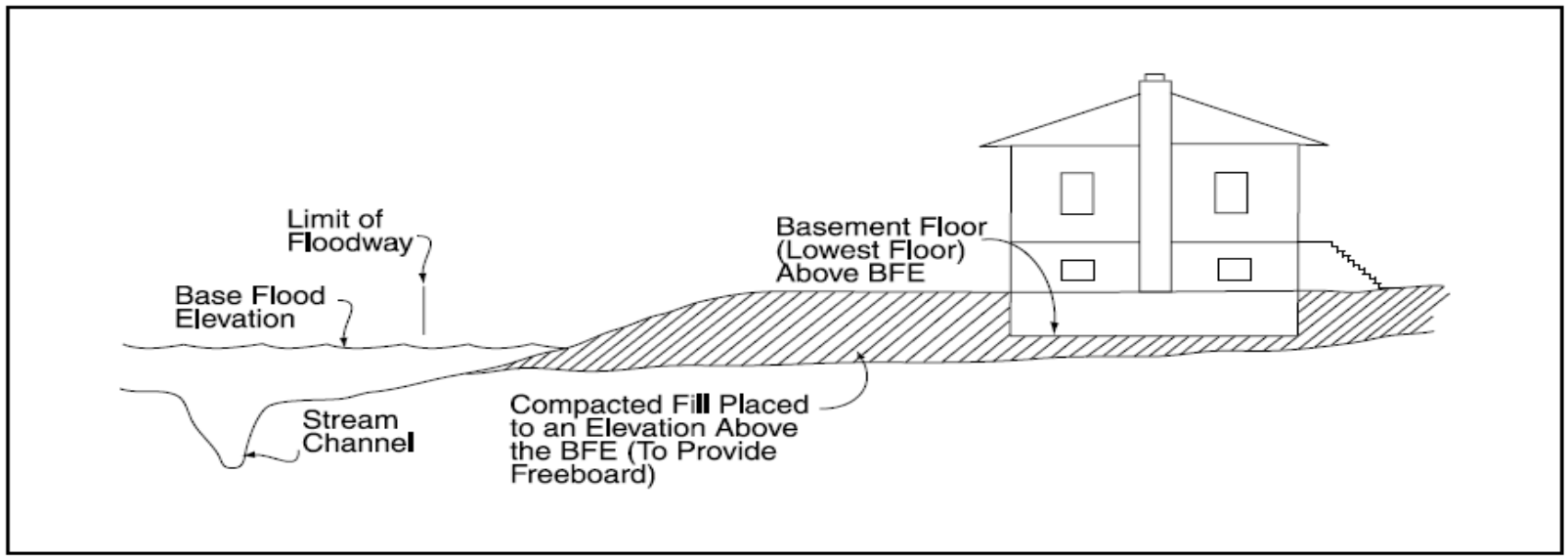

Figure 5 Basement foundation with lowest floor above the BFE. Damage from floods below the BFE is eliminated.

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Foundation Flood Risk

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Reasonably Safe From Flooding

Follow Guidance in This Bulletin To Ensure That Building Is Reasonably Safe From Flooding

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Lancaster Coach Homes

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Lancaster Coach Homes

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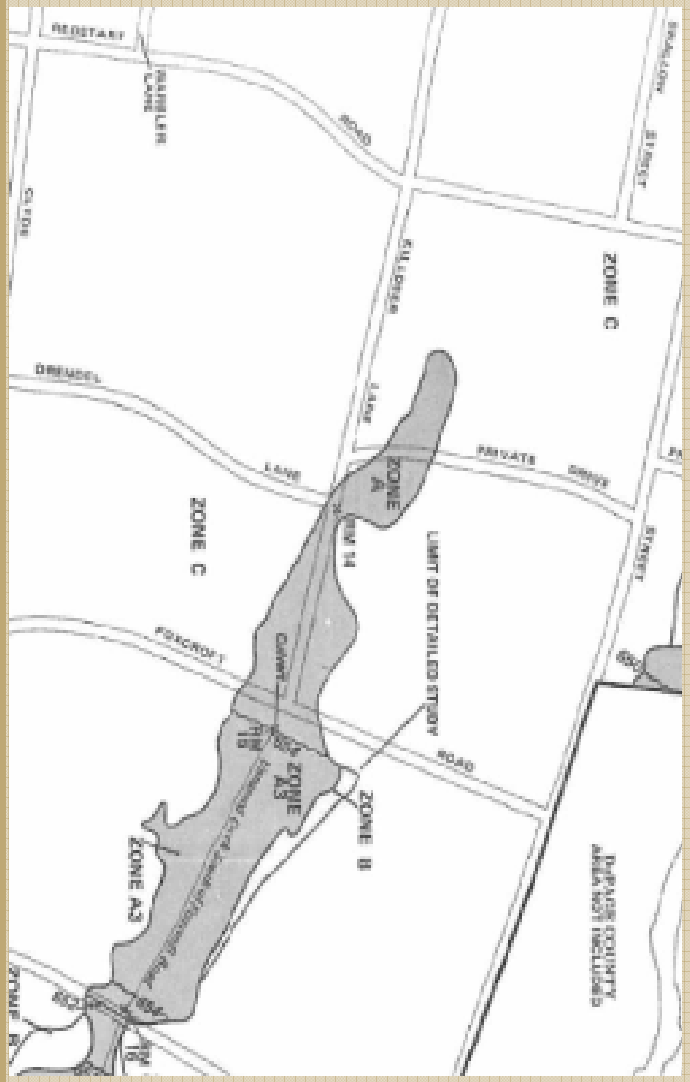
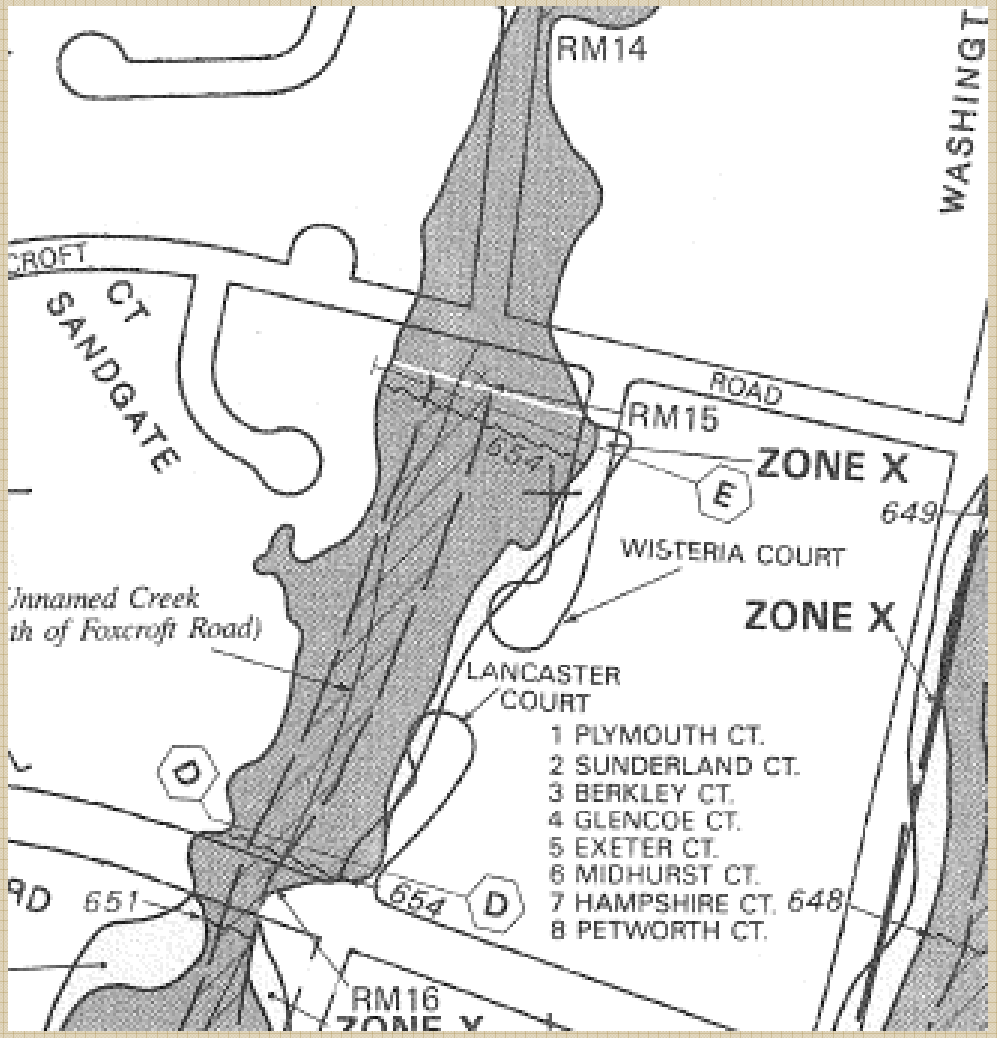


Historic Map



Current Regulatory Map

Project History

Future Regulatory Map

Lancaster Coach Homes

- No 20 Foot Setback
- No Soils Information
- Basement Are More Than 5 Feet Below BFE
- Limited Sump Pump Info.
- Engineered Approach
- TB 10-01 Will Help Resolve Violation

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QUESTIONS?